Homeschool Packet

# Saxon
# *Math 87*
## An Incremental Development
### SECOND EDITION

HAKE

SAXON

# Homeschool Packet
## for
# Saxon Math 87
## An Incremental Development, Second Edition

**Stephen Hake and John Saxon**

## Answers

### Contents

*Math 87: An Incremental Development*
*Second Edition*

*Homeschool Packet*

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**WWW:** www.saxonhomeschool.com

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# Using Saxon Materials in a Homeschool Environment

**Introduction**

This guide to using the Saxon Homeschool Math and Physics programs has been designed to help homeschoolers using our *Math 54* through *Calculus* and *Physics* get the most benefit from our program. Please read through this carefully and consider the advice given. Among all of the available learning programs, the Saxon program is unique. Some of this advice is common sense. However, many of these guidelines are specific to the Saxon program and require special attention by the parent-teacher and the student.

**Materials Available**

The basic package Saxon Publishers offers for homeschool students for grades four and above consists of a student textbook, test booklet, and answer booklet. The test booklets for *Math 54* through *Math 87* also include facts practice problems. The answer booklet includes answers to all the problems in the textbook, answers to the facts practice problems, and answers to the tests.

Also available from Saxon Publishers are solutions manuals for *Algebra 1/2* through *Calculus* and *Physics*. The solutions manuals contain step-by-step solutions for each problem in every lesson. These manuals are highly recommended as a powerful tool to aid in evaluating the student or to assist the student in developing solution strategies. We also offer a video that describes the Saxon philosophy and is an overview of the Saxon math program. To order any of our materials, please consult our catalog or call our customer service department at (800) 416-8171.

If you have access to the Internet, you can take advantage of our online services. Our World Wide Web site contains our latest catalogs, teacher resources, in-service information, errata, and much more. You can visit our site at **http://www.saxonhomeschool.com.** You can also contact us by E-mail to get general or specific help. For general help, our E-mail address is **info@saxonhomeschool.com.** For help with specific math questions, our E-mail address is **mathhelp@saxonhomeschool.com.**

**Planning the Course**

The first step when planning a course of study is to determine a schedule for how many lessons will be taught each week. To do this, find the total number of lessons in the textbook being studied. All lessons should be taken into account, including the review lessons, the numbered lessons, and any extra sections to be studied. Next, divide the total number of lessons by the amount of time desired to complete the textbook. For example, if you were beginning the *Algebra 1* program, its textbook has 3 review lessons plus 132 numbered lessons, which equals 135 lessons in all. Dividing the total number of lessons by the total number of weeks in a regular school year (estimated at 36 weeks) gives you 3.75 lessons per week. This means you will need to complete 3 to 4 lessons per week in order to cover every lesson in the textbook within a school year. A student will most likely be able to complete more lessons per week at the beginning of a book than towards the end. A similar strategy can be used to develop a time schedule to meet your own specific needs. Once you have developed your schedule, try to maintain a constant pace. *This is a very important point.* If a student's study schedule is broken up or erratic, his or her quality of learning will suffer.

It is also important to assure that the student is adequately prepared for each successive textbook. Knowledge of the basic addition, subtraction, multiplication, and division facts is crucial for success in mathematics. The Saxon Middle Grade Series, which includes *Math 54* through *Math 87*, continually practices these facts to ensure full mastery. To assist in this process we use several methods. For instance, fact cards, called *Middle Grades Basic Facts*, are available in our catalog. We also employ facts practice problems which are incorporated into the test booklets. These facts are designed to be practiced as speed drills so that the

student becomes progressively faster at answering each fact. Regular practice with these facts will allow for a smoother transition between textbooks.

## Teaching the Lessons

Though the textbook is the main tool for student learning, the help of a knowledgeable and concerned parent-teacher enhances the learning process. **The parent-teacher must assume responsibility for the student's education.** This can best be accomplished by ensuring that the student demonstrates competency in each area of study before continuing to the next, and making sure that the student completes all assignments. **Do not allow the student to do independent study.**

Part of the parent-teacher's responsibility lies in being prepared. Each lesson should be read and fully understood by the parent-teacher before being taught. This will ensure that any questions that may arise can be answered quickly and accurately. If, after reading the lesson, the parent-teacher is uncomfortable with any material, further assistance should be sought through other knowledgeable sources.

Each lesson is designed to be taught within fifteen to twenty minutes. This allows more time for actual problem solving by the student. During the lecture period, all lesson material should be presented and any example problems should be demonstrated. The student should also maintain a notebook that includes any relevant information presented in the lesson. For example, any formulas, definitions, or strategies should be written in the notebook for quick and easy reference in future problem sets. Especially important are bold words or sentences and boxed items. The notebook should be maintained daily in an organized fashion. After the lecture, the student should work the practice problems first to make sure that he/she has grasped the basic concepts discussed in that lesson. With the remaining time allotted (preferably 40–60 minutes, depending on the subject matter), the student should begin the problem set. The parent-teacher should be available for assistance and guidance during this period. When this time period has expired, instruct the student to complete the remaining problems before the next lecture. It is important that the student be responsible for completing **all** the problems in the problem sets. Only in this way will the student succeed in mathematics.

## Assigning the Problem Sets

Before working the problem sets, there are several things of which the parent-teacher and student should be aware. First of all, it is impossible to construct an example problem for each type of problem in the problem sets. Many problems are designed to extend the concepts already learned by the student. If the student cannot work a problem, he or she should first return to the lesson or lessons relevant to that problem in order to gain further insight. After reviewing the lesson, if the student is still having problems, he or she should then seek parent-teacher assistance. It is important that the student develop an individual problem-solving strategy. The student should copy the problem, write legibly, and show all of his or her work. The student should attempt to solve the problem using clear, logical steps. The steps that a student uses to solve the problem should be evident in his or her solution. A final point to consider is when to use a calculator. A calculator should only be used in problems involving complicated decimal computations, radicals, trigonometric functions, or logarithmic functions.

When the student has completed an assigned problem set, it must be evaluated by the parent-teacher. If time allows, check each problem to ensure that all work was shown and that the correct answer was obtained; otherwise, spot-check an assortment of problems. When comparing the student's answers to the answer booklet or solutions manual, be aware of equivalent forms of the same answer (e.g., $\frac{3}{2} = 1\frac{1}{2} = 1.5$). These equivalent forms are usually counted correct

unless the problem asks for a specific form. Also, recognize that problems involving rounding or estimation may not exactly match the given answer, but should be relatively close. Each problem with an incorrect answer must be examined to determine where the error occurred. Review all errors with the student to determine whether the error was a computational error or a conceptual error. Any concepts not understood by the student should be re-taught as soon as possible so that the student will be able to work related problems in the future. If the parent-teacher or student, after referring back to the relevant lesson or lessons, still has a question regarding a specific problem in the textbook, they may seek further help from the *Saxon Publishers Math Helpline*.

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**Saxon Publishers Math Helpline**

(405) 573-6451

The helpline is designed solely to answer questions concerning lessons and problem sets in Saxon textbooks. Help is available each weekday from 2:00 p.m to 5:00 p.m. (CST).

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Before calling our helpline, please make every attempt to solve your problem. Keep in mind that many mathematical concepts may not be obvious upon first reading, but do become familiar with rereading and practice.

## Assessing the Student

After a concept has been practiced, the student has an opportunity to demonstrate his/her competency of the learned material. Two methods of assessing the student are facts practices and tests. Facts practice is a component of the Saxon Middle Grades Series and for *Math 54* and *Math 65* in particular. Facts are designed to be given at the beginning of each lecture period and then reviewed with the student. The student should keep track of his or her time and get progressively faster as the course continues.

The second method of assessment is tests. Tests are provided that contain problems similar to those that have been practiced for at least several lessons. In *Math 54* through *Math 87*, tests are given every five lessons, beginning with Lesson 10. In *Algebra 1/2* through *Calculus*, tests are given every four lessons. Testing schedules are provided in the Homeschool Packets.

On these tests, the student will use the same problem-solving methods and strategies used for the homework. The test problems should be copied and worked on a separate sheet of paper. *This sheet of paper should not be scratch paper.* Allowing the use of scratch paper may falsely convey that it is acceptable for the student to be messy and disorganized. The sheet(s) of paper should be $8\frac{1}{2}$" × 11" ruled notebook paper or any type of standard graph paper, such as 1-cm grid paper. The student should write legibly and in an organized manner, precisely showing each step taken to determine the answer. It is important for the student to show all work so that understanding and strategy can be analyzed.

Each test problem should be graded by comparing the student's answer with the answer provided. If an answer does not match, determine where the mistake was made. After grading, review the test with the student and allow him or her to decide whether the mistakes were computational or conceptual. Be sure to let the student determine the location and type of mistake. The parent-teacher should only verify or reinforce the student's conclusion. Addition and subtraction errors, incorrectly copied problems, and careless mistakes are considered to be computational mistakes. Emphasize to the student that computational mistakes

can be avoided by careful review of his or her solution before completing the assignment. Conceptual mistakes, however, are usually caused by a lack of understanding of the material and should be promptly dealt with by reviewing and practicing the problematic concepts in the relevant lesson(s). Also, in order to see if the same type of problem is being missed repeatedly, the parent-teacher should both save and refer to old tests. If such a situation is discovered, the cause should be determined before continuing.

## Getting Started

Consult these guidelines regularly for assistance and direction. Before beginning, remember that the Saxon program is meant to be flexible. The parent-teacher and student must decide what they are capable of accomplishing. Establish a schedule that works for you and your student. Do not try to go too fast. The main objectives are consistency and completion of the entire textbook, including every problem. Even if a student is familiar with a topic, do not skip that particular lesson. Review can only help with future learning. Remember, mathematics is not difficult. Mathematics is just different. Practice and dedication will turn things unfamiliar and different into things familiar.

| | |
|---|---|
| **Planning the Course** | • Determine the number of weeks you have to complete the book.<br>• Determine the total number of lessons in the book.<br>• Divide the number of lessons by the number of weeks.<br>• Be sure to complete the same number of lessons each week. |
| **Teaching the Lessons** | • Be sure that the student completes all assignments.<br>• Do not allow the student to do independent study.<br>• Read and understand each lesson before teaching it.<br>• Teach for only 15–20 minutes.<br>• Have the student keep a notebook.<br>• Make sure that the student completes all practice problems.<br>• Make sure that all problems in the problem set are completed. |
| **Assigning the Problem Sets** | • Have student refer to previous material, if necessary.<br>• Assist student in developing a logical problem-solving strategy.<br>• Allow calculators only with complicated problems.<br>• Watch out for equivalent answers $\left(\text{e.g., } \frac{3}{2} = 1\frac{1}{2} = 1.5\right)$.<br>• Watch out for estimated answers; close ones are counted correct.<br>• Review all errors with the student. |
| **Assessing the Student** | • Use facts practice with Saxon Middle Grades.<br>• Do not allow scratch paper on tests.<br>• Allow the student to determine problem areas.<br>• Reteach any misunderstood concepts. |
| **Contacting Us** | • *Customer Service:* (800) 416-8171<br>• *Saxon Math Helpline:* (405) 573-6451<br>• *WWW:* http://www.saxonhomeschool.com<br>• *E-mail:* info@saxonhomeschool.com<br>  mathhelp@saxonhomeschool.com |

Name _____    Time _____

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| $6$ $\times 8$ **48** | $5$ $\times 7$ **35** | $3$ $\times 3$ **9** | $6$ $\times 2$ **12** | $4$ $\times 7$ **28** | $9$ $\times 3$ **27** | $8$ $\times 5$ **40** | $2$ $\times 4$ **8** |
| $7$ $\times 2$ **14** | $4$ $\times 5$ **20** | $8$ $\times 2$ **16** | $8$ $\times 6$ **48** | $2$ $\times 9$ **18** | $5$ $\times 6$ **30** | $9$ $\times 7$ **63** | $4$ $\times 9$ **36** |
| $8$ $\times 9$ **72** | $7$ $\times 9$ **63** | $2$ $\times 6$ **12** | $3$ $\times 8$ **24** | $7$ $\times 8$ **56** | $9$ $\times 6$ **54** | $3$ $\times 2$ **6** | $6$ $\times 7$ **42** |
| $5$ $\times 2$ **10** | $3$ $\times 7$ **21** | $8$ $\times 7$ **56** | $6$ $\times 3$ **18** | $2$ $\times 2$ **4** | $7$ $\times 7$ **49** | $9$ $\times 8$ **72** | $4$ $\times 3$ **12** |
| $7$ $\times 6$ **42** | $8$ $\times 8$ **64** | $4$ $\times 8$ **32** | $3$ $\times 5$ **15** | $8$ $\times 3$ **24** | $9$ $\times 5$ **45** | $2$ $\times 7$ **14** | $5$ $\times 8$ **40** |
| $6$ $\times 6$ **36** | $2$ $\times 3$ **6** | $4$ $\times 4$ **16** | $5$ $\times 3$ **15** | $9$ $\times 9$ **81** | $3$ $\times 9$ **27** | $8$ $\times 4$ **32** | $7$ $\times 3$ **21** |
| $4$ $\times 6$ **24** | $7$ $\times 5$ **35** | $3$ $\times 6$ **18** | $6$ $\times 9$ **54** | $5$ $\times 4$ **20** | $9$ $\times 4$ **36** | $2$ $\times 5$ **10** | $6$ $\times 4$ **24** |
| $5$ $\times 9$ **45** | $3$ $\times 4$ **12** | $6$ $\times 5$ **30** | $2$ $\times 8$ **16** | $7$ $\times 4$ **28** | $4$ $\times 2$ **8** | $5$ $\times 5$ **25** | $9$ $\times 2$ **18** |

Name _____

Time _____

Find the value of each variable.

| | | |
|---|---|---|
| $a + 12 = 20$ <br> $a = \textbf{8}$ | $b - 8 = 10$ <br> $b = \textbf{18}$ | $5c = 40$ <br> $c = \textbf{8}$ |
| $\dfrac{d}{4} = 12$ <br> $d = \textbf{48}$ | $11 + e = 24$ <br> $e = \textbf{13}$ | $25 - f = 10$ <br> $f = \textbf{15}$ |
| $10g = 60$ <br> $g = \textbf{6}$ | $\dfrac{24}{h} = 6$ <br> $h = \textbf{4}$ | $17 = j + 8$ <br> $j = \textbf{9}$ |
| $20 = k - 5$ <br> $k = \textbf{25}$ | $30 = 6m$ <br> $m = \textbf{5}$ | $9 = \dfrac{n}{3}$ <br> $n = \textbf{27}$ |
| $18 = 6 + p$ <br> $p = \textbf{12}$ | $5 = 15 - q$ <br> $q = \textbf{10}$ | $36 = 4r$ <br> $r = \textbf{9}$ |
| $2 = \dfrac{16}{s}$ <br> $s = \textbf{8}$ | $5 + 7 + t = 20$ <br> $t = \textbf{8}$ | $u - 15 = 30$ <br> $u = \textbf{45}$ |
| $8v = 48$ <br> $v = \textbf{6}$ | $\dfrac{w}{3} = 6$ <br> $w = \textbf{18}$ | $21 - x = 12$ <br> $x = \textbf{9}$ |
| $y + 8 = 12$ <br> $y = \textbf{4}$ | $36 = 3z$ <br> $z = \textbf{12}$ | $\dfrac{48}{a} = 4$ <br> $a = \textbf{12}$ |
| $b - 12 = 15$ <br> $b = \textbf{27}$ | $75 = 3c$ <br> $c = \textbf{25}$ | $\dfrac{d}{12} = 6$ <br> $d = \textbf{72}$ |
| $36 = f + 24$ <br> $f = \textbf{12}$ | $g - 24 = 24$ <br> $g = \textbf{48}$ | $12h = 12$ <br> $h = \textbf{1}$ |

**Name** _____　　　**Time** _____

Write each improper fraction as a mixed number or a whole number.

| | | | | |
|---|---|---|---|---|
| $\frac{5}{2} = 2\frac{1}{2}$ | $\frac{6}{3} = 2$ | $\frac{7}{4} = 1\frac{3}{4}$ | $\frac{12}{5} = 2\frac{2}{5}$ | $\frac{8}{2} = 4$ |
| $\frac{10}{3} = 3\frac{1}{3}$ | $\frac{15}{2} = 7\frac{1}{2}$ | $\frac{21}{4} = 5\frac{1}{4}$ | $\frac{15}{5} = 3$ | $\frac{11}{8} = 1\frac{3}{8}$ |
| $2\frac{3}{2} = 3\frac{1}{2}$ | $4\frac{5}{4} = 5\frac{1}{4}$ | $3\frac{6}{2} = 6$ | $3\frac{7}{4} = 4\frac{3}{4}$ | $6\frac{5}{2} = 8\frac{1}{2}$ |

Write each mixed number as an improper fraction.

| | | | | |
|---|---|---|---|---|
| $1\frac{1}{2} = \frac{3}{2}$ | $2\frac{2}{3} = \frac{8}{3}$ | $3\frac{3}{4} = \frac{15}{4}$ | $2\frac{1}{2} = \frac{5}{2}$ | $4\frac{1}{5} = \frac{21}{5}$ |
| $6\frac{2}{3} = \frac{20}{3}$ | $2\frac{3}{4} = \frac{11}{4}$ | $3\frac{1}{3} = \frac{10}{3}$ | $4\frac{1}{2} = \frac{9}{2}$ | $2\frac{4}{5} = \frac{14}{5}$ |
| $1\frac{5}{6} = \frac{11}{6}$ | $5\frac{3}{4} = \frac{23}{4}$ | $1\frac{7}{8} = \frac{15}{8}$ | $3\frac{1}{6} = \frac{19}{6}$ | $2\frac{3}{10} = \frac{23}{10}$ |

Name _____

Time _____

| | | | | |
|---|---|---|---|---|
| $\frac{60}{100} = \frac{3}{5}$ | $\frac{2}{12} = \frac{1}{6}$ | $\frac{4}{16} = \frac{1}{4}$ | $\frac{2}{6} = \frac{1}{3}$ | $\frac{5}{10} = \frac{1}{2}$ |
| $\frac{50}{100} = \frac{1}{2}$ | $\frac{2}{16} = \frac{1}{8}$ | $\frac{8}{12} = \frac{2}{3}$ | $\frac{5}{100} = \frac{1}{20}$ | $\frac{3}{9} = \frac{1}{3}$ |
| $\frac{8}{16} = \frac{1}{2}$ | $\frac{2}{100} = \frac{1}{50}$ | $\frac{20}{100} = \frac{1}{5}$ | $\frac{6}{8} = \frac{3}{4}$ | $\frac{10}{100} = \frac{1}{10}$ |
| $\frac{2}{4} = \frac{1}{2}$ | $\frac{4}{10} = \frac{2}{5}$ | $\frac{90}{100} = \frac{9}{10}$ | $\frac{3}{12} = \frac{1}{4}$ | $\frac{6}{16} = \frac{3}{8}$ |
| $\frac{80}{100} = \frac{4}{5}$ | $\frac{9}{12} = \frac{3}{4}$ | $\frac{3}{6} = \frac{1}{2}$ | $\frac{12}{16} = \frac{3}{4}$ | $\frac{4}{8} = \frac{1}{2}$ |
| $\frac{6}{9} = \frac{2}{3}$ | $\frac{25}{100} = \frac{1}{4}$ | $\frac{4}{12} = \frac{1}{3}$ | $\frac{6}{10} = \frac{3}{5}$ | $\frac{40}{100} = \frac{2}{5}$ |
| $\frac{4}{100} = \frac{1}{25}$ | $\frac{2}{10} = \frac{1}{5}$ | $\frac{10}{16} = \frac{5}{8}$ | $\frac{10}{12} = \frac{5}{6}$ | $\frac{4}{6} = \frac{2}{3}$ |
| $\frac{14}{16} = \frac{7}{8}$ | $\frac{2}{8} = \frac{1}{4}$ | $\frac{6}{12} = \frac{1}{2}$ | $\frac{8}{10} = \frac{4}{5}$ | $\frac{75}{100} = \frac{3}{4}$ |
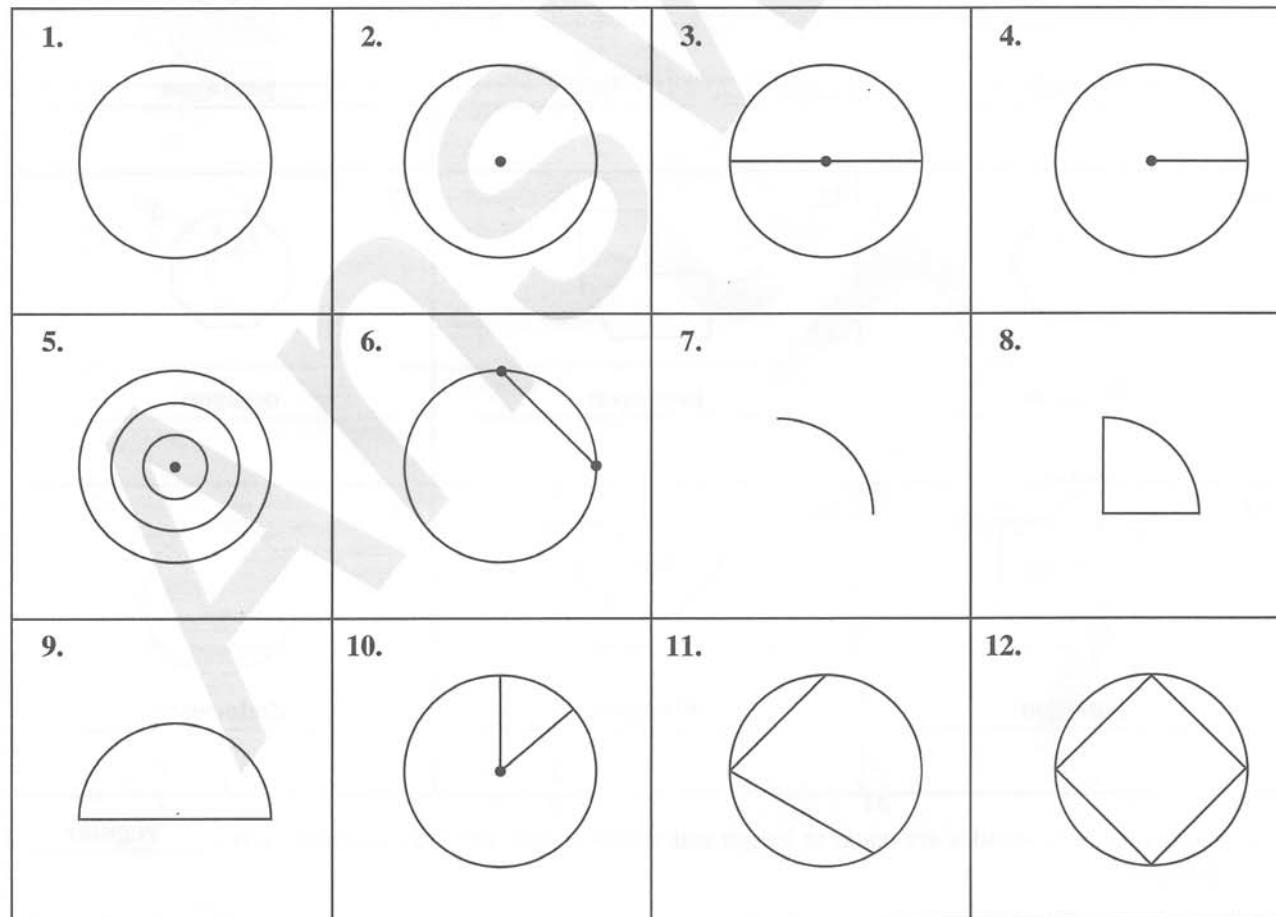
**Name** _____          **Time** _____

Write the word that completes each sentence.

1. The distance around a circle is its _____circumference_____.

2. Every point on a circle is the same distance from the _____center_____.

3. The distance across a circle through its center is its _____diameter_____.

4. The distance from a circle to its center is its _____radius_____.

5. Two or more circles with the same center are _____concentric_____ circles.

6. A segment between two points on a circle is a _____chord_____.

7. Part of a circumference is an _____arc_____.

8. A portion of a circle and its interior, bound by an arc and two radii, is a _____sector_____.

9. Half of a circle is a _____semicircle_____.

10. An angle whose vertex is the center of a circle is a _____central_____ angle.

11. An angle whose vertex is on the circumference of a circle and whose sides include chords of the circle is an _____inscribed_____ angle.

12. A polygon within a circle all of whose vertices are on the circle is an _____inscribed_____ polygon.
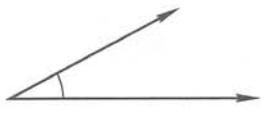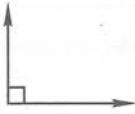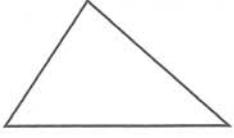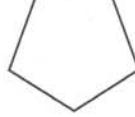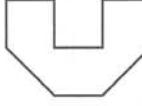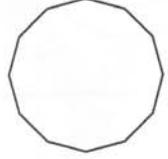
Illustrate answers 1–12 below.

Name _____     Time _____

Name each illustrated figure.

| 1. | 2. | 3. |
|----|----|----|
| segment | ray | line |
| 4. | 5. | 6. |
| acute angle | right angle | obtuse angle |
| 7. | 8. | 9. |
| triangle | quadrilateral | pentagon |
| 10. | 11. | 12. |
| hexagon | heptagon | octagon |
| 13. | 14. | 15. |
| nonagon | decagon | dodecagon |

**16.** A polygon whose sides are equal in length and whose angles are equal in measure is a ___regular___ polygon.

Name _____

Time _____

Reduce the answers.

| | | | |
|---|---|---|---|
| $\frac{2}{3} + \frac{2}{3} = 1\frac{1}{3}$ | $\frac{2}{3} - \frac{2}{3} = 0$ | $\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$ | $\frac{2}{3} \div \frac{2}{3} = 1$ |
| $\frac{3}{4} + \frac{1}{4} = 1$ | $\frac{3}{4} - \frac{1}{4} = \frac{1}{2}$ | $\frac{3}{4} \times \frac{1}{4} = \frac{3}{16}$ | $\frac{3}{4} \div \frac{1}{4} = 3$ |
| $\frac{2}{3} + \frac{1}{2} = 1\frac{1}{6}$ | $\frac{2}{3} - \frac{1}{2} = \frac{1}{6}$ | $\frac{2}{3} \times \frac{1}{2} = \frac{1}{3}$ | $\frac{2}{3} \div \frac{1}{2} = 1\frac{1}{3}$ |
| $\frac{3}{4} + \frac{2}{3} = 1\frac{5}{12}$ | $\frac{3}{4} - \frac{2}{3} = \frac{1}{12}$ | $\frac{3}{4} \times \frac{2}{3} = \frac{1}{2}$ | $\frac{3}{4} \div \frac{2}{3} = 1\frac{1}{8}$ |
| $\frac{2}{5} + \frac{1}{4} = \frac{13}{20}$ | $\frac{2}{5} - \frac{1}{4} = \frac{3}{20}$ | $\frac{2}{5} \times \frac{1}{4} = \frac{1}{10}$ | $\frac{2}{5} \div \frac{1}{4} = 1\frac{3}{5}$ |
| $\frac{1}{2} + \frac{5}{8} = 1\frac{1}{8}$ | $\frac{5}{8} - \frac{1}{2} = \frac{1}{8}$ | $\frac{1}{2} \times \frac{5}{8} = \frac{5}{16}$ | $\frac{1}{2} \div \frac{5}{8} = \frac{4}{5}$ |

Name _____        Time _____

Complete each equivalent measure.

| Customary Units | Metric Units |
|---|---|

**Customary Units**

Linear Measure

1. 1 foot = __12__ inches

2. 1 yard = __36__ inches

3. 1 yard = __3__ feet

4. 1 mile = __5280__ feet

5. 1 mile = __1760__ yards

Area Measure

6. 1 foot$^2$ = __144__ inches$^2$

7. 1 yard$^2$ = __9__ feet$^2$

Volume Measure

8. 1 yard$^3$ = __27__ feet$^3$

Weight

9. 1 pound = __16__ ounces

10. 1 ton = __2000__ pounds

Liquid Measure

11. 1 pint = __16__ ounces

12. 1 pint = __2__ cups

13. 1 quart = __2__ pints

14. 1 gallon = __4__ quarts

Temperature

15. Water freezes at __32__ °F.

16. Water boils at __212__ °F.

17. Normal body temperature is __98.6__ °F.

Customary to Metric

18. 1 inch = __2.54__ centimeters

**Metric Units**

Linear Measure

19. 1 centimeter = __10__ millimeters

20. 1 meter = __100__ centimeters

21. 1 meter = __1000__ millimeters

22. 1 kilometer = __1000__ meters

Area Measure

23. 1 meter$^2$ = __10,000__ centimeters$^2$

24. 1 kilometer$^2$ = __1,000,000__ meters$^2$

Volume Measure

25. 1 meter$^3$ = __1,000,000__ centimeters$^3$

Mass

26. 1 gram = __1000__ milligrams

27. 1 kilogram = __1000__ grams

28. 1 metric ton = __1000__ kilograms

Capacity

29. 1 liter = __1000__ milliliters

30. One milliliter of water has a volume of __1 cm$^3$__ and a mass of __1 gram__. One thousand cm$^3$ of water fills a __1__-liter container and has a mass of __1__ kilogram.

Temperature

31. Water freezes at __0__ °C.

32. Water boils at __100__ °C.

33. Normal body temperature is __37__ °C.

Name _____          Time _____

Find the number that completes each proportion.

| | | | |
|---|---|---|---|
| $\dfrac{3}{4} = \dfrac{a}{12}$ <br><br> $a = 9$ | $\dfrac{3}{4} = \dfrac{12}{b}$ <br><br> $b = 16$ | $\dfrac{c}{5} = \dfrac{12}{20}$ <br><br> $c = 3$ | $\dfrac{2}{d} = \dfrac{12}{24}$ <br><br> $d = 4$ |
| $\dfrac{4}{10} = \dfrac{e}{30}$ <br><br> $e = 12$ | $\dfrac{8}{12} = \dfrac{4}{f}$ <br><br> $f = 6$ | $\dfrac{g}{10} = \dfrac{10}{5}$ <br><br> $g = 20$ | $\dfrac{5}{h} = \dfrac{6}{18}$ <br><br> $h = 15$ |
| $\dfrac{15}{20} = \dfrac{i}{40}$ <br><br> $i = 30$ | $\dfrac{25}{100} = \dfrac{5}{j}$ <br><br> $j = 20$ | $\dfrac{k}{30} = \dfrac{3}{9}$ <br><br> $k = 10$ | $\dfrac{5}{m} = \dfrac{10}{100}$ <br><br> $m = 50$ |
| $\dfrac{50}{100} = \dfrac{n}{30}$ <br><br> $n = 15$ | $\dfrac{20}{15} = \dfrac{60}{p}$ <br><br> $p = 45$ | $\dfrac{q}{40} = \dfrac{75}{100}$ <br><br> $q = 30$ | $\dfrac{5}{r} = \dfrac{4}{16}$ <br><br> $r = 20$ |
| $\dfrac{2}{5} = \dfrac{s}{100}$ <br><br> $s = 40$ | $\dfrac{6}{8} = \dfrac{9}{t}$ <br><br> $t = 12$ | $\dfrac{u}{16} = \dfrac{8}{4}$ <br><br> $u = 32$ | $\dfrac{60}{v} = \dfrac{3}{2}$ <br><br> $v = 40$ |
| $\dfrac{8}{10} = \dfrac{w}{100}$ <br><br> $w = 80$ | $\dfrac{9}{12} = \dfrac{36}{x}$ <br><br> $x = 48$ | $\dfrac{y}{30} = \dfrac{6}{20}$ <br><br> $y = 9$ | $\dfrac{24}{z} = \dfrac{8}{6}$ <br><br> $z = 18$ |

**Name** _____

**Time** _____

| | | |
|---|---|---|
| $0.8 + 0.4 = \textbf{1.2}$ | $0.8 \times 0.4 = \textbf{0.32}$ | $0.8 \div 0.4 = \textbf{2}$ |
| $1.2 - 0.4 = \textbf{0.8}$ | $1.2 \times 0.4 = \textbf{0.48}$ | $1.2 \div 0.4 = \textbf{3}$ |
| $1.2 + 0.04 = \textbf{1.24}$ | $1.2 \times 0.04 = \textbf{0.048}$ | $1.2 \div 0.04, \textbf{30}$ |
| $1.2 + 4 = \textbf{5.2}$ | $1.2 \times 4 = \textbf{4.8}$ | $1.2 \div 4 = \textbf{0.3}$ |
| $6 - 0.3 = \textbf{5.7}$ | $6 \times 0.3 = \textbf{1.8}$ | $6 \div 0.3 = \textbf{20}$ |
| $0.3 + 6 = \textbf{6.3}$ | $0.3 \times 6 = \textbf{1.8}$ | $0.3 \div 6 = \textbf{0.05}$ |
| $0.01 - 0.01 = \textbf{0}$ | $0.01 \times 0.01 = \textbf{0.0001}$ | $0.01 \div 0.01 = \textbf{1}$ |

Name _____     Time _____

Simplify each power or root.

| | | | |
|---|---|---|---|
| $\sqrt{100} = \mathbf{10}$ | $\sqrt{16} = \mathbf{4}$ | $\sqrt{81} = \mathbf{9}$ | $\sqrt{4} = \mathbf{2}$ |
| $\sqrt{144} = \mathbf{12}$ | $\sqrt{1} = \mathbf{1}$ | $\sqrt{64} = \mathbf{8}$ | $\sqrt{49} = \mathbf{7}$ |
| $\sqrt{25} = \mathbf{5}$ | $\sqrt{121} = \mathbf{11}$ | $\sqrt{9} = \mathbf{3}$ | $\sqrt{36} = \mathbf{6}$ |
| $\sqrt{169} = \mathbf{13}$ | $\sqrt{225} = \mathbf{15}$ | $\sqrt{196} = \mathbf{14}$ | $\sqrt{625} = \mathbf{25}$ |
| $8^2 = \mathbf{64}$ | $5^2 = \mathbf{25}$ | $3^2 = \mathbf{9}$ | $12^2 = \mathbf{144}$ |
| $10^2 = \mathbf{100}$ | $2^3 = \mathbf{8}$ | $6^2 = \mathbf{36}$ | $3^3 = \mathbf{27}$ |
| $4^2 = \mathbf{16}$ | $10^3 = \mathbf{1000}$ | $7^2 = \mathbf{49}$ | $15^2 = \mathbf{225}$ |
| $5^3 = \mathbf{125}$ | $25^2 = \mathbf{625}$ | $4^3 = \mathbf{64}$ | $9^2 = \mathbf{81}$ |

Name _____   Time _____

Write each fraction as a decimal and as a percent. Write repeating decimals with a bar over the repetend.

| Fraction | Decimal | Percent |
| --- | --- | --- |
| $\frac{1}{2}$ | 0.5 | 50% |
| $\frac{1}{3}$ | $0.\overline{3}$ | $33\frac{1}{3}\%$ |
| $\frac{2}{3}$ | $0.\overline{6}$ | $66\frac{2}{3}\%$ |
| $\frac{1}{4}$ | 0.25 | 25% |
| $\frac{3}{4}$ | 0.75 | 75% |
| $\frac{1}{5}$ | 0.2 | 20% |
| $\frac{2}{5}$ | 0.4 | 40% |
| $\frac{3}{5}$ | 0.6 | 60% |
| $\frac{4}{5}$ | 0.8 | 80% |
| $\frac{1}{6}$ | $0.1\overline{6}$ | $16\frac{2}{3}\%$ |
| $\frac{5}{6}$ | $0.8\overline{3}$ | $83\frac{1}{3}\%$ |
| $\frac{1}{8}$ | 0.125 | $12\frac{1}{2}\%$ |
| $\frac{3}{8}$ | 0.375 | $37\frac{1}{2}\%$ |
| $\frac{5}{8}$ | 0.625 | $62\frac{1}{2}\%$ |
| $\frac{7}{8}$ | 0.875 | $87\frac{1}{2}\%$ |
| $\frac{1}{9}$ | $0.\overline{1}$ | $11\frac{1}{9}\%$ |
| $\frac{1}{10}$ | 0.1 | 10% |
| $\frac{3}{10}$ | 0.3 | 30% |
| $\frac{7}{10}$ | 0.7 | 70% |
| $\frac{9}{10}$ | 0.9 | 90% |
| $\frac{1}{20}$ | 0.05 | 5% |
| $\frac{1}{25}$ | 0.04 | 4% |
| $\frac{1}{50}$ | 0.02 | 2% |
| $\frac{1}{100}$ | 0.01 | 1% |
| $1\frac{1}{2}$ | 1.5 | 150% |

Name _____     Time _____

Complete each equivalent measure.

1. 2 meters = ___200___ centimeters

2. 1.5 kilometers = ___1500___ meters

3. 2.54 centimeters = ___25.4___ millimeters

4. 125 centimeters = ___1.25___ meters

5. 75 millimeters = ___7.5___ centimeters

6. 0.8 meter = ___800___ millimeters

7. 10 kilometers = ___10,000___ meters

8. 0.1 kilometer = ___100___ meters

9. 5000 meters = ___5___ kilometers

10. 50 centimeters = ___0.5___ meter

11. 50 centimeters = ___500___ millimeters

12. 2 liters = ___2000___ milliliters

13. 250 milliliters = ___0.25___ liter

14. 4 kilograms = ___4000___ grams

15. 2.5 grams = ___2500___ milligrams

16. 500 milligrams = ___0.5___ gram

17. 0.5 kilogram = ___500___ grams

18. Two liters of water has a volume of
___2000___ cubic centimeters and a mass
of ___2___ kilograms.

Record the factor indicated by each prefix.

| | Prefix | Factor |
|---|---|---|
| 19. | kilo- | 1000 |
| 20. | hecto- | 100 |
| 21. | deka- | 10 |
| | (unit) | 1 |
| 22. | deci- | $\frac{1}{10}$ |
| 23. | centi- | $\frac{1}{100}$ |
| 24. | milli- | $\frac{1}{1000}$ |

Name _____          Time _____
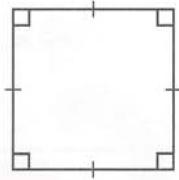
| | | | |
|---|---|---|---|
| $3 + 1\frac{2}{3} = \mathbf{4\frac{2}{3}}$ | $3 - 1\frac{2}{3} = \mathbf{1\frac{1}{3}}$ | $3 \times 1\frac{2}{3} = \mathbf{5}$ | $3 \div 1\frac{2}{3} = \mathbf{1\frac{4}{5}}$ |
| $1\frac{2}{3} + 1\frac{1}{2} = \mathbf{3\frac{1}{6}}$ | $1\frac{2}{3} - 1\frac{1}{2} = \mathbf{\frac{1}{6}}$ | $1\frac{2}{3} \times 1\frac{1}{2} = \mathbf{2\frac{1}{2}}$ | $1\frac{2}{3} \div 1\frac{1}{2} = \mathbf{1\frac{1}{9}}$ |
| $2\frac{1}{2} + 1\frac{2}{3} = \mathbf{4\frac{1}{6}}$ | $2\frac{1}{2} - 1\frac{2}{3} = \mathbf{\frac{5}{6}}$ | $2\frac{1}{2} \times 1\frac{2}{3} = \mathbf{4\frac{1}{6}}$ | $2\frac{1}{2} \div 1\frac{2}{3} = \mathbf{1\frac{1}{2}}$ |
| $4\frac{1}{2} + 2\frac{1}{4} = \mathbf{6\frac{3}{4}}$ | $4\frac{1}{2} - 2\frac{1}{4} = \mathbf{2\frac{1}{4}}$ | $4\frac{1}{2} \times 2\frac{1}{4} = \mathbf{10\frac{1}{8}}$ | $4\frac{1}{2} \div 2\frac{1}{4} = \mathbf{2}$ |
| $6\frac{2}{3} + 3\frac{3}{4} = \mathbf{10\frac{5}{12}}$ | $6\frac{2}{3} - 3\frac{3}{4} = \mathbf{2\frac{11}{12}}$ | $6\frac{2}{3} \times 3\frac{3}{4} = \mathbf{25}$ | $3\frac{3}{4} \div 6\frac{2}{3} = \mathbf{\frac{9}{16}}$ |
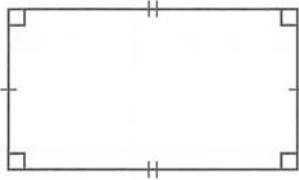
Name _____     Time _____

Select from the words at the bottom of the page to describe each figure.
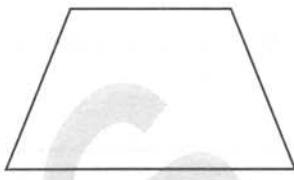
**1.**

square
rectangle
rhombus
parallelogram
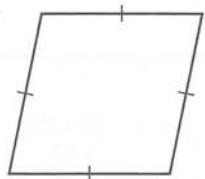
**2.**

rectangle
parallelogram

**3.**

trapezoid
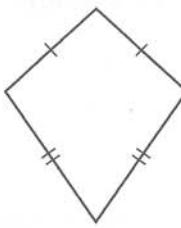
**4.**

rhombus
parallelogram
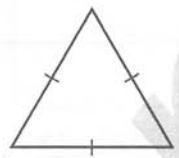
**5.**

parallelogram
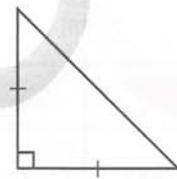
**6.**

kite
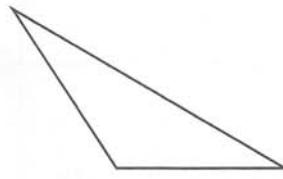
**7.**

equilateral triangle
acute triangle
isosceles triangle

**8.**

isosceles triangle
right triangle

**9.**

scalene triangle
obtuse triangle

**Word List:**

| | | | |
|---|---|---|---|
| kite | rectangle | isosceles triangle | right triangle |
| trapezoid | rhombus | scalene triangle | acute triangle |
| parallelogram | square | equilateral triangle | obtuse triangle |

**Name** _____     **Time** _____
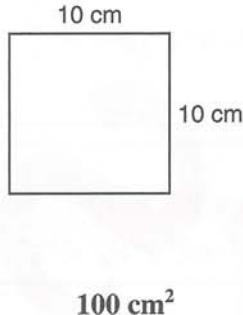
| | | | |
|---|---|---|---|
| $(-8) + (-2) = $ **−10** | $(-8) - (-2) = $ **−6** | $(-8)(-2) = $ **+16** | $\dfrac{-8}{-2} = $ **+4** |
| $(-9) + (+3) = $ **−6** | $(-9) - (+3) = $ **−12** | $(-9)(+3) = $ **−27** | $\dfrac{-9}{+3} = $ **−3** |
| $12 + (-2) = $ **+10** | $12 - (-2) = $ **+14** | $(12)(-2) = $ **−24** | $\dfrac{12}{-2} = $ **−6** |
| $(+12) + (+6) = $ **+18** | $(+12) - (+6) = $ **+6** | $(+12)(+6) = $ **+72** | $\dfrac{+12}{+6} = $ **+2** |
| $-20 + (+5) = $ **−15** | $-20 - (+5) = $ **−25** | $(-20)(+5) = $ **−100** | $\dfrac{-20}{+5} = $ **−4** |
| $(-15) + (-3) = $ **−18** | $(-15) - (-3) = $ **−12** | $(-15)(-3) = $ **+45** | $\dfrac{-15}{-3} = $ **+5** |
| $(+30) + (-6) = $ **+24** | $(+30) - (-6) = $ **+36** | $(+30)(-6) = $ **−180** | $\dfrac{+30}{-6} = $ **−5** |
| $(-5) + (-6) + (-2) = $ **−13** | $(-5) - (-6) - (-2) = $ **+3** | $(-5)(-6)(-2) = $ **−60** | $\dfrac{(-5)(-6)}{(-2)} = $ **−15** |
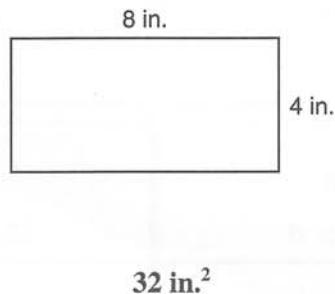
**Name** _____     **Time** _____

Find the area of each figure. Angles that look like right angles are right angles.
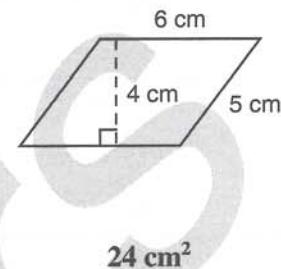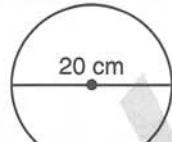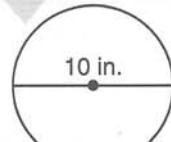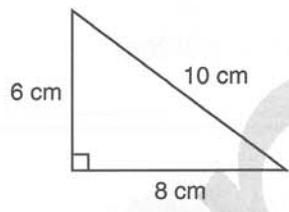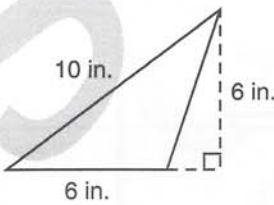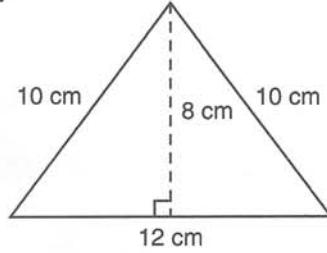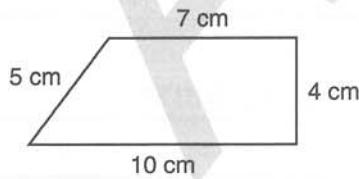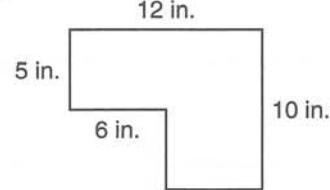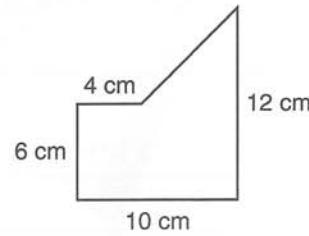
| | | |
|---|---|---|
| **1.**  10 cm, 10 cm square  **100 cm²** | **2.**  8 in., 4 in. rectangle  **32 in.²** | **3.**  6 cm, 4 cm, 5 cm parallelogram  **24 cm²** |
| **4.**  7 in. circle  Use $\frac{22}{7}$ for $\pi$.  **154 in.²** | **5.**  20 cm circle  Use 3.14 for $\pi$.  **314 cm²** | **6.**  10 in. circle  Leave $\pi$ as $\pi$.  **25$\pi$ in.²** |
| **7.**  6 cm, 10 cm, 8 cm triangle  **24 cm²** | **8.**  10 in., 6 in., 6 in. triangle  **18 in.²** | **9.**  10 cm, 8 cm, 10 cm, 12 cm triangle  **48 cm²** |
| **10.**  7 cm, 5 cm, 4 cm, 10 cm trapezoid  **34 cm²** | **11.**  12 in., 5 in., 6 in., 10 in.  **90 in.²** | **12.**  4 cm, 12 cm, 6 cm, 10 cm  **78 cm²** |

Name _____    Time _____

Write each number in the proper form of scientific notation.

| | |
|---|---|
| $186{,}000 = \mathbf{1.86 \times 10^5}$ | $0.0005 = \mathbf{5 \times 10^{-4}}$ |
| $30{,}500{,}000 = \mathbf{3.05 \times 10^7}$ | $36 \times 10^4 = \mathbf{3.6 \times 10^5}$ |
| $0.35 \times 10^5 = \mathbf{3.5 \times 10^4}$ | $48 \times 10^{-3} = \mathbf{4.8 \times 10^{-2}}$ |
| $2.5 \text{ billion} = \mathbf{2.5 \times 10^9}$ | $15 \text{ thousandths} = \mathbf{1.5 \times 10^{-2}}$ |
| $12 \text{ million} = \mathbf{1.2 \times 10^7}$ | $\dfrac{1}{1{,}000{,}000} = \mathbf{1 \times 10^{-6}}$ |

Write each number in standard form.

| | |
|---|---|
| $1 \times 10^6 = \mathbf{1{,}000{,}000}$ | $1 \times 10^{-6} = \mathbf{0.000001}$ |
| $2.4 \times 10^4 = \mathbf{24{,}000}$ | $5 \times 10^{-4} = \mathbf{0.0005}$ |
| $4.75 \times 10^5 = \mathbf{475{,}000}$ | $2.5 \times 10^{-3} = \mathbf{0.0025}$ |
| $3.125 \times 10^3 = \mathbf{3125}$ | $1.25 \times 10^{-2} = \mathbf{0.0125}$ |
| $3.025 \times 10^2 = \mathbf{302.5}$ | $1.05 \times 10^{-1} = \mathbf{0.105}$ |

Name _____

Time _____

| | |
|---|---|
| $6 + 6 \times 6 - 6 \div 6 = \mathbf{41}$ | $5 + 5^2 + 5 \div 5 - 5 \times 5 = \mathbf{6}$ |
| $3^2 + \sqrt{4} + 5(6) - 7 + 8 = \mathbf{42}$ | $6 \times 4 \div 2 - 6 \div 2 \times 4 = \mathbf{0}$ |
| $4 + 2(3 + 5) - 6 \div 2 = \mathbf{17}$ | $8 + 7 \times 6 - (5 + 4) \div 3 + 2 = \mathbf{49}$ |
| $2 + 2[3 + 4(7 - 5)] = \mathbf{24}$ | $3[10 + (6 - 4) - 3(2 + 1)] = \mathbf{9}$ |
| $\dfrac{(4)(3)(2)}{4 - 3 + 2} = \mathbf{8}$ | $\sqrt{1^3 + 2^3 + 3^3} = \mathbf{6}$ |
| $\dfrac{6 + 8(7 - 5) - 2}{4(3) - (4 + 3)} = \mathbf{4}$ | $(2 + 3)^2 + 5[4^2 - 2(3)] = \mathbf{75}$ |
| $(-3) + (-3)(-3) - (-3) = \mathbf{9}$ | $\sqrt{-3 - (3)(-3) - (-3)} = \mathbf{3}$ |
| $\dfrac{3(-3) - (-3)(-3)}{(-3) - 3(-3)} = \mathbf{-3}$ | $\dfrac{(-3) - (-3) - \sqrt{3(3)}}{3^2 - 3(3) - 3} = \mathbf{1}$ |

**Name** _____     Time _____

| | | |
|---|---|---|
| $2x + 5 = 45$ <br> $2x = \mathbf{40}$ <br> $x = \mathbf{20}$ | $3y + 4 = 22$ <br> $3y = \mathbf{18}$ <br> $y = \mathbf{6}$ | $6w + 8 = 50$ <br> $6w = \mathbf{42}$ <br> $w = \mathbf{7}$ |
| $5n - 3 = 32$ <br> $5n = \mathbf{35}$ <br> $n = \mathbf{7}$ | $3m - 7 = 26$ <br> $3m = \mathbf{33}$ <br> $m = \mathbf{11}$ | $8p - 9 = 47$ <br> $8p = \mathbf{56}$ <br> $p = \mathbf{7}$ |
| $15 = 3a - 6$ <br> $\mathbf{21} = 3a$ <br> $\mathbf{7} = a$ | $24 = 3b + 6$ <br> $\mathbf{18} = 3b$ <br> $\mathbf{6} = b$ | $45 = 5c - 10$ <br> $\mathbf{55} = 5c$ <br> $\mathbf{11} = c$ |
| $-2x + 9 = 25$ <br> $-2x = \mathbf{16}$ <br> $x = \mathbf{-8}$ | $\frac{3}{4}m + 12 = 36$ <br> $\frac{3}{4}m = \mathbf{24}$ <br> $m = \mathbf{32}$ | $0.5w - 1.5 = 4.5$ <br> $0.5w = \mathbf{6}$ <br> $w = \mathbf{12}$ |
| $-\frac{2}{3}n - 6 = 18$ <br> $-\frac{2}{3}n = \mathbf{24}$ <br> $n = \mathbf{-36}$ | $25 = 10 - 5y$ <br> $\mathbf{15} = -5y$ <br> $\mathbf{-3} = y$ | $-0.3f + 1.2 = 4.8$ <br> $-0.3f = \mathbf{3.6}$ <br> $f = \mathbf{-12}$ |

Name _____

Time _____

Write each percent as a decimal and as a reduced fraction. Write repeating decimals with a bar over the repetend.

| Percent | Decimal | Fraction |
|---|---|---|
| 10% | 0.1 | $\frac{1}{10}$ |
| 90% | 0.9 | $\frac{9}{10}$ |
| 5% | 0.05 | $\frac{1}{20}$ |
| 40% | 0.4 | $\frac{2}{5}$ |
| $12\frac{1}{2}\%$ | 0.125 | $\frac{1}{8}$ |
| 50% | 0.5 | $\frac{1}{2}$ |
| 2% | 0.02 | $\frac{1}{50}$ |
| 30% | 0.3 | $\frac{3}{10}$ |
| $87\frac{1}{2}\%$ | 0.875 | $\frac{7}{8}$ |
| 25% | 0.25 | $\frac{1}{4}$ |
| 80% | 0.8 | $\frac{4}{5}$ |
| $33\frac{1}{3}\%$ | $0.\overline{3}$ | $\frac{1}{3}$ |
| 60% | 0.6 | $\frac{3}{5}$ |
| $62\frac{1}{2}\%$ | 0.625 | $\frac{5}{8}$ |
| 20% | 0.2 | $\frac{1}{5}$ |
| 4% | 0.04 | $\frac{1}{25}$ |
| 75% | 0.75 | $\frac{3}{4}$ |
| $66\frac{2}{3}\%$ | $0.\overline{6}$ | $\frac{2}{3}$ |
| $37\frac{1}{2}\%$ | 0.375 | $\frac{3}{8}$ |
| 70% | 0.7 | $\frac{7}{10}$ |
| 1% | 0.01 | $\frac{1}{100}$ |
| $16\frac{2}{3}\%$ | $0.1\overline{6}$ | $\frac{1}{6}$ |
| $83\frac{1}{3}\%$ | $0.8\overline{3}$ | $\frac{5}{6}$ |
| $8\frac{1}{3}\%$ | $0.08\overline{3}$ | $\frac{1}{12}$ |
| $11\frac{1}{9}\%$ | $0.\overline{1}$ | $\frac{1}{9}$ |

Name _____            Time _____

Simplify.

| | | | |
|---|---|---|---|
| $6x + 2x = \mathbf{8x}$ | $6x - 2x = \mathbf{4x}$ | $(6x)(2x) = \mathbf{12x^2}$ | $\dfrac{6x}{2x} = \mathbf{3}$ |
| $6xy + 2xy = \mathbf{8xy}$ | $6xy - 2xy = \mathbf{4xy}$ | $6xy(2xy) = \mathbf{12x^2y^2}$ | $\dfrac{6xy}{2xy} = \mathbf{3}$ |
| $x + y + x = \mathbf{2x + y}$ | $x + y - x = \mathbf{y}$ | $(x)(y)(-x) = \mathbf{-x^2y}$ | $\dfrac{xy}{x} = \mathbf{y}$ |
| $3x + x + 3 = \mathbf{4x + 3}$ | $3x - x - 3 = \mathbf{2x - 3}$ | $(3x)(-x)(-3) = \mathbf{9x^2}$ | $\dfrac{(2x)(8xy)}{4y} = \mathbf{4x^2}$ |
| $3x + 2y + x - y = \mathbf{4x + y}$ | | $5xy - 2x + xy - x = \mathbf{6xy - 3x}$ | |

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Name _____    Time _____

Simplify and express each answer in the proper form of scientific notation.

| | | |
|---|---|---|
| $(1 \times 10^6)(1 \times 10^6) =$<br>**$1 \times 10^{12}$** | $(3 \times 10^3)(3 \times 10^3) =$<br>**$9 \times 10^6$** | $(4 \times 10^{-5})(2 \times 10^{-6}) =$<br>**$8 \times 10^{-11}$** |
| $(5 \times 10^5)(5 \times 10^5) =$<br>**$2.5 \times 10^{11}$** | $(6 \times 10^{-3})(7 \times 10^{-4}) =$<br>**$4.2 \times 10^{-6}$** | $(3 \times 10^6)(2 \times 10^{-4}) =$<br>**$6 \times 10^2$** |
| $(9 \times 10^{-6})(2 \times 10^2) =$<br>**$1.8 \times 10^{-3}$** | $(5 \times 10^8)(4 \times 10^{-2}) =$<br>**$2 \times 10^7$** | $(2.5 \times 10^{-6})(4 \times 10^{-4}) =$<br>**$1 \times 10^{-9}$** |
| $\dfrac{8 \times 10^8}{2 \times 10^2} = \mathbf{4 \times 10^6}$ | $\dfrac{5 \times 10^6}{2 \times 10^3} = \mathbf{2.5 \times 10^3}$ | $\dfrac{9 \times 10^3}{3 \times 10^8} = \mathbf{3 \times 10^{-5}}$ |
| $\dfrac{7.5 \times 10^3}{2.5 \times 10^6} = \mathbf{3 \times 10^{-3}}$ | $\dfrac{2 \times 10^6}{4 \times 10^2} = \mathbf{5 \times 10^3}$ | $\dfrac{1 \times 10^3}{4 \times 10^8} = \mathbf{2.5 \times 10^{-6}}$ |
| $\dfrac{6 \times 10^4}{2 \times 10^{-4}} = \mathbf{3 \times 10^8}$ | $\dfrac{8 \times 10^{-8}}{2 \times 10^{-2}} = \mathbf{4 \times 10^{-6}}$ | $\dfrac{2.5 \times 10^{-4}}{5 \times 10^{-8}} = \mathbf{5 \times 10^3}$ |

# TEST 1

**1.** Product of 12 and 60 tells us to multiply.
(1)

Sum of 12 and 36 tells us to add.

$(12 \times 60) \div (12 + 36) =$

$720 \div 48 = 15$

**The quotient is 15.**

**2.** Commutative property tells us to change the order.
(2)

$4 \times 5 = 5 \times 4$

**3.** The mathematical symbol for "is less than" is "<."
(4)

$-5 < 5$

**4.** Start at the right and insert commas.
(5)

$$1\,4\,,\,3\,2\,8\,,\,7\,3\,5$$

    ↑      ↑
    M     Th

**Fourteen million, three hundred twenty-eight thousand, seven hundred thirty-five.**

**5.**
(2)

$$\overset{-3}{\frown}\ \overset{-3}{\frown}\ \overset{-3}{\frown}\ \overset{-3}{\frown}$$

63, 60, 57, 54, 51, __, __, __,

The rule is to subtract 3. Therefore the next three numbers are **48, 45, and 42.**
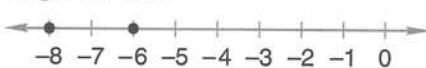
**6.** Write each non-zero digit times its place value.
(5)

$75,000 = (7 \times 10,000) + (5 \times 1000)$
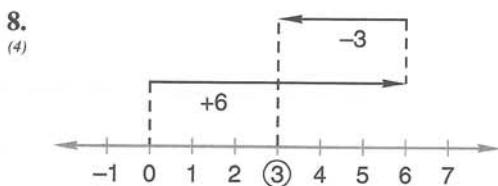
**7.** If necessary, use a number line.
(4)

"<" means "is to the left of" and is read "is less than"

">" means "is to the right of" and is read "is greater than"

$$\xleftarrow{\quad\bullet\ \ \ \ \ \bullet \ \ \ \ \ \ \ \ \ \ \ }$$
−8 −7 −6 −5 −4 −3 −2 −1 0

$-6 \ \circled{>} \ -8$

**8.**
(4)

```
              ┌───── −3 ───┐
              ↓            ⋮
      ┌──────── +6 ────────┘
      ⋮              ⋮
 ──┼──┼──┼──┼──┼──┼──┼──┼──
  −1  0  1  2 ③  4  5  6  7
```

Move 6 units to the right then 3 units to the left.

**9.** Draw a skeleton.
(5)

$$\underline{\ \ },\ \underline{\ \ }\ \underline{\ \ }\ \underset{M}{\underline{3}},\ \underline{0}\ \underline{4}\ \underset{Th}{\underline{0}},\ \underline{7}\ \underline{0}\ \underline{0}$$

**10.** 
(3)

$$\begin{array}{r} T \\ +\ \$5.50 \\ \hline \$12.00 \end{array}$$ ⟵ Missing addend tells us to subtract

$$\begin{array}{r} \$12.00 \\ -\ \$5.50 \\ \hline \$6.50 \end{array}$$

$T = \$6.50$

**11.**
(3)

$$\begin{array}{r} B \\ -\ 4782 \\ \hline 2084 \end{array}$$ ⟵ Missing minuend tells us to add

$$\begin{array}{r} 2084 \\ +\ 4782 \\ \hline 6866 \end{array}$$

$B = 6866$

**12.**
(3)

$$\begin{array}{r} F \\ \times\ 7 \\ \hline \$51.80 \end{array}$$ ⟵ Missing factor tells us to divide

$\$51.80 \div 7 = 7.4$

$F = \$7.40$

**13.**
(3)

$$\begin{array}{r} 6048 \\ -\ Y \\ \hline 2532 \end{array}$$ ⟵ Missing subtrahend tells us to subtract

$$\begin{array}{r} 6048 \\ -\ 2532 \\ \hline 3516 \end{array} \qquad Check: \begin{array}{r} 6048 \\ -\ 3516 \\ \hline 2532 \end{array}$$

$Y = 3516$

**14.**
(3)

$$\begin{array}{r} 15 \\ \times\ P \\ \hline 270 \end{array}$$ ⟵ Missing factor tells us to divide

$270 \div 15 = 18 \qquad Check: \begin{array}{r} 15 \\ \times\ 18 \\ \hline 270 \end{array}$

$P = 18$

**15.**
(3)

$$\begin{array}{r} 1587 \\ +\ C \\ \hline 2950 \end{array}$$ ⟵ Missing addend tells us to subtract

$$\begin{array}{r} 2950 \\ -\ 1587 \\ \hline 1363 \end{array} \qquad Check: \begin{array}{r} 1587 \\ +\ 1363 \\ \hline 2950 \end{array}$$

$C = 1363$

**16.** $9 \cdot 22 \cdot 25 =$
(1)

$198 \cdot 25 = \mathbf{4950}$

**17.** $1000 - (720 - 38) =$
(2)

$1000 - 682 = \mathbf{318}$

**18.**
(1)

$$6\overline{)38,154}$$ quotient **6,359**

$$
\begin{array}{r}
36 \\
\hline
2\ 1 \\
1\ 8 \\
\hline
3\ 5 \\
3\ 0 \\
\hline
5\ 4 \\
5\ 4 \\
\hline
0
\end{array}
$$

**19.** 150(18)    Means Multiply
(1)    = **2700**

**20.** $\dfrac{\$41.30}{10}$    Means Divide
(1)
    = **\$4.13**

## TEST 2

**1.** (a) Two dimes = 20¢
(8)

Two dimes = $\dfrac{20}{100}$ of a dollar.

**So two dimes is $\dfrac{1}{5}$ of a dollar.**

(b) We need to convert either $\frac{20}{100}$, or $\frac{1}{5}$ to a percent. Instead of using the denominator 100, we use the % sign.

$\dfrac{20}{100} = 20\%$.

**So two dimes is 20% of a dollar.**
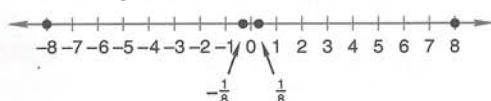
**2.** The answer is the reciprocal of $\dfrac{5}{8}$.
(9)

**So there are $\dfrac{8}{5}$ of the $\dfrac{5}{8}$'s in 1.**

**3.** Multiply the whole number times the denominator
(10) and add the numerator.

$9\dfrac{5}{8} = \dfrac{72 + 5}{8} = \dfrac{77}{8}$

**4.** (a) If necessary, use a number line.
(8,4)



In order: $-8, -\dfrac{1}{8}, \dfrac{1}{8}, 8$

(b) $-\dfrac{1}{8}, \dfrac{1}{8}$    **because integers do not include fractions.**

**5.** Associative property tells us to regroup.
(2)
**(6 + 8) + 2 = 6 + (8 + 2)**
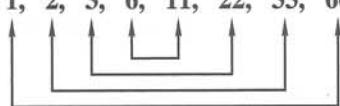
**6.** Draw skeletons to convert from words to digits.
(5)

$$
\begin{array}{r}
3\ \ 0\ \ 0,0\ \ 0\ \ 0,0\ \ 0\ \ 0 \\
\text{M}\qquad\ \ \text{Th} \\
-\quad 5\ \ 6,0\ \ 0\ \ 0,0\ \ 0\ \ 0 \\
\text{M}\qquad\ \ \text{Th} \\
\hline
2\ \ 4\ \ 4,0\ \ 0\ \ 0,0\ \ 0\ \ 0
\end{array}
$$
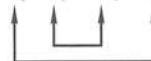
**two hundred forty-four million**

**7.** Factors often come in pairs.
(6)
(a) **1, 2, 3, 6, 11, 22, 33, 66**



(b) **1, 5, 11, 55**



(c) **1, 11**

(d) **The GCF is 11 because 11 is the largest factor of both numbers.**

**8.** [The product of four and one] [is less than]
(4)         (4 × 1)                    <

[the sum of four and one]
    (4 + 1)

**So (4 × 1) < (4 + 1)**

**9.**
(3)
$$
\begin{array}{r}
3955 \\
+\quad C \\
\hline
7000
\end{array}
$$ ← Missing addend tells us to subtract

$$
\begin{array}{r}
7000 \\
-\ 3955 \\
\hline
3045
\end{array}
$$
*Check:*
$$
\begin{array}{r}
3955 \\
+\ 3045 \\
\hline
7000
\end{array}
$$

**C = 3045**

**10.**
(3)
$$
\begin{array}{r}
G \\
-\ \$4.20 \\
\hline
\$6.50
\end{array}
$$
Common sense tells us G must be larger than either of the other two numbers, so we must add.

$$
\begin{array}{r}
\$6.50 \\
+\ 4.20 \\
\hline
\$10.70
\end{array}
$$
*Check:*
$$
\begin{array}{r}
\$10.70 \\
-\ \ 4.20 \\
\hline
\$6.50
\end{array}
$$

**G = \$10.70**

**11.**
(3)

$$\begin{array}{r} 55 \\ \times\ B \\ \hline 605 \end{array}$$ ← Missing factor tells us to divide

$605 \div 55 = 11$    *Check:* $\begin{array}{r} 55 \\ \times\ 11 \\ \hline 605 \end{array}$

$B = 11$

**12.**
(9)

$\dfrac{1}{11} + \dfrac{2}{11} = \dfrac{3}{11}$    because we have common denominators.

**13.**
(8)

(a) $\dfrac{25}{36}$ is shaded    (b) $\dfrac{11}{36}$ is unshaded

*Note:* the sum of the shaded parts and the unshaded parts is $\frac{36}{36}$ or 1.

**14.**
(9)

$\dfrac{7}{13} - \dfrac{6}{13} = \dfrac{1}{13}$    because we have common denominators.

**15.**
(9)

$\dfrac{4}{7} \times \dfrac{4}{9} = \dfrac{16}{63}$

**16.**
(1)

$$\begin{array}{r} 4{,}324\ \text{r}\ 2 \\ 8\overline{)34{,}594} \\ \underline{32}\phantom{{,}594} \\ 2\,5\phantom{94} \\ \underline{2\,4}\phantom{94} \\ 19\phantom{4} \\ \underline{16}\phantom{4} \\ 34 \\ \underline{32} \\ 2 \end{array}$$

**17.**
(1)

90($7.44)    Means Multiply

= **$669.60**

**18.**
(9)

$\dfrac{3}{4} \cdot \dfrac{1}{8} \cdot \dfrac{5}{7} = \dfrac{15}{224}$ ← We multiplied numerators

← We multiplied denominators

**19.**
(7)

$\overline{BC}$ or it can be written $\overline{CB}$

**20.**
(7)

$\overline{CD}$, $\overline{BC}$, and $\overline{BD}$

# TEST 3

**1.**
(12)

We must subtract:    $\begin{array}{r} 22{,}374 \\ -\ 14{,}998 \\ \hline 7{,}376 \end{array}$

The population increased by **7,376**.

**2.**
(13)

The word "each" tells us this is an equal groups problem.

$$\begin{array}{r} 13 \\ \times\ 18 \\ \hline 234 \end{array}$$

There were **234** T-Shirts in the shipment.

**3.**
(12)

Find the product of 8 and 4.
Find the sum of 8 and 4.
Then subtract.

$(8 \times 4) - (8 + 4) =$

$32 - 12 = 20$

**The product is 20 greater than the sum.**

**4.**
(11)

"In all" tells us to add.

$$\begin{array}{r} \$7.23 \\ 2.23 \\ +\quad .98 \\ \hline \$10.44 \end{array}$$

Gregory spent **$10.44**.

**5.**
(12)

$$\begin{array}{r} 1728 \\ -\ 1556 \\ \hline 172 \end{array}$$

There were **172** years from 1556 to 1728.

**6.**
(14)

$29\% + N_j = 100\%$

$N_j = 71\%$

**71% of the students did not wear jeans.**

**7.**
(10)



$\dfrac{8}{8} + \dfrac{3}{8} = \dfrac{11}{8}$

**8.**
(15)

$\dfrac{2}{3} \times \left(\dfrac{16}{16}\right) = \dfrac{?}{48}$
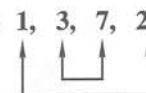
$\dfrac{2}{3} = \dfrac{32}{48}$

**9.**
(15)

$\dfrac{1}{5} \cdot \dfrac{2}{2} = \dfrac{?}{10}$

$\dfrac{1}{5} = \dfrac{2}{10}$

Now $\dfrac{2}{10} - \dfrac{1}{10} = \dfrac{1}{10}$

**The difference is $\dfrac{1}{10}$.**

10. (a) **1, 3, 7, 21**   Because **1 · 21 gives 21.**
(6)                               **3 · 7 gives 21.**

(b) **1, 2, 3, 6, 11, 22, 33, 66**
**Because 1 · 66 gives 66**
**Because 2 · 33 is 66**
**Because 3 · 22 is 66**
**Because 6 · 11 is 66**

(c) **1, 3 are factors of both**

(d) **3 is the greatest common factor of 21 and 66.**

11. $\overline{RS}$ or $\overline{SR}$ has endpoints $R$ and $S$.
(7)
$\overline{ST}$ or $\overline{TS}$ has endpoints $T$ and $S$.

$\overline{RT}$ or $\overline{TR}$ has endpoints $R$ and $T$.

12. $2\dfrac{3}{5}$ is represented.
(8)

13. $\dfrac{11}{22} + \dfrac{13}{22} = \dfrac{24}{22}$
(10)

$= \dfrac{12}{11} = 1\dfrac{1}{11}$

14. $\dfrac{8}{5} \cdot \dfrac{5}{4} = \dfrac{40}{20}$   Then Reduce
(15)

$= 2$

15. 
(1)
$$\begin{array}{r} 7{,}703 \text{ r } 4 \\ 5\overline{)38{,}519} \\ \underline{35} \\ 3\,5 \\ \underline{3\,5} \\ 01 \\ \underline{0} \\ 19 \\ \underline{15} \\ 4 \end{array}$$

16. $\dfrac{1060}{20}$   Means Divide   $20\overline{)1060}$
(1)                                           $\underline{100}$
                                                    $60$
$\dfrac{1060}{20} = 53$                $\underline{60}$

17. 
(1)
$$\begin{array}{r} 122 \\ \times\ 84 \\ \hline 488 \\ 976\ \ \\ \hline 10{,}248 \end{array}$$

18. $(4 + 3)(3) =$
(2)
$7 \cdot 3 = 21$

19. $14t = 1820$   $t$ is the missing factor,
(3)
$t = 130$   therefore divide $\dfrac{1820}{14}$.

20. $\$20.00 - Z = \$4.52$
(3)
$Z = \$20.00 - \$4.52$
$Z = \$15.48$

# TEST 4

1. 
(12)
$$\begin{array}{r} 1993 \\ -\quad 84 \\ \hline 1909 \end{array}$$   This is a time problem.

Great Grandma was born in **1909.**

2. This is an equal groups problem.
(13)
$\dfrac{5000 \text{ bushels}}{40 \text{ acres}} = 125$ bushels per acre

**The crop produced an average of 125 bushels per acre.**

3. One yard $= 3$ feet.
(16)
2 feet $= \dfrac{2}{3}$ of 1 yard.

$$3\overline{)2.00}\ \ {\scriptstyle 0.66\frac{2}{3}} = \dfrac{66\frac{2}{3}}{100} = 66\dfrac{2}{3}\%$$

$$\begin{array}{r} 0.66\tfrac{2}{3} \\ 3\overline{)2.00} \\ \underline{1\,8} \\ 20 \\ \underline{18} \\ 2 \end{array}$$

Two feet is $66\dfrac{2}{3}\%$ of a yard.

4. Some went away problem.
(11)
$$\begin{array}{r} 689 \text{ tickets} \\ -\quad 39 \text{ tickets not sold} \\ \hline 650 \text{ tickets sold} \end{array}$$

**650** tickets were sold.

5. 
(12)
$$\begin{array}{r} \underline{1{,}\,0\ \ 0\ \ 0{,}\,0\ \ 0\ \ 0{,}\,0\ \ 0\ \ 0} \\ \text{B} \qquad\quad \text{M} \qquad\quad \text{Th} \\ - \qquad \underline{7\ \ 1{,}\,0\ \ 0\ \ 0{,}\,0\ \ 0\ \ 0} \\ \text{M} \qquad\quad \text{Th} \\ \hline 9\ \ 2\ \ 9{,}\,0\ \ 0\ \ 0{,}\,0\ \ 0\ \ 0 \end{array}$$

**nine hundred twenty-nine million**

6. $\dfrac{5}{16} + \left(\dfrac{3}{16} + \dfrac{7}{16}\right) = \left(\dfrac{5}{16} + \dfrac{3}{16}\right) + \dfrac{7}{16}$
(9)

Since we recognize this as the associative property of addition, we do not need to do the computation.

7. Six minus 9 equals negative three.
(4)

$$6 \quad - \quad 9 \quad = \quad -3$$

8. (a) Perimeter = 13 ft + 13 ft + 13 ft + 13 ft
(20)
   **The perimeter is 52 feet.**

   (b) Area = 13 ft × 13 ft
   **The area is 169 sq. feet.**

9. (a) $\dfrac{2}{16} \div \dfrac{2}{2} = \dfrac{1}{8}$
(15)

   (b) $8\dfrac{10}{16} = 8 + \dfrac{10 \div 2}{16 \div 2} = 8\dfrac{5}{8}$

10. $2\dfrac{1}{4} = \dfrac{(2 \cdot 4) + 1}{4} = \dfrac{9}{4}$
(10,15)

   $\dfrac{9}{4} \times \dfrac{5}{9} = \dfrac{45}{36}$;  Now we must reduce.

   $\dfrac{45}{36} \div \dfrac{9}{9} = \dfrac{5}{4} = 1\dfrac{1}{4}$

11. (a) $\dfrac{1}{2} \cdot \dfrac{20}{20} = \dfrac{?}{40}$
(15)

   $? = 20$

   (b) $\dfrac{2}{5} \cdot \dfrac{8}{8} = \dfrac{?}{40}$

   $? = 16$

12.
(17)

   $43°$

13. $\begin{array}{r} 3446 \\ - \quad N \\ \hline 1428 \end{array}$  ← Missing subtrahend tells us to subtract
(3)

   $\begin{array}{r} 3446 \\ - 1428 \\ \hline 2018 \end{array}$  *Check:* $\begin{array}{r} 3446 \\ - 2018 \\ \hline 1428 \end{array}$

   $N = 2018$

14. $30j = \$55.50$  Missing factor tells us to divide
(3)
   $\$55.50 \div 30 = \$1.85$

   $j = \$1.85$

15. (a) $\dfrac{1}{8} \times \dfrac{8}{8} = \dfrac{?}{64}$    (b) $\dfrac{1}{2} \times \dfrac{32}{32} = \dfrac{?}{64}$
(15)

   $? = 8$    $? = 32$

16. $\dfrac{3}{8} + \dfrac{5}{8} + \dfrac{1}{8} = \dfrac{9}{8} = 1\dfrac{1}{8}$
(10)

17. $\dfrac{17}{19} - \dfrac{11}{19} = \dfrac{6}{19}$
(9)

18. $\left(\dfrac{1}{4}\right)^2 = \dfrac{1}{4} \times \dfrac{1}{4} = \dfrac{1}{16}$
(20)

19. $\sqrt{256} = 16$    because $16 \times 16 = 256$
(20)

20. $14(10 + 11) =$
(2)
   $14(21) = 294$

# TEST 5

1. This is an equal groups problem so we divide.
(13)

   $\begin{array}{r} 32 \\ 25\overline{)800} \end{array}$

   **32 books were packed in each box.**

2. $\begin{array}{r} 1712 \\ - 1383 \\ \hline 329 \end{array}$  This is a later-earlier-difference problem.
(12)
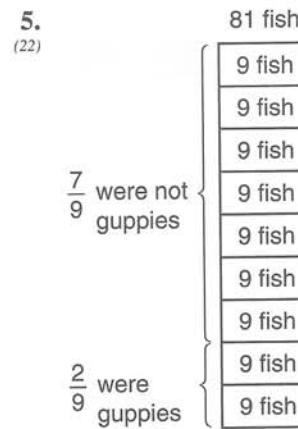
   **It was 329 years from 1383 to 1712.**

3. $\begin{array}{r} \$15.00 \text{ paid} \\ - \$11.76 \text{ lunch} \\ \hline \$3.24 \text{ got back} \end{array}$
(11)

   **He should get \$3.24 back.**
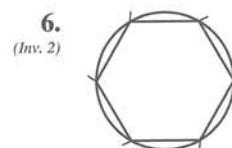
4. $\begin{array}{r} 283 \text{ pages} \\ - 181 \text{ pages} \\ \hline 102 \text{ pages} \end{array}$
(12)

   **She still must read 102 pages.**

5.
(22)

81 fish

$\dfrac{7}{9}$ were not guppies
| 9 fish |
| 9 fish |
| 9 fish |
| 9 fish |
| 9 fish |
| 9 fish |
| 9 fish |

$\dfrac{2}{9}$ were guppies
| 9 fish |
| 9 fish |
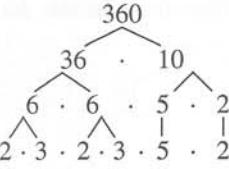
   (a) **18 fish were guppies.**

   (b) **63 fish were not guppies.**

6.
(Inv. 2)

   See textbook pages 111-112 for a detailed explanation.

**7.**
(21)

$$360$$

$$36 \cdot 10$$

$$6 \cdot 6 \cdot 5 \cdot 2$$

$$2 \cdot 3 \cdot 2 \cdot 3 \cdot 5 \cdot 2$$

or we could use other factors such as:

$$18 \cdot 20 \qquad \text{or}$$

$$40 \cdot 9 \qquad \text{or others}$$

Since we prefer to write the primes in order, we write: $2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$

**8.** (a) $3\dfrac{8}{5} = \dfrac{(3 \times 5) + 8}{5} = \dfrac{23}{5} = 4\dfrac{3}{5}$
(23)

(b) $\dfrac{105}{90}$    Convert first    $90\overline{)105}^{\,1\frac{15}{90}}$

$$\underline{90}$$
$$15$$

then reduce $= 1\dfrac{1}{6}$    We also could have reduced first.

(c) $\dfrac{640 \div 10}{780 \div 10} = \dfrac{64 \div 2}{78 \div 2} = \dfrac{32}{39}$

**9.** (a) **The reciprocal of $\frac{3}{7}$ is $\frac{7}{3}$ because $\frac{3}{7} \cdot \frac{7}{3} = 1$.**
(9)

(b) First we write $9\frac{2}{3}$ as $\frac{29}{3}$. **The reciprocal is $\frac{3}{29}$.**

(c) First we write 6 as $\frac{6}{1}$. **The reciprocal is $\frac{1}{6}$.**

**10.** (a) $\dfrac{1}{4} \times \dfrac{18}{18} = \dfrac{?}{72}$    (b) $\dfrac{7}{9} \times \dfrac{8}{8} = \dfrac{?}{72}$
(15)
$$? = 18 \qquad\qquad\qquad ? = 56$$

**11.** $61 - C = 30$    This is a missing subtrahend.
(3)
    $61$      *Check:* $61 - 31 = 30$
$-\;30$
$\overline{\;\;31}$
$$C = 31$$

**12.** $g - 57 = 56$    Missing minuend so we add.
(3)
    $57$      *Check:* $113 - 57 = 56$
$+\;56$
$\overline{113}$
$$g = 113$$

**13.** $15h = 465$    Missing factor so
(3)
$465 \div 15 = 31$    we divide.
$$h = 31 \qquad \textit{Check: } 15 \cdot 31 = 465$$

**14.**
(23)

$$8 \longrightarrow 7\dfrac{3}{3}$$

$$-\,1\dfrac{2}{3} \qquad -\,1\dfrac{2}{3}$$

$$6\dfrac{1}{3}$$

**15.**
(10)

$$6\dfrac{4}{7}$$

$$+\,6\dfrac{4}{7}$$

$$12\dfrac{8}{7} = 12 + 1\dfrac{1}{7} = 13\dfrac{1}{7}$$

**16.**
(23)

$$6\dfrac{3}{7} \longrightarrow 5\dfrac{10}{7}$$

$$-\,2\dfrac{5}{7} \qquad -\,2\dfrac{5}{7}$$

$$3\dfrac{5}{7}$$

**17.** $\dfrac{2}{5} \cdot \dfrac{5}{8} \cdot \dfrac{8}{13} = \dfrac{80}{520}$    Then reduce
(24)
$$= \dfrac{2}{13}$$

**18.** $\dfrac{3}{7} \div \dfrac{7}{10} = \dfrac{3}{7} \times \dfrac{10}{7} = \dfrac{30}{49}$
(25)

If you do not understand *why* we write the division problem as a multiplication problem, please refer to Example 4 on page 142.

**19.** $3^4 - \sqrt{441} = 3 \cdot 3 \cdot 3 \cdot 3 - \sqrt{21 \cdot 21}$
(20)
$$= 81 - 21 = 60$$

**20.** (a) **Side $AB$ is parallel to side $CD$.**
(20)

(b) Area $= (29 \text{ mm})(14 \text{ mm})$

     Area $= $ **406 sq. mm**

# TEST 6

**1.** Average tells us to find the total and divide by the
(28) number of members.

$$\dfrac{82 \text{ in.} + 74 \text{ in.} + 78 \text{ in.} + 80 \text{ in.} + 76 \text{ in.}}{5}$$

$$= 78 \text{ in.}$$

**The average height is 78 inches.**

**Test Solutions**

**2.** First we must find out how much Tyler spent.
(28)

$$\begin{array}{r} 9 \text{ pounds} \\ \times\ \$0.87 \text{ per pound} \\ \hline \$7.83 \text{ amount spent} \end{array}$$

Now, find out how much he had left:

$$\begin{array}{r} \$10.00 \\ -\ \ 7.83 \\ \hline \$2.17 \end{array}$$
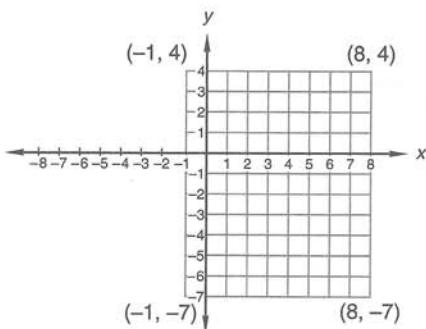
**Tyler should get back $2.17 in change.**

**3.**
(11)
$$\begin{array}{r} 4498 \text{ total visitors} \\ -\ 2808 \text{ visitors with discount} \\ \hline 1690 \text{ visitors at regular price} \end{array}$$

**1690 visitors paid regular price.**

**4.**
(Inv. 3)



(−1, 4)　　　　　(8, 4)

(−1, −7)　　　　(8, −7)

(a) **The coordinates of the 4th vertex are: (8, 4)**

(b) Area = (9 units)(11 units)

　　**Area = 99 sq. units**

**5.** 25% means $\dfrac{25}{100}$ which reduces to $\dfrac{1}{4}$.
(22)

2540 miles

$\dfrac{1}{4}$ the first day | 635 miles
| 635 miles
$\dfrac{3}{4}$ left to travel | 635 miles
| 635 miles

(a) **The Chins traveled 635 miles the first day.**

(b) **They still had to travel 1905 miles.**

**6.** First, notice 7 ft = 84 inches. Then we must
(19) divide the perimeter by 4 to find the length of each side. 84 ÷ 4 = 21 in.

**The length of each side is 21 inches.**

**7.** (a) Circle the 8 because it is in the thousands
(29)　　place:

6⑧,261

　　Since the 2 in the hundreds place is less than 5
　　we round 68,261 to **68,000.**

(b) Circle the 2 because it is in the hundreds place:

68,②61

Since the 6 in the tens place is greater than 5 we round 68,261 to **68,300.**

**8.** First round 1641 to 1600, then round 41 to 40.
(29) Next mentally divide 1600 ÷ 40.

**Finally the estimate is 40.**

**9.** (a) We can reduce several ways:
(15,24)

$$\frac{160}{240} = \frac{16 \times \cancel{10}}{24 \times \cancel{10}} = \frac{16}{24}$$

Then recognize that: $\dfrac{16}{24} = \dfrac{\cancel{8} \times 2}{\cancel{8} \times 3}$

$$\frac{160}{240} = \frac{2}{3}$$

(b) We could also prime factor the numerator and the denominator.

$$\frac{160}{240} = \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 2 \cdot \cancel{5}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 3 \cdot \cancel{5}} = \frac{2}{3}$$

**10.** One method is to find common denominators.
(30)

$$\frac{7}{8} = \frac{49}{56}, \quad \frac{8}{7} = \frac{64}{56}$$

So $\dfrac{49}{56} < \dfrac{64}{56}$　　$\dfrac{7}{8} < \dfrac{8}{7}$

Another method would be to recognize that

$$\frac{7}{8} < 1 \text{ and } \frac{8}{7} > 1 \quad \text{so } \frac{7}{8} \text{ must be } < \frac{8}{7}.$$

**11.** List the multiples of 10 and of 8.
(27)

The multiples of 10: 10, 20, 30, ㊵, 50, 60, ...

The multiples of 8: 8, 16, 24, 32, ㊵, 48, ...
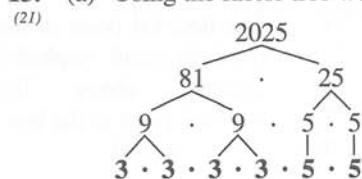
The first one we find in common is 40.

**So the LCM of 10 and 8 is 40.**

**12.** (a) **Chord $\overline{ST}$ is a diameter.**
(Inv. 2)

(b) **∠SRT appears to be a right angle.**

**13.** (a) Using the factor tree we can start with:
(21)

$$2025$$
$$81 \cdot 25$$
$$9 \cdot 9 \cdot 5 \cdot 5$$
$$3 \cdot 3 \cdot 3 \cdot 3 \cdot 5 \cdot 5$$

(b) The $\sqrt{2025}$ will have half as many factors as 2025.

$$\sqrt{2025} = 3 \cdot 3 \cdot 5 = \mathbf{45}$$

**14.** $9c = 4 \cdot 36$ → This is a missing factor problem
(3) so we must divide 144 by 9.

$$9c = 144$$
$$c = \mathbf{16}$$

**15.** $287 + r = 971$ → Missing addend so we subtract
(3)
$$r = \mathbf{684}$$

**16.** $94 - h = 49$ → Missing subtrahend
(3) so we subtract
$$h = \mathbf{45}$$

**17.** $\dfrac{3}{5} + \dfrac{1}{2} = \dfrac{6}{10} + \dfrac{5}{10} = \dfrac{11}{10} = \mathbf{1\dfrac{1}{10}}$
(30)

**18.** $\dfrac{6}{7} - \dfrac{1}{8} = \dfrac{48}{56} - \dfrac{7}{56} = \mathbf{\dfrac{41}{56}}$
(30)

**19.** We must perform the operation in parentheses first.
(30) This time we will reduce before multiplying.

$$\left(\dfrac{\overset{1}{\cancel{2}}}{3} \cdot \dfrac{5}{\underset{3}{\cancel{6}}}\right) - \dfrac{2}{5} = \dfrac{5}{9} - \dfrac{2}{5} = \dfrac{25}{45} - \dfrac{18}{45} = \mathbf{\dfrac{7}{45}}$$

**20.** $5\dfrac{1}{3} \div 1\dfrac{7}{9} =$
(26)

$$\dfrac{16}{3} \div \dfrac{16}{9} = \text{→ Changed mixed numbers to improper fractions}$$

$$\dfrac{\overset{1}{\cancel{16}}}{\underset{1}{\cancel{3}}} \cdot \dfrac{\overset{3}{\cancel{9}}}{\underset{1}{\cancel{16}}} = \text{→ Multiplied by reciprocal of the divisor}$$

$$= \mathbf{3}$$

## TEST 7

**1.** Average tells us to find the total and divide by the
(28) number of items.

$$\dfrac{\$113.96 + \$99.21 + \$93.20 + \$128.95}{4}$$

$$= \$108.83$$

**The average weekly grocery bill was $108.83.**

**2.** $\begin{array}{r} \$9521 \\ - \phantom{0}3267 \\ \hline \$6254 \end{array}$
(12)

**The price was reduced by $6254.**

**3.** First calculate the yearly price at $4.25 per issue.
(28)

$\$4.25 \times 12 = \$51$ per year

Then subtract $\$51 - \$41.40$ to get $9.60.

**$9.60 can be saved by paying the subscription price.**

**4.** Ivan's time in seconds is $60 \text{ s} + 2 \text{ s} = 62 \text{ s}$. We
(28) must subtract $62 \text{ s} - 7 \text{ s}$ to get Donovan's time.
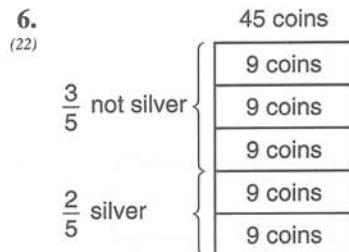
**Donovan's time was 55 seconds for one lap.**

**5.** First we multiply $28 \text{ cm} \times 4$ to find the perimeter
(19) of the square.

$$28 \times 4 = 112 \text{ cm}$$

Then we divide 112 cm by 7 to find the depth of each side of the heptagon because a heptagon has 7 sides.

**Each side of the heptagon is 16 cm.**

**6.**
(22)

45 coins

| | |
|---|---|
| $\dfrac{3}{5}$ not silver | 9 coins |
| | 9 coins |
| | 9 coins |
| $\dfrac{2}{5}$ silver | 9 coins |
| | 9 coins |

(a) **18 coins were silver**

(b) **27 coins were not silver**

**7.**
(34)

0 — 18 19, 18.5

**18.5 is halfway between 18 and 19.**

**8.** List the multiples of 5, 10, and 8 and look for the
(27) smallest multiple in common.

Multiples of 5: 5, 10, 15, 20, 25, 30, 35, ④0

Multiples of 10: 10, 20, 30, ④0

Multiples of 8: 8, 16, 24, 32, ④0

**The LCM of 5, 10, and 8 is 40.**

**9.** (a) Circle the third 2 because it is in the hundredths place:
(33)

$$\downarrow$$

$$1832.2\,②\,43$$

Since the 4 in the thousandths place is less than 5, we round 1832.2243 to **1832.22** because we do not include any zeros that would follow.

(b) Circle the 8 in the hundreds place:

$$\downarrow$$

$$1\,⑧\,32.2243$$

1832.2243 rounds to **1800** because the next digit behind the 8 is less than 5.

*Note:* We need the 2 zeros before the decimal point as place holders, but not the zeros that follow the decimal point.

**10.** $\dfrac{34\cancel{0}}{72\cancel{0}} = \dfrac{\overset{17}{\cancel{34}}}{\underset{36}{\cancel{72}}} = \dfrac{17}{36}$
(15,24)
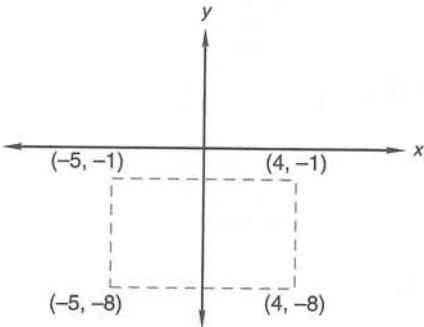
We could also prime factor:

$$\dfrac{340}{720} = \dfrac{\cancel{2}\cdot\cancel{2}\cdot\cancel{5}\cdot 17}{\cancel{2}\cdot\cancel{2}\cdot 2\cdot 2\cdot 3\cdot 3\cdot\cancel{5}} = \dfrac{17}{36}$$

**11.** **59.5** See explanation for problem # 7.
(34)

**12.**
(Inv. 3)



(a) **The coordinates of the fourth vertex are (−5, −8)**

(b) Area = 9 units × 7 units
**The area is 63 sq. units.**

**13.** $7s = 5 \cdot 49$  give us
(3)
$7s = 245$ ⟶ Missing factor so we divide by 7
$s = 35$

**14.** **Two hundred thirty-seven and two hundred**
(31) **eight thousandths.**

**15.** $2.5 \times 2.5 = \mathbf{6.25}$
(35)

Because each factor has one decimal place, the product has 2 decimal places.
Also, tenths × tenths = hundredths.

**16.** $2.73 \div 3 = 3\overline{\smash{)}\,2.73}$  The decimal point in the
(35)
$$\begin{array}{r} 0.91 \\ 3\overline{\smash{)}2.73} \\ \underline{2\,7} \\ 3 \\ \underline{3} \\ 0 \end{array}$$
quotient is placed directly above the decimal point in the box.

**17.**  $\begin{array}{r} 3.23 \\ 1. \\ +\ 8.5 \\ \hline 12.73 \end{array}$  Align the decimal points.
(35)

**18.**  $\begin{array}{r} 14.170 \\ -\ 2.146 \\ \hline 12.024 \end{array}$  Align the decimal points. We also needed to write an extra zero after 14.17.
(35)

**19.** $4\dfrac{1}{3} - \left( \dfrac{\cancel{6}}{7} \cdot \dfrac{3}{\overset{}{\underset{2}{\cancel{4}}}} \right)$  First we perform operations in parentheses giving us:
(23,30)

$4\dfrac{1}{3} - \dfrac{9}{14}$  Then we need a common denominator.

$4\dfrac{1}{3} = 4\dfrac{14}{42}$  Now we need to regroup.

$-\dfrac{9}{14} = -\dfrac{27}{42}$

$$\begin{array}{r} 3\dfrac{56}{42} \\ -\ \dfrac{27}{42} \\ \hline 3\dfrac{29}{42} \end{array}$$

**20.** $\left( 6\dfrac{1}{4} + 6\dfrac{1}{2} \right) \div \left( 6 - 4\dfrac{1}{4} \right) =$
(26,30)

*Scratch work:*

$6 = 5\dfrac{4}{4}$

$-\,4\dfrac{1}{4} = -\,4\dfrac{1}{4}$

$\rule{1cm}{0.4pt}$

$1\dfrac{3}{4}$

$\left( 6\dfrac{1}{4} + 6\dfrac{2}{4} \right) \div \left( 1\dfrac{3}{4} \right) =$

$12\dfrac{3}{4} \div 1\dfrac{3}{4} =$  Now convert mixed number to improper

$\dfrac{51}{4} \div \dfrac{7}{4} =$  Convert ÷ to ×

$\dfrac{51}{\cancel{4}} \times \dfrac{\cancel{4}}{7} = \dfrac{51}{7} = 7\dfrac{2}{7}$

Convert improper to mixed number because we like to see answers written as mixed numbers.
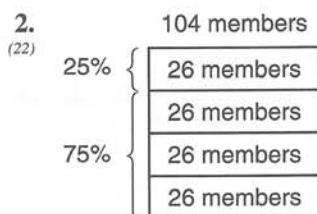
# TEST 8

**1.** (a) 6 min 50 s = 6 · 60 + 50
(28)
= 360 + 50

**It took Mia 410 seconds to run 5 laps.**

(b) Average = $\dfrac{410}{5}$

**Mia's average time was 82 seconds.**

**2.**
(22)

104 members

25% $\left\{\begin{array}{l} \boxed{26 \text{ members}} \\ \boxed{26 \text{ members}} \end{array}\right.$

75% $\left\{\begin{array}{l} \boxed{26 \text{ members}} \\ \boxed{26 \text{ members}} \end{array}\right.$

We need to divide the diagram into 4 parts of 25% each.

$\dfrac{1}{4}$ of 104 = 26

(a) **26 members did not have blue eyes.**

(b) **78 members had blue eyes.**

**3.** Each centimeter is 10 millimeters, so divide
(32) 81 mm by 10 to get cm.

81 mm = **8.1 cm**

**4.** Circle the 2 because it is in the thousandths place.
(33)
0.75②659 rounds to **0.753.**

See Test 7, problem 9 for a complete explanation.

**5.** m(3rd ∠) + 74 + 30 = 180
(40)
**The measure of the third angle is 76°.**

**6.** (a) **38.37**
(31)

(b) $38\dfrac{37}{100}$

**7.** This is an equal groups problem.
(13)
(24 boxes)(24 chimes per box) = 576 wind chimes

**There were 576 wind chimes in the shipment.**

**8.**
(36)

9 dark
+ 7 milk
16 total

$\dfrac{\text{milk}}{\text{total}} = \dfrac{7}{16}$

$\dfrac{7}{16}$ **of the chocolates were milk chocolates.**

Also see Lesson 36, Example 3.

**9.** (0.37)(0.01) = **0.0037**
(35)
**because each factor has 2 decimal places.**

**10.** $7\overline{)0.287}$ → $\dfrac{0.041}{7\,)\,0.287}$
(35)

**11.** $11\dfrac{1}{12} = 11\dfrac{1}{12} = 10\dfrac{13}{12}$
(23,30)

$-\ 7\dfrac{1}{4} = -7\dfrac{3}{12}\ \ -7\dfrac{3}{12}$

$\rule{3cm}{0.4pt}$

$3\dfrac{10}{12}$

$= 3\dfrac{5}{6}$

**12.** $2\dfrac{1}{4} \cdot 2\dfrac{2}{3} =$
(26)

$\dfrac{\overset{}{9}}{\underset{1}{4}} \cdot \dfrac{\overset{2}{8}}{3} = \dfrac{\overset{3}{9}}{1} \cdot \dfrac{2}{\underset{1}{3}}$
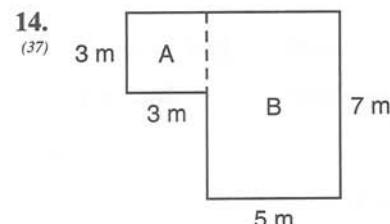
We could have combined these two steps.

$= \mathbf{6}$

**13.** $8 \div 2\dfrac{5}{6} = 8 \div \dfrac{17}{6}$
(26)

$= \dfrac{8}{1} \cdot \dfrac{6}{17}$

$= \dfrac{48}{17} = 2\dfrac{14}{17}$

**14.**
(37)



Area A = (3 m)(3 m) = 9 m²
+ Area B = (5 m)(7 m) = 35 m²
$\rule{5cm}{0.4pt}$
**Total Area = 44 m²**

**15.** $\dfrac{9}{8} = \dfrac{f}{48}$
(39)

We can write

$\dfrac{9}{8} \cdot \dfrac{6}{6} = \dfrac{f}{48}$

$\dfrac{54}{48} = \dfrac{f}{48}$

So f = **54**

OR we can write

9 · 48 = 8 · f
432 = 8f
**54 = f**
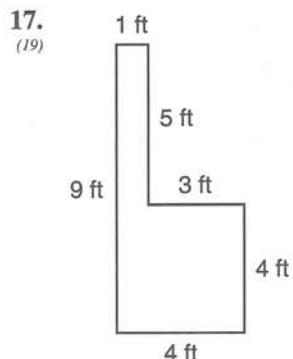
**16.**
(35)

$w + 0.35 = 2.04$

$w = \textbf{1.69}$

*Scratch Work:*

$$\begin{array}{r} 2.04 \\ -\ 0.35 \\ \hline 1.69 \end{array}$$

**17.**
(19)



$P = 9 + 1 + 5 + 3 + 4 + 4$

$P = \textbf{26 ft}$

**18.**
(37)



b = 11
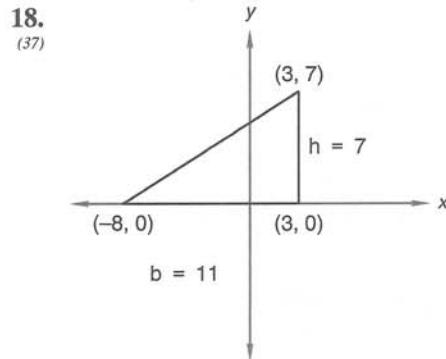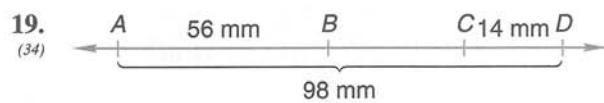
$A = \dfrac{b \cdot h}{2}$
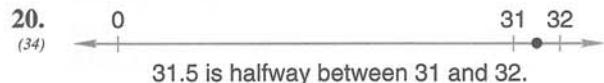
$A = \dfrac{11 \cdot 7}{2} = \dfrac{77}{2}$

$A = \textbf{38}\dfrac{\textbf{1}}{\textbf{2}}$ **sq. units**

**19.**
(34)



$\mathrm{m}(\overline{BC}) = 98\text{ mm} - (56\text{ mm} + 14\text{ mm})$

$= 98\text{ mm} - 70\text{ mm}$

$= 28\text{ mm}$

$\overline{BC}$ **is 28 mm long.**

**20.**
(34)



31.5 is halfway between 31 and 32.

# TEST 9

**1.**
(36)

$\text{Probability} = \dfrac{\text{number of favorable outcomes}}{\text{number of possible outcomes}}$

$\text{Probability of number} < 3 = \dfrac{\text{Either a 1 or a 2}}{6}$

$= \dfrac{2}{6}$

**The probability of rolling a number less than 3 is $\frac{1}{3}$.**

**2.**
(Inv. 4)

(a)  Mean =

$\dfrac{100 + 98 + 92 + 84 + 93 + 88 + 97 + 91 + 87 + 91}{10}$

**Mean = 92.1**

(b)  stem | leaf

$\begin{array}{c|l} 10 & 0 \\ 9 & 8\ 7\ 3\ 2\ 1\ 1 \\ 8 & 8\ 7\ 4 \end{array}$ ⟵ median

There are 10 scores so the median is the average of the score 5th from the top (92) and the score 5th from the bottom (91).

**The median is 91.5.**

**3.**
(41)

$f(g + h) =$

$0.6(4 + 0.5) = 0.6(4.5) = \textbf{2.7}$

**4.**
(38)

(a)  Scores listed in order were Julie (23), Dawn (20), Teri (17), Mark (12), and Mary (10).

Teri (17) − Mary (10) = 7

**Third place received 7 more votes than 5th place.**
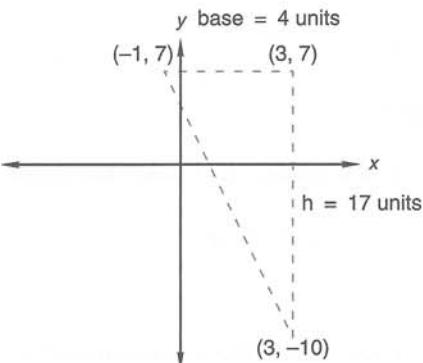
(b)  Total votes = 82

Dawn's votes = 20

$\dfrac{20}{82} = \dfrac{10}{41}$

**Dawn received $\dfrac{10}{41}$ of the votes.**

**5.**
(37, Inv. 3)

$$A = \frac{1}{2}bh$$

$$A = \frac{1}{2}(4)(17)$$

$$A = 2(17)$$

$$A = \textbf{34 sq. units}$$

*Note:* If the lengths of both the base and the height are odd numbers, use the formula

$$A = \frac{b \cdot h}{2}$$

Otherwise, it is probably easier to use

$$A = \frac{1}{2}bh$$

**11.** $29 + 90 + a = 180$
(40)

$$119 + a = 180$$

$$\mathbf{m\angle a = 61°}$$

$$\mathbf{m\angle c = 61°}$$ because $a$ and $c$ are vertical angles

$$a + b = 180$$

$$61 + b = 180$$ because $a$ and $b$ are supplementary

$$\mathbf{m\angle b = 119°}$$

**6.** (a) If $\frac{3}{8}$ were delirious, then $\frac{5}{8}$ were dazed.
(36)

(b) $\dfrac{\text{delirious}}{\text{dazed}} = \dfrac{\frac{3}{8}}{\frac{5}{8}}$ or $\dfrac{3}{5}$

We can think of this as a total of 8 people, 3 delirious and 5 dazed.

**The ratio of delirious to dazed was $\dfrac{3}{5}$.**

**12.** $11\overline{)3.200000}$
(42)
$$\begin{array}{r} 0.290909 = \mathbf{0.2\overline{90}} \\ \hline \end{array}$$

or use your calculator for $3.2 \div 11$ and observe the pattern.

$$\begin{array}{r}
2\,2 \\ \hline
1\,00 \\
99 \\ \hline
100 \\
99 \\ \hline
100 \\
99 \\ \hline
1
\end{array}$$

**7.**
(19)



3 mm  [rectangle]  3 mm

Perimeter = 2 widths + 2 lengths

16 mm = 2(3) mm + 2 lengths

16 mm = 6 mm + 2 lengths

2 lengths = 10 mm

**So the length must be 5 mm.**

**13.** $\dfrac{5}{8} = \dfrac{d}{48}$  Cross multiply
(39)

$$5 \cdot 48 = 8d$$

$$240 = 8d$$

$$\mathbf{30 = d}$$

**8.** Recall 327% means $\dfrac{327}{100}$ **which equals 3.27.**
(43)

We could have thought $327\% = 3\dfrac{27}{100}$.

**14.** $9 = v + 7.98$  Missing addend
(3,35)
$$v = \mathbf{1.02}$$  *Scratch Work:*
$$\begin{array}{r} 9.00 \\ -\ 7.98 \\ \hline 1.02 \end{array}$$

**9.** $4\overline{)5.00}$  $\dfrac{5}{4} = \mathbf{1.25}$
(43)

$$\begin{array}{r}
1.25 \\ \hline
4 \\ \hline
1\,0 \\
8 \\ \hline
20 \\
20 \\ \hline
0
\end{array}$$

We could also think

$\dfrac{5}{4} = 1\dfrac{1}{4} = 1.25$

**15.** $0.188 = 8 - p$  Missing subtrahend
(3,35)
$$p = \mathbf{7.812}$$  *Scratch Work:*
$$\begin{array}{r} 8.000 \\ -\ 0.188 \\ \hline 7.812 \end{array}$$

**10.** We remove the bar and write $67.\overline{24}$ to more than 4 places continuing the repeating pattern.
(42)

We get $67.\overline{24} = 67.242④24\ldots$

Then we round to 4 places and get **67.2424.**

**16.** $1\dfrac{2}{3} = 1\dfrac{8}{12}$
(23,30)

$$\dfrac{1}{4} = \dfrac{3}{12}$$

$$+\ 2\dfrac{2}{3} = 2\dfrac{8}{12}$$

$$\overline{\qquad\qquad}$$

$$3\dfrac{19}{12} = \mathbf{4\dfrac{7}{12}}$$

**17.**
(23,30)
$$6\frac{1}{2} - \left(5 - 2\frac{3}{10}\right)$$

$$6\frac{1}{2} - 2\frac{7}{10} = 6\frac{5}{10} - 2\frac{7}{10}$$

$$= 5\frac{15}{10} - 2\frac{7}{10}$$

$$= 3\frac{8}{10} = 3\frac{4}{5}$$

*Scratch Work:*
$$5 = 4\frac{10}{10}$$
$$-2\frac{3}{10} = -2\frac{3}{10}$$
$$\overline{\qquad\qquad 2\frac{7}{10}}$$

**18.**
(26)
$$3\frac{1}{5} \cdot 4\frac{3}{8} \cdot 2$$

$$\frac{\overset{2}{\cancel{16}}}{\cancel{5}} \cdot \frac{\overset{7}{\cancel{35}}}{\cancel{8}} \cdot 2 = 28$$
$$\phantom{xx}_1 \phantom{xxx}_1$$

**19.**
(26)
$$5 \div 2\frac{1}{2} = 5 \div \frac{5}{2}$$

$$= \frac{\overset{1}{\cancel{5}}}{1} \cdot \frac{2}{\cancel{5}} = 2$$
$$\phantom{x}_1$$

**20.**
(35,45)
$0.9\overline{)5.49}$ is equivalent to $9\overline{)54.9}$ with quotient $6.1$

$5.49 \div 9 = 6.1$

# TEST 10

**1.**
(46)
$$\begin{array}{r} \$65.60 \\ \times \phantom{xx} .05 \\ \hline 3.2800 \end{array} \quad \text{to find the tax}$$
$$= \$3.28$$

The total price equals price plus tax.
$$\begin{array}{r} \$65.60 \\ + \phantom{x} 3.28 \\ \hline 68.88 \end{array}$$

The total price is **$68.88.**

**2.**
(46)
Brand X is $\dfrac{\$2.70}{10 \text{ oz.}} = \dfrac{\$0.27}{1 \text{ ounce}}$

Brand Y $= \dfrac{\$0.31}{1 \text{ ounce}} = \dfrac{\$3.41}{11 \text{ ounces}}$

The cost of 11 ounces of Brand Y is **$3.41.**

**3.**
(36)
$$\frac{\text{pansies}}{\text{petunias}} = \frac{17}{8} \quad \text{so} \quad \frac{\text{petunias}}{\text{pansies}} = \frac{8}{17}$$

The ratio of petunias to pansies was **8 to 17.**

**4.**
(28)
$$\text{Average} = \frac{\$119.97 + 98.58 + 99.18 + 105.15}{4}$$

The average grocery bill was **$105.72.**
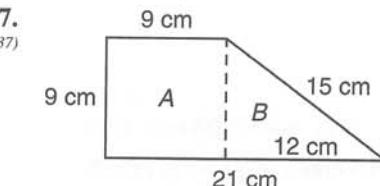
**5.**
(31,35)
$$\begin{array}{rcl} 3.5 & = & 3.50 \\ - \phantom{x}3.01 & = & -\phantom{x}3.01 \\ \hline & & 0.49 \end{array}$$

**Three and one hundredth is forty-nine hundredths less than three and five tenths.**

**6.**
(22)

66 boats

$$50\% = \frac{1}{2} \left\{ \boxed{33 \text{ boats}} \right.$$
$$50\% = \frac{1}{2} \left\{ \boxed{33 \text{ boats}} \right.$$

(a) **One half of the boats were not for sale.**

(b) **33 boats were not for sale.**

**7.**
(37)



$$\begin{array}{l} \text{Area } A = (9 \text{ cm})(9 \text{ cm}) = 81 \text{ sq. cm} \\ + \text{ Area } B = \frac{1}{2}bh = \frac{1}{2} \cdot 12 \cdot 9 = 54 \text{ sq. cm} \\ \hline \phantom{xxxxxxxx} \text{Total Area} = \textbf{135 sq. cm} \end{array}$$

**8.**
(48)
$$16\% = \frac{16}{100} = \frac{4}{25}$$

**9.**
(42)
Use a calculator to perform $3.8 \div 11$

This gives $0.3454545\ldots$

**Observe the pattern to get $0.3\overline{45}$.**

**10.**
(15)
$$\frac{624}{656} = \frac{156 \cdot \cancel{4}}{164 \cdot \cancel{4}} = \frac{39 \cdot \cancel{4}}{41 \cdot \cancel{4}} = \frac{39}{41}$$

We could also prime factor and get

$$\frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 39}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 41}$$

**11.**
*(20)*

$$\text{Perimeter} = 4 \cdot \text{length of each side}$$
$$96 = 4 \cdot S$$

Length of each side $= 24$

$$\text{Area} = (\text{side})(\text{side})$$
$$\text{Area} = (24)(24)$$
$$\textbf{Area} = \textbf{576 sq. inches}$$

**12.**
*(39)*

$\dfrac{2}{7} = \dfrac{8}{z}$    Cross multiply

$$2z = 56$$
$$z = \textbf{28}$$

**13.**
*(35)*

$4f = 1.6$    *Note:* $1.6 \div 4 = 0.4$

$$f = \textbf{0.4}$$

**14.**
*(35)*

$9 - y = 1.85$    *Scratch Work:*    $9.00$
$$y = \textbf{7.15} \qquad\qquad \underline{-\ 1.85}$$
$$7.15$$

**15.**
*(49)*

$$\begin{array}{r} 10\,\text{hr} \ \ 10\,\text{min} \ \ 50\,\text{s} \\ +\ 12\,\text{hr} \ \ \ 8\,\text{min} \ \ 45\,\text{s} \\ \hline 22\,\text{hr} \ \ 18\,\text{min} \ \ 95\,\text{s} \end{array}$$

*Note:* $95 \sec = 1 \min \ 35 \, \text{s}$

**We get 22 h 19 min 35 s**

**16.**
*(20)*

$$6^2 - 3^2 = 6 \cdot 6 - 3 \cdot 3$$
$$= 36 - 9 = \textbf{27}$$

**17.**
*(30)*

$$7\frac{1}{4} = 7\frac{2}{8}$$
$$-5\frac{1}{8} = -5\frac{1}{8}$$
$$\overline{\qquad\qquad 2\frac{1}{8}}$$

**18.**
*(26)*

$$6\frac{1}{4} \div 3\frac{1}{8} = \frac{25}{4} \div \frac{25}{8}$$

$$= \frac{\overset{1}{\cancel{25}}}{\underset{1}{\cancel{4}}} \cdot \frac{\overset{2}{\cancel{8}}}{\underset{1}{\cancel{25}}} = \textbf{2}$$

**19.**
*(47)*

$0.185 \times 10^4 = \textbf{1850}$

$10^4$ tells us to move the decimal point 4 places to the right.

**20.**
*(45)*

$0.07\overline{)0.861}$ is equivalent to $7\overline{)86.1}$

$0.861 \div 0.07 = \textbf{12.3}$

## TEST 11

**1.**
*(54)*

| | Ratio | Actual Count |
|---|---|---|
| Sailors | 1 | 25 |
| Pirates | 4 | P |

$\longrightarrow \dfrac{1}{4} = \dfrac{25}{P}$

$P = 100$
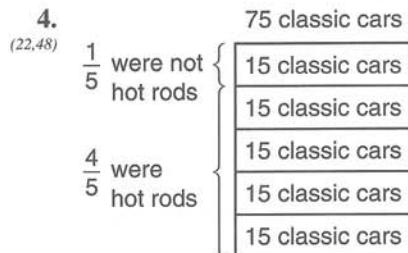
**There were 100 pirates.**

**2.**
*(55)*

Total of first 4 tests $= 87 + 97 + 83 + 87$
$$= 354$$

To have an average of 90 for the 5 tests her total must be 450.

**She needs to score 96 on her last test.**

**3.**
*(46)*

$\$6.84 \div 12 = \$0.57$ per single serving

**\$0.09 can be saved by buying yogurt by the case.**

**4.**
*(22,48)*

75 classic cars

$\dfrac{1}{5}$ were not hot rods $\left\{\begin{array}{|c|}\hline \text{15 classic cars} \\\hline \text{15 classic cars} \\\hline\end{array}\right.$

$\dfrac{4}{5}$ were hot rods $\left\{\begin{array}{|c|}\hline \text{15 classic cars} \\\hline \text{15 classic cars} \\\hline \text{15 classic cars} \\\hline\end{array}\right.$

(a) **60 classic cars were hot rods.**

(b) $\dfrac{4}{5} \times 100\% = 80\%$

**80% of the classic cars were hot rods.**

**5.**
*(51)*

(a) Forty-four trillion $= 44{,}000{,}000{,}000{,}000$
$$= \textbf{4.4} \times \textbf{10}^{13}$$

(b) **65,100**

**6.**
*(35)*

$1.9 + 0.3 \ \bigcirc \ 7 - 2.84$

$$\textbf{2.2} < \textbf{4.16}$$
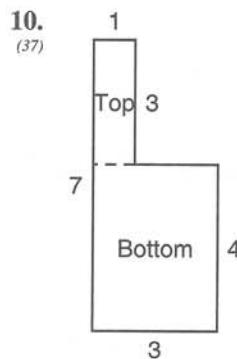
**7.**
*(50)*

$\dfrac{710 \ \cancel{\text{mm}}}{1} \cdot \dfrac{1 \ \text{cm}}{10 \ \cancel{\text{mm}}} = \textbf{71 cm}$

**8.**
*(48)*

| FRACTION | DECIMAL | PERCENT |
|---|---|---|
| $4\frac{3}{4}$ | **4.75** | **475%** |
| $\frac{475}{1000} = \frac{19}{400}$ | **0.0475** | $4\frac{3}{4}\%$ |

**9.**
*(41)*

$$bc - cd = (5)(2) - (2)(4)$$
$$= 10 - 8 = \textbf{2}$$

**10.**
(37)
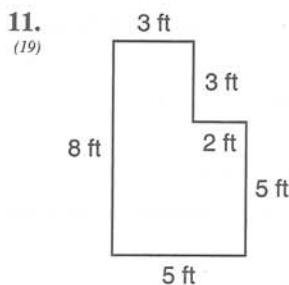


Area of Top $= 3 \cdot 1$
$= 3$ sq. in.

Area of Bottom $= (3)(4)$
$= 12$ sq. in.

Total Area $= $ **15 sq. in.**

**11.**
(19)



$P = 3 + 3 + 2 + 5 + 5 + 8$

$P = $ **26 ft**

**12.** (a) $\dfrac{9}{16}$ **is shaded.**
(8)

(b) $\dfrac{7}{16}$ **is shaded.**

**13.** $7 = p + 3.63$    Missing addend
(35)

$p = $ **3.37**

*Scratch Work:*   $\begin{array}{r} 7.00 \\ -\ 3.63 \\ \hline 3.37 \end{array}$

**14.** $\dfrac{g}{6} \times \dfrac{16}{12}$
(39)

$12\,g = 96$    Missing Factor

$g = $ **8**

**15.** $15^2 - 4^3 - 3^2 - \sqrt{289} =$
(20)

$225 - 64 - 9 - 17 = $ **135**

**16.** $3 + 3 \times 3 - 3 \div 3 = 3 + 9 - 3 \div 3$
(52)

$= 3 + 9 - 1 = $ **11**

Do multiplication and division from left to right first.

**17.** $4\dfrac{3}{4} + 2\dfrac{1}{12} + 1\dfrac{1}{8} = 4\dfrac{18}{24} + 2\dfrac{2}{24} + 1\dfrac{3}{24}$
(30)

$= 7\dfrac{23}{24}$

**18.** $4\dfrac{4}{5} \cdot 3\dfrac{1}{8} \cdot 1\dfrac{9}{20} = \dfrac{\overset{3}{\cancel{24}}}{\cancel{5}} \cdot \dfrac{\overset{5}{\cancel{25}}}{\cancel{8}} \cdot \dfrac{29}{20}$
(26)

$= \dfrac{3}{1} \cdot \dfrac{\overset{1}{\cancel{5}}}{1} \cdot \dfrac{29}{\underset{4}{\cancel{20}}} = \dfrac{87}{4} = 21\dfrac{3}{4}$

**19.** $(0.8)(0.17)(0.04)$
(35)

**0.00544**

*Note:* 5 decimal places.

**20.** $0.018 \overline{)7.200} \phantom{x}^{\textstyle 400.}$
(45)

# TEST 12

**1.** One half gallon $= 4$ pints
(16)

$\$1.20 \div 4 = \$0.30$

**The cost per pint is \$0.30.**

**2.**
(54)

| | Ratio | Actual Count |
|---|---|---|
| Oatmeal | 8 | 3 cups |
| Raisins | 7 | $R$ cups of raisins |

$8R = 21$

$R = \dfrac{21}{8} = 2\dfrac{5}{8}$

$2\dfrac{5}{8}$ **cups of raisins will be needed.**

**3.** If the average for 3 races was 53.4 s, the total time
(55) was 160.2.

The slowest plus the fastest was $56.4 + 51.3$ or 107.7 s.

Therefore the time for the other race was $160.2 - 107.7$ or **52.5 seconds.**

**4.** Total distance is 9 miles.
(46)

$\dfrac{9 \text{ mi}}{60 \text{ min}} = \dfrac{9 \text{ mi}}{1 \text{ hr}}$

**Sophia's speed was 9 miles per hour.**

**5.** $WN = 20\%$ of 30
(60)

$WN = 0.20 \cdot 30$

$WN = $ **6**

**6.** (a) $\dfrac{4}{5}$ was advertisements.
(48,54)

**80% was advertisements.**

(b) $\dfrac{\text{News}}{\text{Advertisements}} = \dfrac{20\%}{80\%} = \dfrac{20}{80}$
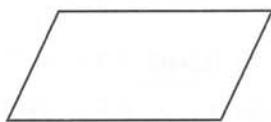
*Note:* News area was 20%.

**The ratio of news area to advertisements was $\frac{1}{4}$.**

**7.** (a) $0.000297 = \mathbf{2.97 \times 10^{-4}}$
(57)

(b) **0.00000442**

**8.** **Parallelogram**
(Inv. 6)



**9.** $\dfrac{1050 \;\cancel{yd}}{1} \cdot \dfrac{3 \text{ ft}}{1 \;\cancel{yd}} = \mathbf{3150 \text{ ft}}$
(50)

**10.**
(48)

| FRACTION | DECIMAL | PERCENT |
|---|---|---|
| $\frac{10}{100} = \frac{1}{10}$ | **0.1** | 10% |
| $\frac{3}{8}$ | **0.375** | **37.5%** |

First convert $\dfrac{3}{8}$ to a percent.

$\dfrac{3}{8} \times 100\% = \dfrac{300}{8}$

$= 37.5\%$
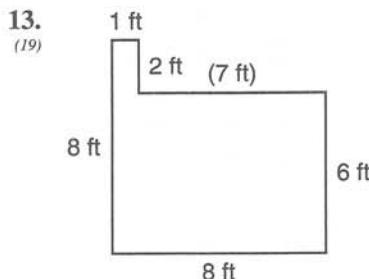
Then convert 37.5% to 0.375.

**11.** $e + 4.8 = 8$     Missing Addend
(35)

$e = \mathbf{3.2}$

*Scratch Work:*     $\begin{array}{r} 8 \\ -\;4.8 \\ \hline 3.2 \end{array}$
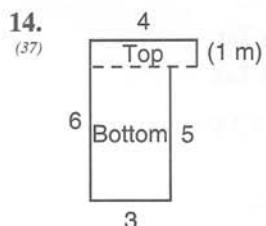
**12.** $\dfrac{7}{4} = \dfrac{h}{28}$
(39)

$4h = 28 \cdot 7$

$4h = 196$

$h = \mathbf{49}$

*Scratch Work:* $196 \div 4 = 49$

**13.**
(19)



$P = 1 + 2 + 7 + 6 + 8 + 8$

$P = \mathbf{32 \text{ ft}}$

**14.**
(37)



Area of Top $= (4)(1)$

$= 4 \text{ m}^2$

$+$ Area of Bottom $= (5)(3)$

$= 15 \text{ m}^2$

Total Area $= \mathbf{19 \text{ m}^2}$

**15.** $3 + (3 \times 3) - (3 \div 3) =$
(52)

$3 + 9 - 1 = \mathbf{11}$

*Note:* We inserted parentheses to indicate the operations we perform first.

**16.** $3^4 - \sqrt{900} + 3^2 = 81 - 30 + 9$
(20)

$= 51 + 9 = \mathbf{60}$

**17.**
(49)

$\begin{array}{r} 1 \text{ yd } 2 \text{ ft} \\ +\;7 \text{ yd } 1 \text{ ft } 3 \text{ in.} \\ \hline 8 \text{ yd } 3 \text{ ft } 3 \text{ in.} \end{array} = \mathbf{9 \text{ yd } 3 \text{ in.}}$

**18.** $5\dfrac{2}{5} + \left( 5\dfrac{1}{30} - 2\dfrac{5}{6} \right) = 5\dfrac{2}{5} + 2\dfrac{1}{5} = \mathbf{7\dfrac{3}{5}}$
(30)

Perform operations in parentheses first.

*Scratch work:* $\quad 5\dfrac{1}{30} = 5\dfrac{1}{30} = 4\dfrac{31}{30}$

$-\;2\dfrac{5}{6} = -2\dfrac{25}{30} = -2\dfrac{25}{30}$

$\overline{\qquad\qquad\qquad\quad 2\dfrac{6}{30} = 2\dfrac{1}{5}}$

**19.** $5\dfrac{5}{8} \div \left(2\dfrac{6}{7} \div 4\right) = 5\dfrac{5}{6} \div \left(\dfrac{\overset{5}{\cancel{20}}}{7} \cdot \dfrac{1}{\underset{1}{\cancel{4}}}\right)$
(26)

$$= 5\dfrac{5}{6} \div \dfrac{5}{7} = \dfrac{\overset{7}{\cancel{35}}}{6} \cdot \dfrac{7}{\underset{1}{\cancel{5}}}$$

$$= \dfrac{49}{6} = 8\dfrac{1}{6}$$

**20.** $5.3(0.03)0.009 = \mathbf{0.001431}$
(35)
Answer must contain 6 decimal places.

# TEST 13

**1.** $\$10{,}000 \times 0.061 = $ Sales Tax
(46)
$$\$610 = \text{Sales Tax}$$

Total Price = Car + Sales Tax
$$= \$10{,}610$$
**The total price is \$10,610.**

**2.** Each disc $= \$64.61 \div 13$
(46)
**The cost of each disc is \$4.97.**

**3.**
(65)

| | Ratio | Actual Count |
|---|---|---|
| Slugs | 4 | *Slugs* |
| Snails | 7 | *Snails* |
| Total | 11 | 330 |

$$\dfrac{Slugs}{Total} = \dfrac{4}{11} = \dfrac{Sl}{330}$$

$$11\,Sl = 4 \cdot 330$$
$$11\,Sl = 1320 \qquad \text{Missing Factor}$$
**There were 120 slugs.**

*Scratch work:* $1320 \div 11 = 120$

**4.** Average $= \dfrac{3\dfrac{3}{10} + 3 + 4\dfrac{1}{2} + 1\dfrac{1}{5}}{4}$
(28,30)

The average is **3**.

*Scratch work:* $\quad 3\dfrac{3}{10} = 3\dfrac{3}{10}$

$$+\,3 = 3$$

$$+\,4\dfrac{1}{2} = 4\dfrac{5}{10}$$

$$+\,1\dfrac{1}{5} = 1\dfrac{2}{10}$$
$$\overline{\phantom{xxxxxxxx}}$$
$$11\dfrac{10}{10} = 12$$

Then $12 \div 4 = 3$

**5.** $WN = 18\%$ of $350$
(60)

$WN = 0.18 \times 350 \qquad$ Because $18\% = \dfrac{18}{100}$

$WN = \mathbf{63} \qquad\qquad\qquad\qquad = 0.18$

**6.** (a) $\dfrac{3}{4} \times 100\% = \dfrac{300}{4}\% = 75\%$
(60)

**Joel gave 75% of his sports cards to his brother.**

(b) He gave away 75% of 228.

Gave away $0.75 \times 228$ because $75\% = 0.75$

Gave away 171

**Joel had 57 sports cards left.**

**7.** (a) $\mathbf{0.0002}$ $\mathbf{2.0 \times 10^{-4}}$
(57)

(b) $7.1 \times 10^{-2} = \mathbf{0.071}$

Move decimal point 2 places to the left.

**8.** $m\angle D = \mathbf{80°}$
(61)
Because $m\angle C + m\angle D = 180°$, $\angle C$ and $\angle D$ are supplementary angles.

**9.** $7.5$ kg $\bigcirc$ $7500$ g
(32,50)
**7500 g = 7500 g**

*Scratch work:* $\dfrac{7.5 \,\cancel{\text{kg}}}{1} \cdot \dfrac{1000 \text{ g}}{1 \,\cancel{\text{kg}}} = 7500$ g

**10.** $0.33\overline{\smash{)}3.000}$
(45)
$\qquad \mathbf{9.0}$
$\qquad \underline{2\ 97}$
$\qquad\quad 30$

9.0 rounded to the nearest whole number is 9.

We need one decimal place in order to round to the nearest whole number.

**11.** $(-2) + (+7) + (-9) + (+3) =$
(64)
$(+7) + (+3) + (-2) + (-9) =$
$$(+10) + (-11) = \mathbf{-1}$$

Let's rearrange the terms and put the positive numbers first.

*Note:* Always read numbers like $(+7)$ and $(+3)$ as positive seven and positive three. Always read numbers like $(-2)$ and $(-9)$ as negative two and negative nine. Do *not* read them as minus two and minus 9. The word minus always means to subtract. Reading these numbers as minus numbers will only create more confusion.

**12.**
(48)

| Fraction | Decimal | Percent |
|----------|---------|---------|
| $\frac{13}{25}$ | **0.52** | **52%** |
| $\frac{2}{5}$ | 0.4 | **40%** |

*Scratch work:* $\dfrac{13}{\overset{}{25}} \times \overset{4}{\cancel{100}}\% = 52\%$

$$\frac{13}{25} = \frac{52}{100} = 0.52$$

Also $0.4 \times 100\% = 40\%$ and $0.4 = \dfrac{4}{10} = \dfrac{2}{5}$

*Note:* To convert either a fraction or a decimal number to a percent, just multiply by 100%.

**13.** Area = Base × Height
(61)
Area = 18 × 23

**The area is 414 sq. cm.**

*Note:* The height is not 25 cm.

**14.** $jk + j + k = \left(\dfrac{5}{8}\right)\left(\dfrac{1}{2}\right) + \dfrac{5}{8} + \dfrac{1}{2}$
(52)

$$= \frac{5}{16} + \frac{5}{8} + \frac{1}{2}$$

$$= \frac{5}{16} + \frac{10}{16} + \frac{8}{16} = \frac{23}{16} = 1\frac{7}{16}$$

**15.** $\dfrac{w}{8} = \dfrac{25}{20}$
(39)

$$20w = 8 \cdot 25$$
$$20w = 200$$
$$w = 10$$

**16.** $2.7p = 0.216$    Missing Factor
(45)
$$p = 0.08$$

*Scratch work:* $2.7\overline{)0.216}$ with quotient $0.08$, subtracting $216$

**17.** $27 - 2[2(6 - 2)] = 27 - 2[2 \cdot 4]$
(63)
$$= 27 - 2 \cdot 8$$
$$= 27 - 16 = 11$$

Simplify within parentheses. Then simplify within brackets. Remember order of operations.

*Note: Always* write each step when simplifying. Most mistakes are made in this type of problem by trying to combine multiple steps. Then we make careless errors and it takes more time to find the mistake than it would have taken to show all steps.

**18.** $2\dfrac{1}{4} + \left(5\dfrac{9}{20} - 4\dfrac{4}{5}\right) = 2\dfrac{1}{4} + \dfrac{13}{20}$
(30,63)

$$= 2\frac{5}{20} + \frac{13}{20}$$

$$= 2\frac{18}{20} = 2\frac{9}{10}$$

Simplify within parentheses first.

*Scratch work:* $\quad 5\dfrac{9}{20} = 5\dfrac{9}{20} = 4\dfrac{29}{20}$

$$-4\frac{4}{5} = -4\frac{16}{20} = -4\frac{16}{20}$$

$$\frac{13}{20}$$

**19.** $1\dfrac{2}{5}\left(12 \div 1\dfrac{1}{3}\right) = 1\dfrac{2}{5} \cdot 9$
(26,63)

$$= \frac{7}{5} \cdot \frac{9}{1} = \frac{63}{5} = 12\frac{3}{5}$$

Simplify within parentheses first.

*Scratch work:* $12 \div 1\dfrac{1}{3} =$

$$12 \div \frac{4}{3} =$$

$$\overset{3}{\cancel{12}} \times \frac{3}{\underset{1}{\cancel{4}}} = 9$$

**20.** $0.6(0.6)(2.4) = \mathbf{0.864}$
(35)

We need 3 decimal places in our product.

# Test 14

**1.** Total trip was 560 km.
(46)

Average speed was $560 \div 10$.

**Simone's average speed was 56 km/hr.**

**2.**
(65)

|  | Ratio | Actual Count |
|--|-------|--------------|
| Bunnies | 1 | $B$ |
| Hares | 2 | $H$ |
| Total | 3 | 117 |

$$\frac{1}{3} = \frac{B}{117}$$

$$3B = 117$$

$$B = 39$$

**There were 39 bunnies.**

**3.** Since $\pi > 3$ and $1200 \div 3 = 400$, her estimate
(66) was too large. **The diameter is less than 400.**

**4.** (a) $\$8.88 \div 4 = \$2.22$
(53)

**The cost of 1 pound was $2.22.**

(b) $\$2.22 \times 9 = \$19.98$

**9 pounds will cost $19.98.**

**5.** $\underbrace{(0.2 + 0.6)}_{\text{Sum}} - \underbrace{(0.1 \times 0.5)}_{\text{Product}} = $ Difference
(35)

$0.8 \quad - \quad 0.05 \quad = \quad \mathbf{0.75}$

**6.** (a) $WN = \dfrac{3}{5} \times 40$
(48,60)

$WN = 24$

**24 tarts were cherry.**

(b) $\dfrac{2}{\cancel{5}_1} \times \cancel{100}^{20}\% = 40\%$

**40% of the tarts were not cherry.**

**7.** $xy - (x - y) = (0.7)(0.6) - (0.7 - 0.6)$
(52)
$= 0.42 - 0.1 = \mathbf{0.32}$

**8.** (a) $\quad 14 \times 10^7 =$
(69)
$1.4 \times 10^1 \times 10^7 = \mathbf{1.4 \times 10^8}$

(b) $\quad 14 \times 10^{-7} =$
$1.4 \times 10^1 \times 10^{-7} = \mathbf{1.4 \times 10^{-6}}$

**9.** The height and the width are also 4 in. because we
(70) have a cube. The base is 16 cubes.

Volume $= \dfrac{16 \text{ cubes}}{1 \cancel{\text{layer}}} \times 4 \cancel{\text{layers}}$
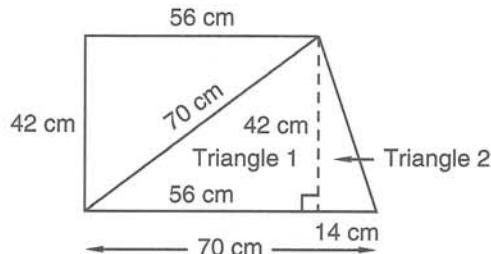
Volume $= 64$ cubes. Since each cube is 1 cubic
inch, **the volume is 64 cu in.**

**10.** Total faces are front + back + 2 sides + top
(67) + bottom.

**A cube has 6 faces.**

**11.** $1\dfrac{1}{3} \div \left(1\dfrac{1}{2} \cdot 2\right) = \dfrac{4}{3} \div \left(\dfrac{3}{\cancel{2}_1} \cdot \cancel{2}^1\right)$
(26,63)

$= \dfrac{4}{3} \div 3 = \dfrac{4}{3} \times \dfrac{1}{3} = \dfrac{4}{9}$

**12.**
(62,37)



(a) Area of triangle 1 $= \dfrac{56 \text{ cm} \cdot 42 \text{ cm}}{2}$

$= \mathbf{1176 \text{ cm}^2}$

(b) Triangle 1 + Triangle 2 gives us an isosceles
triangle with 2 sides of length 70 cm.

Area of
isosceles triangle $= \dfrac{70 \text{ cm} \times 42 \text{ cm}}{2}$

Area of isosceles triangle $= \mathbf{1470 \text{ sq. cm}}$

*Note:* Remember that $\text{cm}^2$ and sq. cm are
the same.

**13.** $\dfrac{\overset{16}{\cancel{16,000} \text{ g}}}{1} \cdot \dfrac{1 \text{ kg}}{\underset{1}{\cancel{1000} \text{ g}}} = \mathbf{16 \text{ kg}}$
(50)

**14.**
(48)

| FRACTION | DECIMAL | PERCENT |
|---|---|---|
| $\dfrac{1}{25}$ | **0.04** | 4% |
| $\dfrac{7}{8}$ | **0.875** | **87.5%** |

*Scratch Work:* $4\% = \dfrac{4}{100} = 0.04$

Then reduce $\dfrac{4}{100}$

$\dfrac{7}{8} = 8\overline{)7.000}^{\;0.875}$ and $0.875 \times 100\% = 87.5\%$

**15.** $(-4) + (-1) - (-7) - (-8) = \qquad$ Think
(68) $(-4) + (-1) + (+7) + (+8) = \qquad$ Addition
$(-5) + (+15) = \mathbf{+10 \text{ or } 10}$

**16.** $45 + p = 50.5$
(Inv. 7)

Let's write this as $\qquad p + 45 = 50.5$

Then $\qquad\qquad p + 45 - 45 = 50.5 - 45$

$p = \mathbf{5.5}$

**17.** $\dfrac{\cancel{6}v}{\cancel{6}} = \dfrac{50}{6}$
(Inv. 7)

$v = \dfrac{25}{3}$

$v = \mathbf{8\dfrac{1}{3}}$

**18.**
(60)

$WN = 80\%$ of $\$500$

$WN = 0.80 \times \$500$

$WN = \mathbf{\$400}$

**19.**
(43)

$3.2 \times 4\dfrac{1}{2} =$

$3.2 \times 4.5 = \mathbf{14.4}$

**20.**
(66)

(a) $c = \pi d$

$c = \left(\dfrac{22}{\cancel{7}}\right) \overset{7}{\cancel{49}} \text{ mm}$

$c = \mathbf{154 \text{ mm}}$

(b) $c = \pi d$

$c = \pi 64$

$c = \mathbf{64\pi \text{ cm}}$

*Note: Always—Always* write the formula first. Whenever you are solving an area, perimeter, or circumference problem, write the formula first. This will help you memorize the formulas. Writing the formulas also helps you organize your work.

## TEST 15

**1.**
(72,Inv. 7)

$\dfrac{\text{Earth}}{\text{Space}} = \dfrac{\text{Earth}}{\text{Space}}$

$\dfrac{300}{50} = \dfrac{180}{Sp}$

$300\,Sp = (180)(50)$

$\dfrac{\cancel{300}\,Sp}{\cancel{300}} = \dfrac{9000}{300}$

$Sp = 30$

**The astronaut would weigh 30 pounds on the Theta Space Station.**

**2.**
(34)

**The number halfway between 56 and 57 is 56.5.**

*Note:* We could also find the average of 56 and 57.

**3.**
(19)
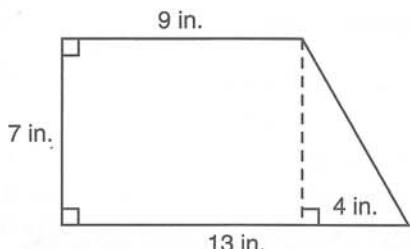
Perimeter $= 4 + 14 + 18 + 14$

$P = \mathbf{50 \text{ m}}$

**4.**
(75)

Area of rectangle $= 9 \cdot 7 = 63$ sq. in.

$+$ Area of triangle $= \frac{1}{2} \cdot 4 \cdot 7 = 14$ sq. in.

Total Area $= \mathbf{77 \text{ sq. in.}}$



**5.**
(20)

$16^2 - \sqrt{16} = 256 - 4 = 252$

**Sixteen squared is 252 bigger than the square root of sixteen.**

**6.**
(65)

| | Ratio | Actual Count |
|---|---|---|
| Boys | 4 | $B$ |
| Girls | 7 | $G$ |
| Total | 11 | 418 |

$\dfrac{\text{Girls}}{\text{Total}}$ is $\dfrac{7}{11} = \dfrac{G}{418}$

$11G = 418 \cdot 7$

$G = 266$

**There were 266 girls.**

**7.**
(50)

$\dfrac{8.3 \text{ g}}{1} \cdot \dfrac{1000 \text{ mg}}{1 \text{ g}} = \mathbf{8300 \text{ mg}}$

**8.**
(60,71,74)

(a) $\dfrac{1}{3} = \dfrac{12}{\text{Total}}$ or $\dfrac{1}{3}$ of $WN = 12$

Total $= 36$

$3 \cdot \dfrac{1}{3} \cdot WN = 12 \cdot 3$

$WN = 36$

**They played 36 games.**

(b) $WN = 75\%$ of $36$

$WN = \dfrac{3}{4} \cdot 36$

$WN = 27$

**They won 27 games.**

**9.**
(74)

$36 = \dfrac{4}{5} \cdot W_N$

$\left(\dfrac{5}{4}\right) \cdot 36 = \left(\dfrac{5}{4}\right)\left(\dfrac{4}{5}\right)W_N$

$45 = W_N$

**10.**
(74)

$10 \cdot \dfrac{1}{10} \cdot W_N = 291 \cdot 10$

$W_N = \mathbf{2910}$

Multiply both sides by the reciprocal of $\frac{1}{10}$.

**11.**
(73)

(a) $-8(-5) = \mathbf{+40}$  Because $(-)(-) = (+)$

(b) $-7(+2) = \mathbf{-14}$  Because $(-)(+) = (-)$

(c) $\dfrac{-15}{-5} = \mathbf{+3}$  Because $\dfrac{(-)}{(-)} = (+)$

(d) $\dfrac{18}{-3} = \mathbf{-6}$  Because $\dfrac{(+)}{(-)} = (-)$

**12.** The base is 9 in. by 9 in.
(70)
The base is 81 sq. in.

The height is 9 in.

**The volume is 81 · 9 cubic in. or 729 in.³.**

**13.** (a) $C = \pi d$
(66)
$C = (3.14)(52)$

$C = \textbf{163.28 in.}$

(b) $C = \pi d$

$C = \pi \cdot 52$

but we usually write it as $C = \textbf{52}\pi \textbf{ m}$

**14.**
(48)

| Fraction | Decimal | Percent |
|----------|---------|---------|
| $\frac{1}{9}$ | $0.\overline{1}$ | $11\frac{1}{9}\%$ |
| $\frac{2}{5}$ | $0.4$ | $\textbf{40}\%$ |

*Scratch work:*

$\frac{1}{9} \times 100\% = \frac{100}{9}\% = 11.\overline{1}\%$

$0.4 = \frac{4}{10} = \frac{2}{5}$

$0.4 \times 100\% = 40\%$

$9)\overline{1.000} \quad 0.111 = 0.\overline{1}$

*Note:* We usually don't write percents with repeating decimals, so we chose not to write $11\frac{1}{9}\%$ as $11.\overline{1}\%$.

**15.** $40s - (st - t^2) = (40)(11) - (11 \cdot 6 - 6^2)$
(52)
$= 40 \cdot 11 - (66 - 36)$

$= 40 \cdot 11 - 30$

$= 440 - 30 = \textbf{410}$

**16.** $\left(\frac{4}{3}\right)\frac{3}{4}y = 24\left(\frac{4}{3}\right)$
(Inv. 7)
$y = \textbf{32}$

Multiply by the reciprocal of $\frac{3}{4}$.

**17.** $s + 1.6 = 5$
(35,Inv. 7)
$s + 1.6 - 1.6 = 5 - 1.6$

$s = \textbf{3.4}$

Subtract 1.6 from both sides.

**18.** $\frac{\$524}{1 \text{ wk}} \cdot \frac{1 \text{ wk}}{5 \text{ days}} \cdot \frac{1 \text{ day}}{8 \text{ hr}} = \frac{\$524}{40 \text{ hr}}$
(50)
$= \frac{\textbf{\$13.10}}{\textbf{1 hr}}$

**19.** $-(-6) - (-5) + 7 =$
(68)
$(+6) + (+5) + 7 = \textbf{18}$

*Note:* Always rewrite the problem as addition.

**20.** $2\frac{7}{9} \div \left(3\frac{1}{2} + 4\frac{1}{6}\right) = 2\frac{7}{9} \div 7\frac{2}{3}$
(30)
$= \frac{25}{9} \div \frac{23}{3}$

$= \frac{25}{\overset{3}{\cancel{9}}} \cdot \frac{\overset{1}{\cancel{3}}}{23} = \frac{25}{69}$

*Scratch work:*

$3\frac{1}{2} = 3\frac{3}{6}$

$+ 4\frac{1}{6} = +4\frac{1}{6}$

$7\frac{4}{6} = 7\frac{2}{3}$

# Test 16

**1.** 
(55)

$\begin{array}{cc} \$5.80 & \$5.20 \\ \times \quad 2 & \times \quad 3 \\ \hline \$11.60 + & \$15.60 = \$27.20 \text{ Total Pay} \end{array}$

Average $= \$27.20 \div 5 = \$5.44$

**Camille's average pay was \$5.44 per hour.**

**2.** $a + (a^2 - ab) - b =$
(52)
$10 + (10^2 - 10 \cdot 4) - 4 =$

$10 + (100 - 40) - 4 =$

$10 + 60 - 4 = \textbf{66}$

**3.** Since $d - e = 0$, $d$ and $e$ must be equal.
(79)
We write $d \circledequal e$

**4.**
(65)

| | Ratio | Actual Count |
|-------|-------|--------------|
| Boys | 2 | $B$ |
| Girls | 3 | $G$ |
| Total | 5 | 155 |

$\frac{\text{Boys}}{\text{Total}}$ is $\frac{2}{5} = \frac{B}{155}$

$5B = 310$

$B = 62$

**There were 62 boys.**

**5.** $\frac{120 \text{ miles}}{6 \text{ gallons}} = \frac{260 \text{ miles}}{g \text{ gallons}}$
(72)
$120g = 260 \cdot 6$

$g = 13$

**It will take 13 gallons to travel 260 miles.**
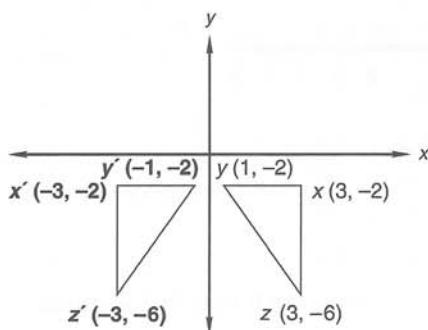
**6.** $C = \pi d$
(66)
$C = (3.14)35$

$C = 109.9$

**The circumference of the track to the nearest meter is 110 m.**
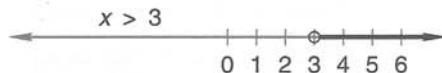
**7.**
(80)



**8.**
(78)



**9.** $\dfrac{1}{4}$ of $W_N = 28$
(71)

$(4)\dfrac{1}{4} \cdot W_N = 28(4)$    Multiply both sides by 4.

$\qquad W_N = 112$

**The full spool contained 112 inches of wire.**

**10.** (a) $14(-90) = -1260$
(73)

(b) $(19)(60) = 1140$

    *Note*: We can write (+60) as 60.

(c) $\dfrac{-88}{-11} = 8$

(d) $\dfrac{350}{-7} = -50$

**11.**
(48)

| Fraction | Decimal | Percent |
|---|---|---|
| $\frac{4}{9}$ | $0.\overline{4}$ | $44\frac{4}{9}\%$ |
| $\frac{65}{100} = \frac{13}{20}$ | $0.65$ | $65\%$ |

*Scratch Work:* $\dfrac{0.444...}{9\overline{)4.000}} = 0.\overline{4}$

If we stop dividing after 2 decimal places, we get $0.44\frac{4}{9}$ which $= 44\frac{4}{9}\%$.

**12.**    $42 = \dfrac{3}{5} \cdot W_N$    Multiply both sides by $\frac{5}{3}$
(74)

$\dfrac{5}{\cancel{3}_1} \cdot \overset{14}{\cancel{42}} = \dfrac{5}{3} \cdot \dfrac{3}{5} \cdot W_N$

$\qquad 70 = W_N$

**13.** $\dfrac{W_P \cdot \cancel{60}}{\cancel{60}} = \dfrac{18}{60}$    Divide both sides by 60
(77, Inv. 7)
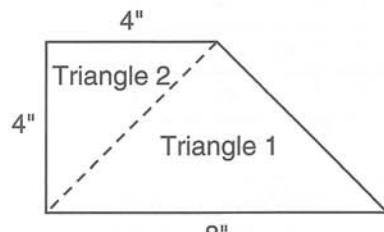
$\qquad W_p = \dfrac{18}{60}$

$\qquad W_p = \mathbf{30\%}$

*Scratch Work:* $\dfrac{18}{60} = \dfrac{3}{10} = \dfrac{30}{100} = 30\%$

**14.** $\dfrac{2\frac{4}{5}}{\frac{61}{1}} = \dfrac{\frac{14}{5} \cdot \frac{1}{61}}{\cancel{61}_1 \cdot \frac{1}{\cancel{61}_1}} = \dfrac{14}{305}$
(76)

**15.**
(75)



Area of triangle 1 $= \dfrac{8 \times 4}{2}$

$\qquad\qquad\qquad\quad = 16$ sq. in.

$+$ Area of triangle 1 $= \dfrac{4 \times 4}{2}$

$\qquad\qquad\qquad\quad = 16$ sq. in.

Total Area $= 16 + 8 = \mathbf{24\ in.^2}$

**16.** $\dfrac{5}{4} \cdot \dfrac{4}{5}x = \overset{25}{\cancel{100}} \cdot \dfrac{5}{\cancel{4}_1}$
(Inv. 7)

$\qquad x = \mathbf{125}$

**17.** $0.02 + 6.2 = h - 0.02 + 0.02$
(Inv. 7)

$\qquad 6.22 = h$

**18.**
(52)
$$\frac{4^2 + 6 \cdot 8 - 6 \cdot 3^2}{\sqrt{81}} = \frac{16 + 48 - 6 \cdot 9}{9}$$
$$= \frac{16 + 48 - 54}{9}$$
$$= \frac{10}{9} = 1\frac{1}{9}$$

**19.**
(43)
$$6\frac{1}{3} \div 1.9 = 6\frac{1}{3} \div 1\frac{9}{10}$$
$$= \frac{19}{3} \div \frac{19}{10}$$
$$= \frac{\cancel{19}}{3} \cdot \frac{10}{\cancel{19}} = \frac{10}{3} = 3\frac{1}{3}$$

**20.**
(68)
$$-33 - (-23) + (+32) =$$
$$-33 + 23 + 32 = \qquad \text{Write as addition.}$$
$$-33 + 55 = \mathbf{22} \qquad \text{Add positives first.}$$

## TEST 17

**1.**
(65)

|        | Ratio | Actual Count |
|--------|-------|--------------|
| Won    | 2     | W            |
| Lost   | 5     | L            |
| Played | 7     | 49           |

$$\frac{\text{Lost}}{\text{Played}} \text{ is } \frac{5}{7} = \frac{L}{49}$$
$$7L = 5 \cdot 49$$
$$L = 35$$

**The team lost 35 games.**

**2.**
(28, Inv. 4)
Range = Highest − Lowest

Range = 70 − 41

**Range = 29**

Mean is average.
$$\frac{70 + 69 + 65 + 57 + 4 \cdot 53 + 47 + 44 + 41}{11}$$

$$\text{Mean} = \frac{605}{11} = \mathbf{55}$$

Median is middle score.

70, 69, 65, 57, 53, $\boxed{53}$, 53, 53, 47, 44, 41
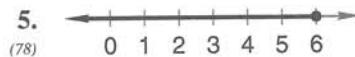
**Median is 53.**

Mode is the number that occurs most frequently.

**Mode is 53.**

**3.**
(54)
$$\frac{\text{Good}}{\text{Bad}} \text{ is } \frac{5}{17} = \frac{G}{204}$$
$$17G = 5 \cdot 204$$
$$G = \mathbf{60}$$

**4.**
(50)
$$\frac{0.37 \, \cancel{L}}{1} \cdot \frac{1000 \text{ mL}}{1 \, \cancel{L}} = \mathbf{370 \text{ mL}}$$

**5.**
(78)



**6.**
(53)
$$\frac{20 \text{ s}}{2 \text{ ft}} = \frac{180 \text{ s}}{HL} \qquad$$ Remember to convert minutes to seconds.
$$20 \cdot HL = 180 \cdot 2$$
$$HL = \mathbf{18}$$

**The taffy will be 18 ft long in 3 minutes.**

**7.**
(81)

|             | Percent | Actual Count |
|-------------|---------|--------------|
| Waved       | 38      | W            |
| Did not wave| 62      | 124          |
| Total       | 100     | T            |

$$\frac{62}{100} = \frac{124}{T}$$
$$62T = 124 \cdot 100$$
$$T = 200$$

**There were 200 fans.**

**8.**
(22)

$$\frac{1}{5} \left\{ \begin{array}{l} \\ \end{array} \right.$$
$$\frac{4}{5} \left\{ \begin{array}{l} \\ \\ \\ \\ \end{array} \right.$$

$110,000

$22,000
$22,000
$22,000
$22,000
$22,000

(a) **The goal was to raise $110,000.**

(b) **They fell short by 20%.**

*Note:* $\frac{1}{5} = 20\%$

**9.**
(84)
$$6x + 3 + 4x + 5 =$$
$$6x + 4x + 3 + 5 = \qquad \text{Rearrange terms}$$
$$\mathbf{10x + 8}$$

**10.**
(70)
The base is 10 cm by 6 cm = 60 sq. cm

The height is layers or 4 cm

**The volume is 60 · 4 cu cm or 240 cm³.**

**11.** $A = \pi r^2$     Always write formula first.
(82)

$$A = \frac{22}{7} \cdot 42^2$$

$$A = \frac{22}{7} \cdot 1764$$

$$A = \textbf{5544 in.}^2$$

**12.**
(48)

| Fraction | Decimal | Percent |
|----------|---------|---------|
| $\frac{9}{10}$ | **0.9** | 90% |
| $\frac{21}{40}$ | **0.525** | **52.5%** |

*Scratch Work:*

$$90\% = \frac{90}{100} = 0.9 = \frac{9}{10}$$

$$\frac{21}{\overset{2}{\underset{}{40}}} \times \overset{5}{100}\% = \frac{105}{2}\% = 52.5\%$$

$$\begin{array}{r} 0.525 \\ 40\overline{)21.000} \end{array}$$

**13.** **A rectangle. A rectangle is a quadrilateral that**
(Inv. 6) **has four right angles.**

**14.**    $A = b \cdot h$
(61)

     $A = (62)(52)$

Area = **3224 km²**

*Note:* You may choose not to include labels during your computation, but be sure to label your answer. However, it is best to include labels during computation.

Area = base · height

Area = (62 km)(52 km)

Area = 62 · 52 · km · km

Area = **3224 km²**

**15.**    $(2.2 \times 10^5)(2.1 \times 10^6) =$
(83)

$(2.2 \times 2.1) \times (10^5 \times 10^6) = \textbf{4.62} \times \textbf{10}^{11}$

**16.** $\dfrac{4.5}{0.9} = \dfrac{0.9n}{0.9}$
(Inv. 7)

     $\textbf{5} = n$

**17.** $s + \dfrac{1}{2} - \dfrac{1}{2} = 6\dfrac{19}{24} - \dfrac{1}{2}$
(Inv. 7)

$$s = 6\frac{7}{24}$$

**18.** $2\left\{23 - \left[5^2 - 3(4 - 2)\right]\right\} =$
(63)

$$2\left\{23 - \left[5^2 - 3 \cdot 2\right]\right\} =$$

$$2\left\{23 - \left[25 - 6\right]\right\} =$$

$$2\left\{23 - 19\right\} =$$

$$2 \cdot 4 = \textbf{8}$$

*Note:* Show all steps on these simplify problems to avoid errors.

**19.** $0.7 \div \left(3\dfrac{7}{9} - 2\dfrac{2}{3}\right) =$
(43)

$$\frac{7}{10} \div \frac{10}{9} = \frac{7}{10} \times \frac{9}{10} = \frac{63}{100}$$

*Scratch Work:*    $3\dfrac{7}{9} = \quad 3\dfrac{7}{9}$

$$-2\frac{2}{3} = -2\frac{6}{9}$$

$$\overline{\qquad\qquad 1\dfrac{1}{9}}$$

**20.** $(-5) + (-9) - (-6) - (-1) =$
(68)

$$(-5) + (-9) + 6 + 1 =$$

$$-14 + 7 = \textbf{-7}$$

# Test 18

**1.**
(54)

| | Ratio | Actual Count |
|-------|-------|--------------|
| Lions | 4 | 12 |
| Tigers | 5 | $T$ |

$$\frac{4}{5} = \frac{12}{T}$$

$$4T = 60$$

$$T = 15$$

| | Ratio | Actual Count |
|--------|-------|--------------|
| Tigers | 3 | 15 |
| Bears | 5 | $B$ |

$$\frac{3}{5} = \frac{15}{B}$$

$$3B = 75$$

$$B = 25$$

**There were 25 bears.**
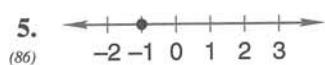
**2.** The base is $3 \text{ cm} \times 5 \text{ cm}$ or 15 sq. cm
(70)  The height is 10 cm or 10 layers

Volume = 15 sq. cm × 10 cm

Volume = **150 cu. cm**

**3.**
(44)
$$\begin{array}{r} 0.307 \\ 78\overline{)24.000} \end{array} \quad \text{will round to } 0.308$$

$$\begin{array}{r} 2\ 34 \\ \hline 600 \\ 546 \\ \hline 54 \end{array}$$

The player's average was **0.308.**

**4.**
(88)
$$\frac{27 \text{ ft} \cdot \text{ft}}{1} \cdot \frac{1 \text{ yd}}{3 \text{ ft}} \cdot \frac{1 \text{ yd}}{3 \text{ ft}} = \textbf{3 sq. yd}$$

**5.**
(86)


$$\text{-2 -1 } 0 \ 1 \ 2 \ 3$$

The only negative integer greater than $-2$ is $-1$.

**6.** (a)
(22,74,48)
$$\frac{7}{10} \cdot W_N = \$56$$

$$\frac{10}{7} \cdot \frac{7}{10} \cdot W_N = \overset{8}{\cancel{56}} \cdot \frac{10}{\underset{1}{\cancel{7}}}$$

$$W_N = 80$$

**The regular price was $80.**

(b) $\dfrac{7}{10} \times 100\% = 70\%$

**Donald bought the book for 70% of the regular price.**

**7.** (a) $\mathbf{m\angle w = 60°}$   because the sum of the
(40)        measures of the angles of a
       triangle is 180.
       $(90 + 30 + w) = 180.$
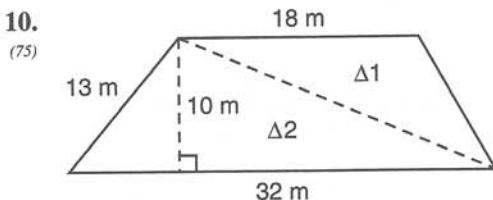
(b) $m\angle y = 60°$   because $\angle w$ and $\angle y$ are
       vertical angles.

   $\mathbf{m\angle z = 66°}$    because

$$m\angle y + 54° + z = 180$$
$$60 + 54 + z = 180$$
$$z = 66$$

**8.** We can name the octagon $ABCDEFGH$.
(89) If we choose $\angle H$ as our vertex, the diagonals are $AC$, $AD$, $AE$, $AF$, and $AG$. $AB$ and $AH$ are not diagonals.

**We can draw 5 diagonals.**

**9.** $C = \pi d$
(66)
$$C = \frac{22}{7} \cdot 98 \qquad \textit{Note: Diameter is 98, not 49.}$$

$C = \textbf{308 in.}$

**10.**
(75)


*Note:* Δ1 is read "Triangle 1."

Area of Δ1 $= \dfrac{b \cdot h}{2}$

$\qquad\qquad = \dfrac{18 \times 10}{2}$

Area of Δ1 = 90 sq. m

Area of Δ2 $= \dfrac{b \cdot h}{2}$

$\qquad\qquad = \dfrac{32 \times 10}{2}$

Area of Δ2 = 160 sq. m

Area of Trapezoid = Area of Δ1 + Area of Δ2

Area of Trapezoid = 90 sq. m + 160 sq. m

Area of Trapezoid = **250 sq. m**

**11.** $(1.2)^2 \bigcirc 1.2$
(79)
$\mathbf{1.44} \;\text{\small$\bigcirc$}\!\!>\; \mathbf{1.2}$

**12.**
(48)

| FRACTION | DECIMAL | PERCENT |
|----------|---------|---------|
| $\frac{27}{50}$ | 0.54 | **54%** |

*Scratch Work:* $0.54 = \dfrac{54}{100} = \dfrac{27}{50}$

$$\frac{54}{100} \times 100\% = 54\%$$

**13.**
(77)
$$\frac{W_P \cdot 60}{60} = \frac{\overset{1}{\cancel{6}}}{\underset{10}{\cancel{60}}}$$

$$W_P = \frac{1}{10}$$

$$W_P = \textbf{10\%}$$

**14.** There are 360° in a full circle. Find of $\frac{1}{6} \times 360$.
(17)

**There are 60° in $\frac{1}{6}$ of a full circle.**

**15.** $\dfrac{25}{100} = \dfrac{N_F}{5000}$    $N_F$ means Number who ordered fries.
(81)

$100\,N_F = 125{,}000$

$N_F = 1250$    Now subtract 1250 from 5000.

**3750 customers did not order fries.**

**16.** $(2.3 \times 10^{-1})(2.4 \times 10^{-9}) =$
(83)

$(2.3 \times 2.4)(10^{-1} \times 10^{-9}) =$

$\mathbf{5.52 \times 10^{-10}}$

**17.** $3\dfrac{2}{5}d = 85$
(90)

$\dfrac{17}{5}d = 85$

$\dfrac{5}{17} \cdot \dfrac{17}{5}d = 85 \cdot \dfrac{5}{17}$

$d = 25$

**18.** $g + 0.86 - 0.86 = 4.92 - 0.86$
(Inv. 7)

$g = 4.06$

**19.** $(-8x^2)(-2xy^2) = (-8)(-2) \cdot x^2 \cdot x \cdot y^2$
(87)

$= 16x^3y^2$

**20.** $(-6) - (-8)(+4) - (-2)(-5) =$
(85)

$-6 - (-32) - 10 =$    Multiply first

$-6 + (+32) + (-10) =$    Write as addition

$-16 + (+32) = \mathbf{16}$

# TEST 19

**1.** The total score for the first four tests was
(55) $83 \times 4$ or 332.

Jerome must have a total score of $85 \times 5$ or 425 for all 5 tests.

**He must earn a 93 on the fifth test.**

**2.**
(65)

| | Ratio | Actual Count |
|---|---|---|
| Boys | $B$ | 10 |
| Girls | $G$ | 15 |
| Total | $T$ | 25 |

$\dfrac{\text{Boys}}{\text{Girls}} = \dfrac{10}{15} = \dfrac{2}{3}$

**The ratio of boys to girls was $\frac{2}{3}$, so the ratio of girls to boys would then be $\frac{3}{2}$.**

**3.** Cost per box is $\$31 \div 5$ or \$6.20.
(53,72)

or $\dfrac{5}{\$31} = \dfrac{8}{C}$

**8 boxes of cherries would cost \$49.60.**

**4.** $P(H, H, H, H, H) = \dfrac{1}{2} \cdot \dfrac{1}{2} \cdot \dfrac{1}{2} \cdot \dfrac{1}{2} \cdot \dfrac{1}{2}$
(94)

**The probability of landing heads 5 times in a row is $\frac{1}{32}$.**

**5.**
(92)

| | Percent | Actual Count |
|---|---|---|
| Before | 100% | $B$ |
| Increase | 25% | $I$ |
| After | 125% | 75¢ |

$\dfrac{100}{125} = \dfrac{B}{75¢}$

$125B = (100)75¢$

$B = \$0.60$

**The cost before the increase was \$0.60 per pound.**

**6.** $\dfrac{W_P \cdot 150}{150} = \dfrac{36}{150}$    *Scratch Work:*
(77)

$W_P = \dfrac{36}{150}$    $150\overline{)36.00}\ \ ^{0.24}$

$W_P = \mathbf{24\%}$

**7.** $\dfrac{1000\ \cancel{cm} \cdot \cancel{cm}}{1} \cdot \dfrac{10\ mm}{1\ \cancel{cm}} \cdot \dfrac{10\ mm}{1\ \cancel{cm}}$
(88)

$= \mathbf{100{,}000\ mm^2}$

**8.** $n = -6m + 2$
(91)

$n = (-6)(-7) + 2$

$n = 42 + 2$

$n = \mathbf{44}$

**9.** Volume = (Area of base)(Height)
(95)

$V = \dfrac{6 \cdot 10}{2} \cdot 6$

$V = 30 \cdot 6$

$V = \mathbf{180 \ cm^3}$

*Note:* This prism is not resting on its base. The base of the prism is a triangle. The base of the triangle is 6. The height of the triangle is 10. The height of the prism is 6.

Mathematicians will often write the formula for the volume as $V = Bh$.

The "B" means area of the base where $b$ means the base of the triangle.

So we could write the formula: $V = Bh$

$$V = \left(\dfrac{6 \cdot 10}{2}\right) \cdot 6$$

**10.** (a) Tax is $0.06 \times \$85 = \mathbf{\$5.10.}$
(46)

(b) Total price is $\$85 + \$5.10$

**The total price is \$90.10.**

**11.** $(2 \times 10^{-4})(3 \times 10^2) =$
(83)

$(2 \times 3)(10^{-4} \times 10^2) = \mathbf{6 \times 10^{-2}}$

**12.**
(48)
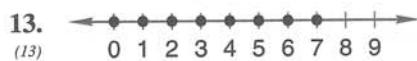
| FRACTION | DECIMAL | PERCENT |
|----------|---------|---------|
| $3\frac{3}{4}$ | **3.75** | **375%** |
| $\frac{3}{80}$ | **0.0375** | $3\frac{3}{4}\%$ |

*Scratch Work:* $3\dfrac{3}{4} = 3.75 = 375\%$

$$3\dfrac{3}{4}\% = \dfrac{3\frac{3}{4}}{100}$$

$$= 0.03\dfrac{3}{4} \text{ or } 0.0375$$

$$\dfrac{3\frac{3}{4}}{100} = \dfrac{\frac{15}{4}}{100} = \dfrac{15}{4} \times \dfrac{1}{100}$$

$$= \dfrac{15}{400} = \dfrac{3}{80}$$

**13.**
(13)



```
  0 1 2 3 4 5 6 7 8 9
```

**14.** $4\dfrac{4}{5}c = 264$
(90)

$\dfrac{5}{24} \cdot \dfrac{24}{5}c = 264 \cdot \dfrac{5}{24}$

$c = \mathbf{55}$

**15.** $2p + 11 = 21$
(93)

$2p + 11 - 11 = 21 - 11$

$\dfrac{2p}{2} = \dfrac{10}{2}$

$p = \mathbf{5}$

**16.** $(4 \cdot 3)^2 - 4(3)^2 =$
(52)

$12^2 - 4 \cdot 9 =$

$144 - 36 = \mathbf{108}$

**17.** $(-3x^2)(3x^2y)(-2xy) =$
(87)

$(-3)(3)(-2)(x^2)(x^2)(x)(y)(y) = \mathbf{18x^5y^2}$

**18.** $4 - \left(7\dfrac{1}{2} - 5.6\right) =$
(43)

$4 - \left(7\dfrac{1}{2} - 5\dfrac{6}{10}\right) =$

$4 - 2\dfrac{9}{10} =$

$3\dfrac{10}{10} - 1\dfrac{9}{10} = \mathbf{2\dfrac{1}{10}}$

*Scratch Work:*

$$7\dfrac{1}{2} = 7\dfrac{5}{10} = 6\dfrac{15}{10}$$

$$-5\dfrac{6}{10} = -5\dfrac{6}{10} = -5\dfrac{6}{10}$$

$$\overline{\phantom{-5\dfrac{6}{10}}}$$

$$1\dfrac{9}{10}$$

**19.** $6x - 4y - 8x + 6y =$
(84)

$6x - 8x - 4y + 6y =$

$6x + (-8x) + (-4y) + 6y = \mathbf{-2x + 2y}$

**20.** $\dfrac{2 - 4 + 1 - 14 + 7(-6)}{3} =$
(91)

$\dfrac{2 - 4 + 1 - 14 - 42}{3} = $ We wrote $+7(-6)$ as $-42$

Think $\dfrac{2 + 1 - 4 - 14 - 42}{3} =$

Gives us $\dfrac{3 - 60}{3} = \dfrac{-57}{3} = \mathbf{-19}$

*Math 87, Second Edition*

# TEST 20

**1.**
(55)

Aaron's total score for the first 4 tests was 344.

His total score for the next 2 tests was 184.

**His average score was $(344 + 184) \div (4 + 2)$ = $528 \div 6$ or 88.**

**2.**
(92)

| | Percent | Actual Count |
|---|---|---|
| Before | 100% | $6.90 |
| Raise | 20% | R |
| After | 120% | A |

$$\frac{100}{120} = \frac{\$6.90}{A}$$

$$100A = 828$$

$$A = \$8.28$$

**Her hourly rate after the raise was $8.28.**

**3.**
(77)

$$\frac{W_P \cdot 14}{14} = \frac{\overset{3}{\cancel{21}}}{\underset{2}{\cancel{14}}}$$

$$W_P = \frac{3}{2}$$

$$W_P = \mathbf{150\%}$$

*Scratch Work:* $\frac{3}{2} \cdot 100\% = \frac{300\%}{2} = 150\%$

**4.**
(88)

$$\frac{2.6 \cancel{m} \cdot \cancel{m}}{1} \cdot \frac{100 \text{ cm}}{1 \cancel{m}} \cdot \frac{100 \text{ cm}}{1 \cancel{m}} = \mathbf{26{,}000 \text{ cm}^2}$$

**5.**
(94)

There are 4 consonants, so $P(C) = \frac{4}{6}$ or $\frac{2}{3}$

$$P(C, C) = \frac{2}{3} \cdot \frac{2}{3}$$

$$P(C, C) = \frac{4}{9}$$

**6.**
(91)

$$\frac{(-4)(-6) + 5(-1)(-3)}{-3} =$$

$$\frac{24 + 15}{-3} = \frac{39}{-3} = \mathbf{-13}$$

**7.** (a)
(71)

$$\frac{\text{squished}}{\text{total}} = \frac{\text{squished}}{\text{total}}$$

$$\frac{1}{3} = \frac{5}{T}$$

$$T = 15$$

**There were 15 boxes in the crate.**

(b) $\frac{2}{3}$ were not squished, **so $66\frac{2}{3}\%$ were not squished.**

*Scratch Work:* $\frac{2}{3} \times 100\% = \frac{200}{3}\%$

$$= 66\frac{2}{3}\%$$

**8.**
(91)

$$\frac{w + x}{y} = \frac{(-4) + (-5)}{-6} = \frac{-9}{-6} = \mathbf{1\frac{1}{2}}$$

**9.** If the perimeter is 76 m, each side is
(20) $76 \div 4$ or 19 m.

Area = (side)(side)

Area = (19)(19)

Area = **361 m²**

*Note:* Don't forget to label.

**10.**
(95)

$V = B \cdot h$

$$V = \left(\frac{14 \cdot 7}{2}\right) \cdot 7$$

$V = 49 \cdot 7$

$V = \mathbf{343 \text{ cm}^3}$

*Note: B* means area of the base which is a triangle. Don't forget to label answer.

**11.**
(82)

$A = \pi r^2$

$A = (3.14) \cdot 2^2$

$A = (3.14)4$

$A = \mathbf{12.56 \text{ cm}^2}$

*Note:* Always write the formula.

Another reason we get sq. cm for area is:

$A = (3.14)(2 \text{ cm})(2 \text{ cm})$

$A = (3.14)(4 \text{ cm}^2)$

**12.**
(46)

$$\begin{array}{r} 20 \text{ yd} \\ \times\ \$17 \text{ per yd} \\ \hline \$340 \end{array} \qquad \begin{array}{r} \$340 \\ \times\ .07 \text{ tax} \\ \hline \$23.80 \text{ tax} \end{array} + \$23.80 \text{ tax} = \$363.80$$

**The total price is $363.80.**

**13.**
(60)

$$W_N = 66\frac{2}{3}\% \text{ of } 24$$

$$W_N = \frac{2}{3} \cdot 24$$

$$W_N = 16$$

*Scratch Work:* $66\frac{2}{3}\% = \dfrac{66\frac{2}{3}}{100}$

$$= \frac{200}{3} \times \frac{1}{100} = \frac{2}{3}$$

**14.** The angle formed by the hands at 1:00 a.m. is $\frac{1}{12}$ of
(7) $360°$ or $30°$.

**So the angle formed at 5:00 a.m. is $(5 \times 30)$ or $150°$.**

**15.**
(83)

$$(4 \times 10^{-2})(5 \times 10^5) =$$

$$(4)(5) \cdot (10^{-2} \times 10^5) =$$

$$20 \cdot (10^3) = (2.0 \times 10^1) \times 10^3$$

$$= 2.0 \times 10^4$$

**16.**
(93)

$$0.5j - 1.2 + 1.2 = 1.2 + 1.2$$

$$\frac{0.5j}{0.5} = \frac{2.4}{0.5}$$

$$j = 4.8$$

**17.**
(93)

$$\frac{2}{3}a - 3 + 3 = 5 + 3$$

$$\frac{3}{2} \cdot \frac{2}{3}a = 8 \cdot \frac{3}{2}$$

$$a = 12$$

**18.**
(52)

$$4^3 - \sqrt{25} + 9^1 \cdot 3^4 =$$

$$64 - 5 + 9 \cdot 81 =$$

$$64 - 5 + 729 = \textbf{788}$$

**19.**
(49)

$$\begin{array}{l} \quad\quad\quad 6 \text{ in.} \\ \dfrac{5 \text{ yd } 1 \text{ ft } 11 \text{ in.}}{5 \text{ yd } 1 \text{ ft } \cancel{17 \text{ in.}}} = \textbf{5 yd 2 ft 5 in.} \\ \quad\quad\quad 1 \text{ ft } 5 \text{ in.} \end{array}$$

**20.**
(96)

$$3c + \overgroup{8(c + 2)} =$$

$$3c + 8c + 16 = \textbf{11c + 16}$$

*Note:* It may help you to remember to multiply
*both c* and 2 by 8 by drawing arrows.

## TEST 21

**1.**
(46)

$$\begin{array}{r} \$21 \\ \times\, 0.15 \text{ (tip)} \\ \hline \$3.15 \end{array}$$

**The tip was \$3.15.**

or by *Lesson 92:*

|        | Percent | Actual |
|--------|---------|--------|
| Dinner | 100%    | \$21   |
| Tip    | 15%     | $T$    |
| Total  | 115%    |        |

$$\frac{100}{15} = \frac{21}{T}$$

$$T = \textbf{\$3.15}$$

**2.**
(72,76)

$$\frac{528 \text{ km}}{8\frac{1}{4} \text{ hr}} = \frac{S \text{ km}}{1 \text{ hr}}$$

$$8\frac{1}{4}S = 528$$

$$\frac{4}{33} \cdot \frac{33}{4}S = 528 \cdot \frac{4}{33}$$

$$S = 64$$

or by *Lesson 76:*

$$\frac{524}{8\frac{1}{4}} = \frac{524 \cdot \frac{4}{33}}{\frac{33}{4} \cdot \frac{4}{33}} = 64$$

**The average speed was 64 km/hr.**

**3.**
(98)

|          | Scale | Measure |
|----------|-------|---------|
| Model    | 1     | 11 in.  |
| Building | 48    | $H$     |

*Note:* Problem gives us inches and asks for feet. Always read carefully.

$$\frac{1}{48} = \frac{11}{H}$$

$$H = 48 \cdot 11 \text{ in.}$$

$$H = 528 \text{ in.}$$

$$H = 44 \text{ ft}$$

**The height of the building is 44 feet.**

**4.**
*(92)*

| | Percent | Actual Count |
|---|---|---|
| Before | 100% | $B$ |
| Discount | 20% | $35 |
| After | 80% | $A$ |

$$\frac{100\%}{20\%} = \frac{B}{\$35}$$

$$3500 = 20B$$

$$\$175 = B$$

**The regular price was $175.**

**5.**
*(92)*

| | Percent | Actual Count |
|---|---|---|
| Before | 100% | $55 |
| Increase | 23% | $I$ |
| After | 123% | $A$ |

$$\frac{100\%}{123\%} = \frac{\$55}{A}$$

$$100A = \$6765$$

$$A = \$67.65$$

**The new price is $67.65.**

**6.**
*(85)*

$$\frac{(-18) - (-4)(+5)}{(-4) - (+5) - (+5)} = \frac{(-18) - (-20)}{(-4) + (-5) + (-5)}$$

$$= \frac{-18 + 20}{-14}$$

$$= \frac{2}{-14} = -\frac{1}{7}$$

**7.**
*(60)*

$W_N = 7.5\%$ of $80

$W_N = 0.075 \cdot \$80$

$W_N = \mathbf{\$6.00}$

*Scratch Work:*

$$7.5\% = \frac{7.5}{100}$$

$$= \frac{75}{1000}$$

$$= 0.075$$

**8.**
*(102)*

$$2n + 22 - 4n = 42$$

$$-2n + 22 = 42 \quad \longrightarrow \text{ Collected like terms}$$

$$\underline{-22 = -22} \quad \longrightarrow \begin{array}{l}\text{Subtracted 22 from}\\ \text{both sides}\end{array}$$

$$\frac{-2n}{-2} = \frac{20}{-2} \quad \longrightarrow \text{ Divided both sides by } -2$$

$$n = \mathbf{-10}$$

**9.**
*(39)*

$$\frac{16}{b} = \frac{94}{4.7}$$

$$16 \cdot 4.7 = 94b$$

$$75.2 = 94b$$

$$\mathbf{0.8} = b$$

**10.**
*(103)*

$-3^2 + (-3)^2$ means $-(3)(3) + (-3)(-3)$

$$= -9 + 9 = \mathbf{0}$$

*Note:* $-3^2$ can be read "The negative of $3^2$ or the opposite of $3^2$."

**11.**
*(100)*

$\sqrt{168}$ **is irrational** (check with a calculator)

$\sqrt{168}$ is approx. 12.961481

but $(12.961481)^2 \neq 168$

**12.**
*(Inv. 10)*

The total % is 100%.

**The chance it will not rain is 94%.**

**13.**
*(100)*

$\sqrt{57}$ is between $\sqrt{49}$ and $\sqrt{64}$ so

$\sqrt{57}$ **is between 7 and 8.**

**14.**
*(103)*

$$\frac{(-6cd)(-4c^2d)}{4c^2d} = \frac{\overset{6}{\cancel{24}}\overset{c}{\cancel{c^3}}\overset{d}{\cancel{d^2}}}{\underset{1}{\cancel{4}}\underset{1}{\cancel{c^2}}\underset{1}{\cancel{d}}} = \mathbf{6cd}$$

**15.**
*(40)*

$$2x + 3x = 90°$$

$$5x = 90°$$

$$x = 18°$$

$$\text{So } 3x = 54°$$

$$\mathbf{m\angle UOV = 54°}$$

**16.**
*(97)*

| | Building | Flagpole |
|---|---|---|
| Height | $H$ | 6 m |
| Shadow | 108 m | 12 m |

$$\frac{H}{108} = \frac{6}{12}$$

$$12H = 648$$

$$H = \mathbf{54\ m}$$

*Note:* When solving proportions, sometimes it is easier to reduce first.

$$\frac{H}{108} = \frac{\overset{1}{\cancel{6}}}{\underset{2}{\cancel{12}}} \quad \begin{array}{l}\text{Gives } 2H = 108\\ \text{which is easier to solve.}\end{array}$$

**17.**
(104)  Perimeter of semicircle $= \dfrac{\pi d}{2}$

$$= \dfrac{(3.14)(\overset{4}{\cancel{8}})}{\underset{1}{\cancel{2}}} = 12.56 \text{ ft}$$

The total perimeter is $12.56 + 9 + 8 + 9$ or **38.56 feet.**

**18.**
(99)  $16^2 + x^2 = 34^2$

$256 + x^2 = 1156$

$x^2 = 900$

$x = \mathbf{30}$

**19.**
(105)  Area of triangle $= \dfrac{8 \cdot 6}{2} = 24 \text{ mm}^2$

Area of triangle $= \dfrac{8 \cdot 6}{2} = 24 \text{ mm}^2$

Area of rectangle $= 10 \cdot 7 = 70 \text{ mm}^2$

Area of rectangle $= 8 \cdot 7 = 56 \text{ mm}^2$

Area of bottom $= 6 \cdot 7 = 42 \text{ mm}^2$

**Total Area $= 216 \text{ mm}^2$**

**20.**
(95)  $V = Bh$ $\qquad$ *B* means area of base

$V = \pi r^2 h$

$V = (3.14)(3)^2(6)$

$V = (3.14)(3 \text{ ft})(3 \text{ ft})(6 \text{ ft})$

$V = \mathbf{169.56 \text{ cu. ft}}$

# TEST 22

**1.**
(Inv. 4)  First list scores in order from highest to lowest.

$72, 69, 69, 69, 69, 64, 60, 58, 46$

Range is highest $-$ lowest.

Range is $72 - 46 = \mathbf{26}$

Mean is average:

$$\dfrac{72 + 4 \cdot 69 + 64 + 60 + 58 + 46}{9} = \mathbf{64}$$

Median is the middle number.

Median is **69**

Mode is the number that occurs most often.

Mode is **69**

**2.**
(94)  $P(R) = \dfrac{26}{52} = \dfrac{1}{2}$ $\quad$ *Note:*
$\qquad\qquad\qquad\qquad$ There are 26 red cards.

$P(\text{2nd Red}) = \dfrac{25}{51}$

$P(\text{2 Reds}) = \dfrac{1}{2} \cdot \dfrac{25}{51} = \dfrac{\mathbf{25}}{\mathbf{102}}$

**3.**
(53)  $\dfrac{\overset{16}{\cancel{160}}}{\underset{30}{\cancel{300}}} = \dfrac{R}{330}$

$\dfrac{\cancel{30}R}{\cancel{30}} = \dfrac{16 \cdot \overset{11}{\cancel{330}}}{\underset{1}{\cancel{30}}}$

$R = 16 \cdot 11$

$R = \mathbf{\$176}$

*Note:* Reduce before multiplying. Many times we can reduce proportions and equations before we multiply. This will make the computation easier.

**4.**
(65)

| | Ratio | Actual Count |
|---|---|---|
| Cats | 4 | C |
| Dogs | 9 | D |
| Total | 13 | 351 |

$\dfrac{4}{13} = \dfrac{C}{351}$

$\dfrac{\cancel{13}C}{\cancel{13}} = \dfrac{4 \cdot \overset{27}{\cancel{351}}}{\underset{1}{\cancel{13}}}$

$C = 108$

**There were 108 cats.**

**5.**
(92)

| | Percent | Actual Count |
|---|---|---|
| Before | 100% | $130 |
| Reduced | 30% | R |
| After | 70% | A |

$\dfrac{\overset{10}{\cancel{100\%}}}{\underset{7}{\cancel{70\%}}} = \dfrac{\$130}{A}$

$10A = 910$

$A = \$91$

**The cost during the balloon festival was \$91.**

**6.**
(60)  $W_N = 4.5\%$ of $\$54$

$W_N = 0.045 \cdot \$54$

$W_N = \mathbf{\$2.43}$

**7.**
(77)

$$10\% \cdot W_N = 220$$

$$\frac{0.10 \cdot W_N}{0.10} = \frac{220}{0.10}$$

$$W_N = \mathbf{2200}$$

**8.**
(108)

$$t = 1.04p$$

$$t = (1.04)(\$7.25)$$

$$t = \mathbf{\$7.54}$$

**9.**
(63)

$$54 - \left\{81 - 3[2 + 2(3^2)]\right\} =$$

$$54 - \left\{81 - 3[2 + 2 \cdot 9]\right\} =$$

$$54 - \left\{81 - 3[2 + 18]\right\} =$$

$$54 - \left\{81 - 3 \cdot 20\right\} =$$

$$54 - \left\{81 - 60\right\} =$$

$$54 - 21 = \mathbf{33}$$

**10.**
(103)

$$\frac{(-6de^3)(15d^2e)}{-15d^3e} = \frac{(-6)(\cancel{15})d^{\cancel{3}} \cdot e^{\cancel{4}}^{e^3}}{-\cancel{15}d^{\cancel{3}} \cdot \cancel{e}}_{-1} = \mathbf{6e^3}$$

*Note:* No need to multiply $(-6)(15)$ because we will need to reduce by 15.

**11.**
(85)

$$\frac{(-5) - (2)(-7) - (-2)^2}{(-1) - (-2)} = \frac{(-5) - (-14) - 4}{-1 + 2}$$

$$= \frac{-5 + 14 - 4}{-1 + 2}$$

$$= \frac{5}{1} = \mathbf{5}$$

**12.**
(98)

| | Scale | Actual |
|---|---|---|
| Model | 1 | 8 in. |
| Object | 48 | $B$ |

$$\frac{1}{48} = \frac{8 \text{ in.}}{B}$$

$$B = 48 \cdot 8 \text{ in.}$$

$$B = 384 \text{ in.}$$

$$B = 32 \text{ ft}$$

**The building was 32 feet tall.**

**13.**
(95)

$$V = Bh$$

$$V = \pi r^2 h$$

$$V = (3.14)(2.5)^2(6)$$

$$V = (3.14)(2.5)^2(6)$$

$$V = \mathbf{117.75 \text{ ft}^3}$$

**14.**
(93)

$$1\frac{3}{7}n - 23 + 23 = 27 + 23 \qquad \text{Added 23}$$

$$\frac{\cancel{7}}{\cancel{10}} \cdot \frac{\cancel{10}}{\cancel{7}}n = \cancel{50}^{5} \cdot \frac{7}{\cancel{10}}_{1} \qquad \text{Wrote } 1\frac{3}{7} \text{ as } \frac{10}{7}$$
$$\text{and multiplied}$$
$$\text{by } \frac{7}{10}.$$

$$n = \mathbf{35}$$

**15.**
(106)

$$r = \frac{s - t}{t} \qquad \textit{Note: A fraction}$$
$$\text{like } \frac{s-t}{t} = \frac{s}{t} - \frac{t}{t}$$

$$r = \frac{s}{t} - \frac{\cancel{t}^1}{\cancel{t}_1}$$

$$r = \frac{s}{t} - 1$$

$$r + 1 = \frac{s}{t} - 1 + 1 \qquad \text{Added 1 to each side}$$
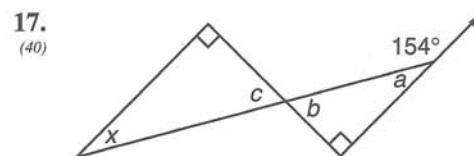
$$\frac{r + 1}{1} = \frac{s}{t} \qquad \text{Wrote equation as a proportion}$$

$$s \cdot \frac{1}{r + 1} = \frac{t}{s} \cdot s \qquad \text{Multiplied both sides by } s$$

$$\frac{s}{r + 1} = \mathbf{t}$$

**16.**
(102)

$$\begin{array}{rcl}
4d + 10 &=& 2d - 14 \\
-2d && = -2d \\
\hline
2d + 10 &=& -14 \\
-10 &=& -10 \\
\hline
\dfrac{2d}{2} &=& \dfrac{-24}{2}
\end{array}$$

$$d = \mathbf{-12}$$

**17.**
(40)



$$\angle a = 180 - 154 = 26°$$

$$\angle b + \angle a = 90°$$

$$\text{So } \angle b = 64°$$

$$\angle c = \angle b \qquad \text{so} \qquad \angle c = 64°$$

$$\angle x + \angle c = 90°$$

$$\text{So } m\angle x = \mathbf{26°}$$

*Note:* During calculation we sometimes write $m\angle a$ as $\angle a$. However, when you write your result, always $m\angle x$ using the "measure of" notation.
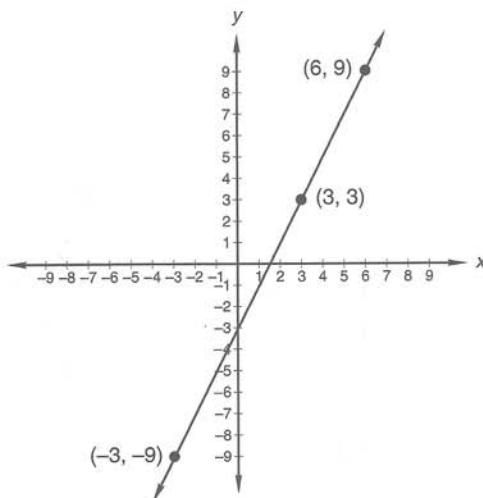
**18.** (a) $y = 2x - 3$
(107)

| $x$ | $y$ |
|-----|-----|
| $-3$ | $-9$ |
| 3 | 3 |
| 6 | 9 |

*Scratch Work:*

$y = (2)(-3) - 3$   gives   $y = -9$

$y = 2 \cdot 3 - 3$   gives   $y = 3$

$y = 2 \cdot 6 - 3$   gives   $y = 9$

(b)



(c) **Slope = 2**

**19.** $P$ of Semicircle $= \dfrac{\pi d}{2}$
(104)

$= \dfrac{(3.14)(6)}{2}$

$= \dfrac{18.84}{2}$

$= 9.42$ cm

Total Perimeter $= 9.42 + 8 + 8 + 6$

$P = \textbf{31.42 cm}$

**20.**  $-2n + 24 + 4n = 50$
(102)
$\phantom{-}2n + 24 = 50$
$\underline{\phantom{-2n} - 24 - 24}$
$\phantom{-2n +} 2n = 26$
$\phantom{-2n +} n = \textbf{13}$

# TEST 23

**1.**
(92)

| | Percent | Actual |
|---|---|---|
| Before | 100% | $40 |
| Reduced | 20% | $R$ |
| After | 80% | $SP$ |

$\dfrac{\overset{5}{\cancel{100\%}}}{\underset{4}{\cancel{80\%}}} \cdot \dfrac{\$40}{SP}$

$5SP = 160$

$SP = \$32$

**The sale price was \$32.**

**2.**  $\dfrac{20 \text{ kg}}{\$31} = \dfrac{30 \text{ kg}}{C}$
(72)

$20C = 930$

$C = \textbf{\$46.50}$

**30 kg would cost \$46.50.**

**3.**
(92)

| | Percent | Actual |
|---|---|---|
| Before | 100% | $OP$ |
| Reduced | 20% | $R$ |
| After | 80% | $384 |

$\dfrac{\overset{5}{\cancel{100\%}}}{\underset{4}{\cancel{80\%}}} \cdot \dfrac{OP}{\$384}$

$4 \cdot OP = \$1920$

$OP = \$480$

**The original price was \$480.**

**4.**  $\dfrac{2 \times 10^7}{4 \times 10^3} = 0.5 \times 10^4$
(111)

$= (5 \times 10^{-1}) \times 10^4$

$= \mathbf{5 \times 10^3}$

**5.**  Numbers are 3.4, 1.5, 0.85, 0.8, 0.4
(Inv. 4)

Median is 0.85

Mean is $\dfrac{3.4 + 1.5 + 0.85 + 0.8 + 0.4}{5} = 1.39$

Mean / Median $= 1.39 - 0.85$

**The median is 0.54 less than the mean.**

**6.** $P(T, T, T) = \dfrac{1}{2} \cdot \dfrac{1}{2} \cdot \dfrac{1}{2}$
(94)

$P(T, T, T) = \dfrac{1}{8}$

**7.**
(110)

| | Principal | | Interest | | Principal | | Interest | | Total |
|---|---|---|---|---|---|---|---|---|---|
| End of 1st year = | $3500 | + | 3500 | × 0.06 = | 3500 | + | $210 | = | 3710 |
| End of 2nd year = | $3710 | + | 3710 | × 0.06 = | 3710 | + | $222.60 | = | 3932.60 |
| End of 3rd year = | $3932.60 | + | 3932.60 | × 0.06 = | 3932.60 | + | $235.96 | = | 4168.56 |
| End of 4th year = | $4168.56 | + | 4168.56 | × 0.06 = | 4168.56 | + | $250.11 | = | 4418.67 |
| End of 5th year = | $4418.67 | + | 4418.67 | × 0.06 = | 4418.67 | + | $265.12 | = | 4683.79 |
| End of 6th year = | $4683.79 | + | 4683.79 | × 0.06 = | 4683.79 | + | $281.03 | = | 4964.82 |

Total Interest: $1464.82

**$1464.82 was earned in 6 years.**

**8.** $\dfrac{W_P \cdot 25}{25} = \dfrac{\$7.75}{25}$
(77)

$W_P = \mathbf{31\%}$

*Scratch Work:* $7.75 \div 25 = 0.31 = 31\%$

**9.** (a) $V = l \cdot w \cdot h$
(50,115)

$V = (100 \text{ cm})(70 \text{ cm})(37 \text{ cm})$

$V = 259{,}000 \text{ cu cm}$

**The aquarium will contain 259 liters.**

(b) **There are 259 kilograms of water.**

*Scratch Work:* $\dfrac{259{,}000 \text{ cm}^3}{1} \cdot \dfrac{1 \text{ L}}{1000 \text{ cm}^3}$

1 L has a mass of 1 kg

**10.** $\dfrac{5 \text{ ft} \cdot \text{ft}}{1} \cdot \dfrac{12 \text{ in.}}{1 \text{ ft}} \cdot \dfrac{12 \text{ in.}}{3 \text{ ft}} = \mathbf{720 \text{ in.}^2}$
(88)

**11.** $a^2 + b^2 = c^2$
(112)

$20^2 + 48^2 = c^2$

$400 + 2304 = c^2$

$\sqrt{2704} = c$

$\mathbf{52} = c$

**The direct distance will be 16 miles shorter.**

**12.** $8^2 \cdot 8^{-2} = 8^0$    *Note:* We add the exponents
(114)

$= \mathbf{1}$    like multiplying in scientific
notation.

**13.** $\dfrac{8d \cdot 7d}{4d + 5d} = \dfrac{56d^{\cancel{2}}}{\underset{1}{\cancel{9d}}} = \dfrac{\mathbf{56d}}{\mathbf{9}}$
(103)

**14.** $\dfrac{(-4) + (-7) + (3)(-3)}{-6 - (-2)} = \dfrac{(-4) + (-7) + (-9)}{-6 + (+2)}$
(91)

$= \dfrac{-20}{-4} = \mathbf{5}$

**15.** $1\dfrac{2}{5}V - 27 = -6$
(93)

$\phantom{1\dfrac{2}{5}V} + 27 = +27$

$\dfrac{5}{7} \cdot \dfrac{7}{5}V = 21 \cdot \dfrac{5}{7}$

$V = \mathbf{15}$

**16.** $2x - 4 < 0$
(78,93)

$\phantom{2x} + 4 + 4$

$2x < 4$

$x < 2$

-3 -2 -1 0 1 2 3

**17.** $V = \dfrac{1}{3}Bh$
(113)

$V = \dfrac{1}{3}(10 \cdot 10)10$

$V = \dfrac{1000}{3} \text{ cm}^3$

$V = \mathbf{333\dfrac{1}{3} \text{ cm}^3}$

*Note:* Sometimes we choose not to show labels
during computation, but DO NOT FORGET to
label your answer.
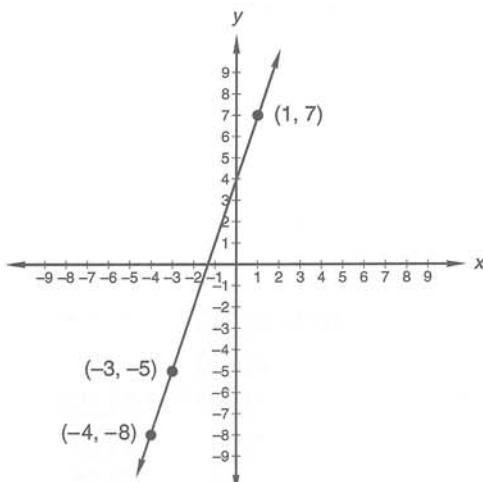
**18.** (a) $y = 3x + 4$    *Scratch Work:*
(107)

| $x$ | $y$ |
|---|---|
| -4 | -8 |
| -3 | -5 |
| 1 | 7 |

$y = 3(-4) + 4 = -8$
$y = 3(-3) + 4 = -5$
$y = 3(-1) + 4 = 7$

(b)



(c) **Slope = 3**

**19.**
*(108)*

$$A = \frac{1}{2}bh$$

$$\frac{2A}{b} = \frac{\cancel{b}h}{\cancel{b}}$$

$$h = \frac{2A}{b} \quad \text{so} \quad h = \frac{2 \cdot \overset{4}{\cancel{56}}}{\underset{1}{\cancel{14}}}$$

$$h = 8$$

**20.**
*(40)*
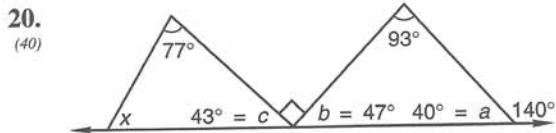


$$m\angle a = 40°$$

$$m\angle b = 47° \quad \text{because } 93° + 40° + b = 180°$$

$$m\angle c = 43° \quad \text{because } c + 90° + 47° = 180°$$

$$m\angle x = 60° \quad \text{because } x + 77° + 43° = 180°$$

## FINAL EXAM

**1.** **$34\frac{7}{9}$ rounds to 35** because $\frac{7}{9} > \frac{1}{2}$, also $\frac{7}{9} \approx 0.77$,
*(29)* which is $> 0.5$.

**2.** $1800 =$
*(21)*



$$1800 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 5$$

**3.** $\dfrac{24\cancel{0}}{40\cancel{0}} = \dfrac{\overset{3}{\cancel{24}}}{\underset{5}{\cancel{40}}} = \dfrac{3}{5}$
*(24)*
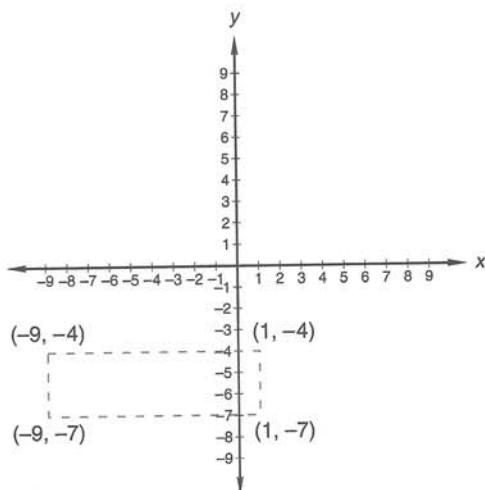
or

$$\frac{240}{400} = \frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 3 \cdot \cancel{5}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 5 \cdot \cancel{5}}$$

$$\text{so} \quad \frac{240}{400} = \frac{3}{5}$$

*Scratch Work:*

| 2 | 240 | | 2 | 400 |
|---|-----|---|---|-----|
| 2 | 120 | | 2 | 200 |
| 2 | 60  | | 2 | 100 |
| 2 | 30  | | 2 | 50  |
| 2 | 15  | | 2 | 25  |
|   | 5   | |   | 5   |

**4.**
*(Inv. 3)*



(−9, −4)   (1, −4)

(−9, −7)   (1, −7)

(a) **The 4th vertex is (1, −7).**

(b) **(10)(3) = 30 square units**

**5.** $2\dfrac{1}{4} \cdot 2\dfrac{2}{3} = \dfrac{\overset{3}{\cancel{9}}}{\underset{1}{\cancel{4}}} \cdot \dfrac{\overset{2}{\cancel{8}}}{\underset{1}{\cancel{3}}} = \mathbf{6}$
*(26)*

**6.** $1\dfrac{4}{9}\left(7 \div 1\dfrac{2}{5}\right) =$ 　　　*Scratch Work:*
*(26)*

$$\frac{13}{9}(5) = \frac{65}{9} \qquad 7 \div \frac{7}{5} = 7 \cdot \frac{5}{7} = 5$$

$$= 7\frac{2}{9}$$

**7.** $\dfrac{7}{8} + \dfrac{1}{5} = \dfrac{35}{40} + \dfrac{8}{40} = \dfrac{43}{40} = \mathbf{1\dfrac{3}{40}}$
*(30)*

**8.** $12\dfrac{3}{4} - 5\dfrac{3}{8} = 12\dfrac{6}{8} - 5\dfrac{3}{8} = \mathbf{7\dfrac{3}{8}}$
*(30)*

**9.** $0.283 = 2 - d$
*(35)* 　　$d = \mathbf{1.717}$

Missing subtrahend so we subtract:
$$\begin{array}{r} 2.000 \\ -\ 0.283 \\ \hline 1.717 \end{array}$$

**10.**
*(Inv. 7)*
$$\begin{array}{r} 2.8 \\ +\ 0.05 \\ \hline \mathbf{2.85} \end{array} = \begin{array}{l} p - 0.05 \\ +\ 0.05 \\ \hline = p \end{array}$$

**11.** $\dfrac{r}{20} = \dfrac{\overset{3}{\cancel{36}}}{\underset{2}{\cancel{24}}}$ 　　*Note:* We can reduce before we
*(39)* 　　　　　　cross multiply.

$$2r = 60$$

$$r = \mathbf{30}$$

**12.** $(0.3)(0.25)(0.04) =$ **0.003**
(35)

*Scratch Work:* $0.075 \times 0.04 = 0.00300$

**13.** $0.632 \div 0.04 =$ **15.8**    *Scratch Work:*
(45)

$$
\begin{array}{r}
15.8 \\
0.04\overline{)0.632} \\
\underline{4\phantom{0}} \\
23 \\
\underline{00} \\
32
\end{array}
$$

**14.** $\dfrac{5^2 + 7 \cdot 4 - 5 \cdot 3^2}{\sqrt{64}} = \dfrac{25 + 7 \cdot 4 - 5 \cdot 9}{8}$
(52)

$$= \dfrac{25 + 28 - 45}{8} = 1$$

**15.** $P = 3\,\text{m} + 20\,\text{m} + 14\,\text{m} + 20\,\text{m}$
(19)

Perimeter = **57 m**

**16.** (a) $0.00344 =$ **3.44** $\times$ **10$^{-3}$**
(57)

(b) $8.12 \times 10^{-5} =$ **0.0000812**

**17.** Tax is $\$35.60 \times 0.05 = \$1.78$
(46,72)
**The total price is \$37.38.**

or

|        | Percent | Actual Count |
|--------|---------|--------------|
| Before | 100%    | $35.60       |
| Tax    | 5%      | $T$          |
| After  | 105%    | $A$          |

$$\frac{100\%}{105\%} = \frac{\$35.60}{A}$$

$$A = \$37.38$$

**18.** $a + 50° + 90° = 180°$
(40)

$a =$ **40°**

$c =$ **40°**    because $a$ and $c$ are vertical angles,

$b =$ **140°**    because $a$ and $b$ are supplementary

**19.**
(65)

|       | Ratio | Actual Count |
|-------|-------|--------------|
| Girls | $G$   | 24           |
| Boys  | $B$   | 8            |
| Total | $T$   | 32           |

$$\frac{G}{B} = \frac{\overset{3}{\cancel{24}}}{\underset{1}{\cancel{8}}}$$

$$\frac{G}{B} = \frac{3}{1}$$

**The ratio of girls to boys was $\dfrac{3}{1}$.**

**20.** Total for the first 3 tests was $78 \times 3$ or 234.
(55)

Total for the next 4 tests was $81 \times 4$ or 324.

Total for all 7 tests was 558.

**The average score for all 7 tests was 79.7.**

**21.** $SA = 4\pi r^2$
(105)

$SA = 4(3.14)3^2$

$SA =$ **113.04 m$^2$**

**22.** $c = \pi d$
(66)

$$c = \left(\frac{22}{7}\right)\overset{16}{\cancel{112}}$$
$$\phantom{c = \left(\frac{22}{7}\right)}_1$$

$c =$ **352 in.**

**23.** $A = \pi r^2$
(82)

$A = (3.14)(4\,\text{cm})(4\,\text{cm})$

$A =$ **50.24 cm$^2$**

**24.** $\dfrac{(-20) - (-8)(-3)}{(-5) - (+2) - (+3)} = \dfrac{(-20) - 24}{(-5) + (-2) + (-3)}$
(85)

$$= \frac{-44}{-10} = 4\frac{2}{5} \text{ or } 4.4$$

**25.** $V = l \cdot w \cdot h$
(70)

$V = (7\,\text{in.})(7\,\text{in.})(7\,\text{in.})$

$V =$ **343 in.$^3$**

**26.** $W_N = \dfrac{1}{10} \cdot 20$
(60)

$W_N = 2$

**Martha ate 2 cookies.**
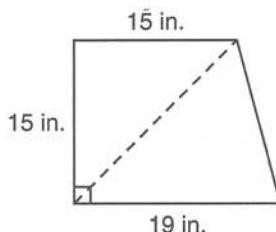
**27.** $(3.3 \times 10^3)(2.4 \times 10^9) =$
(83)

$(3.3 \times 2.4)(10^3 \times 10^9) =$ **7.92** $\times$ **10$^{12}$**

**28.**
*(81)*

| | Percent | Actual Count |
|---|---|---|
| Waved | 36% | $W$ |
| Did Not Wave | 64% | 192 |
| Total | 100% | $T$ |

$$\frac{64\%}{100\%} = \frac{192}{T} \qquad T = 300$$

**There were 300 fans in all.**

**29.**
*(75)*



$$\text{Area of Top } \Delta = \frac{15 \times 15}{2} = 112.5 \text{ in.}^2$$

$$\text{Area of Bottom } \Delta = \frac{19 \times 15}{2} = 142.5$$

$$\text{Area of Trapezoid} = \mathbf{255 \text{ in.}^2}$$

**30.**
*(93)*

$$2\frac{1}{6}b - 15 = \qquad 11$$
$$\underline{\qquad +15 \qquad\qquad +15 \qquad}$$
$$\frac{6}{13} \cdot \frac{13}{6}b = 26 \cdot \frac{6}{13}$$
$$b = \mathbf{12}$$

**31.**
*(91)*

$$\frac{f+g}{h} = \frac{(-6)+(-3)}{(-7)} = \frac{-9}{-7} = \mathbf{1\frac{2}{7}}$$

**32.**
*(92)*

| | Percent | Actual Count |
|---|---|---|
| Before | 100% | $40 |
| Reduced | 25% | $R$ |
| After | 75% | $SP$ |

$$\frac{\overset{4}{\cancel{100\%}}}{\underset{3}{\cancel{75\%}}} \cdot \frac{\$40}{SP} \qquad SP = \$30$$

**The sale price was $30.**

**33.**
*(108)*

$$A = \frac{1}{2}bh$$
$$2A = bh$$
$$\frac{2A}{b} = h$$

$$\frac{\frac{1}{\cancel{2}} \cdot 26}{\frac{\cancel{4}}{2}} = h$$
$$13 = h$$

**34.**
*(94)*

$$P(T, T, T, T) = \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2} \cdot \frac{1}{2}$$
$$P(4T) = \frac{1}{16}$$

**The probability of the coin landing tails up 4 times in a row is $\frac{1}{16}$.**

**35.**
*(97)*

First find the scale factor: $7sf = 21$
$$sf = 3$$
So $n \cdot 3 = 24$
$$n = \mathbf{8}$$

or we could also use: $21 \cdot sf = 7$
$$sf = \frac{1}{3}$$
So $24 \cdot sf = n$
$$24 \cdot \frac{1}{3} = n$$
$$8 = n$$

**36.**
*(84)*

$$4x + y + 3x - 6y = \mathbf{7x - 5y}$$

**37.**
*(112)*

$$c^2 = a^2 + b^2$$
$$c^2 = 9^2 + 40^2$$
$$c^2 = 81 + 1600$$
$$c^2 = 1681$$
$$c = 41$$

**The direct distance would be 8 miles shorter.**

**38.**
*(102)*

$$2n + 14 - 4n = 26$$
$$-2n + 14 = 26$$
$$\underline{\qquad -14 = -14 \qquad}$$
$$\frac{-2n}{-2} = \frac{12}{-2}$$
$$n = \mathbf{-6}$$

**39.**
*(87)*

$$(-7x)(8x^2y)(3x^3y^2) =$$
$$(-7)(8)(3) \cdot x \cdot x^2 \cdot x^3 \cdot y \cdot y^2 = \mathbf{-168x^6y^3}$$

**40.**
*(95)*

$$V = Bh \qquad\qquad \text{Base is a triangle}$$
$$V = \frac{7 \cdot 7}{2} \cdot 7$$
$$V = \frac{49}{2} \cdot 7$$
$$V = \mathbf{171.5 \text{ cm}^3}$$

## LESSON 1

### MENTAL MATH:

a. 60
b. 80
c. 87
d. 6
e. 24
f. 48
g. 5

### PROBLEM SOLVING:

21, 28, 36

### PRACTICE

a. $0.45 per glass;
   45¢ per glass
b. 0
c. 2
d. $5.35
e. $1.53
f. $3.25
g. 6000
h. $4.80
i. 13

### PROBLEM SET 1

1. 19
2. 17
3. 32
4. 3
5. addition, subtraction, multiplication, and division
6. 8
7. $27.15
8. 2368
9. 49
10. 1292
11. 375
12. 5688
13. $2.18
14. 12,000
15. 0
16. 309
17. 7300
18. 30 r 17
19. 1200
20. $7.66
21. 65
22. $200.00
23. $50.00
24. 40
25. $1.25
26. natural numbers
27. $0.25; 25¢
28. All counting numbers are whole numbers.
29. quotient
30. minuend − subtrahend = difference

## LESSON 2

### MENTAL MATH:

a. 48
b. 18
c. 50
d. 900
e. 6000
f. 600
g. 0

### PROBLEM SOLVING:

55

### PRACTICE

a. The additive identity is 0. The multiplicative identity is 1.
b. division
c. $(x + y) + z = x + (y + z)$; Numerical answers will vary.
d. commutative property of multiplication
e. 12
f. 12
g. 2
h. 8
i. 60
j. 60
k. 1
l. 4
m. 16, 32, 64
n. 64, 81, 100

### PROBLEM SET 2

1. 3
2. (a) 4¢ (b) $0.04
3. 75¢ per glass; $0.75 per glass
4. subtraction
5. 15
6. $3 \times 5 = 15$, $5 \times 3 = 15$, $15 \div 3 = 5$, $15 \div 5 = 3$
7. $106.36
8. $5.21
9. $10.78
10. $3.75
11. $17.17
12. $4.37
13. 57
14. 207
15. 40 r 30
16. 27
17. 3
18. $37.50
19. 2795

## LESSON 3

20. 2639
21. $1.25
22. 56,000
23. $1.55
24. 4038
25. 120
26. $10.53
27. $6.25
28. $13.50
29. Zero is called the additive identity because when zero is added to another number, the sum is identical to that number.
30. dividend ÷ divisor = quotient

### LESSON 3

#### MENTAL MATH:

a. 66
b. 30
c. 500
d. 1500
e. 250
f. 900
g. 7

#### PROBLEM SOLVING:

39 seats

#### PRACTICE

a. 19
b. 39
c. 12
d. 96
e. 30
f. 17
g. 31
h. 52
i. 4

### PROBLEM SET 3
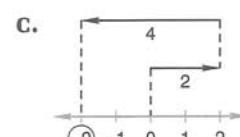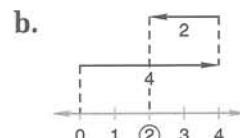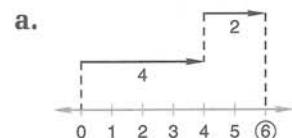
1. 2
2. Add the subtrahend and difference to find the minuend.
3. associative property of addition
4. 14
5. 3 · 4 = 4 · 3
6. 6
7. 29
8. 69
9. 17
10. 173
11. 868
12. 16
13. 25
14. 42,000
15. 12
16. 3
17. 63
18. $32.10
19. $11.77
20. 1833
21. $703.20
22. 158
23. 813
24. 639
25. 5104
26. 25,846
27. 60 r 4
28. $1.25
29. $19.20
30. One is the multiplicative identity because when any number is multiplied by 1, the product is identical to that number.

### LESSON 4

#### MENTAL MATH:

a. 100
b. 120
c. 250
d. 750
e. 2500
f. 40
g. 100

#### PROBLEM SOLVING:

14 dots

#### PRACTICE

a.



b.



c.
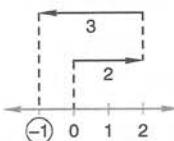


d. −3, −2, −1, 0
e. 2 + 3 < 2 × 3
f. >
g. =
h. 0
i. −194

### PROBLEM SET 4

1. 0
2. 18
3. positive numbers
4. 15¢ each; $0.15 each
5. 5 · 2 > 5 + 2
6. −2, −1, 0, 1
7. (a) =    (b) <    (c) <

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8. Multiply the divisor and quotient to find the dividend.

9.



10. 1

11. 12

12. 777

13. 899

14. $3.50

15. 7

16. 192

17. $56.56

18. $63.51

19. $17.28

20. 210

21. 550

22. 24,000

23. 82

24. −27

25. $9.80

26. $1.10

27. 58

28. $112.50

29. Answers may vary. One answer is
$(2 \times 3) \times 6$
$= 2 \times (3 \times 6)$.

30. $10 + 20 = 30$,
$20 + 10 = 30$,
$30 - 10 = 20$,
$30 - 20 = 10$

### LESSON 5

### MENTAL MATH:

a. 10

b. 144

c. 1000

d. 275

e. 500

f. 500

g. 15

### PROBLEM SOLVING:

$$\begin{array}{r} 7520 \\ - 2607 \\ \hline 4913 \end{array}$$

### PRACTICE

a. 3

b. billions' place

c. $(2 \times 1000) + (5 \times 100)$

d. thirty-six million, four hundred twenty-seven thousand, five hundred eighty

e. forty million, three hundred two thousand, ten

f. 25,206,040

g. 50,402,100,000

h. $15,000,000,000

### PROBLEM SET 5

1. 3000

2. $101,000 > 1,100$

3. fifty million, five hundred seventy-four thousand, six

4. 2

5. 250,005,070

6. >; Negative twelve is greater than negative fifteen.

7. −7, −1, 0, 4, 5, 7

8. Sketch a number line. Start at zero and draw an arrow 5 units long to the right. From this point draw an arrow 4

units long to the left. The second arrow ends at 1 showing that $5 - 4$ is 1.

9. 7 units

10. 32

11. 3867

12. 28

13. $6.30

14. 3,600

15. 18

16. $(7 \times 100,000) + (5 \times 10,000)$

17. 97,203

18. 6,247

19. 4733

20. $195.26

21. 36

22. 4

23. 20,000

24. 50

25. $5.79

26. $10.44

27. 405

28. 0, −2, −4

29. (a) counting numbers or natural numbers
(b) whole numbers
(c) integers

30. {..., −6, −4, −2}

### LESSON 6

### MENTAL MATH:

a. $7.50

b. $15.00

c. $0.55

d. 485

e. 625

f. 75

g. 4

PROBLEM SOLVING:
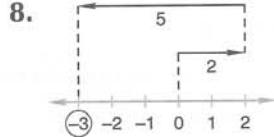
24 glubs

PRACTICE

a. 1, 5, 25

b. 1, 2, 3, 4, 6, 8, 12, 24

c. 1, 23

d. 1, 2, 3, 4, 5, 6, 7, 9, 10

e. 1, 2, 3, 4, 5, 6, 7, 10

f. 1, 2, 3, 4, 5, 6, 8, 9, 10

g. 1, 2, 3, 4, 6

h. 1, 2, 4, 5, 7, 8

i. 1, 2, 4

j. 8

PROBLEM SET 6

1. 4

2. (a) 1, 2, 5, 10  (b) 10

3. {…, −5, −3, −1}

4. 407,006,962

5. 1, 2, 3, 4, 5, 6, 10

6. >; Negative seven is greater than negative eleven.

7. 1, 2, 3, 4, 6, 8, 9

8.


9. $(6 \times 1000) + (4 \times 100)$

10. $5.40

11. 8350

12. 9

13. $6.25

14. 1339

15. 22

16. 256

17. 35

18. 40,000

19. $51.63

20. 96,300

21. $2.25

22. 1001

23. 4,807 r 8

24. 4262

25. $22.97

26. 628

27. 2240

28. $6.00

29. $4.35

30. commutative property of multiplication;

The order of factors can be changed without changing the product.

LESSON 7

MENTAL MATH:

a. −5

b. $25.00

c. 65¢

d. 365

e. 265

f. 48

g. 6

PROBLEM SOLVING:

$10 \times 21 = 210$

PRACTICE

a. point $A$

b. 4 cm

c.


d.


e.


f.


g.


h.


PROBLEM SET 7

1. 12

2. identity property of multiplication

3. 1, 2, 5, 10, 25, 50

4. $2 − 5 = −3$

5. 90,000,000

6. 1, 2, 3, 4, 6, 7

7. −10, −7, −2, 0, 5, 8

8. 121, 144, 169

9. (a) 1, 2, 4, 8  (b) 8

10. 7 units

11. 34

12. $82.46

13. 530

14. $1.80

15. 4000

16. 10

17. There is no remainder (the remainder is zero). A number is divisible by 9 if the sum of its digits is divisible by 9. The sum of the digits in 4554 is 18, which is divisible by 9.

18. 92,459

19. 18,088

20. $7.55

21. 2113

22. >

23. 80,000

24. $1.70

25. 280

26. $47.50

27. (a) $\angle BMC$ (or $\angle CMB$)
(b) $\angle AMC$ (or $\angle CMA$)

28. right angles

29. $\overline{XY}, \overline{YZ}, \overline{XZ}$

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30. Add $m\overline{XY}$ and $m\overline{YZ}$ to find $m\overline{XZ}$.

### LESSON 8

#### MENTAL MATH:

a. −6

b. $2.50

c. 35¢

d. 375

e. 317

f. 2000

g. 11

#### PROBLEM SOLVING:

235, 253, 325, 352, 523, 532

#### PRACTICE

a. $\frac{3}{5}$

b. 60%

c. 50%

d. 

e. 

f. 

g. $4\frac{2}{3}$

h. $13\frac{1}{4}$

i. $3\frac{5}{16}$ in.

#### PROBLEM SET 8

1. $1\frac{3}{4} > 1\frac{3}{5}$

2. $XY$ is $2\frac{1}{4}$ in.; $YZ$ is $1\frac{1}{16}$ in.

3. 20

4. 1, 2, 3, 4, 5, 6, 7, 8

5. $3\frac{4}{5}$

6. (a) =
   (b) commutative property of addition

7. thirty-two billion, five hundred million

8. (a) $\frac{3}{8}$  (b) $\frac{5}{8}$

9. (a) 20%  (b) 80%

10. denominator

11. $7.05

12. $34.52

13. $7.50

14. 4,580

15. 225

16. 14

17. 10

18. 200,000

19. $1.21

20. 4743

21. 120

22. 1000

23. $1.50

24. 989

25. 576

26. $23.70

27. <

28. acute: ∠CBA (or ∠ABC); obtuse: ∠DAB (or ∠BAD); right: ∠CDA (or ∠ADC), ∠DCB (or ∠BCD)

29. (a) $\overline{CB}$  (b) $\overline{DC}$

30. $\overline{QR}$ identifies the segment QR, while QR refers to the distance from Q to R. So $\overline{QR}$ is a segment and QR is a length.

### LESSON 9

#### MENTAL MATH:

a. −2

b. $3.90

c. 71¢

d. 542

e. 540

f. 10

g. 15

#### PROBLEM SOLVING:

$\frac{5}{16}$ $\frac{3}{8}$, $\frac{7}{16}$ $\frac{1}{2}$

#### PRACTICE

a. 1

b. $\frac{1}{5}$

c. $\frac{9}{40}$

d. $\frac{9}{10}$

e. $\frac{8}{21}$

f. 0

g. $28\frac{4}{7}\%$

h. 75%

i. $\frac{5}{4}$

j. $\frac{7}{8}$

k. $\frac{1}{5}$

l. $\frac{8}{5}$

m. $\frac{1}{6}$

n. $\frac{3}{2}$

o. $\frac{1}{4}$

#### PROBLEM SET 9

1. 1

2. 45¢ per pound; $0.45 per pound

3. (a) >; One half is greater than one half times one half
   (b) >; Negative two is greater than negative four.

4. $(2 \times 10{,}000) + (6 \times 1000)$

5. (a) $\frac{1}{10}$  (b) 10%

6. (a) $\frac{5}{9}$  (b) $\frac{4}{9}$

7. It is a segment because it has two endpoints.

8. $LM$ is $1\frac{1}{4}$ in.; $MN$ is $1\frac{1}{4}$ in.; $LN$ is $2\frac{1}{2}$ in.

9. (a) 1, 2, 3, 6, 9, 18
   (b) 1, 2, 3, 4, 6, 8, 12, 24
   (c) 1, 2, 3, 6
   (d) 6

10. 2158

11. 115,000

12. 15

13. $14.40

14. $2.50

15. $110.50

16. 0

17. $2\frac{8}{15}$

18. $2\frac{7}{8}$

19. $\frac{3}{16}$

20. 106

21. $119.50

22. $10.51

23. 47,346

24. $5.04

25. 210,000

26. $\frac{8}{45}$

27. $\frac{7}{9}$

28. (a) $\angle A$ and $\angle B$
    (b) $\overline{AC}$

29. $\frac{1}{16}$

30. $\frac{5}{2}$

## LESSON 10
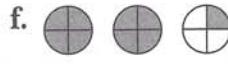
### MENTAL MATH:

a. $-3$

b. $12.50

c. 18¢

d. 494

e. 449

f. 10

g. 7

### PROBLEM SOLVING:

$$\begin{array}{r} 8372 \\ -\ 2465 \\ \hline 5907 \end{array}$$

### PRACTICE

a. $8\frac{3}{4}$ inches

b. $14\frac{2}{7}\%$

c. $2\frac{2}{5}$

---

d. 2

e. $3\frac{5}{7}$

f. 

g. 2

h. $1\frac{5}{9}$

i. $3\frac{1}{3}$

j. $\frac{5}{3}$

k. $\frac{23}{6}$

l. $\frac{19}{4}$

### PROBLEM SET 10

1. Answers may vary. One answer is $\left(\frac{1}{2} \cdot \frac{1}{3}\right) \cdot \frac{1}{6} = \frac{1}{2} \cdot \left(\frac{1}{3} \cdot \frac{1}{6}\right)$.

2. (a) parallel
   (b) perpendicular

3. 15

4. (a) 30%      (b) 70%

5. $\frac{11}{3}$

6. (a) <      (b) >

7. $9\frac{5}{6}$

8. 

9. 1, 2, 3, 4, 5, 6, 7

10. 23,775

11. 22

12. 37,600

13. $10.00

14. $25.00

15. $37.50

16. 10

17. $3\frac{1}{8}$

18. 0

19. $1\frac{9}{20}$

20. 1379

21. $11\frac{1}{9}\%$

22. $17.20

23. 240,000

24. $5\frac{1}{3}$

25. $\frac{8}{27}$

---

26. (a) ray; $\overrightarrow{MC}$
    (b) line; $\overleftrightarrow{PM}$ (or $\overleftrightarrow{MP}$)
    (c) segment; $\overline{FH}$ (or $\overline{HF}$)

27. $\frac{9}{5}$

28. 1, $\frac{1}{2}$, $\frac{1}{4}$

29. C. $\frac{1}{2}$

30. (a) $-5$      (b) $\frac{1}{3}$

### INVESTIGATION 1

1. $\frac{1}{4}$

2. $\frac{1}{8}$

3. $\frac{1}{6}$

4. $\frac{1}{12}$

5. $\frac{1}{6}$

6. $\frac{1}{12}$

7. 6

8. $\frac{1}{4}$

9. $\frac{1}{2}$

10. $\frac{1}{3}$

11. 4

12. 9

13. ; $\frac{5}{3} = 1\frac{2}{3}$

14. $\frac{1}{2}$

15. 

16. $\frac{1}{3}$ and $\frac{1}{6}$

17. $\frac{1}{6}$

18. $\frac{1}{12}$

19. $\frac{1}{4}$

20. $\frac{1}{12}$

21. $66\frac{2}{3}\%$

22. 25%

23. $37\frac{1}{2}\%$

24. 50%

25. $33\frac{1}{3}\%$

26.  Remove $\frac{1}{4}$; $1 - \frac{1}{4} = \frac{3}{4}$

27. $\frac{1}{3}$

28. $\frac{1}{4}$

29. $\frac{1}{4}$

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**30.** $\frac{2}{4} = \frac{1}{2}, \frac{3}{6} = \frac{1}{2}, \frac{4}{8} = \frac{1}{2},$
$\frac{6}{12} = \frac{1}{2}, \frac{1}{3} + \frac{1}{6} = \frac{1}{2},$
$\frac{1}{3} + \frac{2}{12} = \frac{1}{2},$
$\frac{2}{12} + \frac{2}{6} = \frac{1}{2},$
$\frac{4}{12} + \frac{1}{6} = \frac{1}{2},$
$\frac{1}{4} + \frac{2}{8} = \frac{1}{2},$
$\frac{3}{12} + \frac{2}{8} = \frac{1}{2},$
$\frac{3}{12} + \frac{1}{4} = \frac{1}{2}$

### LESSON 11

#### MENTAL MATH:

**a.** $8.25

**b.** $4.00

**c.** $4.50

**d.** 75

**e.** −750

**f.** 14

**g.** 7

#### PROBLEM SOLVING:

4 nickels and 3 dimes

#### PRACTICE

**a.** $118 + N = 230$;
112 pounds

**b.** $T + 216 = 400$;
184 turns

**c.** $254 - H = 126$;
128 horses

**d.** $P - 36 = 164$;
200 sheets

#### PROBLEM SET 11

**1.** $85,000 + V = 200,000$;
115,000 visitors

**2.** $M - \$98.03 = \$12.47$;
$110.50

**3.** $10,000 - D = 5,420$;
4,580 runners
dropped out

**4.** (a) $\frac{7}{8}$ (b) $\frac{1}{8}$ (c) $12\frac{1}{2}\%$

**5.** (a) $-2, 0, \frac{1}{2}, 1$
(b) $\frac{1}{2}$

**6.** $4\frac{3}{8}$ inches

**7.** $1 \cdot 2 < 1 + 2$

**8.** eleven million

**9.** (a) 1, 2, 4, 8, 16
(b) 1, 2, 3, 4, 6, 8, 12, 24
(c) 1, 2, 4, 8
(d) 8

**10.** 2660

**11.** 440

**12.** 20

**13.** $249

**14.** 13

**15.** $1000.00

**16.** <

**17.** $3\frac{1}{9}$

**18.** $1\frac{1}{9}$

**19.** 9720

**20.** 25

**21.** $44.70

**22.** $4.02

**23.** $\frac{5}{54}$

**24.** $\frac{7}{8}$

**25.** $\frac{15}{4}$

**26.** C. 40%

**27.** $\frac{5}{8}, \frac{3}{4}, \frac{7}{8}, 1$

**28.** (a) $\angle 1, \angle 3$ (b) $\angle 2, \angle 4$

**29.** $1\frac{5}{8}$ inches

**30.** $\frac{8}{7}$

### LESSON 12

#### MENTAL MATH:

**a.** $7.10

**b.** $12.90

**c.** $7.50

**d.** 92

**e.** −1500

**f.** 32

**g.** 22

#### PROBLEM SOLVING:

$\frac{3}{4}$ in.
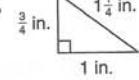
#### PRACTICE

**a.** $1,000,000,000 -$
$25,000,000 = G$;
975,000,000

**b.** $1791 - 1215 = Y$;
576 years

**c.** $1963 - B = 46$; 1917

#### PROBLEM SET 12

**1.** $77,000 - L = 39,400$;
37,600 fans

**2.** $B + 18 = 31$;
13 bananas

**3.** $1215 - 1066 = Y$;
149 years

**4.** $77,000 - 49,600 = F$;
27,400 fewer fans

**5.** 

**6.** identity property of
multiplication

**7.** $1,000,000 - 23,000 = d$;
nine hundred
seventy-seven thousand

**8.** (a) = (b) >

**9.** $\overline{PQ}, \overline{QR}, \overline{PR}$

**10.** (a) $\frac{3}{4}$ (b) 25%

**11.** 1, 2, 4, 5, 10, 20, 25, 50,
100

12. 42

13. 6315

14. 6

15. 2836

16. $3.47

17. 60

18. 224

19. 7,803

20. 840,842

21. 0

22. $1\frac{1}{9}$

23. $2\frac{7}{10}$

24. $2.48

25. $4760\frac{7}{9}$

26. $56.08

27. $1, 1\frac{1}{4}, 1\frac{1}{2}$

28. $\frac{3}{2}$

29. $\frac{5}{3} \times \frac{1}{2} = \frac{5}{6}$

30.  $\frac{3}{4}$ in. $1\frac{1}{4}$ in. 1 in.

### LESSON 13

#### MENTAL MATH:

a. $7.20

b. $2.50

c. $3.25

d. 165

e. −250

f. 43

g. 9

#### PROBLEM SOLVING:

6

#### PRACTICE

a. $24 \times 18¢ = M$; $4.32

b. $R \times 25 = 375$; 15 rows

c. $7P = 1225$;
    175 push-ups

### PROBLEM SET 13

1. $72,112 − 64,309 = I$;
   7,803

2. $60 − N = 17$;
   43 night crawlers

3. $1945 − B = 63$; 1882

4. $75 \times 12 = B$;
   900 beach balls

5. 27

6. (a) $\frac{3}{4}$   (b) 75%

7. 10 units

8. (a) ten thousand, four
       hundred
   (b) $(1 \times 10,000) +$
       $(4 \times 100)$

9. (a) line; $\overleftrightarrow{BR}$ or $\overleftrightarrow{RB}$
   (b) segment; $\overline{TV}$ or $\overline{VT}$
   (c) ray; $\overrightarrow{MW}$

10. (a) 1, 2, 3, 4, 6, 12
    (b) 12

11. (a) $A: \frac{6}{7}$; $B: 1\frac{4}{7}$
    (b) $\frac{5}{7}$

12. 50

13. $5.41

14. 196

15. 150

16. 6

17. 1515

18. 569

19. 5035

20. 4

21. $12.75

22. $2\frac{1}{5}$

23. 24

24. $4\frac{1}{6}$

25. 15,000

26. >

27. $\frac{5}{2} \cdot \frac{1}{3} = \frac{5}{6}$

28. 1

29. obtuse: $\angle D$; acute: $\angle A$;
    right: $\angle B$ and $\angle C$

30. (a) $\overline{DC}$   (b) $\overline{CB}$

### LESSON 14

#### MENTAL MATH:

a. $6.75

b. $6.30

c. $1.75

d. 144

e. 125

f. 18

g. 3

#### PROBLEM SOLVING:



#### PRACTICE

a. $39\% + N = 100\%$;
   61% of the lights
   were off.

b. $\frac{2}{5} + S = \frac{5}{5}$; $\frac{3}{5}$ of the
   pioneers

### PROBLEM SET 14

1. $65 + C = 142$;
   77 grams of cereal

2. $\frac{7}{10} + W = \frac{10}{10}$; $\frac{3}{10}$ of the
   recruits

3. $1789 − 1776 = Y$;
   13 years

4. $T \times 8 = 120$;
   15 truckloads

5. $24\% + N_A = 100\%$;
   76% did not earn an A.

6. 

7. 407,042,603

8. zero property of
   multiplication

9. (a) 1, 2, 4, 8   (b) 8

10. $\overline{XY}, \overline{WX}, \overline{WY}$

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11. Count the number in the group, which is 12. Use this as the denominator. Count the number that are shaded, which is 5. Use this as the numerator. $\frac{5}{12}$

12. 1030

13. $16.53

14. 202

15. 625

16. 6

17. 705

18. $6\frac{2}{5}$

19. $3\frac{3}{4}$

20. $5.46

21. 120

22. $\frac{8}{27}$

23. 45

24. 10,730

25. $19.50

26. 50

27. −3,742

28. <

29. (a) right angle
    (b) straight angle
    (c) obtuse angle

30. $\frac{5}{4}$

### LESSON 15

**MENTAL MATH:**

a. $5.25

b. $0.40

c. $5.02

d. 224

e. 75

f. 26

g. 5

**PROBLEM SOLVING:**

$$\begin{array}{r} 36 \\ \times\ 15 \\ \hline 180 \\ 36 \\ \hline 540 \end{array}$$

**PRACTICE**

a. $\frac{15}{20}, \frac{21}{28}, \frac{9}{12}$

b. $\frac{12}{16}$

c. 16

d. 24

e. $\frac{6}{10} - \frac{5}{10} = \frac{1}{10}$

f. $\frac{1}{2}$

g. $\frac{4}{5}$

h. $\frac{1}{2}$

i. $\frac{3}{4}$

j. $4\frac{1}{2}$

k. $6\frac{3}{4}$

l. $12\frac{8}{15}$

m. $8\frac{2}{3}$

n. $\frac{5}{6}$

o. $2\frac{3}{5}$

p. $\frac{5}{12}$

q. $\frac{9}{10}$

r. $\frac{3}{4}$

s. $\frac{1}{20}$

t. $\frac{4}{6} - \frac{1}{6} = \frac{3}{6}$; $\frac{3}{6}$ reduces to $\frac{1}{2}$.

**PROBLEM SET 15**

1. $1998 - b = 75$; 1923

2. $27 + 38 + 56 = t$; 121 geese

3. $\frac{2}{5}$ of the eggs were cracked.

4. $60c = 9000$; 150 bushels

5. ||  $\frac{5}{8}$ in. longer

6. $3 \cdot 5 > 3 + 5$

7. 1, 2, 3, 4, 5, 6, 7

8. (a) $\frac{3}{4}$    (b) $2\frac{3}{5}$

9. $\frac{6}{9}, \frac{10}{15}, \frac{12}{18}$

10. (a) $\frac{12}{20}$ (b) $\frac{10}{20}$ (c) $\frac{15}{20}$

11. (a) $\overleftrightarrow{QS}$ or $\overleftrightarrow{QR}$ or $\overleftrightarrow{RS}$ (or $\overleftrightarrow{SQ}$ or $\overleftrightarrow{RQ}$ or $\overleftrightarrow{SR}$)
    (b) $\overrightarrow{RT}, \overrightarrow{RQ}, \overrightarrow{RS}$
    (c) $\angle TRS$ (or $\angle SRT$)

12. (a) $3\frac{2}{3}$ (b) 4    (c) $4\frac{1}{3}$

13. 11

14. 50

15. 12

16. $5.05

17. 1225

18. $\frac{4}{5}$

19. $\frac{7}{20}$

20. 8

21. $1\frac{4}{5}$

22. $2\frac{1}{4}$

23. 1

24. $1\frac{1}{2}$

25. 3

26. $\frac{5}{6}$

27. $\frac{5}{9}$

28. 143

29. $\frac{2}{6} + \frac{1}{6} = \frac{3}{6} = \frac{1}{2}$

30. $\frac{8}{3} \cdot \frac{1}{4} = \frac{8}{12} = \frac{2}{3}$

## LESSON 16

### MENTAL MATH:

a. −10

b. $1.50

c. 82¢

d. 92

e. 125

f. $\frac{1}{6}$

g. 2

### PROBLEM SOLVING:

5 pennies, 2 dimes, 1 quarter, or 6 nickels and 2 dimes

### PRACTICE

a. 2 yards

b. 2 quarts

c. 8 lb

d. 1 in.

e. 212°F

f. 14 ft

### PROBLEM SET 16

1. $35 + n = 118$; 83 students

2. $18c = 4500$; 250 cartons

3. $324 - f = 27$; 297 ducks

4. $(2 \times 100) + (5 \times 10)$

5. (a) = (b) >

6. $AB$ is $1\frac{3}{8}$ in.; $CB$ is $1\frac{3}{8}$ in.; $CA$ is $2\frac{3}{4}$ in.

7. (a) $\frac{2}{3}$ (b) $\frac{2}{5}$ (c) $6\frac{5}{6}$

8. 

9. (a) $\frac{20}{24}$ (b) $\frac{9}{24}$ (c) $\frac{6}{24}$

10. (a) $33\frac{1}{3}\%$ (b) $\frac{1}{4}$

11. 1, 2, 3, 5, 6, 7, 9

12. (a) $2\frac{2}{7}$ (b) 5 (c) $3\frac{7}{9}$

13. 1863

14. 77

15. 2

16. $6.10

17. 42

18. $2\frac{1}{2}$

19. $1\frac{1}{10}$ in.

20. $\frac{1}{4}$

21. 2

22. 625

23. $12\frac{1}{2}\%$

24. $7,777\frac{7}{9}$

25. 2025

26. $\frac{1}{4}, \frac{5}{16}, \frac{3}{8}$

27. acute angle, obtuse angle

28. $\frac{5}{2} \times \frac{5}{3} = \frac{25}{6} = 4\frac{1}{6}$

29. $\frac{4}{6} + \frac{1}{6} = \frac{5}{6}$

30. $\frac{8}{3}$

## LESSON 17

### MENTAL MATH:

a. $5.00

b. $0.36

c. $3.60

d. 165

e. 125

f. 16

g. 5

### PROBLEM SOLVING:

1 and 6

### PRACTICE

a. 90°
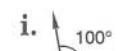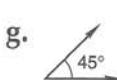
b. 50°

c. 115°

d. 65°

e. 130°

f. 23°

g. 

h. 

i. 

j. 

### PROBLEM SET 17

1. $2420 + 5090 = t$; 7510 soldiers

2. $\frac{3}{20} + f = \frac{20}{20}$; $\frac{17}{20}$ of the answers.

3. $15s = 210$; 14 students

4. $1620 - 1492 = d$; 128 years

5. C. $\frac{5}{3}$

6. (a) $\overrightarrow{QR}$ (or $\overrightarrow{RQ}$)
   (b) $\overrightarrow{RT}$ (or $\overrightarrow{TR}$)
   (c) 90°

7. (a) $\frac{3}{4}$ (b) $3\frac{2}{3}$ (c) $\frac{1}{4}$

8. 40 oz

9. (a) 4 (b) 6 (c) 15

10. 
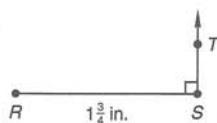
11. (a) 1, 2, 5, 10 (b) 10

12. 

13. 372

14. $18.70

15. $3.75

16. 5

17. 11

18. $2\frac{2}{3}$

19. $\frac{1}{3}$

20. $2.50

21. 3025

22. 28 in.

23. $1\frac{1}{2}$ in.

24. $\frac{3}{4}$ in.

25. 3

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**26.** $5 bill, 1 nickel, 3 pennies

**27.** (a) =
(b) associative property of multiplication

**28.** 5%

**29.** $\frac{15}{4}; \frac{4}{15}$

**30.** $\frac{6}{8} + \frac{5}{8} = \frac{11}{8} = 1\frac{3}{8}$

### LESSON 18

#### MENTAL MATH:

**a.** $5.50

**b.** $16.50

**c.** $7.50

**d.** 144

**e.** 125

**f.** $\frac{1}{8}$

**g.** 7

#### PROBLEM SOLVING:

8-17-32
8-32-17
17-8-32
17-32-8
32-8-17
32-17-8

#### PRACTICE

**a.** octagon

**b.** square

**c.** acute angle

**d.** yes

**e.** no

**f.** $\angle B$

**g.** equal in measure

#### PROBLEM SET 18
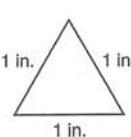
**1.** $6d = 3300$; 550 miles

**2.** $456 + 517 = t$; 973 miles

**3.** $3977 + W = 5000$; 1023 meters

**4.** $1,000,000,000 - 10,000,000 = d$; nine hundred ninety million

**5.** (a) $-1, 0, \frac{3}{4}, 1, \frac{5}{3}$
(b) $-1, 0$

**6.** side $AD$

**7.** (a) $-2$  (b) 4

**8.** (a) $\frac{1}{50}$  (b) $\frac{3}{5}$  (c) $6\frac{3}{4}$

**9.** (a) $\frac{24}{30}$  (b) $\frac{20}{30}$  (c) $\frac{5}{30}$

**10.** 3 sides

**11.** (a) 
(b) acute angles

**12.** (a) 25%  (b) $\frac{3}{4}$

**13.** $\frac{8}{8}$ or 1

**14.** $\frac{4}{10}$ or $\frac{2}{5}$

**15.** 8

**16.** $\frac{4}{6}$ or $\frac{2}{3}$

**17.** $\frac{4}{3}$

**18.** $5\frac{2}{5}$

**19.** $\frac{3}{4}$

**20.** 45

**21.** 60,000

**22.** 441

**23.** 180 in.

**24.** 50%

**25.** (a) 90°  (b) 60°

**26.** (a)  135°  (b) 45°

**27.** (a) $\triangle SQR$
(b) $\triangle XYZ$
(c) $\angle F$

**28.** $\frac{3}{6} + \frac{2}{6} = \frac{5}{6}$

**29.** $\frac{9}{4} \cdot \frac{4}{3} = \frac{36}{12} = 3$

**30.**  regular

### LESSON 19

#### MENTAL MATH:

**a.** $10.00

**b.** $1.20

**c.** 24¢

**d.** 224

**e.** 375

**f.** 60

**g.** 12

#### PROBLEM SOLVING:

Billy gives Bobby 3 tickets and Mary 7 tickets. (Then they each have 15.)
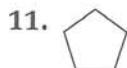
#### PRACTICE

**a.** 13 in.

**b.** 25 cm

**c.** 96 inches

**d.** 30 in.

**e.** 25 feet

#### PROBLEM SET 19

**1.** $\frac{1}{8} + d = \frac{8}{8}; \frac{7}{8}$ of the students

**2.** $f - 76 = 124$; 200 people

**3.** $84 \times 6 = t$; 504 slices of pie

**4.** 87 years

**5.** (a) eighteen million, seven hundred thousand
(b) $(8 \times 100) + (7 \times 10) + (4 \times 1)$

**6.** $3 - 7 = -4$

**7.** freezes at 32°F; boils at 212°F

**8.** 28 cm

**9.** (a) $3\frac{2}{3}$  (b) $\frac{5}{8}$  (c) $\frac{1}{25}$

**10.** (a) 27  (b) 16

11. 

12. octagon

13. (a) 90°    (b) 360°

14. 7451

15. $1.37

16. 7

17. 23

18. $3.53

19. 2

20. $3\frac{1}{4}$

21. $\frac{2}{7}$
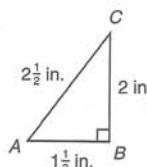
22. $4\frac{1}{2}$

23. 2500

24. 9,100

25. (a) 2    (b) 10

26.



27. $\frac{10}{3} \cdot \frac{3}{2} = \frac{30}{6} = 5$

28. $\frac{9}{10} - \frac{5}{10} = \frac{4}{10} = \frac{2}{5}$

29. $33\frac{1}{3}\%$

30. 34 in.

## LESSON 20

### MENTAL MATH:

a. $7.25

b. $3.60

c. $0.68

d. 215

e. 500

f. $\frac{3}{8}$

g. 1

### PROBLEM SOLVING:

$$8\overline{)928} = 116$$

$$\begin{array}{r} 8 \\ \hline 12 \\ 8 \\ \hline 48 \\ 48 \\ \hline 0 \end{array}$$

### PRACTICE

a. four cubed; 64

b. one half squared; $\frac{1}{4}$

c. ten to the sixth power; 1,000,000

d. base is 10; exponent is 3

e. 10

f. 20

g. 15

h. 150 m²

i. 10 in.²

j. 16 cm²

k. 25 cm²

l. 10,000 square yards

### PROBLEM SET 20

1. $4d = 628$; 157 students

2. $p - 36 = 46$; 82 parrots

3. $225 + f = 600$; 375 fish

4. $21,050 + 48,972 = t$; 70,022

5. 20¢ each; $0.20 each

6. (a) $-2, -\frac{1}{2}, 0, \frac{1}{3}, 1$
   (b) $\frac{1}{3}$ and $-\frac{1}{2}$

7. B. $33\frac{1}{3}\%$

8. sides $DC$ and $AB$

9. (a) $\frac{1}{27}$
   (b) 10,000  (c) 12

10. (a) $\frac{8}{36}$    (b) $\frac{27}{36}$

11. (a) 1, 2, 5, 10
    (b) 1, 7
    (c) 1

12. 6 inches

13. 18

14. 26

15. 12

16. 36

17. 44

18. 15

19. $2\frac{3}{5}$

20. $3\frac{2}{3}$

21. $2\frac{1}{12}$

22. 705

23. 9000

24. 0

25. 1

26. $\frac{5}{10} + \frac{3}{10} = \frac{8}{10} = \frac{4}{5}$

27. $\frac{9}{5} \cdot \frac{1}{3} = \frac{9}{15} = \frac{3}{5}$

28. identity property of multiplication

29. (a) 48 in. or 4 ft
    (b) 144 in.² or 1 ft²

30. 36 in.

### Investigation 2

1. 60°

2. 180°

3. a six-point star with a regular hexagon inside

4. 120°

5. $33\frac{1}{3}\%$

6. 60°

7. $16\frac{2}{3}\%$

8. circumference

9. diameter

10. radius

11. arc

12. sector

13. concentric circles

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14. chord

15. inscribed polygon

16. semicircle

17. central angle

18. radius

19. center of the circle

20. inscribed angle

### LESSON 21

#### MENTAL MATH:
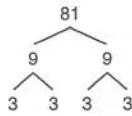
a. $2.24

b. $0.65

c. $4.25

d. 204

e. 4

f. 12

g. 1

#### PROBLEM SOLVING:

5 hours

#### PRACTICE

a. 2, 3, 5, 7, 11, 13, 17, 19, 23, 29

b. composite number

c. $81 = 3 \cdot 3 \cdot 3 \cdot 3$

```
        81
       /  \
      9    9
     /\    /\
    3  3  3  3
```

d. $360 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 5$

$$
\begin{array}{r}
1 \\
5\overline{)5} \\
3\overline{)15} \\
3\overline{)45} \\
2\overline{)90} \\
2\overline{)180} \\
2\overline{)360}
\end{array}
$$

e. $64 = 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$; $\sqrt{64} = 8 = 2 \cdot 2 \cdot 2$

#### PROBLEM SET 21

1. $\frac{2}{3} + n = \frac{3}{3}$; $\frac{1}{3}$ of the students

2. $7q = 343$; 49 quills

3. $2{,}000{,}000{,}000 - 21{,}000{,}000 = d$; one billion, nine hundred seventy-nine million

4. $14{,}289 + $824 = N$; $15{,}113

5. (a) $3\frac{4}{7}$  (b) $\frac{1}{4}$  (c) $\frac{3}{25}$

6. 53, 59

7. (a) $2 \cdot 5 \cdot 5$
   (b) $2 \cdot 2 \cdot 3 \cdot 5$
   (c) $2 \cdot 2 \cdot 3 \cdot 5 \cdot 5$
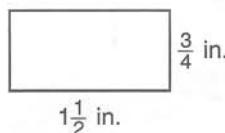
8. *C.* The tick mark between *B* and *C* is halfway between 1000 and 2000, which is 1500, so choices *A* and *B* are eliminated. *C* is closer to 1500 than to 2000 so *C* is the best choice.

9. (a) 10  (b) 9  (c) 2

10. (a) 3  (b) 9

11. 9 square inches

12. (a) $1\frac{1}{2}$ in.  (b) $4\frac{1}{2}$ in.



13. 46 in.

14. $\frac{2}{5}$

15. $\frac{5}{3}$

16. 4

17. 1250

18. $\frac{4}{6}$ or $\frac{2}{3}$

19. $5\frac{1}{3}$

20. 17

21. 2
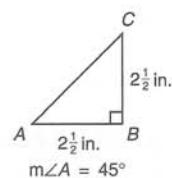
22. $\frac{8}{27}$

23. (a) $225 = 3 \cdot 3 \cdot 5 \cdot 5$
    (b) $\sqrt{225} = 15 = 3 \cdot 5$

24. If we divide the numerator and denominator of a fraction by their GCF, we reduce the fraction to lowest terms in one step.

25.


26. $\frac{7}{4} \times \frac{3}{2} = \frac{21}{8} = 2\frac{5}{8}$

27. (a) $\overline{CB}$  (b) $\overline{AB}$
    (c) $\overline{MC}$ and $\overline{MB}$
    (d) $\angle ABC$

28. 25%

29. $\frac{10}{3}$

30. (a) $\triangle KLJ$
    (b) $\triangle DEF$
    (c) $\angle S$
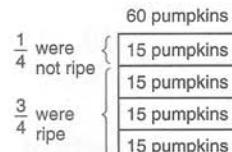
### LESSON 22

#### MENTAL MATH:

a. $2.53

b. $8.00

c. $2.11

d. 371

e. 5

f. 6

g. octagon

#### PROBLEM SOLVING:

64 inches

#### PRACTICE



a. 45 pumpkins

b. 15 pumpkins

20 tomatoes

| 4 tomatoes |
|---|
| 4 tomatoes |
| 4 tomatoes |
| 4 tomatoes |
| 4 tomatoes |

$\frac{3}{5}$ were green

$\frac{2}{5}$ were not green

**c.** $\frac{2}{5}$

**d.** 12 tomatoes

### PROBLEM SET 22

**1.** $28 + 30 + 23 = t$;
81 students

**2.** $3r = 81$; 27 students

**3.** $126,000 - L = 79,000$;
47,000 were lost.

**4.** $10,313 - 2,700 = d$;
seven thousand, six
hundred thirteen

**5.**

36 spectators

| 4 spectators |
|---|
| 4 spectators |
| 4 spectators |
| 4 spectators |
| 4 spectators |
| 4 spectators |
| 4 spectators |
| 4 spectators |
| 4 spectators |

$\frac{5}{9}$ were happy

$\frac{4}{9}$ were not happy

(a) 20 spectators

(b) 16 spectators

**6.**

36 eggs

| 9 eggs |
|---|
| 9 eggs |
| 9 eggs |
| 9 eggs |

$\frac{3}{4}$ were not cracked

$\frac{1}{4}$ were cracked

(a) $\frac{3}{4}$  (b) 27 eggs
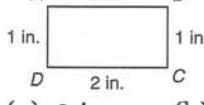
**7.** (a) $\frac{2}{5}$  (b) 60%

**8.** (a) 4  (b) 12

**9.** (a) 0

(b) zero property of
multiplication

**10.** $0 < 2$

**11.**

A  2 in.  B
1 in. [rectangle] 1 in.
D  2 in.  C

(a) 6 in.  (b) 2 in.$^2$
(c) 360°

**12.** (a) $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$
(b) $2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 5$
(c) $30 = 2 \cdot 3 \cdot 5$

**13.** (a) $\frac{50}{60}$  (b) $\frac{36}{60}$  (c) $\frac{35}{60}$

**14.** $2\frac{1}{60}$

**15.** (a) $-2, -\frac{2}{3}, 0, 1, \frac{3}{2}$
(b) 1 and $\frac{3}{2}$

**16.** $\frac{6}{12}$ or $\frac{1}{2}$

**17.** 10

**18.** 7

**19.** 11

**20.** 4

**21.** $2\frac{1}{2}$

**22.** 25
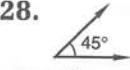
**23.** $\frac{25}{36}$

**24.** 30

**25.** $\frac{9}{5}$

**26.** $\frac{3}{2} \times \frac{5}{3} = \frac{15}{6} = 2\frac{1}{2}$

**27.** 21 oz

**28.**

45°

**29.** $\frac{1}{100}$

**30.** $-1$

### LESSON 23

#### MENTAL MATH:

**a.** $4.63

**b.** $0.25

**c.** $-51$

**d.** 496

**e.** 4

**f.** 38

**g.** 5

#### PROBLEM SOLVING:

6 routes

### PRACTICE

**a.** $4\frac{2}{3}$

**b.** $4\frac{3}{5}$

**c.** $3\frac{1}{3}$

**d.** $87\frac{1}{2}\%$

**e.** $66\frac{2}{3}\%$

### PROBLEM SET 23

**1.** $18 \times 36 = e$;
648 exposures

**2.** $50,000,000 - 250,000$
$= d$; forty-nine million,
seven hundred fifty
thousand

**3.** $259 + 269 + 307 = t$;
835 people

**4.** $16p = \$14.24$;
89¢ per pound

**5.**

56 restaurants

| 7 restaurants |
|---|
| 7 restaurants |
| 7 restaurants |
| 7 restaurants |
| 7 restaurants |
| 7 restaurants |
| 7 restaurants |
| 7 restaurants |

$\frac{3}{8}$ were closed

$\frac{5}{8}$ were open

(a) 21 restaurants
(b) 35 restaurants

**6.**

30 students

| 6 students |
|---|
| 6 students |
| 6 students |
| 6 students |
| 6 students |

$\frac{3}{5}$ were girls

$\frac{2}{5}$ were boys

(a) 12 boys
(b) 18 girls
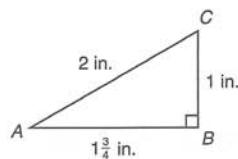
**7.** 115 yards

**8.** (a) 5  (b) 15

**9.** Express the mixed
number as an improper
fraction. Then make a
new fraction, reversing
the numerator and the
denominator.

**10.** (a) =  (b) <

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11. $\frac{9}{4} \times \frac{10}{3} = \frac{90}{12} = 7\frac{1}{2}$

12. (a) 30  (b) 16  (c) 3

13. (a) $400 = 2^4 \cdot 5^2$

(b) $\sqrt{400} = 2^2 \cdot 5$

14. (a) acute angle
(b) right angle
(c) obtuse angle
(d) $\overrightarrow{DC}$

15. 15

16. 50

17. 9

18. $5\frac{2}{4}$ or $5\frac{1}{2}$

19. $5\frac{6}{8}$ or $5\frac{3}{4}$

20. $1\frac{2}{3}$

21. $16\frac{2}{3}\%$

22. $\frac{2}{3}$

23. $\frac{1}{2}$

24.


The perimeter is about $4\frac{3}{4}$ inches.

25. m∠A is about 30°.

26. 52 ft

27. $\frac{3}{4} \times \frac{1}{3} = \frac{3}{12} = \frac{1}{4}$

28. $\frac{9}{12} - \frac{8}{12} = \frac{1}{12}$

29. (a) $4^3, 5^3$  (b) 64, 125

30. (a) $\overline{AB}$  (b) $\angle CMB$
(c) $\angle ACB$

### LESSON 24

### MENTAL MATH:

a. $6.72

b. $15.00

c. 64¢

d. 260

e. 5

f. 8

g. 15

### PROBLEM SOLVING:



### PRACTICE

a. $\frac{1}{3}$

b. $\frac{5}{18}$

c. 18

d. $\frac{3}{16}$

e. $\frac{1}{5}$

f. $\frac{5}{7}$

g. $\frac{2 \cdot 2 \cdot 3 \cdot 3}{3 \cdot 3 \cdot 5} \cdot \frac{5 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 3}$
$= \frac{5}{6}$

### PROBLEM SET 24

1. $3026 - 2895 = d$;
131 miles

2. $15 \times 24 = m$;
360 microprocessors

3.
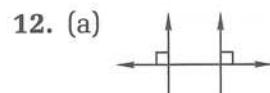

(a) $\frac{3}{4}$   (b) $22.50

4. 18 inches

5. 20 steps

6. (a) 8   (b) 24

7. (a) $\frac{1}{3}$   (b) $\frac{1}{3}$

8. (a) $\frac{9}{10}$   (b) 60

9. (a) acute angle
(b) right angle
(c) obtuse angle

10. Equivalent fractions are formed by multiplying or dividing a fraction by a fraction equal to 1. To change from 5ths to 30ths we multiply $\frac{3}{5}$ by $\frac{6}{6}$.

11. (a) $10,000 = 2^4 \cdot 5^4$
(b) $\sqrt{10,000} = 100$
$= 2^2 \cdot 5^2$

12. (a)


(b) right angles

13. (a) 9 inches
(b) 81 square inches

14. commutative property

15. $3\frac{1}{2}$

16. $6\frac{1}{2}$

17. $12\frac{1}{2}$

18. $3.36

19. $10^3$ or 1000

20. −1

21. $33\frac{1}{3}\%$

22. $3\frac{1}{4}$

23. $\frac{25}{36}$

24. $\frac{1}{3}$

25. 8

26. $(2 \times 10,000) + (4 \times 1000)$

27. 90 yards

28. $\frac{3}{12} + \frac{2}{12} = \frac{5}{12}$

29. $\angle DAC$ and $\angle BCA$;
$\angle DCA$ and $\angle BAC$

30. (a) $-1, -\frac{1}{2}, 0, \frac{1}{2}, 1$
(b) $1\frac{1}{2}, 2, 2\frac{1}{2}$

### LESSON 25

### MENTAL MATH:

a. $4.64

b. $6.00

c. $0.76

d. 252

e. 6

f. 9

g. 7

### PROBLEM SOLVING:
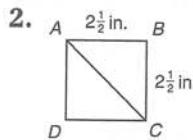
### PRACTICE

a. $\frac{3}{2}$, $1\frac{1}{8}$

b. 4

c. Instead of dividing by the divisor, multiply by the reciprocal of the divisor.

d. Pressing this key changes the number previously entered to its reciprocal (in decimal form).

e. $\frac{9}{10}$

f. $3\frac{1}{2}$

g. $1\frac{1}{4}$

### PROBLEM SET 25

1. $6b = 324$; 54 boxes

2. 
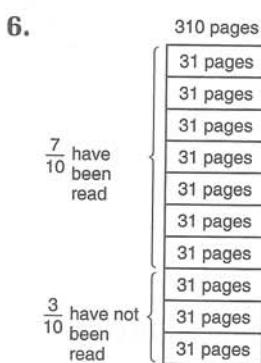

   (a) 10 in.    (b) 90°
   (c) 45°    (d) 180°

3. 28 relatives

4. 21 players

5. 14 players

6. 


   (a) 217 pages
   (b) 93 pages

7. (a) $\frac{4}{3}$    (b) $1\frac{1}{6}$

8. C. $\frac{2}{5}$. A little less than half is shaded. We eliminate $\frac{2}{3}$, which is more than $\frac{1}{2}$. Since $\frac{2}{4}$ equals $\frac{1}{2}$, and $\frac{2}{5}$ is a little less than $\frac{1}{2}$, we choose $\frac{2}{5}$.

9. $\frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{3} \cdot \cancel{7}}{\cancel{2} \cdot \cancel{3} \cdot 5 \cdot \cancel{7}} = \frac{2}{5}$

10. (a) $\frac{10}{9}$    (b) $\frac{1}{8}$    (c) $\frac{8}{19}$
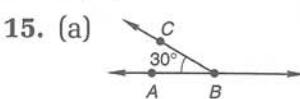
11. $\frac{15}{20} + \frac{16}{20} = \frac{31}{20} = 1\frac{11}{20}$

12. $640 = 2^7 \cdot 5$

13. $\frac{\cancel{2}}{\cancel{3}} \cdot \frac{\cancel{3}}{\cancel{4}} = 6$

14. (a) $A$: $4\frac{2}{3}$; $B$: $5\frac{1}{2}$
    (b) $\frac{5}{6}$

15. (a)

    (b) acute angle

16. $1\frac{5}{12}$

17. $10\frac{1}{2}$

18. 45°

19. $\frac{3}{4}$

20. 8

21. $\frac{2}{9}$

22. $\frac{2}{5}$

23. $1\frac{1}{3}$

24. $\frac{18}{35}$

25. $12\frac{1}{2}\%$

26. $\frac{5}{3}$ or $1\frac{2}{3}$

27. (a) $4 \cdot 8 = 8 \cdot 4$
    or $32 = 32$
    (b) 2

28. 3 feet

29. 16 in.

30. −5

### LESSON 26

#### MENTAL MATH:

a. $9.54

b. $30.00

c. 93¢

d. 222

e. $1\frac{1}{3}$

f. 16

g. 0

#### PROBLEM SOLVING:

$24.00

### PRACTICE

a. 4

b. $8\frac{1}{6}$

c. $11\frac{1}{4}$

d. $\frac{5}{9}$

e. $\frac{3}{4}$

f. $7\frac{1}{2}$
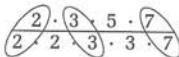
g. 2

h. $\frac{1}{2}$

i. $7\frac{1}{2}$

### PROBLEM SET 26

1. $23 + M = 61$;
   38 millimeters

2. $26 \times 85¢ = t$; $22.10

3. $1453 - 330 = B$;
   1123 years

4. $20.00 - S = $11.25;
   $8.75

5. $12 \times 12 = P$;
   144 pencils

6. 


   (a) 24 marbles
   (b) 36 marbles

7. 500 pounds

8. (a) $\frac{3}{100}$    (b) 97%

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**9.** (a)



$$= \frac{5}{6}$$
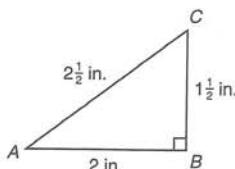
(b) 42

**10.** (a) $\frac{9}{5}$  (b) $\frac{4}{23}$

(c) $\frac{1}{7}$

**11.** (a) $\frac{15}{24}$  (b) $\frac{10}{24}$

(c) $\frac{15}{24} + \frac{10}{24} = \frac{25}{24} = 1\frac{1}{24}$

**12.** $(1 \times 10,000,000) +$
$(5 \times 1,000,000)$

**13.**



**14.** (a) $-3, 0, \frac{5}{6}, 1, \frac{4}{3}$

(b) 0, 1

**15.** $15\frac{1}{3}$

**16.** 105

**17.** 30°

**18.** $41\frac{2}{3}$

**19.** (a) 100 in.²

(b) 50 in.²

**20.** $4\frac{2}{3}$

**21.** $\frac{1}{32}$

**22.** $6\frac{1}{4}$

**23.** $\frac{3}{5}$

**24.** $\frac{5}{6}$

**25.** $8\frac{3}{4}$

**26.** $10^3$ or 1000

**27.** 459

**28.** $62.56

**29.** 128,000

**30.** 45°

**LESSON 27**

**MENTAL MATH:**

**a.** $5.73

**b.** $12.50

**c.** 420

**d.** 210

**e.** $1\frac{1}{2}$

**f.** 18

**g.** 0

**PROBLEM SOLVING:**

It is not true that the total is 8. Although 5, 2, and 1 totals 8, 5 and 2 are on opposite faces. Also 4, 3, and 1 totals 8, but 4 and 3 are on opposite faces.

**PRACTICE**

**a.** 40

**b.** 60

**c.** 120

**d.** 150

**e.** 5

**f.** $240 \div 4 = 60$

**g.** $\frac{\$6.00 \div 6}{12 \div 6} = \frac{\$1.00}{2} = 50¢$

**h.** $280 \div 10 = 28$

**PROBLEM SET 27**

**1.** $11,460 + 9,420 + 8,916 = P; 29,796$

**2.** $6 \cdot 12 = I; 72$ inches

**3.** $0.15 per egg; Some equivalent division problems:
$0.90 ÷ 6
$0.60 ÷ 4
$0.45 ÷ 3
$0.30 ÷ 2

**4.** $1,000,000,000 - 10,900,000 = d;$ nine hundred eighty-nine million, one hundred thousand

**5.**



(a) 267 students

(b) 445 students

**6.** (a) 9 in.  (b) 54 in.²

**7.** 225

**8.** 3500

**9.** (a) $\frac{6}{25}$  (b) $\frac{1}{5}$

**10.** (a) 70°F  (b) 110°F

**11.** (a) $\frac{15}{36}$  (b) $\frac{6}{36}$  (c) $\frac{28}{36}$

(d) identity property of multiplication

**12.** (a) $576 = 2^6 \cdot 3^2$

(b) 24

**13.** $\frac{\overset{5}{\cancel{35}}}{\cancel{6}} \times \frac{\overset{8}{\cancel{48}}}{\cancel{7}} = 40$

**14.** (a) obtuse angle

(b) $\overline{AB}$ and $\overline{ED}$

**15.** (a) $\frac{1}{2}$  (b) $\frac{1}{2}$  (c) $\frac{1}{2}$

**16.** (a) 18 ft  (b) 18 ft²

**17.** 36°

**18.** 128

**19.** $3\frac{3}{4}$

**20.** 11

**21.** $8\frac{2}{5}$

**22.** 8

**23.** 4

**24.** $1\frac{3}{4}$

**25.** $\frac{1}{4}$

**26.** $\frac{2}{3}$

**27.** 9 inches

**28.** 75¢

**29.** (a) 20 in.  (b) 16 in.²

**30.** (a) $\overline{CB}$ (or $\overline{BC}$)
(b) $\overline{AB}$ (or $\overline{BA}$)
(c) $\angle AMC$ (or $\angle CMA$)
(d) $\angle ABC$ and $\angle BAM$
(e) $\overline{MA}$ and $\overline{MB}$

### LESSON 28

#### MENTAL MATH:

**a.** $9.22
**b.** $175.00
**c.** $3.71
**d.** 424
**e.** $1\frac{1}{4}$
**f.** 10
**g.** $4.00

#### PROBLEM SOLVING:

$4 \cdot 3 \cdot 2 \cdot 1 = 24$

#### PRACTICE

**a.** $4.88
**b.** 20 boys
**c.** 28 students
**d.** $33\frac{1}{2}$
**e.** 55; 55
**f.** B. 84

#### PROBLEM SET 28

**1.** 244 pounds
**2.** 314 seconds
**3.** $72.92
**4.** 1451
**5.**

| | 5000 meters |
|---|---|
| Jill led $\frac{3}{4}$ | 1250 meters |
| | 1250 meters |
| | 1250 meters |
| Jill did not lead $\frac{1}{4}$ | 1250 meters |

(a) 3750 meters
(b) 1250 meters
**6.** (a) 24 in. (b) 32 in.$^2$
**7.** (a) 3, 6, 9, 12, 15, 18
(b) 4, 8, 12, 16, 20, 24
(c) 12 (d) 108
**8.** (a) 280 (b) 300
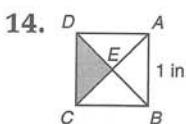
**9.** $\dfrac{\cancel{2}\,\cancel{2}\,\cancel{2}\,\cancel{2} \cdot 7}{\cancel{2}\,\cancel{2}\,\cancel{2} \cdot 2 \cdot 3 \cdot 5} = \dfrac{7}{30}$

**10.** $(5 \times 1000) + (2 \times 100) + (8 \times 10)$ feet

**11.** (a) $\frac{21}{24}$ (b) $\frac{22}{24}$
(c) $\frac{21}{24} + \frac{22}{24} = \frac{43}{24} = 1\frac{19}{24}$

**12.** (a) $3600 = 2^4 \cdot 3^2 \cdot 5^2$
(b) 60

**13.** Add the six numbers. Then divide the sum by 6.

**14.**



(a) 1 square inch
(d) 25%

**15.** (a) $-1, 0, \frac{1}{10}, 1, \frac{11}{10}$
(b) $-1$ and 1

**16.** 30°

**17.** 36

**18.** 3

**19.** $3\frac{1}{3}$

**20.** $12\frac{1}{4}$

**21.** $3\frac{7}{8}$

**22.** 8

**23.** $\frac{3}{10}$

**24.** 3
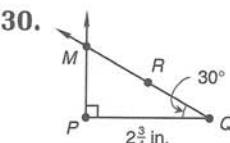
**25.** 125

**26.** 0

**27.** $161.36

**28.** $41.04

**29.** (a) $\angle ACD$ (b) $\overline{CB}$
(c) 15 in.$^2$

**30.**



$\angle PMQ$ measures 60°.

### LESSON 29

#### MENTAL MATH:

**a.** $7.30
**b.** $1.25
**c.** $1.02
**d.** 198
**e.** $1\frac{2}{3}$
**f.** 12
**g.** 10

#### PROBLEM SOLVING:

Huck was facing south. He was 3 paces west of the tree.
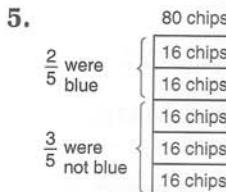
#### PRACTICE

**a.** 1800
**b.** 5000
**c.** 186,000
**d.** 5000
**e.** 9000
**f.** 300
**g.** 3

#### PROBLEM SET 29

**1.** 200 inches
**2.** The cost per pound means the cost for each pound. We divide $3.68, which is the cost for 8 pounds, by 8.
**3.** 80
**4.** seven hundred eighty billion, two hundred million
**5.**

| | 80 chips |
|---|---|
| $\frac{2}{5}$ were blue | 16 chips |
| | 16 chips |
| | 16 chips |
| $\frac{3}{5}$ were not blue | 16 chips |
| | 16 chips |

(a) 32 chips
(b) 48 chips
**6.** (a) 24 (b) 144

7. (a) 3 in. (b) $\frac{9}{16}$in.$^2$

8. (a) 400 (b) 370

9. 11,000

10. (a) 5 (b) $4\frac{1}{2}$

11. (a) 20 (b) 5

12. $1,000,000,000 = 2^9 \cdot 5^9$

13. (a) 50% (b) 50%
    (c) 50%

14. (a) 10 in. (b) 12 in.$^2$

15. (a) $\angle AFB$ (b) 90°

16. 16

17. $10\frac{5}{9}$

18. $8\frac{1}{3}$

19. $\frac{2}{3}$

20. $1\frac{1}{3}$

21. $\frac{10}{21}$

22. $179.76

23. 2

24. 160,000

25. (a) $4,000,000 = 2^8 \cdot 5^6$
    (b) 2,000

26. (a) 2 inches
    (b) 6 inches

27. $\frac{4}{6} - \frac{3}{6} = \frac{1}{6}$

28. (a) acute angle
    (b) obtuse angle
    (c) straight angle

29. 16 ounces

30. 34 in.

### LESSON 30

#### MENTAL MATH:

a. $3.98

b. $150.00

c. 9

d. 420

e. $4\frac{1}{3}$

f. 15

g. 6

#### PROBLEM SOLVING:

$$53\overline{)1696}$$
$$\begin{array}{r} 32 \\ \underline{159} \\ 106 \\ \underline{106} \\ 0 \end{array}$$

#### PRACTICE

a. $\frac{6}{10} < \frac{7}{10}$

b. $\frac{25}{60} < \frac{28}{60}$

c. $1\frac{23}{24}$

d. $5\frac{1}{3}$

e. $10\frac{3}{8}$

f. $1\frac{11}{18}$

g. $\frac{17}{225}$
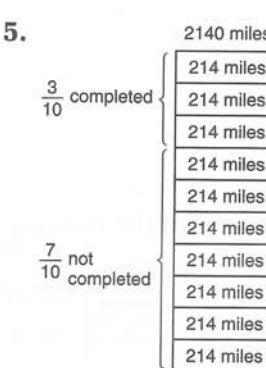
#### PROBLEM SET 30

1. 78 inches

2. $4.78

3. 1982 miles

4. $\frac{6}{13}$ of the students

5.

| | 2140 miles |
|---|---|
| $\frac{3}{10}$ completed | 214 miles |
| | 214 miles |
| | 214 miles |
| $\frac{7}{10}$ not completed | 214 miles |
| | 214 miles |
| | 214 miles |
| | 214 miles |
| | 214 miles |
| | 214 miles |
| | 214 miles |

   (a) 642 miles
   (b) 1498 miles

6. 15 inches

7. $\frac{1}{45}$

8. (a) 36,000 (b) 36,500

9. 600

10. (a) $\frac{8}{25}$ (b) $\frac{2}{3}$

11. $\frac{20}{24} < \frac{21}{24}$

12. (a) 9 in.$^2$ (b) 16 in.$^2$
    (c) 25 in.$^2$

13. (a) 22 in.
    (b) The perimeter of the hexagon is 6 in. less than the combined perimeter of the squares because a 3 in. side of the smaller square and the adjoining 3 in. portion of a side of the larger square are not part of the perimeter of the hexagon.

14. (a) $5184 = 2^6 \cdot 3^4$
    (b) $2^3 \cdot 3^2 = 72$

15. 16

16. 1, 2, 3, 5, 6, 7, 9

17. 36

18. 60°

19. $1.25

20. $120.00

21. $\frac{5}{6}$

22. $\frac{5}{12}$

23. $1\frac{1}{3}$

24. $1\frac{1}{2}$
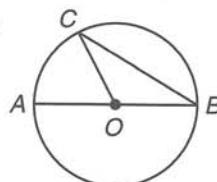
25. $\frac{21}{32}$

26. $1\frac{3}{5}$

27. $5\frac{1}{2}$

28. $3\frac{3}{8}$

29. 

See student work. One possibility is shown.
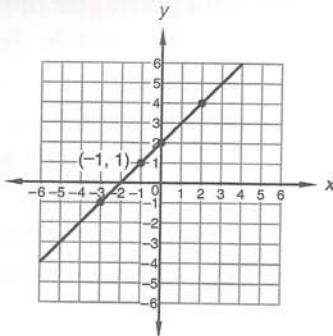
30. (a) $\overline{AB}$
    (b) $\overline{OA}, \overline{OB}, \overline{OC}$
    (c) $\angle BOC$

## INVESTIGATION 3

**1.**



**2.** $(-2, -2)$

**3.** 16 units; 15 units$^2$
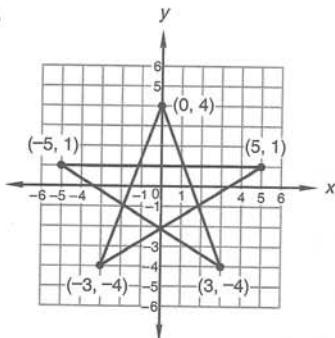
**4.** Six whole squares plus 4 half squares totals 8 square units.

**5.** 45°

**6.** (a) 3rd     (b) 1st
(c) 4th     (d) 2nd

**7.** m∠$A$ = 90°;
m∠$B$ = 45°;
m∠$C$ = 45°;

**8.**



**9.** See student work.

**10.** See student work.

### LESSON 31

#### MENTAL MATH:

**a.** $3.01

**b.** $2.45

**c.** 8

**d.** $\frac{3}{4}$

**e.** 19

**f.** 45

**g.** 3

### PROBLEM SOLVING:

169, 196, 225

#### PRACTICE

**a.** $\frac{3}{100}$; 0.03

**b.** $\frac{3}{10}$; 0.3

**c.** 3

**d.** 4

**e.** twenty-five and one hundred thirty-four thousandths

**f.** one hundred and one hundredth

**g.** 102.3

**h.** 0.0125

**i.** 300.075

#### PROBLEM SET 31

**1.** $30.88

**2.** 341 pages

**3.** $1.33

**4.** 115 years

**5.** Divide the perimeter of the square by 4 to find the length of a side. Then multiply the length of a side by 6 to find the perimeter of the hexagon.

**6.**



(a) 16 questions
(b) 4 questions

**7.** (a) 500,000
(b) 481,000

**8.** 30,000

**9.** (a) $\frac{7}{100}$   (b) 0.07
(c) 7%

**10.** 7

**11.** (a) =      (b) <
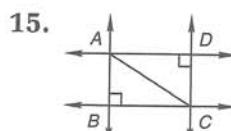
**12.** (a) 24 units
(b) 36 units$^2$

**13.** (a) 8      (b) 14
(c) 1

**14.** (a) 2025 = $3^4 \cdot 5^2$
(b) 45

**15.**



(a) rectangle
(b) ∠$BCA$

**16.** 8

**17.** 45°

**18.** $121.40

**19.** $223.20

**20.** $1\frac{1}{6}$

**21.** $\frac{1}{12}$

**22.** $3\frac{1}{2}$

**23.** $\frac{2}{3}$

**24.** $1\frac{11}{21}$

**25.** $\frac{5}{8}$

**26.** $5\frac{1}{3}$

**27.** $3\frac{5}{8}$

**28.** 0

**29.** $\frac{1}{2}$

**30.** (a) 180°   (b) 90°
(c) 45°

### LESSON 32

#### MENTAL MATH:

**a.** $2.77

**b.** $2.00

**c.** 20

**d.** $\frac{3}{5}$

**e.** 25

**f.** 12

**g.** 2

#### PROBLEM SOLVING:

16 pennies

### PRACTICE

**a.** 200 centimeters

**b.** A gallon bottle can hold a little less than four liters. (Have students check the label on a gallon bottle; 3.78 liters.)

**c.** 1000 × 2.2 pounds is about 2200 pounds

**d.** 18°F
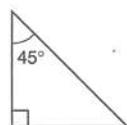
### PROBLEM SET 32

**1.** 5750

**2.** 3 hours, 26 minutes

**3.** $\frac{1}{4}$ mile

**4.** 25 cm

**5.** (a) 3,000,000

(b) 3,200,000

**6.** 150,000

**7.**



(a) 125 songs

(b) 75 songs

**8.** (a) $\frac{9}{10}$ (b) 0.9

(c) 90%

**9.** three and twenty-five thousandths

**10.** 76.05

**11.** $30.00 ÷ 5 = $6.00

**12.** (a) (2 × 1000) + (5 × 100)

(b) 2500 = $2^2 \cdot 5^4$

(c) 50

**13.** $0.60 per liter

**14.**



**15.** (a) 36 cm$^2$

(b) 64 cm$^2$

(c) 100 cm$^2$

**16.** 44 cm

**17.** 15

**18.** 115°

**19.** $1\frac{1}{8}$

**20.** $\frac{1}{12}$

**21.** $\frac{13}{80}$

**22.** $10\frac{2}{3}$

**23.** 6

**24.** $6\frac{1}{8}$

**25.** $9\frac{5}{8}$

**26.** $3\frac{2}{3}$

**27.** 2

**28.** $\frac{1}{3}$

**29.** (a) (2, 3) (b) 35 units$^2$

**30.** (a) $\overline{BC}$

(b) ∠AOC or ∠BOC

(c) ∠ABC or ∠BCO

### LESSON 33

#### MENTAL MATH:

**a.** $1.85

**b.** $3.30

**c.** 9

**d.** $\frac{4}{5}$

**e.** 20

**f.** 25

**g.** 12

#### PROBLEM SOLVING:



6 handshakes

#### PRACTICE

**a.** =

**b.** <

**c.** >

**d.** 3.1416

**e.** 400

**f.** 57

**g.** 10.2

**h.**
$$\begin{array}{r} 9 \\ 22 \\ + \ 11 \\ \hline 42 \end{array}$$

### PROBLEM SET 33

**1.** We multiply 5 times 12 inches to find the number of inches in 5 feet. Then we add 8 inches to find the total number of inches in 5 feet, 8 inches.

**2.** 46°F

**3.** 33,114 people

**4.** 60, 45

**5.** 32 cm

**6.**



(a) 20 questions

(b) 40 questions

(c) $33\frac{1}{3}$%

**7.** 25 units$^2$

**8.** (a) 15.74

(b) 16 × 3 = 48

**9.** (a) one hundred fifty and thirty-five thousandths

(b) fifteen ten thousandths
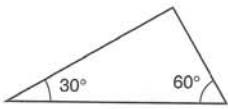
**10.** (a) 0.125

(b) 100.025

**11.** (a) < (b) >

**12.** (a) 4 cm (b) 40 mm

**13.**



**14.** $N \cdot 0 = 0$

**15.** 441

**16.** 9

**17.** 45°

**18.** (a) 0
   (b) identity property of addition

**19.** $1\frac{7}{8}$

**20.** $\frac{7}{12}$

**21.** $4\frac{1}{8}$

**22.** 3

**23.** $\frac{1}{2}$

**24.** $1\frac{1}{5}$

**25.** $14\frac{3}{8}$

**26.** $3\frac{2}{3}$

**27.** $1\frac{1}{2}$

**28.** $5920.00

**29.** $2.50

**30.**



### LESSON 34

### MENTAL MATH:

**a.** $5.50

**b.** $2.40

**c.** 18

**d.** $\frac{2}{3}$

**e.** 42

**f.** 24

**g.** 3

### PROBLEM SOLVING:

8 blocks, 3 faces

12 blocks, 2 faces

6 blocks, 1 face

1 block, unpainted

### PRACTICE

**a.** 1.6 cm

**b.** 0.75 meter

**c.** 157 centimeters

**d.** 2.65

**e.** 10.01

### PROBLEM SET 34

**1** 201 raisins

**2.** 535 parts per million

**3.** $16.50

**4.** 1969

**5.** 9 inches

**6.**



   (a) $1.60   (b) $2.40

**7.** First round 396 to 400 and 71 to 70. Then multiply 400 and 70.

**8.** 7.494

**9.** (a) two hundred and two hundredths
   (b) one thousand, six hundred twenty-five millionths

**10.** (a) 0.000175
   (b) 3030.03

**11.** (a) <   (b) >

**12.** (a) 2.7 cm   (b) 27 mm

**13.** 8.25

**14.** (a) (3, 0)   (b) 9 units²

**15.** (a) 7.5   (b) 0.75

**16.** 25

**17.** 106°

**18.** A. 25

**19.** 2

**20.** $\frac{7}{72}$

**21.** $2\frac{2}{3}$
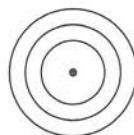
**22.** 1

**23.** $3\frac{3}{20}$

**24.** $\frac{4}{5}$

**25.** $11\frac{1}{8}$

**26.** $3\frac{1}{2}$

**27.** $\frac{3}{4}$

**28.** 5,050

**29.** $39.96

**30.**



Note: Not actual size.

### LESSON 35

### MENTAL MATH:

**a.** $5.51

**b.** $3.20

**c.** 27

**d.** $\frac{5}{8}$

**e.** 14

**f.** 10

**g.** decade

### PROBLEM SOLVING:

$$\begin{array}{r} 1231\ r\ 5 \\ 8\overline{)9853} \\ \underline{8}\phantom{000} \\ 18\phantom{00} \\ \underline{16}\phantom{00} \\ 25\phantom{0} \\ \underline{24}\phantom{0} \\ 13 \\ \underline{8} \\ 5 \end{array}$$
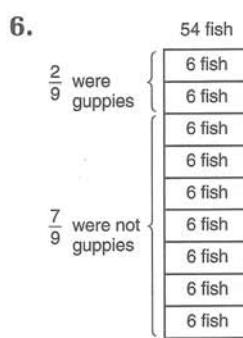
### PRACTICE

**a.** 28.25

**b.** 23.41

**c.** 2

**d.** 30.884

**e.** 14.764

**f.** 11.125

**g.** 1.008

**h.** 0.0072

**i.** 37.8

**j.** 0.006

**k.** 0.4

**l.** 0.027

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**m.** 2.4

**n.** 0.006

**o.** 0.68

**p.** 0.05

## PROBLEM SET 35

1. Add all the bills together and divide by 6.

2. $\frac{3}{4}$ gallon

3. $0.45

4. 58 seconds

5. 20 cm

6.



54 fish

$\frac{2}{9}$ were guppies

6 fish
6 fish

$\frac{7}{9}$ were not guppies

6 fish
6 fish
6 fish
6 fish
6 fish
6 fish
6 fish

(a) 12 fish    (b) 42 fish

7. (a) 100 cm² 
   (b) 36 cm² 
   (c) 64 cm²

8. (a) $\frac{99}{100}$    (b) 0.99
   (c) 99%

9. (a) (3, 2)   (b) 24 units²

10. (a) one hundred and seventy-five thousandths
    (b) 0.00025

11. (a) 3.5 centimeters
    (b) 35 millimeters

12.    $1.50
     ×    12
     _____
     $18.00

13. 3.37

14. 48 ÷ 3 = 16
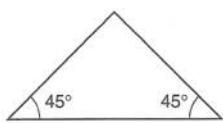
15. 1.25

16. 6

17. 1.23

18. 5.8

19. 24.03

20. 27.78

21. 31.538

22. 10.71

23. $7\frac{11}{12}$

24. 15

25. $\frac{1}{3}$

26. $1\frac{1}{3}$

27. 0.12

28. 0.06

29. 6

30.



45°    45°

## LESSON 36

### MENTAL MATH:

**a.** $14.50

**b.** $6.00

**c.** 16

**d.** $\frac{4}{5}$

**e.** 3

**f.** 36

**g.** 9

### PROBLEM SOLVING:

24

### PRACTICE

**a.** $\frac{3}{8}$

**b.** $\frac{8}{7}$

**c.** $\frac{3}{5}$

**d.** $\frac{3}{8}$

**e.** $\frac{1}{2}$

**f.** $\frac{1}{4}$

**g.** 0

**h.** 1

**i.** $\frac{1}{2}$

**j.** $\frac{3}{4}$

## PROBLEM SET 36

1. $\frac{9}{7}$

2. 20 inches

3. 245 pages

4. 3.24 seconds

5.



30 players

$\frac{2}{5}$ had never played rugby

6 players
6 players

$\frac{3}{5}$ had played rugby

6 players
6 players
6 players

(a) 12 players
(b) $\frac{3}{2}$

6. One way to find *BC* in millimeters is to first convert *AB* to 40 mm and *AC* to 95 mm. Then subtract 40 mm from 95 mm.

7. (a) 104 cm² 
   (b) 42 cm

8. 3600 + 2900 + 900 = 7400

9. (a) 6.857
   (b) 7 × 2 = 14

10. (a) 12,000,000
    (b) 0.000012

11. (a) $\frac{1}{4}$    (b) $\frac{1}{3}$
    (c) $\frac{5}{12}$    (d) 0

12. (a) 4.2 cm   (b) 42 mm

13. 13.56

14. (a) $\frac{17}{20}$

    (b) $\frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2}}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2}} \cdot \frac{\cancel{2} \cdot \cancel{3} \cdot 3}{\cancel{3} \cdot 5 \cdot 5}$

    $= \frac{6}{25}$

15. $6\frac{3}{4}$ hr or 7 hr and $8 per hour. She earned a little less than $56.

16. (a) ∠*MPN*
    (b) ∠*LPM*
    (c) ∠*LPN*

17. 18

18. 4.8

**19.** 30.57

**20.** 3.78

**21.** $7\frac{1}{12}$

**22.** $10\frac{1}{2}$

**23.** $3\frac{2}{3}$

**24.** $4\frac{3}{4}$

**25.** $\frac{11}{18}$

**26.** $3\frac{2}{3}$

**27.** (a) 122.5   (b) 1.225

**28.** 0.175

**29.** 0.024

**30.** See student work.

### LESSON 37

### MENTAL MATH:

**a.** $4.65

**b.** $6.25

**c.** 21

**d.** $\frac{3}{5}$

**e.** 2

**f.** 18

**g.** 30

### PROBLEM SOLVING:

9
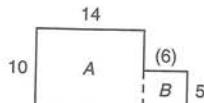
### PRACTICE

**a.** 30 cm²

**b.** 48 cm²

**c.** 18 cm²

**d.**
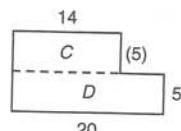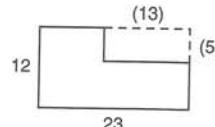


Area $A$ = 140 m²
+ Area $B$ =  30 m²
Total   = 170 m²

or



Area $C$ =  70 m²
+ Area $D$ = 100 m²
Total   = 170 m²

**e.**



Large  = 276 cm²
− Small =  65 cm²
Figure = 211 cm²

**f.** 256 in.²

**g.** $A = \frac{1}{2}bh;$   $A = \frac{bh}{2}$

### PROBLEM SET 37
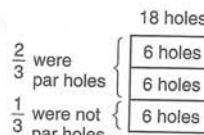
**1.** $\frac{2}{1}$

**2.** 52 cars

**3.** 45 seconds
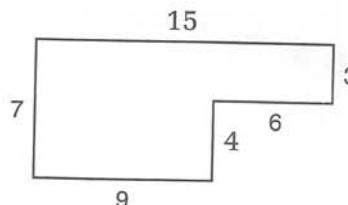
**4.** Subtract $1.30 from $10 to find how much the 3 gallons of milk cost. Then divide that number by 3 to find how much each gallon cost.

**5.**



(a) 12 holes

(b) 6 holes



**6.** 44 in.

**7.** 81 in.²

**8.** (a) 15     (b) 3
(c) 20

**9.** (a) 0.49    (b) 0.51
(c) 51%

**10.** (a) 3184.56
(b) 3200
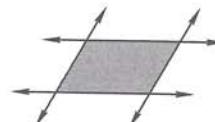
**11.** (a) twenty-five hundred thousandths
(b) 60.07

**12.** (a) $\frac{1}{50}$    (b) $\frac{2}{3}$

**13.** $1\frac{1}{8}$ in.

**14.** One possibility



**15.** (a) 48 cm   (b) 108 cm²

**16.** 0.5 > 0.06

**17.** $\frac{1}{2}$

**18.** 14

**19.** 2.5

**20.** 4.05

**21.** 1.5

**22.** 30

**23.** $5\frac{1}{12}$

**24.** $1\frac{1}{2}$
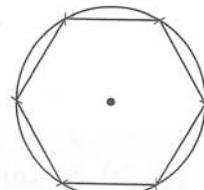
**25.** $2\frac{1}{30}$

**26.** $\frac{2}{3}$

**27.** $1\frac{3}{4}$

**28.** (a) 2.5     (b) 0.025

**29.**



**30.** fourth quadrant

### LESSON 38

### MENTAL MATH:

**a.** $6.44

**b.** $7.50

**c.** 25

**d.** $\frac{1}{2}$

**e.** 60

**f.** 35

**g.** 6

### PROBLEM SOLVING:

$\frac{1}{2}$ ft²

  *Math 87, Second Edition*
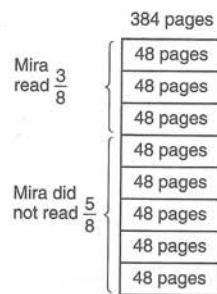
### PRACTICE

**a.** 20,000 doughnuts

**b.** 26,000 cans

**c.** Test 4

**d.** $\frac{1}{6}$

### PROBLEM SET 38

**1.** $\frac{3}{10}$

**2.** 115 pages

**3.** 352 seconds

**4.** 5000 cans

**5.** 75

**6.** See student work.

**7.**

384 pages

Mira read $\frac{3}{8}$ { 48 pages / 48 pages / 48 pages

Mira did not read $\frac{5}{8}$ { 48 pages / 48 pages / 48 pages / 48 pages / 48 pages

(a) 144 pages
(b) 48 pages

**8.** (a) 432 in.$^2$
(b) 100 in.

**9.** (a) 14  (b) 5  (c) 30

**10.** (a) 3000
(b) 2986.342

**11.** (a) 1    (b) 4

**12.** 0.9, 0.6, 0.3

**13.** (a) 1.2 cm
(b) 12 mm

**14.** The number 3.4 is between 3 and 4 and is nearly halfway between. Point $B$ is too close to 3 to be 3.4. So the best choice is $C$.

**15.** (a) $\overline{AC}$    (b) $\overline{BC}$
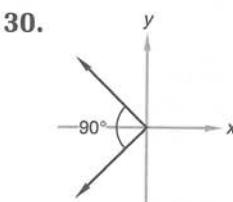
**16.** (a) 18 cm$^2$
(b) 18 cm$^2$
(c) 36 cm$^2$

**17.** 2.4

**18.** 8.3

**19.** 0.45

**20.** 6.25

**21.** 37.07

**22.** 0.25

**23.** 7

**24.** $1\frac{7}{8}$

**25.** $1\frac{1}{2}$

**26.** 0

**27.** A. $4 \cdot 4^2$

**28.** 125 mL

**29.** reverse 916.42 and 916.37

**30.**



### LESSON 39

### MENTAL MATH:

**a.** $2.45

**b.** $7.20

**c.** 35

**d.** $\frac{3}{4}$

**e.** 16

**f.** 32

**g.** 0

### PROBLEM SOLVING:

Even, 2–4–6, yes

Odd, 1–3–5, yes

### PRACTICE

**a.** 9

**b.** 24

**c.** 10

**d.** 20

**e.** 12

**f.** 75

### PROBLEM SET 39

**1.** 3 inches

**2.** between his thirteenth and fourteenth birthdays

**3.** $\frac{3}{4}$

**4.** 464 miles

**5.** $234

**6.**

105 adults

$\frac{3}{7}$ were less than 5 feet tall { 15 adults / 15 adults / 15 adults

$\frac{4}{7}$ were 5 feet tall or taller { 15 adults / 15 adults / 15 adults / 15 adults

(a) 45 adults
(b) 60 adults

**7.** 5800 mm$^2$

**8.** 410 mm

**9.** (a) 2.5    (b) $2\frac{1}{2}$

**10.** (a) 0.92    (b) 0.91667

**11.**    $1.40
   $\times$   9
   $12.60

**12.** (a) 100.075
(b) 0.175

**13.** (a) $\angle RPS$   (b) $\angle QPR$
(c) $\angle QPS$

**14.** 0.01, 0.001, 0.0001

Divide a term by 10 to find the next term of the sequence.

**15.** 9

**16.** 24

**17.** 6

**18.** 0.39

**19.** 0.6

**20.** 0.9

**21.** 0.48

**22.** 30.19

**23.** 1.11

**24.** $11\frac{1}{24}$

**25.** $2\frac{13}{20}$

**26.** 15

**27.** $\frac{5}{6}$

**28.** (a) 48 mm

(b) 108 mm$^2$

**29.** $\frac{2}{6} = \frac{1}{3}$

**30.** $\frac{1}{2}, \frac{7}{12}, \frac{2}{3}, \frac{5}{6}$

## LESSON 40

### MENTAL MATH:

**a.** $18.00

**b.** $5.00

**c.** 18

**d.** $\frac{3}{8}$

**e.** 23

**f.** 40

**g.** $4.30

### PROBLEM SOLVING:

$$\begin{array}{r} 24 \\ 17\overline{)408} \\ \underline{34} \\ 68 \\ \underline{68} \\ 0 \end{array}$$
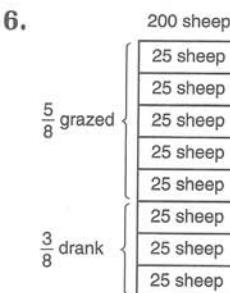
### PRACTICE

**a.** Each angle measures 60° because they equally share 180°.
$\frac{180°}{3} = 60°$

**b.** 20°; Angle $ACB$ and $\angle ACD$ are complementary: 90° − 70° = 20°

**c.** $\angle CAB$ measures 70° because it is the third angle of a triangle whose other angles measure 90° and 20°: 180° − (90° + 20°) = 70°.

**d.** They are not vertical angles. Their angles are equal in measure but they are not non-adjacent angles formed by two intersecting lines.

**e.** m$\angle x = 60°$;
m$\angle y = 120°$;
m$\angle z = 60°$

### PROBLEM SET 40

**1.** (a) $\frac{2}{5}$     (b) $\frac{2}{5}$

**2.** (a) 380 seconds
(b) 95 seconds

**3.** 432 miles

**4.** 4.8°F

**5.** (a) 210 mm
(b) 2450 mm$^2$

**6.**



(a) 125 sheep
(b) 75 sheep

**7.** 2.5 cm

**8.** (a) 0.083     (b) 0.1

**9.** (a) twelve and fifty-four thousandths
(b) ten and eleven hundredths

**10.** 15 units$^2$

**11.** 0.76

**12.** (a) 35°     (b) 145°
(c) 35°

**13.** $\angle BCE$

**14.** (a) identity property of multiplication
(b) 24

**15.** 20

**16.** 1

**17.** 20

**18.** 2.2

**19.** 4.29

**20.** 0.486

**21.** 0.0075

**22.** 22.5

**23.** 1.2

**24.** 2.85

**25.** 0.66

**26.** 10

**27.** $1\frac{1}{5}$

**28.** $1\frac{1}{75}$

**29.** $2\frac{13}{20}$

**30.** $\frac{1}{4} \times 32 = 8$

### INVESTIGATION 4

**1.** 41

**2.** 37

**3.** 40

**4.** 32 and 47

**5.**

| 1 | 5 |
|---|---|
| 2 | 6 6 7 8 9 9 |
| 3 | 0l2 3 5 6 8 8 8 8 8l |
| 4 | 0 1 2 3 5 5 6 7l7 8 |
| 5 | 0 2 4 5 7 8 |

2l9 represents a score of 29

**6.** 31, 39, 47

**7.** 38

**8.** 15 and 58

**9.** 43

**10.** 16

**11.**



**12.** 15

## LESSON 41

### MENTAL MATH:

**a.** 700

**b.** 15.4

**c.** 25

**d.** 9

**e.** 1200

**f.** 21

**g.** $1\frac{1}{6}, \frac{1}{6}, \frac{1}{3}, 1\frac{1}{3}$

**PROBLEM SOLVING:**
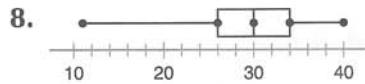
$1 + 2 + \ldots + 8 + 9$
$= 45$ blocks

**PRACTICE**

**a.** 120 in.$^2$

**b.** 24 ft$^2$

**c.** $x(y + z) = xy + xz$

**d.** $6(15) = 90$;
$6 \cdot 20 - 6 \cdot 5$
$= 120 - 30 = 90$

**e.** $p = 2(l + w)$;
$p = 2l + 2w$

**PROBLEM SET 41**

**1.** $\frac{3}{4}$

**2.** 107 points

**3.** 234 inches

**4.** (a) associative property of addition
(b) associative property of multiplication
(c) distributive property

**5.** 6.2 kilometers

**6.** (a) $\frac{3}{10}$    (b) $\frac{7}{3}$

**7.** (a) 30 correct answers
(b) 26 correct answers
(c) 34 correct answers
(d) 11 correct answers

**8.** 

**9.** (a) 52 ft$^2$    (b) 32 ft

**10.** (a) 3.6    (b) $3\frac{3}{5}$

**11.** 17

**12.** (a) 42 mm
(b) 84 mm$^2$

**13.** (a) 0.00067
(b) 100.023

**14.** 62.8

**15.** $\frac{35}{70}, \frac{42}{70}, \frac{50}{70}$

**16.** 1.5

**17.** 45

**18.** 4.15

**19.** 0.048

**20.** 19.04

**21.** 0.0048

**22.** 0.863

**23.** 0.065

**24.** 0.925

**25.** $1\frac{1}{96}$

**26.** $5\frac{3}{4}$

**27.** $1\frac{5}{12}$

**28.** 12

**29.** $\frac{3}{4}$

**30.** $m\angle x = 48°$;
$m\angle y = 132°$;
$m\angle z = 48°$

**LESSON 42**

**MENTAL MATH:**

**a.** $2.34

**b.** 40

**c.** 5

**d.** 2

**e.** 6

**f.** 28

**g.** 25

**PROBLEM SOLVING:**

1 cup
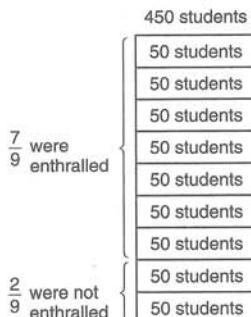
**PRACTICE**

**a.** $2.\overline{72}$

**b.** $0.81\overline{6}$

**c.** 0.667

**d.** 5.382

**e.** $0.141\overline{6}$

**f.** 0.1417

**PROBLEM SET 42**

**1.** $\frac{2}{3}$

**2.** 27 students

**3.** 161 miles

**4.** 

(a) 350 students
(b) 100 students

**5.** (a) 5.1667    (b) 5.2727

**6.** (a) 8 students
(b) $\frac{3}{10}$
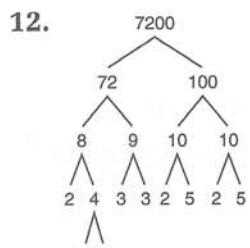
**7.** 18 units$^2$

**8.** (a) 80 in.    (b) 320 in.$^2$
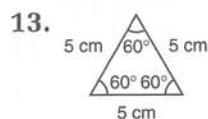
**9.** (a) $0.1\overline{54}$    (b) 0.155

**10.** 0.607

**11.** $\frac{2}{6} = \frac{1}{3}$

**12.** 

(b) $7200 = 2^5 \cdot 3^2 \cdot 5^2$

**13.** 

**14.** 60

**15.** 35

**16.** 0.8

**17.** 4.4

**18.** 5.83

**19.** 60

**20.** $4(11) = 44$;
$4 \cdot 5 + 4 \cdot 6 =$
$20 + 24 = 44$

**21.** 343

**22.** $0.36

**23.** $24 \div 6 = 4$

**24.** (a) diameter
    (b) radius

**25.** 1.775

**26.** $12\frac{1}{3}$

**27.** $1\frac{1}{12}$

**28.** 48

**29.** $1\frac{1}{3}$

**30.** $m\angle a = 140°$;
    $m\angle b = 50°$;
    $m\angle c = 130°$

## LESSON 43

### MENTAL MATH:

**a.** $2.88

**b.** 0.035

**c.** 7

**d.** 39

**e.** $60.00

**f.** 60

**g.** $\frac{11}{12}, \frac{5}{12}, \frac{1}{6}, 2\frac{2}{3}$

### PROBLEM SOLVING:

The total can be 4–24, which is 21 different numbers.

### PRACTICE

**a.** $\frac{6}{25}$

**b.** $45\frac{3}{5}$

**c.** $2\frac{3}{8}$

**d.** 5.75

**e.** 4.6

**f.** 0.625

**g.** $0.8\overline{3}$

**h.** 0.08

**i.** 0.125

**j.** 1.5

**k.** 0.065
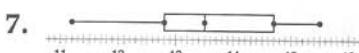
### PROBLEM SET 43

**1.** $\frac{2}{7}$

**2.** (a) 704 seconds
    (b) 88 seconds

**3.** 7.7 gallons

**4.** 275,200,000 people

**5.**



    (a) 10 games    (b) $\frac{2}{1}$

**6.** (a) 13.5 seconds
    (b) 12.8 seconds
    (c) 14.7 seconds

**7.**



**8.** 80 mm
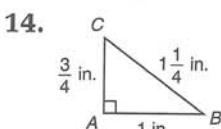
**9.** (a) $\frac{3}{8}$    (b) $5\frac{11}{20}$

**10.** (a) 2.4    (b) 0.125

**11.** (a) 0.455    (b) 3.143
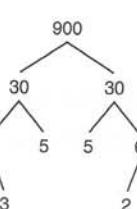
**12.** (a) $0.158\overline{3}$    (b) 0.158

**13.** 3.883

**14.**



**15.** $\frac{26}{52} = \frac{1}{2}$

**16.** (a)



    (b) $900 = 2^2 \cdot 3^2 \cdot 5^2$
    (c) $\sqrt{900} = 30$
    $= 2 \cdot 3 \cdot 5$

**17.** 2.5

**18.** 1.48

**19.** 500 eyedroppers

**20.** (a) 0.08    (b) $0.71

**21.** (a) 2.4 m    (b) 0.24 m²

**22.** =; The division problems are equivalent problems because the quotients are equal.

**23.** 14

**24.** 1.625

**25.** $1\frac{17}{30}$

**26.** $12\frac{3}{5}$

**27.** 4

**28.** $m\angle a = 70°$;
    $m\angle b = 60°$;
    $m\angle c = 120°$

**29.** (5, 10)

**30.** (a) 180°    (b) 90°
    (c) 45°

## LESSON 44

### MENTAL MATH:

**a.** $3.20

**b.** 0.05

**c.** 6

**d.** 60

**e.** 1

**f.** 150

**g.** 6

### PROBLEM SOLVING:
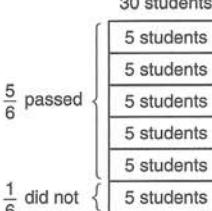
3 and 11, not 1 and 13 because 1 is not prime.
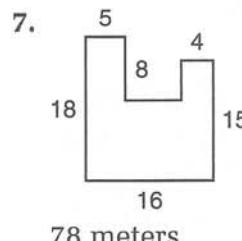
### PRACTICE

**a.** 13 r 3

**b.** $13\frac{3}{4}$

**c.** 13.75

**d.** 1.833

**e.** 23, 23, 23, and 24 students

### PROBLEM SET 44

**1.** $\frac{4}{3}$

**2.** 89

**3.** $\frac{3}{5}$

**4.** $3.50

**5.** two and eight hundred eighty-three thousandths

**6.**

30 students

5 passed / 6 { 5 students / 5 students / 5 students / 5 students / 5 students }
1 did not / 6 pass { 5 students }

(a) 5 students     (b) $\frac{5}{1}$

**7.**

5
4
8
18
15
16

78 meters

**8.** (a) $\frac{3}{4}$     (b) 0.625
    (c) 1.25

**9.** $\frac{1}{4}$

**10.** B. $(2 \cdot 3) + (2 \cdot 4)$

**11.** 15, 21, 28

**12.** (a) $0.4\overline{90}$     (b) 0.491

**13.** 210

**14.** (a) $-12, 0, 0.12, \frac{1}{2}, 1.2$
    (b) $0, -12$

**15.** (a) 18 inches
    (b) 24 books

**16.** 5

**17.** 2

**18.** 20

**19.** 0.86

**20.** 0.9

**21.** 30 meters

**22.** See student work.
    (a) $6.25 \text{ cm}^2$
    (b) 10 cm

**23.** 9 sq. units

**24.** 2.0525

**25.** 0.017

**26.** $9\frac{1}{12}$

**27.** $\frac{1}{6}$

**28.** 100

**29.** $\frac{2}{3}$

**30.** (a) 55°; The other two
    angles of $\triangle ABD$ are
    35° and 90°. For the
    total to be 180°, this
    angle is 55°.

    (b) 35°; Since the figure
    is a rectangle, $\angle ABC$
    is 90°. We found
    that $\angle ABD$ is 55°;
    $\angle CBD$ is the
    complement of
    $\angle ABD$, so the
    measure is 35°.

    (c) 55°; $\angle BDC$ is the
    complement of a 35°
    angle. Also, $\angle BDC$ is
    the third angle of a
    triangle whose other
    two angles measure
    35° and 90°.

### LESSON 45

#### MENTAL MATH:

**a.** $10.50

**b.** 125

**c.** 15

**d.** 100

**e.** 12

**f.** 50

**g.** $1\frac{5}{12}, \frac{1}{12}, \frac{1}{2}, 1\frac{1}{8}$

#### PROBLEM SOLVING:

982
× 9
8838

#### PRACTICE

**a.** 8.6

**b.** 1.6

**c.** 340

**d.** 300

**e.** 16 pens

**f.** If we multiply $\frac{0.25}{0.5}$ by $\frac{10}{10}$
    the result is $\frac{2.5}{5}$. Since
    $\frac{10}{10}$ equals 1, we have not
    changed the value by
    multiplying, we have
    only changed the form.

#### PROBLEM SET 45

**1.** $\frac{3}{5}$

**2.** $4.20

**3.** four and one hundredth

**4.** (a) 4 votes   (b) $\frac{1}{5}$

**5.**

Riders on the
Giant Gyro

4 were / 7 euphoric { $\frac{1}{7}$ of riders / $\frac{1}{7}$ of riders / $\frac{1}{7}$ of riders / $\frac{1}{7}$ of riders }
3 were / 7 vertiginous { $\frac{1}{7}$ of riders / $\frac{1}{7}$ of riders / $\frac{1}{7}$ of riders }

(a) $\frac{3}{7}$     (b) $\frac{4}{3}$

**6.** 80

**7.** 2500

**8.** (a) 18 cm     (b) $180 \text{ cm}^2$

**9.** (a) $62\frac{1}{2}$     (b) 0.09
    (c) 0.075
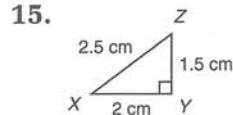
**10.** (a) 23.54545
    (b) 0.91667

**11.** 2000 grams

**12.** $0.33

**13.** (a) 0.567     (b) $0.5\overline{6}$

**14.** $\frac{1}{13}$

**15.**

z
2.5 cm     1.5 cm
X    2 cm    Y

**16.** (a) 6 cm     (b) $1.5 \text{ cm}^2$

**17.** 12

**18.** 11

**19.** 0.97

**20.** 2.62

**21.** 0.0225

**22.** 12

23. 2.828

24. 0.8

25. $1\frac{7}{8}$

26. $3\frac{5}{12}$

27. 10

28. 6

29. 33 pencils

30. (a) See student work.

(b) The sum of the angle measures of a triangle is 180°.

### LESSON 46

#### MENTAL MATH:

a. $7.38

b. 0.036

c. 10

d. 10

e. 12

f. 72

g. 24

#### PROBLEM SOLVING:
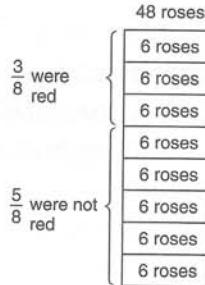
Yes

#### PRACTICE

a. 4¢ per ounce

b. 5¢ per ounce

c. The 24-ounce jar is the better buy because $\frac{9.5¢}{oz}$ is less than $\frac{11¢}{oz}$.

d. 52 mi/hr or 52 mph

e. 23 mi/gal or 23 mpg

f. (a) $41\frac{francs}{dollar}$

(b) $\frac{1}{41}\frac{dollar}{francs}$

g. $2.58

h. $39.47

i. $10.97

j. $2.25

### PROBLEM SET 46

1. Brand X = $0.15 per ounce; Brand Y = $0.16 per ounce; Brand X is the better buy.

2. 117 kilometers per hour

3. $\frac{4}{3}$

4. $2.94

5. one and seventeen hundredths

6. 16 books

7.



48 roses

$\frac{3}{8}$ were red { 6 roses / 6 roses / 6 roses

$\frac{5}{8}$ were not red { 6 roses / 6 roses / 6 roses / 6 roses / 6 roses

(a) 18 roses

(b) 30 roses

(c) $\frac{5}{8}$

8. (a) <   (b) =

9. 300 feet

10. (a) $\frac{2}{25}$   (b) 0.375
(c) $0.0\overline{9}$

11. (a) $1.05   (b) $16.00

12. 6 units$^2$

13. $\frac{3}{13}$

14. 5.6

15. 3

16. 75

17. 3.5

18. 10

19. 0.3(0.4 + 0.5)
     0.3(0.9)
       0.27
        or
   0.3(0.4 + 0.5)
   0.12 + 0.15
       0.27

20. (a) 38 in.   (b) 48 in.$^2$

21. (a) 180°   (b) 120°
    (c) 60°

22. $4\frac{5}{72}$

23. $4\frac{1}{6}$

24. 3

25. $1\frac{2}{3}$

26. 14.08

27. 150

28. Round $6\frac{7}{8}$ to 7 and round $5\frac{1}{16}$ to 5. Then multiply 7 and 5.

29. (a) $\angle CAB$   (b) $\overline{BA}$

30. (a) 60°   (b) 75°
    (c) 45°

### LESSON 47

#### MENTAL MATH:

a. $41.00

b. 15

c. 6

d. $100.00

e. 32

f. 50

g. $\frac{9}{10}, \frac{1}{10}, \frac{1}{5}, 1\frac{1}{4}$

#### PROBLEM SOLVING:

8 eggs
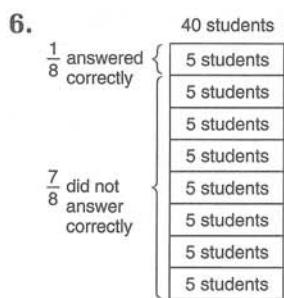
#### PRACTICE

a. $(4 \times 10^2) + (5 \times 10^1) + (6 \times 10^0)$

b. $(1 \times 10^3) + (7 \times 10^2) + (6 \times 10^1)$

c. $(1 \times 10^5) + (8 \times 10^4) + (6 \times 10^3)$

d. 24,250

e. 25,000,000

f. 0.0125

g. 0.00048

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h. 7

i. 6

j. 2,500,000

k. 15,000,000,000

l. 1,600,000,000,000

### PROBLEM SET 47

1. (a) true    (b) true

2. $\frac{5}{6}$

3. $\frac{4}{11}$

4. 1.56

5. (a) 134,800,000 viewers
   (b) $(5 \times 10^3) +$
       $(2 \times 10^2) +$
       $(8 \times 10^1)$

6.



   (a) 5 students
   (b) 35 students

7. (a) 10 glasses
   (b) 11 glasses

8. (a) Answers may vary.
   (b) Answers may vary.

9. (a) $\frac{3}{8}$    (b) 0.625

10. $4.51

11. (a) 53,714.545
    (b) 54,000

12. (a) 7    (b) 4

13. 3.03

14. 60

15. 5.4

16. 2.25

17. 0.9

18. 42 cm

19. (a) 2 inches
    (b) 6 inches

20. 20

21. 3600

22. $10\frac{1}{30}$

23. $2\frac{19}{24}$

24. 10

25. $\frac{1}{2}$

26. 50.886

27. (a) 42 in.    (b) 84 in.$^2$

28. 1.25 < 12.5

29. $\frac{1}{2}, \frac{7}{12}, \frac{2}{3}, \frac{5}{6}$

30. (a) 50°    (b) 65°
    (c) Together, ∠b and ∠c
        form a straight angle
        that is 180°. To find
        the measure of
        ∠c we subtract the
        measure of ∠b
        from 180°.

### LESSON 48

#### MENTAL MATH:

a. $245.00

b. 1.275

c. 6

d. 4

e. 24

f. 30

g. 1

#### PROBLEM SOLVING:

The sum of the
numbers is 45,
which we divide by 3.
$\frac{45}{3} = 15$

#### PRACTICE

a. $0.\overline{6}$

b. $66\frac{2}{3}\%$

c. $1\frac{1}{10}$

d. 110%

e. $\frac{1}{25}$

f. 0.04

### PROBLEM SET 48

1. $32 \frac{\text{kilometers}}{\text{hour}}$

2. $\frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3 \cdot 7}{3 \cdot 3 \cdot 3 \cdot 7 \cdot 7}$
   $= \frac{16}{21}$

3. 64 years

4. (a) $\frac{7}{12}$    (b) $\frac{5}{7}$

5. 6-ounce can is $0.15
   per ounce; 9-ounce can
   is $0.14 per ounce;
   9-ounce can is a
   better buy

6. 2725

7. (a) 13%    (b) $\frac{1}{5}$
   (c) $6400

8.



   (a) 210 pages
   (b) 126 pages

9. (a) 0.5    (b) 50%
   (c) $\frac{1}{10}$    (d) 10%
   (e) $\frac{1}{4}$    (f) 0.25

10. 0.545

11. (a) See student answer.
    (b) 5 centimeters

12. (a) The exponent is 3,
        and the base is 5.
    (b) 8

13. 2 inches

14.



    100 cm

15. 65 mpg

16. 250

17. 16

18. 0.24

19. $\frac{1}{6}$

20. 60

21. 60

22. $1\frac{5}{12}$

23. $12\frac{1}{12}$

24. 1

25. 2

26. $199.00

27. 9 sq. units

28. $\frac{2}{5}$

29. $53.75

30. m∠a = 40°;
    m∠b = 50°;
    m∠c = 130°

### LESSON 49

#### MENTAL MATH:

a. $52.00

b. 257.5

c. 10

d. 6

e. 20

f. 60

g. $\frac{14}{15}$, $\frac{4}{15}$, $\frac{1}{5}$, $1\frac{4}{5}$

#### PROBLEM SOLVING:

1. 3Q, 2D, 1N

2. 1HD, 1Q, 1D, 3N

3. 1HD, 5D

#### PRACTICE

a. 5 feet, 10 inches

b. 75 inches

c. 6 ft, 8 in.

d. 4 yd, 1 ft, 5 in.

e. 12 hr, 20 s

### PROBLEM SET 49

1. 25

2. 9.2 yards

3. 25¢ per arrow

4. 49 sides

5. 6.39

6.

| | 72 billy goats |
|---|---|
| $\frac{2}{9}$ were gruff | 8 goats |
| | 8 goats |
| $\frac{7}{9}$ were cordial | 8 goats |
| | 8 goats |
| | 8 goats |
| | 8 goats |
| | 8 goats |
| | 8 goats |
| | 8 goats |

   (a) 56 billy goats
   (b) $\frac{2}{7}$

7. 0.5, $0.\overline{54}$, $0.\overline{5}$

8. (a) Answers may vary.
   (b) $2\frac{5}{8}$ inches

9. (a) 90%  (b) 160%
   (c) $83\frac{1}{3}$%

10. (a) $\frac{3}{4}$  (b) 0.75
    (c) $\frac{1}{20}$  (d) 0.05

11. 3720 times

12. $\frac{1}{6}$

13. (a) 1 in.²  (b) $\frac{1}{4}$ in.²
    (c) $\frac{3}{4}$ in.²

14. 4 in.

15. (a) 8 cm  (b) 6 cm
    (c) 4.8 cm

16. 40

17. 1.6

18. $\frac{1}{3}$

19. 0.29

20. 74

21. 31,400

22. $5\frac{5}{12}$

23. $16\frac{2}{3}$

24. 6 days

25. 4 yd  1 ft  3 in.

26. Round 35.675 to 36.
    Round $2\frac{7}{8}$ to 3. Then
    divide 36 by 3.

27. $23.32

28. 0.01

29. $300.00

30. m∠a = 32°;
    m∠b = 58°;
    m∠c = 122°

### LESSON 50

#### MENTAL MATH:

a. $240

b. 1.25

c. 8

d. 15

e. 10

f. 16

g. −5

#### PROBLEM SOLVING:
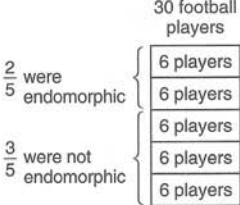
$$\begin{array}{r} 143 \\ \times\ \ 7 \\ \hline 1001 \end{array}$$

#### PRACTICE

a. $\frac{1\ yd}{36\ in.}$ and $\frac{36\ in.}{1\ yd}$

b. $\frac{100\ cm}{1\ m}$ and $\frac{1\ m}{100\ cm}$

c. $\frac{16\ oz}{1\ lb}$ and $\frac{1\ lb}{16\ oz}$

d. 360 inches

e. 8 yd

f. 288 pence

### PROBLEM SET 50

1. 2.5

2. (a) $\frac{2}{5}$  (b) 60%
   (c) $\frac{3}{10}$

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3. 13-ounce box =
   9¢ per ounce;
   18-ounce box =
   8¢ per ounce;
   18-ounce box is the
   better buy.

4. $8 \frac{\text{miles}}{\text{hour}}$

5. $4.50

6. 7 hours

7.

| | 30 football players |
|---|---|
| $\frac{2}{5}$ were endomorphic | 6 players |
| | 6 players |
| | 6 players |
| $\frac{3}{5}$ were not endomorphic | 6 players |
| | 6 players |

   (a) 12 football players
   (b) 60%

8. B. 40%

9. 3.8333
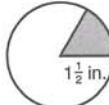
10. $(7 \times 10^6) + (5 \times 10^5)$

11. (a) 60%    (b) $16\frac{2}{3}\%$
    (c) 150%

12. (a) $\frac{3}{10}$    (b) 0.3
    (c) $2\frac{1}{2}$    (d) 2.5

13. 97

14. (a) 96 cm²  (b) 24 cm²
    (c) 120 cm²

15.

   $1\frac{1}{2}$ in.

16. 60

17. 6

18. 2.04
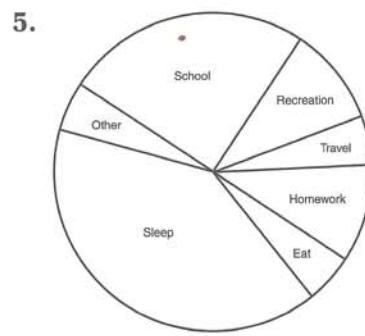
19. $\frac{1}{12}$

20. (a) distributive
       property
    (b) commutative
       property of addition
    (c) identity property of
       multiplication
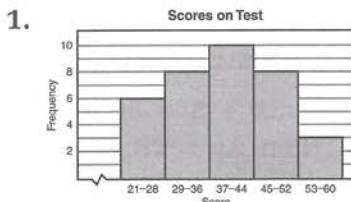
21. B. $10^4$

22. (a) (0, 2) (b) 8 sq. units
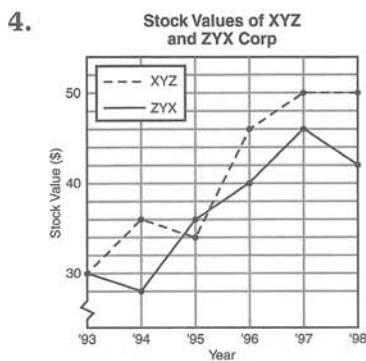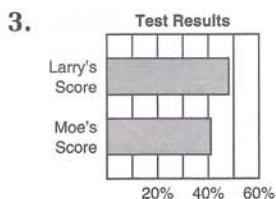
23. $2\frac{1}{2}$ cookies

24. (a) $20 - 6 = 14$
    (b) 15
    (c) See student work.

25. 12 hr  9 min  5 s

26. 8 yd

27. $4\frac{5}{12}$

28. $11\frac{3}{14}$

29. (a) 60°      (b) 50°
    (c) 50°

30. $4(5 - 3)$  or  $4(5 - 3)$
    $4(2)$           $20 - 12$
    $8$                $8$

**INVESTIGATION 5**

1.

   Scores on Test

2. The graph on the left
   creates the visual
   impression that sales
   doubled because the
   vertical scale starts at
   400 units instead of
   being equally divided
   from 0 units to 600
   units.

3.

   Test Results

4.

   Stock Values of XYZ
   and ZYX Corp

5.

   Central ∠
     90°
     36°
     18°
     36°
     18°
    144°
     18°

**LESSON 51**

**MENTAL MATH:**

a. $14.00

b. 450

c. 12

d. 5000 m

e. 200

f. 25

g. $1\frac{3}{8}, \frac{3}{8}, \frac{7}{16}, 1\frac{3}{4}$

**PROBLEM SOLVING:**

1,000,000

**PRACTICE**

a. $1.5 \times 10^7$

b. $4 \times 10^{11}$

c. $5.09 \times 10^6$

d. $2.5 \times 10^{11}$

e. 3,400,000

f. 500,000,000

g. 100,000

h. <

i. =

## PROBLEM SET 51

1. 3 tests

2. 80

3. $7\frac{1}{2}$ in.

4. 7¢ per can

5. (a) $\frac{2}{7}$     (b) $\frac{5}{2}$

6. (a) $1.2 \times 10^7$
   (b) $1.76 \times 10^4$

7. (a) 12,000
   (b) 5,000,000

8. (a) 0.125    (b) 0.875

9. (a) 30,000    (b) 5000

10. (a) $\frac{2}{5}$     (b) 0.4
    (c) $\frac{1}{25}$     (d) 0.04

11. (a) 180°    (b) 90°
    (c) 45°     (d) 45°

12. $16.59

13. 0

14. (a) $\angle Z$    (b) $\overline{DC}$

15. 64 m

16. 144 m²

17. 16

18. 10

19. 1.68

20. 1.44

21. 60

22. 160 mm

23. 8 days 3 hr 15 min

24. 5 yd 2 in.

25. $8\frac{1}{24}$

26. $5\frac{25}{27}$

27. 0.5(0.5 + 0.6)
       0.5(1.1)
         0.55
          or
      0.5(0.5 + 0.6)
       0.25 + 0.3
         0.55

28. $m\angle A = 90°$;
    $m\angle B = 45°$;
    $m\angle C = 45°$

29. 16 sq. units

30. 180°F

## LESSON 52

### MENTAL MATH:

a. $4.50

b. 0.045

c. 18

d. 2.5 m

e. 600

f. 180

g. 200 km
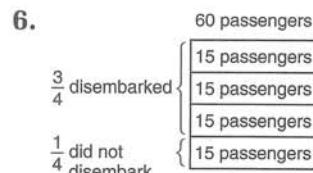
### PROBLEM SOLVING:

If $3x + 5 = 80$,
then $3x = 75$, because
$75 + 5 = 80$.

If $3x = 75$, then
$x = 25$, because
$3 \cdot 25 = 75$.

We test the solution by
multiplying 25 by 3 and
adding 5 which
equals 80.

### PRACTICE

a. 29

b. 12

c. 13

d. 9

e. 3

f. 27

g. $\frac{1}{6}$

## PROBLEM SET 52

1. 3

2. 8 nonagons

3. 176.803

4. (a) $1.98    (b) $6.37

5. (a) 140 pages
   (b) 190 pages

6.

60 passengers

$\frac{3}{4}$ disembarked { 15 passengers / 15 passengers / 15 passengers

$\frac{1}{4}$ did not disembark { 15 passengers

(a) 45 passengers
(b) 25%

7. (a) $3.75 \times 10^6$
   (b) $8 \times 10^7$

8. (a) 2,050,000
   (b) 40

9. (a) 0.375    (b) 0.065

10. 3.273

11. (a) $2\frac{1}{2}$    (b) 2.5
    (c) $\frac{1}{4}$     (d) 0.25

12. (a) $7\frac{7}{9}$    (b) $7.\overline{7}$

13. 0.99

14.
3 cm

2 cm

(a) 100 mm
(b) 6 cm²

15. (a) 36 cm² (b) 24 cm²
    (c) 60 cm²

16. 15

17. 2

18. 13.2

19. 10

20. 20

21. 19

22. 38

23. 8 hr 39 min 25 s

24. $20\frac{1}{12}$

25. $3\frac{5}{8}$

26. 100

27. 10

28. 1,000,000

29. 140 cm

30. $\frac{1}{3}$

## LESSON 53

### MENTAL MATH:

**a.** $10.00

**b.** 127.5

**c.** 35

**d.** 350 mm

**e.** $\frac{1}{4}$

**f.** 27

**g.** 121

### PROBLEM SOLVING:
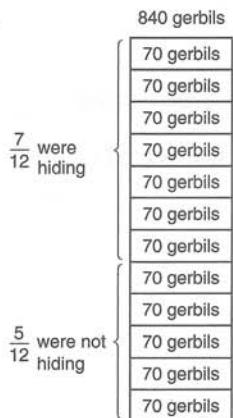
Zero. No triangle can be made.

### PRACTICE

**a.** $\frac{15 \text{ chairs}}{1 \text{ row}}, \frac{1 \text{ row}}{15 \text{ chairs}}$

**b.** 270 chairs

**c.** $\frac{24 \text{ miles}}{1 \text{ gallon}}, \frac{1 \text{ gallon}}{24 \text{ miles}}$

**d.** $6\frac{2}{3}$ gallons

### PROBLEM SET 53

**1.** (a) 16 boys
  (b) 16 girls

**2.** 50%

**3.** $\frac{5}{16}$

**4.** (a) $4.58   (b) $19.79

**5.**
```
            840 gerbils
          ┌──────────────┐
          │ 70 gerbils   │
          │ 70 gerbils   │
          │ 70 gerbils   │
  7/12    │ 70 gerbils   │
  were    │ 70 gerbils   │
  hiding  │ 70 gerbils   │
          │ 70 gerbils   │
          ├──────────────┤
          │ 70 gerbils   │
          │ 70 gerbils   │
  5/12    │ 70 gerbils   │
  were not│ 70 gerbils   │
  hiding  │ 70 gerbils   │
          └──────────────┘
```
  (a) $\frac{5}{12}$
  (b) 350 gerbils

**6.** (a) $1 \times 10^{12}$
  (b) $4.75 \times 10^5$

**7.** (a) 700   (b) >

**8.** (a) 105 ft   (b) 20 m

**9.** 108

**10.** $20{,}000 - 12{,}000$
  $= 8{,}000$

**11.** (a) $1\frac{1}{2}$   (b) 1.5
  (c) $\frac{3}{20}$   (d) 0.15

**12.** (a) 80%   (b) 6%

**13.** 35 cm

**14.** (a) 104 ft$^2$   (b) 46 ft

**15.** (a) $\frac{1.6 \text{ C\$}}{1 \text{ US\$}}; \frac{1 \text{ US\$}}{1.6 \text{ C\$}}$
  (b) 256 C$

**16.** 500

**17.** 1

**18.** 0.75

**19.** 0.15

**20.** 58

**21.** 14

**22.** 28

**23.** 4 yd  1 ft  2 in.

**24.** $15\frac{1}{6}$

**25.** $3\frac{4}{5}$

**26.** 69.95

**27.** 1.2

**28.** 33 flats

**29.** $\frac{4}{5}$

**30.** $m\angle a = 50°$;
  $m\angle b = 40°$;
  $m\angle c = 80°$

## LESSON 54

### MENTAL MATH:

**a.** $18.00

**b.** 1.275

**c.** 8

**d.** 150 cm

**e.** 3

**f.** 27

**g.** $1\frac{3}{20}, \frac{7}{20}, \frac{3}{10}, 1\frac{7}{8}$

### PROBLEM SOLVING:

3 girls

### PRACTICE

**a.** 49 boys

**b.** 25 sparrows

**c.** 405 untagged fish

### PROBLEM SET 54

**1.** 83 years
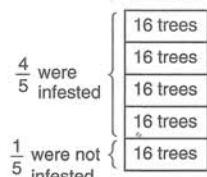
**2.** 197 cm

**3.** 960 losers

**4.** $4.55

**5.** $\frac{12}{2} = 6$

**6.**
```
                 80 trees
              ┌───────────┐
              │ 16 trees  │
              │ 16 trees  │
  4/5 were    │ 16 trees  │
  infested    │ 16 trees  │
              ├───────────┤
  1/5 were not│ 16 trees  │
  infested    └───────────┘
```
  (a) 64 trees
  (b) 16 trees

**7.** (a) $4.05 \times 10^5$
  (b) 4000

**8.** (a) 8   (b) 4

**9.** (a) 1760 yd
  (b) 3000 mm

**10.** 3.1416

**11.** (a) 144°   (b) 108°
  (c) 72°   (d) 36°

**12.** (a) 240 miles
  (b) 5 hours

**13.** B. $2^4$

**14.** 42 cm

**15.** 62 cm$^2$

**16.** (a) identity property of addition
  (b) distributive property
  (c) associative property of addition

**17.** (a) 2 inches
  (b) 0.25 square inches

**18.** The average score is likely to be below the median score. The mean "balances" low scores with high scores. The scores above the median are not far enough above the median to allow the balance point for all the scores to be at or above the median.

**19.** 2.1

**20.** 1.41

**21.** 18

**22.** 1

**23.** 111

**24.** 19
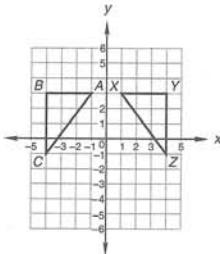
**25.** 1.25

**26.** 4 weeks  5 days

**27.** $6\frac{1}{3}$

**28.** 12

**29.**



**30.** (a) yes    (b) yes
   (c) $\angle C$

## LESSON 55

### MENTAL MATH:

**a.** $5.00

**b.** 37.5

**c.** 40

**d.** 3 km

**e.** $\frac{4}{9}$

**f.** 75

**g.** 75 pages

### PROBLEM SOLVING:

$$\begin{array}{r} 537 \\ \times\ 17 \\ \hline 3759 \\ 537\phantom{0} \\ \hline 9129 \end{array}$$

### PRACTICE

**a.** 90 points

**b.** 68

**c.** 79

### PROBLEM SET 55

**1.** 32 rowboats

**2.** 105

**3.** $0.17 per container

**4.** $\frac{1}{2}$ in.

**5.**



   (a) 9 students
   (b) 30%

**6.** (a) $6.75 \times 10^8$
   (b) 186,000

**7.** (a) 10    (b) 6

**8.** (a) 288 inches
   (b) 50 centimeters

**9.** $0.02 \cdot 0.025 = 0.0005$

**10.** $4.65

**11.** (a) 0.2    (b) 20%
   (c) $\frac{1}{10}$    (d) 10%
   (e) $\frac{3}{4}$    (f) 0.75

**12.** (a) $\overline{AD}$    (b) $\overline{DC}, AH$
   (c) $\angle DAB$

**13.** (a) 48 cm²  (b) 16 cm²
   (c) 64 cm²

**14.** 6 inches

**15.** (a) $\frac{5\ \text{laps}}{4\ \text{min}}; \frac{4\ \text{min}}{5\ \text{laps}}$
   (b) 25 laps
   (c) 16 minutes

**16.** 49

**17.** 400

**18.** $\frac{1}{2}(\frac{1}{4} + \frac{1}{2})$
   $\frac{1}{2}(\frac{3}{4})$
   $\frac{3}{8}$
   or
   $\frac{1}{2}(\frac{1}{4} + \frac{1}{2})$
   $\frac{1}{8} + \frac{1}{4}$
   $\frac{3}{8}$

**19.** 52

**20.** 56

**21.** 360 in.

**22.** 9 yd

**23.** $14\frac{1}{8}$

**24.** $3\frac{7}{15}$

**25.** $73\frac{1}{2}$

**26.** $\frac{4}{9}$

**27.** 8.111

**28.** 0.00168

**29.** $20.00

**30.** $m\angle a = 38°$;
   $m\angle b = 52°$;
   $m\angle c = 38°$

## LESSON 56

### MENTAL MATH:

**a.** 75

**b.** 0.025

**c.** 12

**d.** 50 cm

**e.** 400

**f.** $35.00

**g.** −3

### PROBLEM SOLVING:

$9 \times 10 = 90$

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## PRACTICE

a. 1 hr 44 min 8 s

b. 4 yd 1 ft 10 in.

c. 18 hr, 45 min

## PROBLEM SET 56

1. nine ten thousandths

2. (a) 9 feet    (b) 42 feet

3. $4

4. 86

5. Brand X = 12.5¢ per ounce;
   Brand Y = 12¢ per ounce;
   Brand Y is a better buy.

6. (a) $\frac{3}{8}$    (b) $\frac{3}{5}$
   (c) $62\frac{1}{2}\%$

7. (a) $\angle QPR$ and $\angle TPS$,
       $\angle RPS$ and $\angle QPT$
   (b) $\angle RPQ$ and $\angle SPT$

8. (a) $6.1 \times 10^5$
   (b) 15,000

9. (a) 9 days
   (b) 300 seconds

10. (a) 0.17    (b) $16\frac{2}{3}\%$

11. $1 \times 10^8$ pennies

12. >

13. 70

14. 18°F

15. 40

16. 1.5

17. 110 mm

18. 490 mm$^2$

19. 90

20. 2

21. 8 yd 2 ft

22. 2 yd 2 ft 6 in.

23. 352 km

24. $6\frac{2}{3}$

25. 3

26. $4\frac{11}{16}$

27. The first five numbers in the sequence are the squares of the first five counting numbers. So the 99th number in the sequence is 99$^2$.
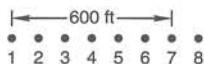
28. See student work. If done accurately, the longest side is twice the length of the shortest side.

29. 25 centimeters

30. (2, 1)

## LESSON 57

### MENTAL MATH:
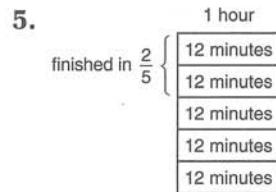
a. 128

b. 4200

c. 28

d. 0.5 L

e. 100

f. $10.00

g. $2\frac{1}{2}$

### PROBLEM SOLVING:

|←——600 ft——→|
• • • • • • • •
1 2 3 4 5 6 7 8

### PRACTICE

a. $2.5 \times 10^{-7}$

b. $1 \times 10^{-9}$

c. $1.05 \times 10^{-4}$

d. 0.00000045

e. 0.001

f. 0.0000125

g. <

h. >

## PROBLEM SET 57

1. 189 riders

2. 100

3. $123.90

4. $0.26 per pint

5.
finished in $\frac{2}{5}$ {
1 hour
12 minutes
12 minutes
12 minutes
12 minutes
12 minutes
}
   (a) 24 minutes
   (b) 40%

6. (a) $1.86 \times 10^5$
   (b) $4 \times 10^{-5}$
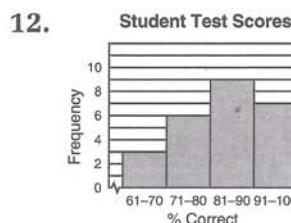
7. (a) 32.5
   (b) 0.0000015

8. 2 liters

9. 0.14286

10. $\frac{1}{3}$

11. $13.75

12.
Student Test Scores

13. (a) =    (b) =

14. 18 yd

15. 12 yd$^2$

16. 10

17. $5.00

18. 41

19. 1394

20. 8

21. 1 yd 2 ft 10 in.

22. 6 gal 2 qt 11 oz

23. 3 pt

24. $21\frac{1}{3}$

25. $11\frac{3}{8}$

26. $\frac{1}{45}$

27. 0.506

28. 8.275

29. 0.0018

30. 5000

## LESSON 58

### MENTAL MATH:

a. 215

b. 0.0042

c. 15

d. 1500 g

e. 10

f. $22.00

g. 1.8, 0.6, 0.72, 2

### PROBLEM SOLVING:

6 handshakes

### PRACTICE

a.

b. $(-3, 4)$

c. 35

d. 5

### PROBLEM SET 58

1. 14 kilometers

2. $3.75

3. 37

4. (a) $\frac{1}{3}$    (b) $\frac{3}{4}$
   (c) 25%

5. 123

6. 
60 questions

$\frac{3}{5}$ were multiple-choice { 12 questions / 12 questions / 12 questions }

$\frac{2}{5}$ were not multiple-choice { 12 questions / 12 questions }

   (a) 36 questions
   (b) 40%

7. (a) $\overline{OA}, \overline{OB}, \overline{OC}$
   (b) $\overline{AC}, \overline{BC}$
   (c) 60°    (d) 30°

8. (a) $1 \times 10^{-7}$
   (b) 15,000,000

9. =

10. 19

11. 5, 0, −5

12. (a) $0.1\overline{6}$    (b) $16\frac{2}{3}\%$
    (c) $\frac{4}{25}$    (d) 0.16

13. 8

14. (a) 55° (b) 125°
    (c) 20°

15. (a) (3, 2)    (b) 9 units²

16. 5 lines

17. (a) $3\frac{1}{2}$ hours
    (b) 3 hours

18. 10

19. 1.53

20. 909

21. 0

22. 3 gal 1 qt

23. 18 hr 45 min

24. 10,560 ft

25. $6\frac{1}{12}$

26. $3\frac{1}{2}$

27. 5

28. 0

29. (a) $2.5, 2, \frac{3}{2}, 0, -\frac{1}{2}, -1$
    (b) −1, 0, 2

30. Tom could double both numbers before dividing, making the equivalent division problem 70 ÷ 5. He could also double both of these numbers making 140 ÷ 10.

## LESSON 59

### MENTAL MATH:

a. 324

b. 0.5

c. 2

d. 1.85 m

e. 16
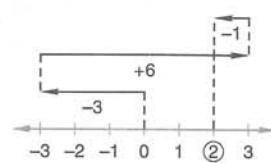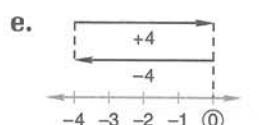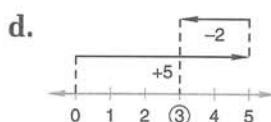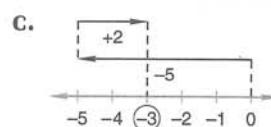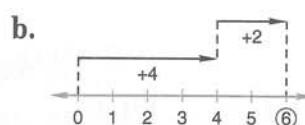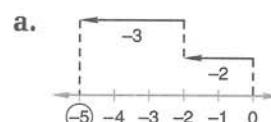
f. $35.00

g. $60.00

### PROBLEM SOLVING:

400 cm²

### PRACTICE

a.

b.

c.

d.

e.

f.

g. 6

h. 0

i. 2

### PROBLEM SET 59

1. $8.30

2. 5°F

3. 86°F

4. 216

5. 98 sonorous voices

**6.**



20 games

$\frac{3}{4}$ won { 5 games / 5 games / 5 games

$\frac{1}{4}$ failed to win { 5 games

(a) 15 games

(b) 25%
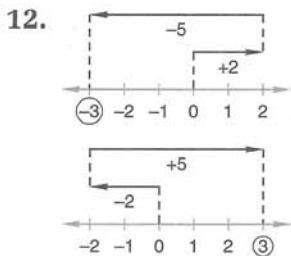
**7.** =

**8.** (a) $4 \times 10^{12}$

(b) 3,670,000,000 miles

**9.** (a) 0.000001 meter

(b) =

**10.** 0.3 m

**11.** (a) $\frac{3}{25}$ (b) 0.12

(c) $0.\overline{3}$ (d) $33\frac{1}{3}\%$

**12.**



**13.** 20

**14.** 0.55

**15.** 1.2

**16.** $\frac{1}{60}$

**17.** 0.052

**18.** 250 mm

**19.** 2025 mm$^2$

**20.** 10

**21.** 1

**22.** 5 yd 1 in.

**23.** 1 pt 10 oz

**24.** 125 mi

**25.** 1

**26.** $\frac{17}{18}$

**27.** $1\frac{9}{10}$

**28.** 0.04

**29.** $1.17

**30.** $\frac{2}{5}$

## LESSON 60

### MENTAL MATH:

**a.** 161

**b.** 4.35

**c.** 10

**d.** 7.5 cm

**e.** 7

**f.** 80¢

**g.** 30¢

### PROBLEM SOLVING:

$$\begin{array}{r} 367 \\ \times \quad 3 \\ \hline 1101 \end{array}$$

(1101 divisible by 3)

### PRACTICE

**a.** $W_N = \frac{4}{5} \times 71; \ 56\frac{4}{5}$

**b.** $\frac{3}{8} \times 3\frac{3}{7} = W_N; \ 1\frac{2}{7}$

**c.** $W_N = 0.6 \times 145; \ 87$

**d.** $0.75 \times 14.4 = W_N; \ 10.8$

**e.** $W_N = 0.5 \times 150; \ 75$

**f.** $0.03 \times \$39 = M; \ \$1.17$

**g.** $W_N = 0.25 \times 64; \ 16$

### PROBLEM SET 60

**1.** 1.2181

**2.** 100 boards

**3.** 432

**4.** (a) 20% (b) $\frac{4}{1}$

**5.** 84 inches

**6.** (a) $8 \times 10^{-8}$

(b) $6.75 \times 10^{10}$

**7.**



96 members

$\frac{2}{3}$ approved { 32 members / 32 members

$\frac{1}{3}$ did not approve { 32 members

(a) 64 members

(b) $33\frac{1}{3}\%$

**8.** $W_N = \frac{3}{4} \times 17; \ 12\frac{3}{4}$

**9.** $W_N = 0.7 \times 6.5; \ 4.55$

**10.** $0.4 \times \$65 = P; \ \$26$

**11.** (a) > (b) =

**12.** (a) 0.125 (b) $12\frac{1}{2}\%$

(c) $1\frac{1}{4}$ (d) 1.25

**13.** (a)



(b)



**14.** (a) $3600 = 2^4 \cdot 3^2 \cdot 5^2$

(b) $\sqrt{3600} = 60$

$= 2^2 \cdot 3 \cdot 5$

**15.** $\frac{1}{12}$

**16.** 0.013

**17.** (a) 180° (b) 120°

(c) 60°

**18.** (a) $\triangle CDB$ (b) $\triangle CEA$

**19.** (a) 24 ft$^2$ (b) 96 ft$^2$

**20.** 48 ft$^2$

**21.** 33

**22.** 5 days 8 hr 42 min

**23.** $72\frac{11}{24}$

**24.** $\frac{4}{15}$

**25.** $\frac{1}{8}$ or 0.125

**26.** 5.915

**27.** 0.003

**28.** 0.035 m

**29.** The first division problem can be multiplied by $\frac{100}{100}$ to form the second division problem. Since $\frac{100}{100}$ equals 1, the quotients are the same.
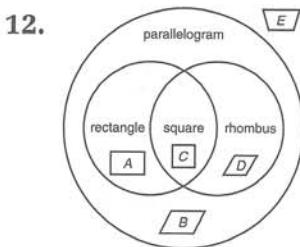
$$\frac{\$1.50}{\$0.25} = \frac{150¢}{25¢}$$

**30.** (0, 2)

## INVESTIGATION 6

1. $A, C$

2. $C, D$

3. $A, B, C, D$

4. $E$

5. $F, G$

6. $A, B, C, D, G$

7. $A, B, C, D$

8. $E$

9. $F, G$

10. $C, D$

11. $A, C$

12.
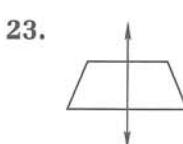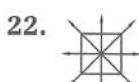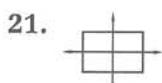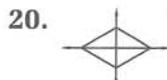


13. Figure K does not have four right angles so it is not a rectangle.

14. Figure K has two pairs of parallel sides so it is a parallelogram.

15. The lengths of the sides were not changed so the perimeters of both figures are the same.

16.



The area of Figure K is less than the area of Figure J. The area becomes less and less the more the sides are shifted.

17. $G$

18. 10 ft

19.



20.



21.



22.



23.



24. See student work. Yes.

25. $A, B, C, D$

26. True. A square is a parallelogram with four right angles.

27. True. All rectangles have two pairs of parallel sides.

28. False. All squares have two pairs of parallel sides, and trapezoids have only one pair of parallel sides.

29. True. Some parallelograms have four right angles.

30. True. A quadrilateral is a trapezoid if and only if it has one pair of parallel sides. No quadrilateral is both a trapezoid and a parallelogram.

## LESSON 61

### MENTAL MATH:

a. 230

b. 0.24

c. 30

d. 1500 m

e. 1

f. $2.10

g. $21.20

### PROBLEM SOLVING:

Since $31^2 = 961$, there are 31 perfect squares less than 1000.

### PRACTICE

a. 44 cm; 96 cm$^2$

b. 46 cm; 120 cm$^2$

c. 40 cm; 90 cm$^2$

d. 105°

e. 75°

f. 105°

g. 75°

h. 60°

i. 30°

j. 120°

### PROBLEM SET 61

1. $0.28 per pint

2. $1\frac{1}{2}$ cups

3. 54.6 seconds

4. 9 miles per hour

5. $5.604 \times 10^7$

6. (a) 70%  (b) $\frac{3}{7}$
   (c) $\frac{7}{10}$

7. (a) $1.05 \times 10^{-3}$
   (b) 302,000

8. $\frac{2}{3}$

9. 5280 feet

10. (a) parallelogram
    (b) trapezoid

11. (a) 24 cm$^2$  (b) 4 cm$^2$
    (c) 28 cm$^2$

12. (a) obtuse angle
    (b) right angle
    (c) acute angle

13. (a) 8     (b) 6
    (c) 9     (d) 2

14. (a) 56 cm    (b) 160 cm$^2$

    (c) 

15. (a) 60°    (b) 61°

    (c) 59°    (d) 60°

16. 0.02 m

17. (a) (0, 5), (0, −5)

    (b) 10 units

18. The scale is balanced so the 3 items on the left have a total mass of 50 g. The labeled masses total 15 g, so the cube must be 35 g because 35 g + 15 g = 50 g.

19. 109

20. 9999

21. 4 gal

22. 1 yd  5 in.

23. 2750 mL

24. $7\frac{17}{24}$

25. 10

26. $16\frac{2}{3}$

27. 10.23

28. 0.0006

29. 0.0005

30. 0.0225

## LESSON 62

### MENTAL MATH:

a. 43

b. 0.025

c. 3

d. 2.5 kg

e. 1

f. $16.00

g. 0

---

**PROBLEM SOLVING:**
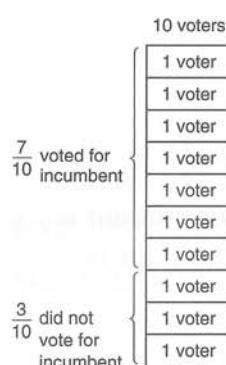
After Alice, 128 m remain. If the pattern continues, the baton will get closer to but will not cross the finish line.

### PRACTICE

a. right triangle

b. obtuse triangle

c. acute triangle

d. scalene triangle

e. equilateral triangle

f. isosceles triangle

g. 11 cm

h. $\angle L, \angle N, \angle M$

### PROBLEM SET 62

1. 2:40 p.m.

2. 188 miles

3. 23.5 miles per gallon

4. 2

5. 128 czarists

6.
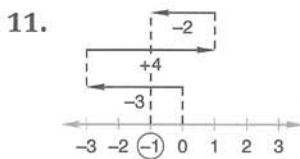


   (a) 70%      (b) $\frac{3}{10}$

7. $W_N = \frac{5}{6} \times 3\frac{1}{3}; \ 2\frac{7}{9}$

8. $10,850

9. 186,000; one hundred eighty-six thousand

10. <

11.



---

12. (a) 0.625    (b) $62\frac{1}{2}\%$

    (c) $2\frac{3}{4}$    (d) 2.75

13. 13

14. (a) 8      (b) 2

15. (a) $\triangle ZWY$   (b) $\triangle WYX$

    (c) $\triangle ZWX$

16. (a) 21 in.    (b) 22 in.$^2$

17. (a) isosceles triangle

    (b) 45°

    (c) 18 cm$^2$

    (d) $\angle C$

18. 0.204

19. $0.90

20. 50

21. 19

22. 2 yd  1 ft  $10\frac{1}{4}$ in.
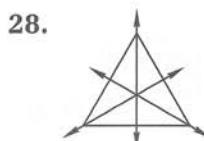
23. 950 mL

24. $1\frac{\text{mi}}{\text{min}}$

25. $5\frac{55}{96}$

26. 1

27. $8\frac{3}{4}$

28.



29. 1

30. 750 g

## LESSON 63

### MENTAL MATH:

a. 1230

b. 0.004

c. 6

d. 500 mL

e. 14

f. $9.00

g. 1400

---

PROBLEM SOLVING:

$\frac{120 \text{ mi}}{1 \text{ hr} + 2 \text{ hr}} = 40$ mph

BOTTOM OF PAGE 385
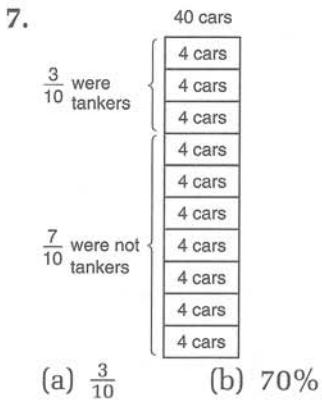
27; This is the numerator. 9; This is the denomenator. 3; This is the quotient.

PRACTICE

a. −2

b. 76

c. 3

d. 10

e. 30
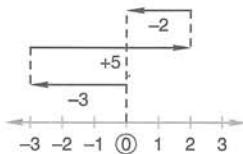
PROBLEM SET 63

1. $33

2. 2400 more times

3. 160 brachiopods

4. 890 miles

5. $W_N = 0.35 \times 840$; 294

6. one hundred forty-nine million, six hundred thousand kilometers

7.



(a) $\frac{3}{10}$   (b) 70%

8. two-thousandths mile per hour

9. 1500 m

10. $363.\overline{3}$

11.



12. (a) $\frac{33}{100}$   (b) 0.33
    (c) $0.\overline{3}$   (d) $33\frac{1}{3}$%

13. Divide the "in" number by 3 to find the "out" number.

14. $\frac{3}{26}$

15. (a) isosceles triangle
    (b) 15 cm   (c) $\triangle ABC$

16. (a) 60°   (b) 60°
    (c) 120°   (d) 60°
    (e) 30°   (f) 30°

17. $\frac{1}{2}$

18. $\frac{7}{36}$

19. 5

20. 25

21. 22

22. 3 days  22 hr

23. $5\frac{\text{mi}}{\text{qt}}$

24. $11\frac{1}{18}$

25. 200

26. $5\frac{7}{9}$

27. 49

28.



29. (a) See student work.
    (b) 12 sq. units
    (c) 45°

30. 250 g

LESSON 64

MENTAL MATH:

a. 180

b. 750

c. 10

d. 200 mm

e. 5

f. $1.00

g. 0.5

PROBLEM SOLVING:

60 cards

PRACTICE

a. +40

b. −173

c. +8

d. +4

e. −5

f. 0

g. $+1\frac{1}{2}$

h. −13.07

PROBLEM SET 64

1. $1.25 \times 10^{12}$

2. $1.45

3. 4 packages

4. 112

5. 2.02

6.



(a) 480 serfs
(b) 60%

7. $W_N = \frac{5}{9} \times 100$; $55\frac{5}{9}$

8. (a) sixteen million degrees Celsius
   (b) seven millionths meter

9. (a) >   (b) >

10. (a) $16\frac{2}{7}$   (b) 16.29
    (c) 16

11. (a) −77   (b) −28

12. (a) $2\frac{1}{2}$   (b) 250%
    (c) $0.\overline{4}$   (d) $44\frac{4}{9}$%

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13. (a) 60°
    (b) The chords are $\overline{AB}$, $\overline{BC}$, and $\overline{CA}$. Each chord is shorter than the diameter, which is the longest chord of a circle.

14. $1\frac{1}{6}$

15. 3.4 m

16. 0.52 m²

17. $\frac{2}{3}$

18. 0.4 or $\frac{2}{5}$

19. 28

20. B. (−2, 1)

21. 5

22. $1\frac{1}{6}$

23. 51

24. 7 gal 1 pt

25. $\frac{7}{12}$

26. 0.091

27. 1.5

28. 1.175

29. $\frac{1}{6}$

30. (a) 122°   (b) 58°
    (c) 122°
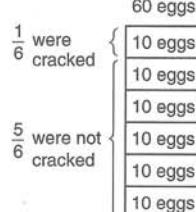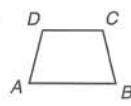
### LESSON 65

#### MENTAL MATH:

a. 21

b. 0.125

c. 6

d. 750 mm

e. 25

f. $3.60

g. $21.40

#### PROBLEM SOLVING:

$$\begin{array}{r} 91\frac{1}{2} \\ 10\overline{)915} \\ \underline{90} \\ 15 \\ \underline{10} \\ 5 \end{array}$$

#### PRACTICE

a. 45 clowns

b. 510 young people

### PROBLEM SET 65

1. (a) $0.48 per pound
   (b) $3.84

2. (a) 0.27 = 0.27
   (b) distributive property

3. 352 big fish

4. 23.3 $\frac{\text{miles}}{\text{gallon}}$

5. $\frac{3}{8}$

6. $1.2 \times 10^{10}$

7.

   $\frac{1}{6}$ were cracked { 60 eggs: 10 eggs, 10 eggs, 10 eggs; $\frac{5}{6}$ were not cracked { 10 eggs, 10 eggs, 10 eggs

   (a) 50 eggs   (b) $\frac{1}{5}$
   (c) $16\frac{2}{3}$%

8. (a)

   (b) trapezoid

9. (a) 12 cm²   (b) 12 cm²
   (c) 12 cm²

10. 0.82

11. $W_N = 0.75 \times 64$; 48

12. $T = 0.08 \times \$7.40$; $0.59

13. (a) −11   (b) −5
    (c) 0

14. (a) (5, 0), (−5, 0)
    (b) 10 units

15. 950 milliliters

16. 31

17. 27 blocks

18. (a) ∠COD   (b) ∠AOB

19. 100

20. (a) 59°   (b) $\overline{AB}$
    (c) isosceles triangle
    (d) C

21. (a) We arrange the numbers in order and look for the middle number. Since there is an even number of scores there is no one middle number. So the median is the mean of the two middle numbers.
    (b) 16.5

22. (a) false   (b) true

23. $10^4$ or 10,000

24. 2 yd 1 ft 4 in.

25. 2 days 21 hr 25 min

26. 5

27. 1.5

28. $1\frac{1}{5}$

29. 14

30. 51

### LESSON 66

#### MENTAL MATH:

a. 6.85

b. 0.0012

c. 8

d. 2 meters

e. 20

f. 6

g. 75

#### PROBLEM SOLVING:

7, 11, 13
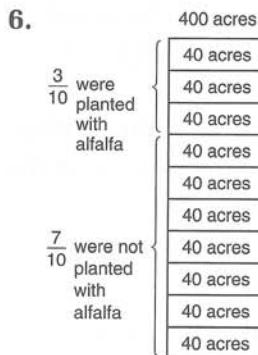
#### PRACTICE

a. 25.12 in.

b. 132 mm

c. $4\pi$ ft

d. 18.84 inches

### PROBLEM SET 66

1. 33%; $6250

2. $12\frac{1}{2}$ miles

3. 0.08

4. 200 dimes

5. $9 \times 10^8$ miles

6.

```
                    400 acres
              ┌─ 40 acres
  3           │  40 acres
 ── were      │  40 acres
 10 planted  ┤  40 acres
    with      │  40 acres
    alfalfa   └─ 40 acres
              ┌─ 40 acres
  7           │  40 acres
 ── were not ┤  40 acres
 10 planted   └─ 40 acres
    with
    alfalfa
```

(a) 30%

(b) 280 acres

7. (a) $\frac{2}{5}$     (b) 40%

(c) A randomly selected test is more likely not to be an A test because less than half the tests are A's.

8. (a) 65.94 in.

(b) 66 in.

9. (a) 336 cm$^2$

(b) 168 cm$^2$

(c) 64 cm

10. $3.25 \times 10^{10}$

11. $W_N = 0.9 \times 3500$; 3150

12. $W_N = \frac{5}{6} \times 2\frac{2}{5}$; 2

13. (a) $\frac{9}{20}$     (b) 45%

(c) $\frac{3}{40}$     (d) 0.075

14. (a) 6     (b) 0
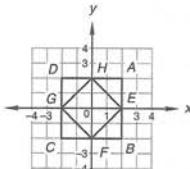
15. 1400 grams

16. (a) 55°     (b) 55°

(c) 125°     (d) 55°

(e) 125°

17. 30,000,000

18. =

19.



(a) 16 units$^2$

(b) 4 units

(c) 8 units$^2$

(d) $\sqrt{8}$ units (How to simplify $\sqrt{8}$ will be taught in a later course.)

20. 20

21. $\frac{11}{14}$

22. 6 lb 3 oz

23. $36\frac{\text{in.}}{\text{yd}}$

24. 0.8

25. 0.032

26. $1\frac{1}{2}$

27. 5

28. Example: If a dozen popsicles cost $2.88, what is the price of each popsicle?

29. $4\frac{1}{2}$ ounces

30. (a) $\overline{AB}, \overline{BC}$

(b) isosceles triangle

(c) 90°

### LESSON 67

#### MENTAL MATH:

a. 33.6

b. 3850

c. 5

d. 200 dm

e. 100

f. 18

g. 720

#### PROBLEM SOLVING:

90 minutes

### PRACTICE

a. triangular prism

b. cone

c. rectangular prism

d. 5 faces

e. 9 edges

f. 6 vertices

g. 

h. 

i. 

j. triangular prism

k. 54 cm$^2$

### PROBLEM SET 67
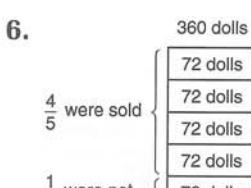
1. (a) $\frac{1}{2}$     (b) $\frac{3}{2}$     (c) $\frac{2}{3}$

2. $\frac{2}{3}$

3. $14\frac{1}{2}$ pounds

4. (a) 88 points

(b) 90.5 points

5. 150 diamonds

6.

```
                  360 dolls
              ┌─ 72 dolls
  4           │  72 dolls
 ── were sold ┤  72 dolls
  5           └─ 72 dolls
  1 were not { 72 dolls
 ── sold
  5
```

(a) 288 dolls

(b) 20%

7. (a) 12 edges

(b) 6 faces

(c) 8 vertices

8. (a) 54 m$^2$     (b) 16 m

(c) 53°

(d) The right triangle is not symmetrical.

9. 7.74

10. $2.5 \times 10^{-3}$

11. $W_N = 0.24 \times 75$; 18

12. $W_N = 1.2 \times 12$; 14.4

13. (a) −9     (b) 3

14. (a) $\frac{1}{25}$     (b) 0.04
(c) 0.875
(d) 87.5% or $87\frac{1}{2}$%

15. 70 cm

16. 1

17. Multiply the "in" number by 7 to find the "out" number; 7

18. (a) 7856.43
(b) 7900

19. 75 inches

20. (a) $\angle A$ and $\angle B$
(b) $\angle B$ and $\angle D$

21. (a) 2(5 ft + 3 ft)
       2(8 ft)
        16 ft
       or
     2(5 ft + 3 ft)
     10 ft + 6 ft
        16 ft
(b) distributive property

22. 2

23. 145

24. 1 ft, 9 in.

25. 5.84

26. 2

27. $3\frac{1}{12}$

28. 1

29. $2\frac{1}{12}$

30. 29

## LESSON 68

### MENTAL MATH:

a. 1.25

b. $\frac{3}{4}$

c. 9

d. 30

e. 200 cm

f. 8

g. 7 m; 3 m$^2$

### PROBLEM SOLVING:

6 triangles

### PRACTICE

a. −5

b. −1

c. 1

d. −1

e. −13

f. −13

### PROBLEM SET 68

1. 687 g

2. 20 hexagons

3. 6

4. (a) $0.31 per pen
(b) $31.00

5. (a) 12 miles per hour
(b) 5 minutes per mile

6. 3 seconds

7. (a) 88      (b) 84
(c) 84

8. 9.1
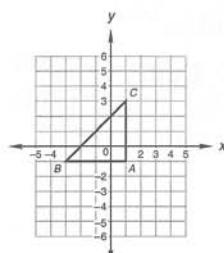
9. (a) 12 cubes
(b) rectangular prism

10. (a) 125.6 cm
(b) $40\pi$ cm

11.



(a) right triangle
(b) isosceles triangle
(c) A
(d) 45°
(e) 8 sq. units

12. $6 \times 10^8$

13. $W_N = 0.75 \times 400$; 300

14. $W_N = 1.5 \times 1.5$; 2.25
or $W_N = 1\frac{1}{2} \times 1\frac{1}{2}$; $2\frac{1}{4}$

15. (a) 2      (b) −10
(c) −2      (d) 10

16. 96 in.$^2$

17. (a) $0.1\dot{2}$      (b) 12%
(c) $1\frac{1}{5}$      (d) 1.2

18. 81

19. (a) rectangular prism
(b) cone
(c) cylinder

20. (a) 45°      (b) 75°
(c) 45°      (d) 60°
(e) 75°      (f) 120°

21. Example: How many $0.25 pens can you buy with $3.00?

22. 10

23. 0.15

24. 2 qt, 15 oz

25. 320

26. 9.901

27. $\frac{3}{8}$

28. $10\frac{1}{8}$

29. 3

30. 21

## LESSON 69

### MENTAL MATH:

a. 2.5

b. 0.075

c. 2

d. 630

e. 2 dm

f. 16

g. $3\frac{1}{2}$

### PROBLEM SOLVING:

6 oz

### PRACTICE

a. $1.6 \times 10^5$

b. $2.4 \times 10^{-6}$

c. $3 \times 10^6$

**d.** $7.5 \times 10^{-9}$

**e.** $1.44 \times 10^9$

**f.** $1.24 \times 10^{-4}$

### PROBLEM SET 69

1. (a) 6.5    (b) 6.5
   (c) 6.7    (d) 1.4

2. 24 games

3. 15 minutes
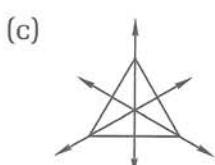
4. (a) $1.5 \times 10^6$
   (b) $1.5 \times 10^4$

5. (a) $\frac{3}{5}$
   (b) 24 Lilliputians
   (c) $\frac{2}{5}$

6. 126 cm

7. (a) sphere
   (b) cylinder
   (c) cone

8. (a) $1\frac{7}{8}$ in.    (b) 60°
   (c)

9. (a) −3    (b) −6

10. (a) 21.98 cm
    (b) 22 cm

11. (a) 108 mm$^2$
    (b) 60 mm$^2$
    (c) $\frac{5}{9}$

12. $W_N = \frac{1}{2} \times 200$; 100

13. $W_N = 2.5 \times 4.2$; 10.5

14. (a) 0.15    (b) 15%
    (c) $1\frac{1}{2}$    (d) 1.5

15. (a) $\angle TPQ$    (b) $\angle SPR$
    (c) 145°

16. 16

17. Multiply the "in" number by 2, then subtract 1 to find the "out" number; 7

18. (a) $13.\overline{09}$    (b) 13

19. 68°F

20. 7 and 31

21. $\frac{5}{16}$

22. 14

23. 12 ft 3 in.

24. $21\frac{km}{min}$

25. 5.875

26. $100.00

27. $6\frac{3}{4}$

28. $8\frac{3}{8}$

29. $\frac{16}{25}$

30. (a) 2.4    (b) $7\frac{1}{3}$

### LESSON 70

#### MENTAL MATH:

**a.** 8.1

**b.** 625

**c.** 6

**d.** $240.00

**e.** 2000 mm

**f.** 15

**g.** 2 m; 0.25 m$^2$

#### PROBLEM SOLVING:

$$\begin{array}{r} 97 \\ \times\ \ 7 \\ \hline 679 \end{array}$$

#### PRACTICE

**a.** 72 cubes

**b.** 1000 1-cm cubes

**c.** 240 ft$^3$

### PROBLEM SET 70

1. 19 kilometers per hour

2. (a) (−3, 1)
   (b) 15 sq. units

3. A little too large, because the diameter equals the circumference divided by π, which is more than 3. Therefore, the diameter must be less than 200 cm.

4. (a) $0.43 per pound
   (b) $4.30

5. 0.58

6. (a) 141 hits
   (b) 25%

7. $2\frac{1}{4}$-inch mark

8. 75 1-cm cubes

9. (a) $2\pi$ in.    (b) 3.14 in.

10. (a) $1.2 \times 10^{-5}$
    (b) $1.2 \times 10^{-7}$

11. 0.85

12. 1250 grams

13. (a) 9    (b) 3

14. $W_N = \frac{1}{6} \times 100$; $16\frac{2}{3}$

15. (a) $\frac{7}{50}$    (b) 0.14
    (c) $0.8\overline{3}$    (d) $83\frac{1}{3}$%

16. (a) 0    (b) −9

17. 0.02

18. 29,375

19. 48

20. pyramid;

21. 24 ft$^2$

22. 5.1

23. 2.5

24. 3 lb 9 oz

25. $\frac{\$210.00}{week}$

26. $\frac{3}{4}$

27. $8\frac{1}{3}$

28. 3

29. 87.4

30. (a) $15.90    (b) $2.25

### INVESTIGATION 7
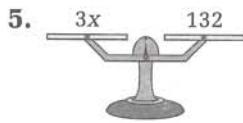
1. subtract 18

2. Subtract 18 from both sides of the equation.

3. On the left side will be 27, and on the right side will be $x$.
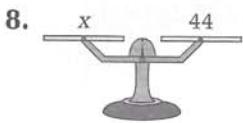
4. Yes, the equation would still be balanced.
$$x + 18 = 45$$

5. 
$3x$     $132$

6. divide by 3

7. Divide both sides of the equation by 3.

8. 
$x$     $44$

9. $3x = 132$
$$\frac{3x}{3} = \frac{132}{3}$$
$$x = 44$$

10. $3x = 132$
$3(44) = 132$
$132 = 132$

11. multiply by $\frac{4}{3}$

12. Multiply both sides of the equation by $\frac{4}{3}$.

13. $\frac{3}{4}x = \frac{9}{10}$
$\frac{4}{3} \cdot \frac{3}{4}x = \frac{9}{10} \cdot \frac{4}{3}$
$1x = \frac{30}{36}$
$x = \frac{6}{5}$ or $\left(1\frac{1}{5}\right)$

14. $\frac{3}{4}x = \frac{9}{10}$
$\frac{3}{4} \cdot 1\frac{1}{5} = \frac{9}{10}$
$\frac{3}{4} \cdot \frac{6}{5} = \frac{9}{10}$
$\frac{18}{20} = \frac{9}{10}$
$\frac{9}{10} = \frac{9}{10}$ ✓

15. (a) subtract 2.5
(b) Subtract 2.5 from both sides of the equation.
(c) $x + 2.5 = 7$
$x + 2.5 - 2.5 = 7 - 2.5$
$x + 0 = 4.5$
$x = 4.5$
(d) $x + 2.5 = 7$
$4.5 + 2.5 = 7$
$7 = 7$ ✓

16. (a) subtract 2
(b) Subtract 2 from both sides of the equation.
(c) $3.6 = y + 2$
$3.6 - 2 = y + 2 - 2$
$1.6 = y + 0$
$1.6 = y$
(d) $3.6 = y + 2$
$3.6 = 1.6 + 2$
$3.6 = 3.6$ ✓

17. (a) divide by 4
(b) Divide both sides of the equation by 4.
(c) $4w = 132$
$\frac{4w}{4} = \frac{132}{4}$
$w = 33$
(d) $4w = 132$
$4(33) = 132$
$132 = 132$ ✓

18. (a) divide by 1.2
(b) Divide both sides of the equation by 1.2.
(c) $1.2m = 1.32$
$\frac{1.2m}{1.2} = \frac{13.2}{1.2}$
$m = 1.1$
(d) $1.2m = 1.32$
$1.2(1.1) = 1.32$
$1.32 = 1.32$ ✓

19. (a) subtract $\frac{3}{4}$
(b) Subtract $\frac{3}{4}$ from both sides of the equation.
(c) $x + \frac{3}{4} = \frac{5}{6}$
$x + \frac{3}{4} - \frac{3}{4} = \frac{5}{6} - \frac{3}{4}$
$x + 0 = \frac{10}{12} - \frac{9}{12}$
$x = \frac{1}{12}$
(d) $x + \frac{3}{4} = \frac{5}{6}$
$\frac{1}{12} + \frac{3}{4} = \frac{5}{6}$
$\frac{1}{12} + \frac{9}{12} = \frac{5}{6}$
$\frac{10}{12} = \frac{5}{6}$
$\frac{5}{6} = \frac{5}{6}$ ✓

20. (a) multiply by $\frac{4}{3}$
(b) Subtract $\frac{4}{3}$ from both sides of the equation.
(c) $\frac{3}{4}x = \frac{5}{6}$
$\frac{4}{3} \cdot \frac{3}{4}x = \frac{5}{6} \cdot \frac{4}{3}$
$1x = \frac{20}{18}$
$x = \frac{10}{9}$
(d) $\frac{3}{4}x = \frac{5}{6}$
$\frac{3}{4} \cdot \frac{10}{9} = \frac{5}{6}$
$\frac{30}{36} = \frac{5}{6}$
$\frac{5}{6} = \frac{5}{6}$ ✓

21. See student work.

22. See student work.

### LESSON 71

### MENTAL MATH:

a. −15

b. 0.0045

c. 80

d. 30

e. 0.5 m

f. $27

g. $32.40

### PROBLEM SOLVING:

9 combinations:
A1, A2, A3,
B1, B2, B3,
C1, C2, C3

### PRACTICE

a. 
25 students

b. 
40 clowns

**c.**



$\frac{3}{4}$ had been answered (12)
$\frac{1}{4}$ will be answered

4 questions
4 questions
4 questions
4 questions

16 questions

16 questions

### PROBLEM SET 71

1. 3 kilometers

2. 3.43

3. 86 percent

4. $1.1 \times 10^{10}$

5. 28

6. 88 new ones

7.



130 pages

$\frac{3}{5}$ read (78)
$\frac{2}{5}$ not read

26 pages
26 pages
26 pages
26 pages
26 pages

   (a) 130 pages
   (b) 52 pages

8. 64 1-inch cubes

9. 96 in.$^2$

10. (a) 87.92 cm
    (b) 88 cm

11. (a) $2.5 \times 10^7$
    (b) $2.5 \times 10^{-5}$

12. (a) $\frac{1}{10}$     (b) 10%
    (c) $\frac{1}{200}$     (d) 0.005

13. (a) $W_N = 0.35 \times 80$; 28
    (b) $\frac{3}{4} \times 24 = W_N$; 18
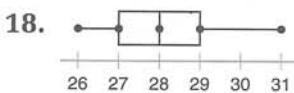
14. Add 7 to the "in" number to find the "out" number. 7

15.
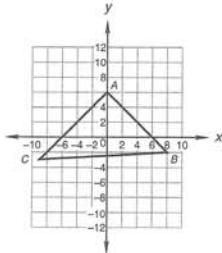

;
8 vertices

16. (a) 36 cm    (b) 24 cm$^2$
    (c) 48 cm$^2$    (d) 72 cm$^2$

17. about $2.50

18.



   26  27  28  29  30  31

19.



$m\angle A = 90°$;
$m\angle B = 48°$;
$m\angle C = 42°$

20. 0.009

21. 20.65

22. 64

23. rhombus

24. 5

25. 1 ft 11 in.

26. 12,600 s

27. $\frac{5}{9}$

28. $3\frac{2}{3}$

29. (a) −18      (b) 1

30. $1\frac{1}{6}$

### LESSON 72

#### MENTAL MATH:

a. 7

b. $\frac{4}{9}$

c. 5

d. 3.6

e. 0.5 kg

f. $12

g. $4.50

#### PROBLEM SOLVING:

6 oz;
$3X + 6 = 18 + X$

#### PRACTICE

a. 5 hours

b. $7\frac{1}{2}$ bales

c. 27

### PROBLEM SET 72

1. 52 years

2. 7 points

3. 2500 milliliters

4. $\frac{7}{10}$

5. 441 herbivores

6. $31\frac{1}{2}$ pounds

7. (a) $\frac{2}{5} \times 60 = W_N$; 24
   (b) $M = 0.75 \times \$24$; $18

8. 63 in.

9.



225 votes

$\frac{2}{3}$ for Edmund (150)
$\frac{1}{3}$ not for Edmund

75 votes
75 votes
75 votes

   (a) 225 votes
   (b) 75 votes

10. 480 ice cubes

11. 376 in.$^2$

12. (a) $6 \times 10^5$
    (b) $6 \times 10^{-7}$

13. 1.46

14. (a) 0.6      (b) 60%
    (c) $\frac{1}{40}$      (d) 0.025

15. (a) $8100 = 2^2 \cdot 3^4 \cdot 5^2$
    (b) 90
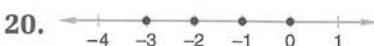
16. (a) 48 in.$^2$   (b) 24 in.$^2$
    (c) 108°

17. (a) sphere
    (b) triangular prism
    (c) cylinder
    Only the triangular prism is a polyhedron because it is the only figure whose faces are polygons.

18. (a) $60\pi$ mm
    (b) 188.4 mm

19. <

20.



   −4  −3  −2  −1  0  1

21. 9

22. $2\frac{5}{12}$

23. 36

**24.** 4

**25.** 3 qt 1 pt

**26.** 880 yd

**27.** $\frac{5}{24}$

**28.** 1

**29.** (a) −11    (b) 10

**30.** 7.15

### LESSON 73

#### MENTAL MATH:

**a.** −10

**b.** 8750

**c.** 36

**d.** 63

**e.** 0.5 L

**f.** $24

**g.** 6

#### PROBLEM SOLVING:
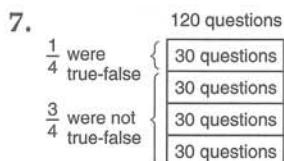
(a) 15

(b) 16

#### PRACTICE

**a.** −21

**b.** −32

**c.** 40

**d.** 24

**e.** −5

**f.** 9

**g.** −7

**h.** 5

**i.** −15

#### PROBLEM SET 73

**1.** 144 packages

**2.** 36 minutes

**3.** 7

**4.** 230 mm

**5.** 11,760 books

**6.** (a) $2.4 \times 10^{-4}$
(b) $2.4 \times 10^{8}$

**7.**

120 questions

$\frac{1}{4}$ were true-false { 30 questions / 30 questions }

$\frac{3}{4}$ were not true-false { 30 questions / 30 questions }

(a) 120 questions
(b) 90 questions

**8.** (a) $\frac{5}{9} \times 45 = W_N$; 25
(b) $W_N = 0.8 \times 760$; 608

**9.** (a) −4        (b) 6
(c) −27       (d) 56

**10.** $\frac{3}{8}$

**11.** (a) (−2, 2)
(b) isosceles triangle
(c) 76°

**12.** If the signs of the two factors are the same—both positive or both negative—then the product is positive. If the signs of the two factors are different, the product is negative.

**13.** 96 1-ft cubes

**14.** (a) 131.88 m
(b) 132 m

**15.** (a) $2\frac{1}{2}$       (b) 250%
(c) $\frac{1}{500}$       (d) 0.002

**16.** right; scalene; 24 cm²

**17.** obtuse; scalene; 10 cm²

**18.** acute; isosceles; 12 cm²

**19.** (a) pyramid
(b) cylinder
(c) cone

**20.** <

**21.** $\frac{13}{24}$

**22.** 25

**23.** 1.76

**24.** 0.28

**25.** 4 yd 1 ft 3 in.

**26.** 500 mm

**27.** 140

**28.** $\frac{15}{16}$

**29.** (a) 0        (b) −28

**30.** 3

### LESSON 74

#### MENTAL MATH:

**a.** 4

**b.** 0.045

**c.** 7

**d.** $3.00

**e.** 0.4 km

**f.** $20

**g.** 1

#### PROBLEM SOLVING:

2826 ft, which is more than $\frac{1}{2}$ mile

#### PRACTICE

**a.** $W_F \times 130 = 80$; $\frac{8}{13}$

**b.** $75 = W_D \times 300$; 0.25

**c.** $80 = 0.4 \times W_N$; 200

**d.** $60 = \frac{5}{6} \times W_N$; 72

**e.** $60 = W_F \times 90$; $\frac{2}{3}$

**f.** $W_D \times 80 = 60$; 0.75

**g.** $40 = 0.08 \times W_N$; 500

**h.** $\frac{6}{5} \times W_N = 60$; 50

#### PROBLEM SET 74

**1.** 36 pages

**2.** 1.5¢ per ounce

**3.** 54 inches

**4.** 30 students

**5.** $2.24

**6.**

300 triathletes

$\frac{5}{6}$ completed the course { 50 triathletes / 50 triathletes / 50 triathletes / 50 triathletes / 50 triathletes }

$\frac{1}{6}$ did not complete the course { 50 triathletes }

(a) 250 triathletes
(b) $\frac{5}{1}$

## Column 1

7. $15 = \frac{3}{8} \times W_N$; 40

8. $70 = W_D \times 200$; 0.35

9. $\frac{2}{5} \times W_N = 120$; 300

10. $P = 0.6 \times \$180.00$; $108.00

11. (a) 27 in.$^3$
    (b) 54 in.$^2$

12. (a) 44 m    (b) $14\pi$ m

13. (a) 3.5    (b) 350%
    (c) $\frac{7}{20}$    (d) 0.35

14. $W_N = 0.2 \times \$35.00$; $7.00

15. (a) Multiply the "in" number by 3 then add 1 to find the "out" number.
    (b) 16, 8

16. $4.25 \times 10^8$

17. (a) parallelogram
    (b) trapezoid
    (c) isosceles

18. (a) 80°    (b) 100°
    (c) 80°    (d) 80°
    (e) 20°    (f) 100°

19. 0.0103, 0.013, 0.021, 0.1023

20. $\frac{1}{6}$

21. $4\frac{3}{10}$

22. 0.046

23. 5.16

24. $\frac{4}{3}$

25. 12

26. 2 hr 49 min 45 s

27. (a) −34    (b) −53

28. (a) −36    (b) 36
    (c) −4    (d) 4

29. $15\frac{5}{6}$

30. south

## Column 2

### LESSON 75

#### MENTAL MATH:

a. −35

b. 225

c. 9

d. $60.00

e. 0.25 g

f. $3.50

g. 1.8

#### PROBLEM SOLVING:

$\frac{3}{4}$

#### PRACTICE

a. 88 cm$^2$

b. 174 cm$^2$

c. 240 cm$^2$

#### PROBLEM SET 75

1. 75 seconds

2. 8.3¢ per ounce

3. 1.5 kilometers

4. $\frac{4}{5}$

5. 20 years

6. =

7. $7\frac{1}{2}$ hours

8.

| 21,000 books | |
|---|---|
| $\frac{2}{5}$ were checked out | 4,200 books |
| | 4,200 books |
| $\frac{3}{5}$ were not checked out | 4,200 books |
| | 4,200 books |
| | 4,200 books |

(a) 8,400 books
(b) 12,600 books

9. $60 = \frac{5}{12} \times W_N$; 144

10. $0.7 \times \$35.00 = M$; $24.50

11. $35 = W_F \times 80$; $\frac{7}{16}$

12. $56 = W_D \times 70$; 0.8

13. (a) −30    (b) −132
    (c) 24    (d) 240

14. 3000 cm$^3$

15. $34\frac{1}{2}$ inches

## Column 3

16. 112 in.$^2$

17. (a) 20 cm    (b) 76 cm
    (c) 376 cm$^2$

18. (a) $1\frac{1}{4}$    (b) 1.25
    (c) 0.125    (d) $12\frac{1}{2}$%

19. $15.00

20. 3

21. 64

22. 22

23. 4.87

24. 78

25. 1 hr 24 min 32 s

26. 3600 in.

27. 12

28. $4\frac{9}{20}$

29. (a) −1    (b) −8

30. (a) 7    (b) 3

### LESSON 76

#### MENTAL MATH:

a. −12

b. 0.0625

c. 4

d. 18

e. 0.5 cm

f. 8

g. $26.50

#### PROBLEM SOLVING:

Kim: 7, 7, 3, 1, 1, 1

7, 3, 3, 3, 3, 1

Shell: 7, 7, 3, 3

4 attempts

#### PRACTICE

a. $\frac{3}{8}$

b. $14\frac{2}{5}$

c. $\frac{3}{5}$

d. $\frac{2}{3}$

e. $\frac{1}{12}$

f. $\frac{1}{24}$

*Math 87, Second Edition*

## LESSON 78

### MENTAL MATH:

a. 8

b. $\frac{9}{16}$

c. 6

d. $32.00

e. 0.75 kg

f. 72

g. $4.50 to $4.80

### PROBLEM SOLVING:

6, 7, 9, 10, 11, 12, 14, 15

### PRACTICE

a.

b.

c.

d.

### PROBLEM SET 78

1. 10 cartons

2. 94

3. $2\frac{5}{6}$
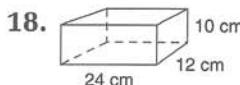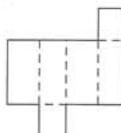
4. 63 monocotyledons

5. 66 millimeters

6. (a)

 (b)

7. 1500 g

8. (a) 20 more people

 (b) $\frac{1}{5}$

9. $42 = \frac{7}{10} \times W_N$; 60

10. $1.5 \times W_N = 600$; 400

11. $0.4 \times 50 = W_N$; 20

12. $40 = W_P \times 50$; 80%

13. (a) 0.0015

 (b) $2.5 \times 10^7$

14. (a) −5 (b) −30

 (c) −300 (d) 180

15. (a) $\frac{1}{2}$ (b) 0.5

 (c) $0.08\overline{3}$ (d) $8\frac{1}{3}$%

16. $\frac{5}{6}$

17. 640 mm$^2$

18.

 2880 cm$^3$

19. one possible pattern:

20. Multiply the "in" number by 5 and subtract 1 to find the "out" number; 19, 1

21. $5.55

22. 1.55

23. 27

24. 69

25. 30

26. 0

27. 10,000 cm$^2$

28. 10

29. $1\frac{19}{20}$
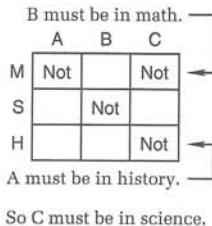
30. (a) −8 (b) 20

## LESSON 79

### MENTAL MATH:

a. −40

b. 3750

c. 250

d. $1.80

e. 1.2 L

f. 25

g. 25

### PROBLEM SOLVING:

B must be in math.

A must be in history.

So C must be in science.

### PRACTICE

a. >

b. =

c. insufficient information

d. insufficient information ($y$ could be greater, or both $x$ and $y$ could be zero.)

### PROBLEM SET 79

1. 26.8 students

2. 9 $\frac{\text{kilometers}}{\text{liter}}$
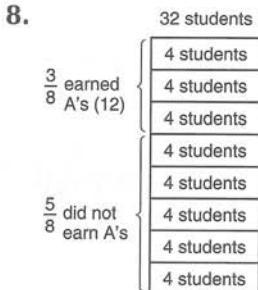
3. 210 more winners

4. (a) $3.75 \times 10^{-5}$

 (b) $3.75 \times 10^7$

5. insufficient information ($x < y$ if both are positive; $x > y$ if both are negative)

6. (a)

 (b)

7. 9 hours

8.

 (a) 20 students

 (b) $62\frac{1}{2}$%

9. $35 = 0.7 \times W_N$; 50

10. $W_P \times 20 = 17$; 85%

11. $W_P \times 20 = 25$; 125%

12. $360 = \frac{3}{4} \times W_N$; 480

13. (a) −18 (b) −24

 (c) −144 (d) 144

14. (a) 0.04 (b) 4%

 (c) $\frac{2}{25}$ (d) 0.08

15. $225

16. $\frac{5}{8}$

17. (a) 38 in. (b) 94 in.$^2$

18. (a) 72 cm³  (b) 108 cm²

19. (a) 3.14 m`  (b) $\pi$ m

20. (a) right; scalene

(b) obtuse; isosceles

(c) acute; equilateral

21. 2.4

22. $2\frac{1}{2}$

23. $\frac{3}{5}$

24. 5

25. 29 min  54 s

26. 9 ft²

27. $40\frac{1}{2}$

28. $15\frac{5}{12}$

29. 2.5

30. (a) 0    (b) −60

## LESSON 80

### MENTAL MATH:

a. −75

b. 1600

c. 8

d. 25

e. 1.5 km

f. 9
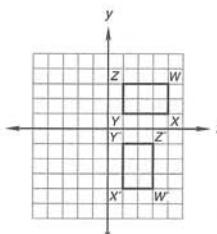
g. 6 m; 2.25 m²

### PROBLEM SOLVING:

1, 3, 6, 10, 15
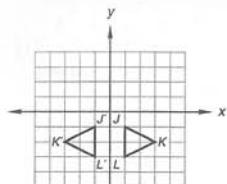
### PRACTICE

b.
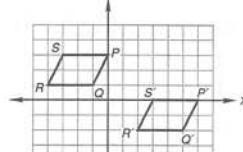

$W'$ (3, −4), $X'$ (1, −4), $Y'$ (1, −1), $Z'$ (3, −1)

c.


$J'$ (−1, −1), $K'$ (−3, −2), $L'$ (−1, −3)

d.


$P'$ (6, 0), $Q'$ (5, −2), $R'$ (2, −2), $S'$ (3, 0)

### PROBLEM SET 80

1. $6.70

2. 5
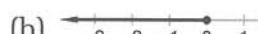
3. insufficient information

4. 12 articles of clothing

5. 94 millimeters

6. 3 pints

7. (a) 

   (b) 

8. 960 customers

9. 

   (a) 72 inches

   (b) 6 feet

10. 600 = $\frac{5}{9}$ × $W_N$; 1080

11. 280 = $W_P$ × 400; 70%

12. $W_N$ = 0.04 × 400; 16

13. 60 = 0.6 × $W_N$; 100

14. (a) −40    (b) 50

    (c) −600    (d) 600

15. $51

16. (a) $\frac{3}{10}$    (b) 30%

    (c) $0.41\overline{6}$    (d) $41\frac{2}{3}$%

17. (a) 3 × 10⁷

    (b) 3 × 10⁻⁵

18. 25 m²

19. (a) 125 in.³

    (b) 150 in.²

20. $\frac{2}{5}$

21. 24

22. 128

23. 1.81

24. 1

25. 10
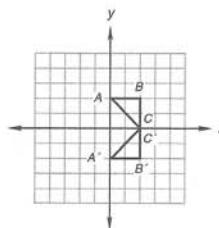
26. 2 lb  11 oz

27. 100 mm²

28. $4\frac{1}{2}$

29. $\frac{11}{12}$

30.


### INVESTIGATION 8

1. 3 cm; 3 cm

2. 90°

3. The line is perpendicular to the segment and divides the segment in half.

4. 90°

5. (a) 2 cm²

   (b) We add the areas of the four triangles. So the area of the square is 8 cm².

6. Each of the smaller angles should be half the measure of the large angle.

**7.** The ray divided the original angle into two congruent angles. That is, the ray divided the angle in half.

**8.** 45°

**9.** Both triangles are isosceles.

**10.** (a) 45°  (b) 45°

**11.** (a) $67\frac{1}{2}°$  (b) $67\frac{1}{2}°$
  (c) $67\frac{1}{2}°$  (d) $67\frac{1}{2}°$

**12.** (a) 135°  (b) 135°

### LESSON 81

#### MENTAL MATH:

**a.** +100

**b.** 0.0012

**c.** 60

**d.** $3.60

**e.** 2.5 cm

**f.** 36

**g.** $27

#### PROBLEM SOLVING:

21, 34, 55
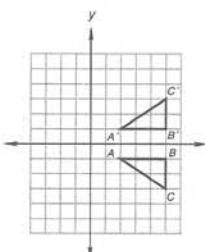
#### PRACTICE

**a.** 70%

**b.** 180 pages

#### PROBLEM SET 81

**1.**
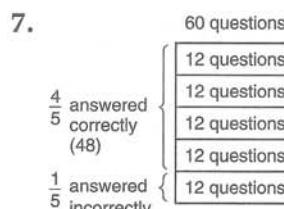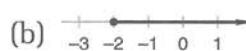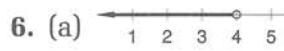


$A'$ (2, 1), $B'$ (5, 1), $C'$ (5, 3)

**2.** (a) 86  (b) 85

**3.** (a) 85  (b) 30

**4.** $6\frac{1}{2}$ inches

**5.** $1.80

**6.** (a) 

  (b) 

**7.**



  (a) 60 questions

  (b) $\frac{4}{1}$

**8.** $1\frac{7}{8}$ inches

**9.** 1800 gleeps

**10.** 84

**11.** insufficient information ($m < n$ if both are positive; $m > n$ if both are negative)

**12.** (a) 2.25  (b) 225%
  (c) $\frac{9}{400}$  (d) 0.0225

**13.** $p = 0.4 \times \$12$; $4.80

**14.** $0.5 \times W_N = 0.4$; 0.8

**15.** $\frac{1}{6}$

**16.** 84%

**17.** 3200 acres
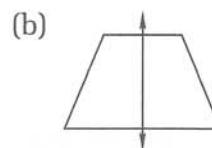
**18.** (a) Angles $ABC$ and $CBD$ are supplementary (total 180°) so m∠$CBD$ = 40°.

  (b) Angles $CBD$ and $DBE$ are complementary (total 90°) so m∠$DBE$ = 50°.

  (c) Angles $DBE$ and $EBA$ are supplementary (total 180°) so m∠$EBA$ = 130°.

  (d) 360°

**19.** $\frac{2 \cdot 2 \cdot 2 \cdot 3 \cdot 5 \cdot 5 \cdot 5}{2 \cdot 2 \cdot 3 \cdot 3 \cdot 5 \cdot 5 \cdot 7} = \frac{10}{21}$

**20.** (a) 180 in.$^2$

  (b) 

**21.** Double the "in" number then subtract 1 to find the "out" number. 7, 0

**22.** (a) $5.6 \times 10^8$
  (b) $5.6 \times 10^{-6}$

**23.** 3.3

**24.** $1\frac{7}{8}$

**25.** 29

**26.** 90

**27.** 2

**28.** 10.65

**29.** (a) 108  (b) −75
  (c) −20  (d) −5

**30.** (a) 6  (b) −45

### LESSON 82

#### MENTAL MATH:

**a.** 18

**b.** 0.01

**c.** 9

**d.** 31.4 ft

**e.** 1.5 m

**f.** 32

**g.** 60

#### PROBLEM SOLVING:

18 ounces;
60 + 2W
= 4W + 24

#### PRACTICE
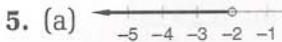
**a.** 113 ft$^2$

**b.** 50.24 cm$^2$

**c.** $16\pi$ cm$^2$

**d.** $50\frac{2}{7}$ cm$^2$

PROBLEM SET 82

1. 20 ft$^3$

2. 6'2"

3. 960 students

4. 0.0254 meter

5. (a) 

   (b) 

6. 375 times

7. 

   25 students

   $\frac{2}{5}$ were boys {5 students, 5 students}

   $\frac{3}{5}$ were girls (15) {5 students, 5 students, 5 students}

   (a) 25 students

   (b) $\frac{3}{2}$

8. =

9. 52%

10. <

11. (a) 43.96 cm

    (b) 44 cm
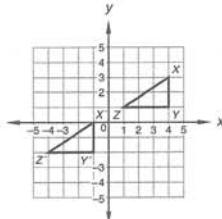
12. (a) 153.86 cm$^2$

    (b) 154 cm$^2$

13. (a) $1\frac{3}{5}$ (b) 160%

    (c) $\frac{2}{125}$ (d) 0.016

14. $M = 0.064 \times \$25$; $1.60

15. (a) $1.2 \times 10^6$

    (b) $1.2 \times 10^{-4}$

16. 112 students

17. 120 pages

18. 59 in.$^2$

19. 

    $X'$ (−1, 0), $Y'$ (−1, −2), $Z'$ (−4, −2)

20. $\frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 5}{2 \cdot 2 \cdot 2 \cdot 2 \cdot 3 \cdot 17} = \frac{5}{17}$

21. (a) 3 chords
    (b) 6 chords
    (c) 60° (d) 120°

22. $1 \times 10^8$

23. 48

24. 0.26

25. 1

26. 0

27. 0.1

28. $4\frac{1}{6}$

29. (a) −6 (b) 24

30. (a) −5 (b) −30

LESSON 83

MENTAL MATH:

a. −20

b. 6,750,000

c. 20

d. $18

e. 0.5 g

f. 64

g. 150 mi

PROBLEM SOLVING:

10

PRACTICE

a. $5.88 \times 10^9$

b. $1.5 \times 10^{13}$

c. $8.4 \times 10^{-10}$

d. $4.2 \times 10^{-6}$
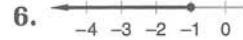
PROBLEM SET 83

1. $1\frac{1}{2} \frac{\text{cents}}{\text{ounce}}$ more

2. 50 apples

3. 84

4. $15

5. 288 pence

6. 

7. 48

8. 11

9. 24 points

10. =

11. (a) $28\pi$ cm (b) 88 cm

12. (a) $196\pi$ cm$^2$
    (b) 616 cm$^2$

13. (a) 1000 cm$^3$
    (b) 600 cm$^2$

14. (a) $2\frac{1}{2}$ (b) 2.5
    (c) $0.58\overline{3}$ (d) $58\frac{1}{3}$%

15. $0.55

16. 20%

17. 60 boats

18. $\frac{2 \cdot 2 \cdot 3 \cdot 5 \cdot 7}{2 \cdot 3 \cdot 3 \cdot 5 \cdot 7} = \frac{2}{3}$

19. 900 m$^2$

20. (a) 36° (b) 144°
    (c) 36° (d) 72°

21. Multiply the "in" number by 2 and then add 1 to find the "out" number; 10, −9

22. (a) $1.8 \times 10^{10}$
    (b) $4.8 \times 10^{-9}$

23. $6\frac{1}{6}$

24. 3.6

25. 31
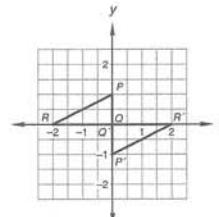
26. 1

27. $\frac{11}{120}$

28. (a) 4 (b) −60

29. (a) −2 (b) −19

30. 

    $P'$ (0, −1), $Q'$ (0, 0), $R'$ (2, 0)

### LESSON 84

**MENTAL MATH:**

a. 0

b. 625

c. 7

d. 94.2 cm

e. 15 mm

f. 36

g. 3

**PROBLEM SOLVING:**

R 2 inches,
B 2 inches

### PRACTICE

a. binomial

b. trinomial

c. monomial

d. binomial

e. $3a^2 + 2a$

f. $6xy - 3x$

g. $3x^2 + x - 2$

h. $2\pi + 4.2$

### PROBLEM SET 84

1. (a) 11°F
   (b) Thursday
   (c) 3°F

2. 18°F

3. $3xy - 2x$

4. (a) 93.5    (b) 95
   (c) 100    (d) 20

5. 147 sailboats

6. 2nd

7. $3.50

8. 60 members

9. (a) 16    (b) 16

10. =

11. (a) 18.84 in.
    (b) 28.26 in.$^2$

12. 480 centimeters

13. 
6 faces

14. (a) 1.8    (b) 180%
    (c) $\frac{9}{500}$    (d) 0.018

15. $p = 0.3 \times \$18.00$;
    $5.40

16. $\frac{1}{8}$

17. 90 pigeons

18. 120 gnomes

19. (a) 44 in.
    (b) 120 in.$^2$

20. (a) $\frac{1}{6}$    (b) $\frac{1}{8}$
    (c) $\frac{5}{24}$

21. **Rule:** To find a term in the sequence, double the preceding term and add 1.

    **Note:** Other rule descriptions are possible including "The value of the $n$th term is $2^n - 1$." Discuss various rules proposed by students.

    63, 127, 255

22. (a) $4.5 \times 10^3$
    (b) $1.5 \times 10^{10}$

23. 9.95

24. 54

25. 11

26. 955 mm

27. 9.6

28. (a) $10^6$ or 1,000,000

29. (a) 4    (b) −30

30. (a) 60    (b) −4

### LESSON 85

**MENTAL MATH:**

a. −72

b. $8 \times 10^9$

c. 120

d. $48

e. 800 m

f. $3

g. 10 m; 6.25 m$^2$

**PROBLEM SOLVING:**

$n + 2n + 3n = 180$

or   $6n = 180$

so   $n = 30$

$2n = 60$

$3n = 90$

### PRACTICE

a. 7

b. 31

c. 46

d. −25

e. 8, 2, −1

f. 3, 0, 8

g. 1, 7, 4

h. $y = x^2$

| x | y |
|---|---|
| 1 | 1 |
| 2 | 4 |
| 3 | 9 |
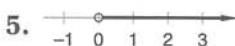
### PROBLEM SET 85

1. 6 games
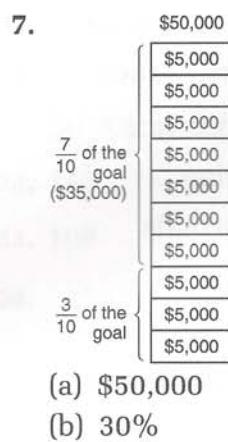
2. (a) 84    (b) 85
   (c) 90    (d) 30

3. 121 dandelions

4. 980 milliliters

5. 
−1 0 1 2 3

6. 12 miles

 *Math 87, Second Edition*

**7.**



$\frac{7}{10}$ of the goal ($35,000)

$\frac{3}{10}$ of the goal

$50,000 / $5,000 (×10 bars) 

(a) $50,000

(b) 30%
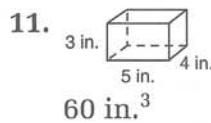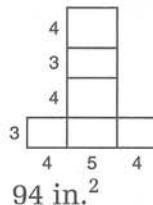
**8.** insufficient information

**9.** (a) 25.12 m

(b) 50.24 m$^2$

**10.** $\frac{7}{20}$

**11.**



3 in. 4 in. 5 in.

60 in.$^3$

**12.** one possible pattern:



94 in.$^2$

**13.** (a) 0.025   (b) $2\frac{1}{2}\%$

(c) $\frac{1}{400}$   (d) 0.0025

**14.** $10,800
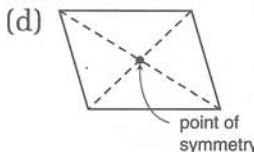
**15.** (a) 17,640 = $2^3 \cdot 3^2 \cdot 5 \cdot 7^2$

(b) The exponents of the prime factors of 17,640 are not all even numbers.

**16.** $\frac{1}{12}$

**17.** 95%

**18.** 140 children

**19.** (a) parallelogram

(b) 57 cm   (c) 192 cm$^2$

(d)



point of symmetry

**20.** (a) 90°   (b) 180°

(c) 30°   (d) 150°

**21.** 9, 5, 1

**22.** =

**23.** 11

**24.** $\frac{5}{12}$

**25.** 6
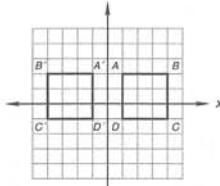
**26.** 29 min  55 s

**27.** 23.75

**28.** (a) −7   (b) −21

**29.** $x^2 + 4x - 12$

**30.**



(a) $D$ (1, −1)

(b) $A'$ (−1, 2), $B'$ (−4, 2), $C'$ (−4, −1), $D'$ (−1, −1)

### LESSON 86

**MENTAL MATH:**

**a.** −58

**b.** $9 \times 10^{-6}$

**c.** 8

**d.** $2.70

**e.** 200 mL

**f.** $90

**g.** $214

**PROBLEM SOLVING:**



**PRACTICE**

**a.**



−4 −3 −2 −1  0

**b.**



−1  0  1  2  3  4

**c.** false

**d.** true

**PROBLEM SET 86**

**1.** $8.88 per ounce

**2.** 56 rookies

**3.** (a) 213 lb   (b) 213 lb

(c) 217 lb   (d) 49 lb

**4.** 48 pecks

**5.** 52 miles per hour

**6.**



−1 0 1 2 3 4

**7.** 45

**8.** (a) 1620 students

(b) 10%

**9.** 3

**10.** insufficient information

**11.** (a) $24\pi$ in.

(b) $144\pi$ in.$^2$

**12.** (a) 5   (b) −3

**13.** (a) 5 faces

(b) 9 edges

(c) 6 vertices

**14.** (a) $\frac{9}{10}$   (b) 90%

(c) $0.91\overline{6}$   (d) $91\frac{2}{3}\%$

**15.** north

**16.** $40

**17.** 16 seeds

**18.** 150%

**19.** (a) trapezoid

(b) 90 mm

(c) 450 mm$^2$

**20.** (a) 120°   (b) 165°

(c) 135°

**21.** 13, 22, 1

**22.** (a) $1.44 \times 10^{-3}$

(b) $4.2 \times 10^{-6}$

**23.** 64

**24.** 2.54

**25.** 2

**26.** 10 lb

**27.** 400

**28.** (a) 32    (b) −34

**29.** $3x^2 + 2xy$

**30.** $3 \cdot 3 \cdot x \cdot y \cdot y$

## LESSON 87

### MENTAL MATH:

**a.** −30

**b.** $8 \times 10^2$

**c.** 40

**d.** 62.8 ft

**e.** 0.75 kg

**f.** $125

**g.** $2\frac{1}{2}$
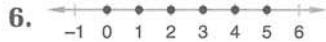
### PROBLEM SOLVING:

375 g; M + 1000 = 3M + 250

### PRACTICE

**a.** $6x^2y$

**b.** $3x^3y^3$

**c.** $-6a^3b^3$

**d.** $20x^3y$

**e.** $-2x^2y^4$

**f.** $6m^4n^2$

**g.** $-12w^4x^3y^2$

**h.** $30d^4f^2g$

### PROBLEM SET 87

**1.** 1125 miles

**2.** 0.125 meter

**3.** $\frac{3}{4}$

**4.** 18'

**5.** 26 miles per gallon

**6.**

−1 0 1 2 3 4 5 6

**7.** 540 feet

**8.** (a) 75°    (b) 105°
(c) 75°    (d) 75°
(e) 105°

**9.** −13

**10.** (a) 440 mm
(b) 15,400 mm$^2$

**11.** (a) 25 units$^2$
(b) m∠A = 135°;
m∠B = 45°;
m∠C = 135°;
m∠D = 45°

**12.** 48 in.$^3$

**13.** (a) $\frac{1}{8}$    (b) 0.125
(c) 0.875    (d) $87\frac{1}{2}\%$

**14.** $W_N = \frac{1}{4} \times 4$; 1

**15.** $30

**16.** 5000 meters

**17.** 125%

**18.** 94 cm$^2$

**19.** (a) 30°    (b) 60°
(c) 120°    (d) ∠COA

**20.** $\frac{2}{3}$

**21.** 8, 6, 2

**22.** (a) $8.4 \times 10^{-12}$
(b) $2.4 \times 10^{13}$

**23.** 17.57

**24.** 14.4

**25.** 2.4

**26.** 925 g

**27.** 21.325

**28.** (a) −19    (b) 15

**29.** (a) $12xy$
(b) $24m^4n^2p$

**30.** $2a$

## LESSON 88

### MENTAL MATH:

**a.** −75

**b.** $3 \times 10^9$

**c.** 12

**d.** $15

**e.** 25.4 mm

**f.** $2.50

**g.** 1250 mi
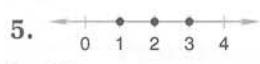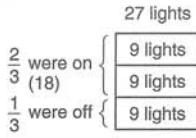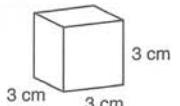
### PROBLEM SOLVING:

1 skilling, 2 ore

### PRACTICE

**a.** 180 inches

**b.** 5400 seconds

**c.** 135 ft$^2$

**d.** 2000 mm$^2$

### PROBLEM SET 88

**1.** $19.50

**2.** 78

**3.** 864 in.$^2$

**4.** 10 brass instruments

**5.**

0 1 2 3 4

**6.** $9

**7.**

27 lights

$\frac{2}{3}$ were on (18) { 9 lights / 9 lights

$\frac{1}{3}$ were off { 9 lights

(a) 9 lights
(b) $66\frac{2}{3}\%$

**8.** 4

**9.** <

**10.** (a) 188.4 ft  (b) 2826 ft$^2$

**11.** 25%

**12.**

3 cm
3 cm   3 cm
(a) 27 cm$^3$
(b) 54 cm$^2$

**13.** $3x + 2y − 6$

**14.** (a) $\frac{1}{8}$    (b) $12\frac{1}{2}\%$
(c) 0.375    (d) $37\frac{1}{2}\%$

**15.** 48

**16.** 75%

**17.** 875

**18.** $24 = \frac{1}{4} \times W_N$; 96

**19.** (a) trapezoid
(b) 140 mm
(c) 900 mm$^2$

**20.** 5, 2, 0
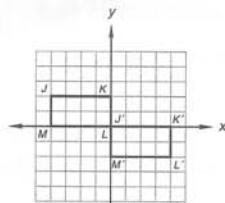
**21.** (a) $3.6 \times 10^{-13}$

(b) $3.6 \times 10^{15}$

**22.** $14\frac{1}{3}$

**23.** 108

**24.**



(a) $M(-4, 0)$

(b) $J'(0, 0)$, $K'(4, 0)$,
$L'(4, -2)$, $M'(0, -2)$

**25.** $x^2 + x - 2$

**26.** D. $4^2 + 4$

**27.** 0.04

**28.** 48

**29.** (a) $-1$    (b) $-9$

**30.** (a) $6x^2$    (b) $-6a^4b^2$

### LESSON 89

### MENTAL MATH:

**a.** $+20$

**b.** $7.5 \times 10^4$

**c.** 10

**d.** $0.64

**e.** 187 cm

**f.** $2.50

**g.** 8
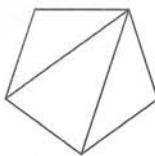
### PROBLEM SOLVING:

4:00; 8:00

### PRACTICE

**a.** For answers, see *Solutions* to Examples 1, 2, and 3.

**b.** one possibility

2 diagonals

**c.** 3 triangles

**d.** $3 \times 180° = 540°$

**e.** $\frac{540°}{5} = 108°$

**f.** $\frac{360°}{5} = 72°$

**g.** $108° + 72° = 180°$

### PROBLEM SET 89
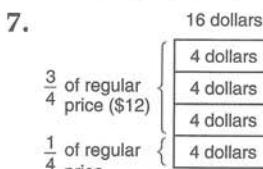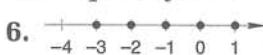
**1.** 120 seconds or 2 minutes

**2.** 16 bears

**3.** 5400 cm$^3$

**4.** 0.393

**5.** 2 square yards

**6.**



**7.**



(a) $16    (b) 75%

**8.** (a) 55°    (b) 125°
(c) 55°    (d) 55°

**9.** (a) 132 in.
(b) 1386 in.$^2$
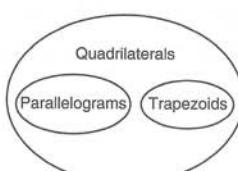
**10.** $\frac{11}{12}$

**11.** 4

**12.** <

**13.** (a) 0.875    (b) $87\frac{1}{2}%$
(c) $8\frac{3}{4}$    (d) 8.75

**14.**
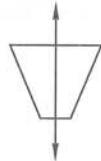


**15.** 1350 customers

**16.** $8

**17.** $20 = W_P \times 200$; 10%

**18.** (a)
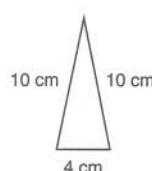


(b) 480 mm$^2$

**19.** 120°

**20.** 4, 3, 18

**21.** $1 \times 10^{-7}$

**22.** (a) 24 cm



(b) There can only be one answer because a 4 cm, 4 cm, 10 cm triangle cannot exist.

**23.** 162

**24.** 7.74

**25.** $3x - 5$

**26.** 1

**27.** 20

**28.** $7\frac{5}{6}$

**29.** (a) $-27$    (b) 1

**30.** (a) $6x^3$    (b) $-6a^2b^3$

### LESSON 90

### MENTAL MATH:

**a.** $-20$

**b.** $8.4 \times 10^{-10}$

**c.** 11

**d.** $3.60
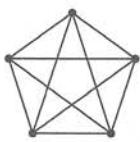
**e.** 0.8 kg

**f.** $1.25

**g.** 1000 in.$^3$

PROBLEM SOLVING:



10 handshakes

PRACTICE

a. 32

b. 140

c. $\frac{12}{5}$

d. $\frac{27}{40}$

e. −0.15

f. $-\frac{8}{9}$

g. 0.16

h. $-\frac{4}{3}$

PROBLEM SET 90

1. ninety-eight hundredths

2. (a) 8.5    (b) 8.5
   (c) 8    (d) 4

3. 0.5¢ per ounce

4. (a) 36°    (b) 144°

5. $2x^2 + 2xy$

6. $40

7. 200 citizens

8. (a) $24 = W_P \times 30$;
   80%
   (b) $30 = W_P \times 24$;
   125%

9. 288 square inches

10.



$\frac{2}{5}$ of doctors (300) did { 150 doctors / 150 doctors }

$\frac{3}{5}$ of doctors did not { 150 doctors / 150 doctors / 150 doctors }

750 doctors

(a) 750 doctors
(b) 450 doctors

11. 10

12. >

13. 9 square inches

14. (a) $1\frac{3}{4}$    (b) 175%

15. $344.50
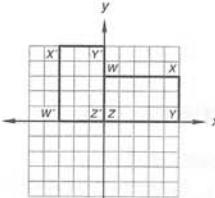
16. $4.8 \times 10^{-2}$

17. (a) 288 in.³
    (b) 312 in.²

18. (a) 314 mm
    (b) 7850 mm²
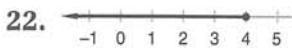
19. 0

20.



(a) $Z\,(0, 0)$
(b) $W'\,(-3, 0)$, $X'\,(-3, 5)$,
    $Y'\,(0, 5)$, $Z'\,(0, 0)$

21. $13\frac{1}{3}$

22.



23. 0.78

24. 9

25. −0.35

26. $10^5$ or 100,000

27. $-6x^3y^2$

28. $\frac{1}{60}$
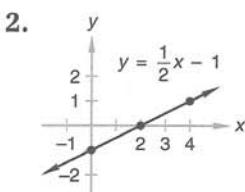
29. (a) 23    (b) −4

30. =

INVESTIGATION 9

1. With the class select
   two or three points such
   as (−1, 0), (5, 6), and
   $(1\frac{1}{2}, 2\frac{1}{2})$.

   Substitute the $(x, y)$
   numbers in $y = x + 1$
   and simplify.

2.



$y = \frac{1}{2}x - 1$

(a) Have the students
    select a point on the
    line and determine
    the coordinates of
    the point.

(b) No. For this
    equation if the
    x-number is
    negative, the
    y-number is also
    negative. Note that
    the graph of the
    function does not
    enter the quadrant
    where x is negative
    and y is positive.

3. The endpoint of the ray
   is (0, 0). If the graph
   were a line there would
   be negative numbers for
   the length of the side
   and for the perimeter.
   Lengths are positive and
   not negative, so the
   graph cannot be a line.
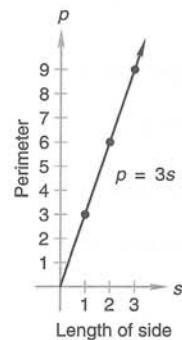
4.

$p = 3s$

| s | p |
|---|---|
| 1 | 3 |
| 2 | 6 |
| 3 | 9 |

$p$ = perimeter
of triangle
$s$ = length of side
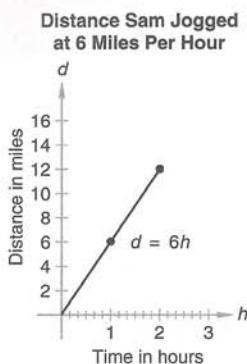
**Perimeter of an
Equilateral Triangle**



$p = 3s$

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**5.**

$$d = 6h$$

| h | d |
|---|---|
| 1 | 6 |
| 2 | 12 |

$d$ = distance in miles
$h$ = time in hours

**Distance Sam Jogged at 6 Miles Per Hour**
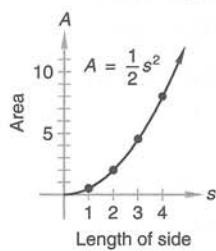


**6.** 4 miles

**7.** $1\frac{1}{2}$ hours

**8.** Sam did not continue jogging forever. He stopped ater 2 hours.

**9.** $4\frac{1}{2}$, 8

**10.** **Area of Half of a Square**



$A = \frac{1}{2}s^2$

**LESSON 91**

**MENTAL MATH:**

**a.** −134

**b.** $1.44 \times 10^6$

**c.** 60

**d.** 15

**e.** 1500 mL

**f.** $200

**g.** 15

**PROBLEM SOLVING:**

5 yd × 4 yd = 20 yd²

---

**PRACTICE**

**a.** −1

**b.** −13

**c.** −6

**d.** −4

**e.** −16

**f.** 0

**PROBLEM SET 91**

**1.** 89.2

**2.** 3

**3.** 52 miles per hour

**4.** 45 laborers

**5.** $14.25

**6.** $32.40

**7.** 50 people

**8.** (a) $20 = 0.4 \times W_N$; 50
    (b) $20 = W_P \times 40$; 50%

**9.** 25 square feet

**10.**

| 80 questions | |
|---|---|
| $\frac{3}{4}$ were multiple choice (60) | 20 questions |
| | 20 questions |
| | 20 questions |
| $\frac{1}{4}$ were not multiple choice | 20 questions |
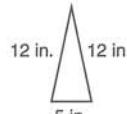
(a) 80 questions

(b) 25%

**11.** −7

**12.** insufficient information

**13.** (a) trapezoid
    (b) 60 mm
    (c) 210 mm²
    (d) 105°

**14.** (a) associative property of addition
    (b) commutative property of multiplication
    (c) distributive property

---

**15.**



12 in.    12 in.

5 in.
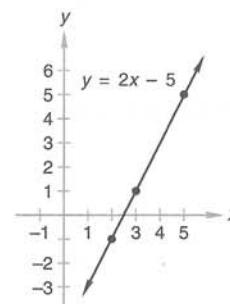
29 inches

**16.** $1.2 \times 10^{-10}$

**17.** (a) 5 faces
     (b) 8 edges
     (c) 5 vertices

**18.** (a) 25.12 cm
     (b) 50.24 cm²

**19.** −1, 1, 5



$y = 2x - 5$

**20.** (a) 60°    (b) 60°
     (c) 55°
     (d) No. The triangles are not the same shape. The triangles do not have matching angles.

**21.** (a) $-4x - 4$
     (b) $9x^2$

**22.**


−4 −3 −2 −1 0

**23.** 20 mm

**24.** 9.75

**25.** $\frac{9}{4}$

**26.** −46

**27.** $1920\frac{\text{ft}}{\text{min}}$

**28.** 8

**29.** 2.5

**30.** (a) $-8\frac{1}{2}$    (b) −49

**LESSON 92**

**MENTAL MATH:**

**a.** −25

**b.** $2.25 \times 10^{-10}$

---

**c.** 16

**d.** 20

**e.** 30 cm

**f.** $60

**g.** $36.00
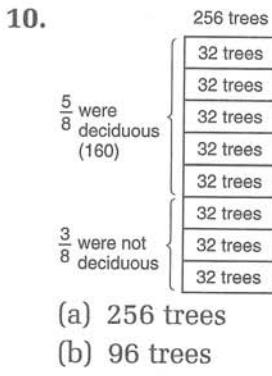
### PROBLEM SOLVING:

10 triangles; 1800°

### PRACTICE

**a.** $17.15

**b.** 50 students

**c.** $30

**d.** $27

### PROBLEM SET 92
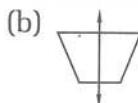
1. 1
2. 95
3. 8 miles per hour
4. $\frac{7}{9}$
5. $9.00
6. 408,000
7. 64¢ per pound
8. (a) $60 = W_P \times 75$; 80%
   (b) $75 = W_P \times 60$; 125%
9. 10,000 square millimeters
10.



| | 256 trees |
|---|---|
| $\frac{5}{8}$ were deciduous (160) | 32 trees |
| | 32 trees |
| | 32 trees |
| | 32 trees |
| | 32 trees |
| | 32 trees |
| $\frac{3}{8}$ were not deciduous | 32 trees |
| | 32 trees |

   (a) 256 trees
   (b) 96 trees
11. −16
12. =
13. (a) 45 cm²
    (b)
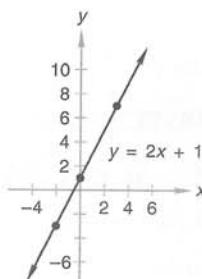


14. (a) $157.50
    (b) $166.95
15. $2.4 \times 10^8$
16. (a) $2.\overline{3}$   (b) $233\frac{1}{3}\%$
    (c) $\frac{1}{30}$   (d) $0.0\overline{3}$
17. $\frac{3}{51} = \frac{1}{17}$
18. 150
19. (a) 2   (b) 3
20. 75 inches
21. 1, 7, −3



$y = 2x + 1$

22. 80°
23. (a) $2x + 2$
    (b) $6x^2 + 6x$
24.



parallelogram

25. 21
26. 5.05
27. −75
28. 18
29. $3\frac{1}{6}$
30. (a) 10   (b) 8

### LESSON 93

### MENTAL MATH:

**a.** 200

**b.** $7.5 \times 10^4$

**c.** 250

**d.** 288 in.²

**e.** 18

**f.** 54

**g.** 15 cm

### PROBLEM SOLVING:

68°F

### PRACTICE

**a.** 25

**b.** 11

**c.** $\frac{10}{9}$

**d.** 7

**e.** 4

**f.** 16

**g.** −27

**h.** 18

**i.**



$x \geq -2$

**j.**



$x < 3$

### PROBLEM SET 93

1. 24 kilometers per hour
2. (a) 9   (b) 37
3. (a) 250 blue marbles
   (b) $\frac{5}{12}$
4. 2250 plastic pterodactyls
5. (a) $18   (b) $32
6. $18x^4y^3$
7. $\frac{2}{50} = \frac{1}{25}$
8. 10,080 minutes
9.



| | 45 cars |
|---|---|
| $\frac{5}{9}$ were not cattle cars | 5 cars |
| | 5 cars |
| | 5 cars |
| | 5 cars |
| | 5 cars |
| $\frac{4}{9}$ were cattle cars | 5 cars |
| | 5 cars |
| | 5 cars |
| | 5 cars |

   (a) 20 cattle cars
   (b) $55\frac{5}{9}\%$
10. >
11. 7
12. $11.76
13. (a) 44 in.   (b) 120 in.²

**14.** (a) $\frac{2}{25}$  (b) 8%
(c) $\frac{1}{12}$  (d) $0.08\overline{3}$

**15.** $7.92
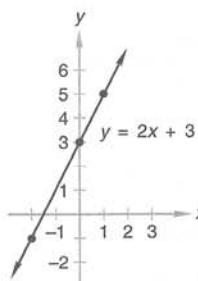
**16.** $4.8 \times 10^5$

**17.** (a) 1000 cm³
(b) 600 cm²

**18.** (a) 314 cm²
(b) 62.8 cm

**19.** $x^2 - 1$

**20.** 5, 3, −1



**21.** $60 = \frac{3}{8} \times W_N$; 160

**22.**



**23.** (a) m∠X = 40°;
m∠Y = 40°;
m∠Z = 50°

(b) Yes. The triangles
are the same shape.
Their corresponding
angles are congruent.

**24.** 0.87

**25.** $\frac{7}{3}$

**26.** 15

**27.** 40

**28.** 9

**29.** 30

**30.** (a) −90  (b) −7

### LESSON 94

### MENTAL MATH:

**a.** 24

**b.** $6 \times 10^{-5}$

**c.** 0.6

**d.** 86°F

**e.** 16

**f.** 55

**g.** 5
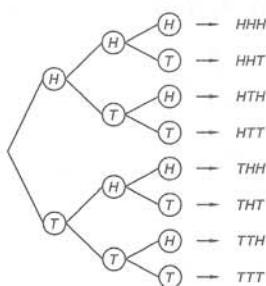
### PROBLEM SOLVING:

$2X + 4.3 = 4X + 1.7$;
$X = 1.3$ lb

### PRACTICE

**a.** $\frac{1}{9}$

**b.**



**c.** $\frac{1}{3} \cdot \frac{1}{4} = \frac{1}{12}$

### PROBLEM SET 94

**1.** $1.12 \times 10^{10}$

**2.** 56 miles per hour

**3.** 10-pound box;
$0.14 per pound more

**4.** $\frac{1}{2}$

**5.** 20 games

**6.** 63

**7.** 80%

**8.** 0.325

**9.** (a) 1728 square inches
(b) 1,000,000
millimeters

**10.**



(a) 300 serfs
(b) 180 serfs

**11.** (a) 0  (b) $\frac{1}{36}$
(c) $\frac{1}{18}$

**12.** −11

**13.** 9 square feet

**14.** (a) $942.50
(b) $15,442.50
(c) $290

**15.** (a) $\frac{2}{3}$  (b) $0.\overline{6}$
(c) 1.75  (d) 175%

**16.** (a) $15.00  (b) $22.50
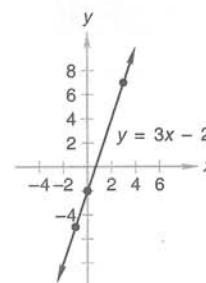
**17.** $1.6 \times 10^{11}$

**18.** 96 cubes

**19.** 42 in.²

**20.** $65.\overline{45}$

**21.** 7, −2, −5



**22.**



**23.** (a) 30°  (b) 135°

**24.** $\frac{1}{4}$ in.

**25.** $\frac{11}{3}$

**26.** $-\frac{1}{6}$

**27.** 20

**28.** (a) $6x^2 + x - 1$
(b) $15x^2 + 20x$

**29.** (a) 2  (b) 25

**30.** 16

### LESSON 95

### MENTAL MATH:

**a.** −28

**b.** $6.25 \times 10^{12}$

**c.** 0.9

**d.** 77°F

**e.** 22

**f.** 90

**g.** 10

## PROBLEM SOLVING:
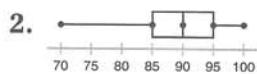
$$\begin{array}{r} 93 \\ \times\ 97 \\ \hline 651 \\ 837 \\ \hline 9021 \end{array}$$

## PRACTICE
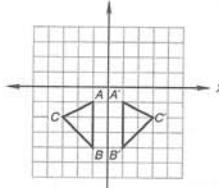
a. 288 cm³

b. 360 cm³

c. 90π cm³

d. 230 cm³

e. 10π cm³

## PROBLEM SET 95

1. $3.85 per mile

2. 
   70 75 80 85 90 95 100

3. 

A′ (1, −1), B′ (1, −4),
C′ (3, −2)

4. $26

5. $\frac{1}{3}$

6. $24.00

7. $3.00

8. $5.07

9. 10 cm²

10. 
    150 Lilliputians
    30 Lilliputians
    $\frac{3}{5}$ believed { 30 Lilliputians
    30 Lilliputians
    30 Lilliputians
    $\frac{2}{5}$ did not believe (60) { 30 Lilliputians
    30 Lilliputians

    (a) 150 Lilliputians
    (b) 90 Lilliputians

11. insufficient information

12. 10

13. (a) $\frac{1}{6}$
    (b) $\frac{15}{36} = \frac{5}{12}$

14. 30,000 mm³

15. 282.6 cm³
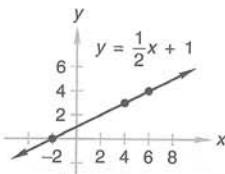
16. $7.37

17. (a) 2.75      (b) 275%
    (c) $\frac{7}{80}$      (d) 0.0875

18. (a) $4x^4y^2$
    (b) $-9y - 5$

19. $3.2 \times 10^{-1}$

20. (a) 4, 3, 0


    (b) (0, 1)

21. $20\frac{5}{6}$

22. (a) 35°      (b) 55°
    (c) 15°

23. 
    −3 −2 −1 0 1

24. 1.54

25. −8

26. 12

27. 
    $x \le 2$
    −1 0 1 2 3
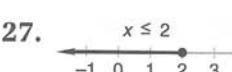
28. 30

29. $\frac{1}{3}$

30. (a) 2      (b) −20

## LESSON 96

### MENTAL MATH:

a. 23

b. $1 \times 10^{13}$

c. 20

d. 59°F

e. 15

f. $100

g. $7.50

### PROBLEM SOLVING:

$\frac{1}{6}$

## PRACTICE

a. 24°

b. 120°

c. 42°

d. See student work.; 55°

e. See student work.; 15°

f. See student work.; 45°

g. See student work.; 145°

h. $x^2 - xy$

i. $-6x + 3$

j. $-x^2 + 2x$

k. $-8 + 6x$

l. $x^2 - x - 6$

m. $x^2 - 5x + 6$

## PROBLEM SET 96

1. $255 per ton

2. 27

3. 5 tanks

4. $\frac{2}{3}$

5. 145 dollars

6. 75

7. 150 customers per day

8. (a) $60 = W_P \times 50$;
       120%
   (b) $50 = W_P \times 60$;
       $83\frac{1}{3}\%$

9. 12,000 square centimeters

10. (a) ∠A and ∠E,
        ∠B and ∠D,
        ∠ACB and ∠ECD;
        $\overline{AB}$ and $\overline{ED}$,
        $\overline{BC}$ and $\overline{DC}$,
        $\overline{AC}$ and $\overline{EC}$.
    (b) 37°

11. >
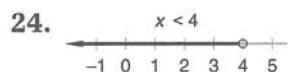
12. 14

13. 81 square inches

14. (a) $\frac{1}{16}$      (b) $\frac{1}{16}$

15. (a) 27 cm³   (b) 60 cm³

16. $310.30

17. (a) $\frac{3}{80}$  (b) 0.0375

18. (a) $8  (b) $16

19. $2.4 \times 10^{-4}$

20. (a) $12\pi$ m  (b) $36\pi$ m$^2$

21. (a) 90°  (b) 150°
    (c) 48°

22. (a) 45°  (b) 135°

23. $Q'$ (8, −4), $R'$ (4, 0),
    $S'$ (0, −4), $T'$ (4, −8)

24.
$$x < 4$$
−1 0 1 2 3 4 5

25. 8

26. 6

27. 68

28. (a) $-3x + 12$
    (b) $x^2 + xy$

29. (a) −22  (b) 18

30. (a) $60a^2b^4c$
    (b) $a^2 - b^2$

### LESSON 97

#### MENTAL MATH:

a. −125

b. $3 \times 10^{12}$

c. 0.9

d. 41°F

e. 65

f. $60

g. $3\frac{1}{2}$

#### PROBLEM SOLVING:

hexagon: 3;
 4 × 180°

$n$-gon: $n - 3$;
 $(n - 2) \times 180°$

Yes, since the sum of the
angle measures of each
triangle is 180°, the
remaining angles must
have the same measure.

#### PRACTICE

a. corresponding angles:
   $\angle W$ and $\angle R$;
   $\angle Y$ and $\angle Q$;
   $\angle X$ and $\angle P$

   corresponding sides:
   $\overline{YW}$ and $\overline{QR}$;
   $\overline{WX}$ and $\overline{RP}$;
   $\overline{XY}$ and $\overline{PQ}$

b. 8

c. 18

d. 12 ft

### PROBLEM SET 97

1. $0.51

2. $1.7 \times 10^{12}$

3. (a) 90  (b) 90  (c) 20

4. 2 miles

5. 5632 yards

6. translation 5 units to the right

7. 27 inches

8. 300 leeks

9. $40 = 2.5 \times W_N$; 16

10. $40 = W_P \times 60$; $66\frac{2}{3}$%

11. $W_D = 0.4 \times 6$; 2.4

12. $16,000

13. 1.91

14. (a) $3\frac{1}{4}$  (b) 325%
    (c) $0.1\overline{6}$  (d) $16\frac{2}{3}$%

15. <

16. $3.24 \times 10^5$

17. (a) 62.8 mm
    (b) 314 mm$^2$

18. 80 ft$^2$

19. (a) 2 m$^3$  (b) $\pi$ m$^3$

20. (a) 35°  (b) 55°
    (c) 65°

21. 8 cm

22. 54 feet; See student diagrams.

23. 300,000

24. 9.9

25. 8

26. $4x + 6$

27. $440 \frac{\text{yd}}{\text{min}}$

28. (a) $3x - 3y$
    (b) $xy - 3x$

29. $\frac{5}{6}$

30. $-2\frac{1}{3}$

### LESSON 98

#### MENTAL MATH:

a. −45

b. $1 \times 10^6$

c. $2\frac{1}{2}$

d. 20 g

e. 15

f. $80

g. 21 mi

#### PROBLEM SOLVING:

Celsius: −10

double: −20

− 10%: −18

(−−2 = +2)

+ 32°: 14°F

#### PRACTICE
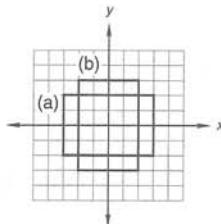
a. 12 feet

b. 18 inches

c. 21

d. 6

e. 2.5

f. 6.25 times

### PROBLEM SET 98
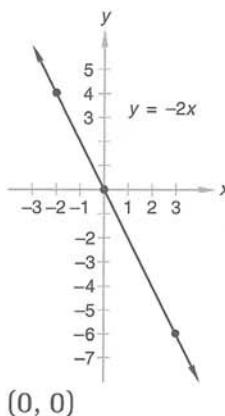
1. $36

2. (a) $\frac{5}{12}$  (b) 0

3. $x^2$

4. 13 points per game

5. (a) 20.5 miles per gallon
   (b) 49.2 miles per hour

6. $12.50

7. $\frac{3}{5} \times W_N = 60$; 100

8. (a) (3, −2)
   (b) (2, 3), (2, −3), (−2, −3), (−2, 3)



9. $\frac{1}{3}$

10. 81

11. $40 = W_P \times 250$; 16%

12. $0.4 \times W_N = 60$; 150

13. $64

14. 100 students

15. $\frac{3}{4}$ inch

16. 

17. (a) $\frac{7}{500}$   (b) 0.014

18. $7 \times 10^{-2}$

19. −6, 0, 4



(0, 0)

20. (a) 6.28 ft   (b) 3.14 ft$^2$

21. See student work.; 40°

22. $x$ = 12 in.; $y$ = 40 in.; area = 96 in.$^2$

23. 2.5

24. −20

25. 39

26. 10

27. 3 qt 1 pt

28. 0.0125

29. $6\frac{5}{6}$

30. 3

## LESSON 99

### MENTAL MATH:

a. 3

b. $3.2 \times 10^{11}$

c. 1

d. 5°F

e. 28

f. $40

g. 10

### PROBLEM SOLVING:

150°

### PRACTICE

a. 10

b. 15

c. 24 feet

### PROBLEM SET 99

1. $2.25

2. $2.48 \times 10^{-3}$

3. (a) 30.5 days
   (b) 31 days
   (c) 31 days
   (d) 2 days

4. 1¢ more per ounce

5. $360

6. 10 ounces

7. 450 stalagmites

8. (a) $0.1 \times W_N = 20$; 200
   (b) $20 = W_P \times 60$; $33\frac{1}{3}\%$

9. (a) right triangle
   (b) equilateral triangle
   (c) isosceles triangle

10. $2.72

11. 80%

12. 9 units$^2$

13. 480 inches; 40 feet

14. (a) $1.\overline{3}$   (b) $133\frac{1}{3}\%$
    (c) $\frac{1}{75}$   (d) $0.01\overline{3}$

15. (a) $2a^4x^3$   (b) $\frac{1}{6}\pi$

16. $7.29 \times 10^5$

17. 9

18. 12

19. 3140 cm$^3$

20. (a) 42°   (b) 38°
    (c) 52°

21. (a) 9 inches
    (b) 1.5
    (c) 2.25 times

22. 200,000

23. 0.09

24. 15

25. 51

26. 28

27. 11

28. 100

29. −2

30. $3x − 6$

## LESSON 100
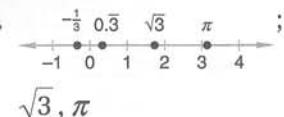
### MENTAL MATH:

a. 6

b. $2.5 \times 10^{-9}$

c. 24

d. −4°F

e. 75

f. $16

g. 3

### PROBLEM SOLVING:

15 handshakes

 *Math 87, Second Edition*
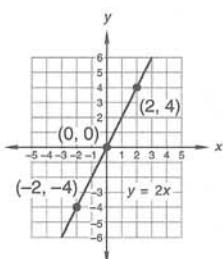
## PRACTICE

a. 2 and 3

b. 8 and 9

c. 26 and 27

d. $\sqrt{2}$

e. $\sqrt{3}$

f.

$\sqrt{3}$ , $\pi$

## PROBLEM SET 100

1. $10.52

2. (a) $\frac{2}{5}$    (b) $\frac{9}{25}$

3. 5.5

4. $7\frac{1}{2}$ hours

5. 6 hours and 40 minutes

6. 24

7. 50 winners

8. (a) $300 = 0.06 \times W_N$; 5000

   (b) $20 = W_P \times 10$; 200%

9. $42.60

10. $x^2 + 3x$

11.

Another point from the 3rd quadrant could be (−1, −2) or (−3, −6).

12. 500

13. (a) $2\frac{1}{2}$ inches

    (b) $\frac{1}{24}$

14. (a) 3         (b) 9 times

    (c) 27 times

15. insufficient information

16. (a) $\frac{18}{25}$        (b) 0.72

17. $2.7 \times 10^{10}$

18. (a) 6 and 7

    (b) 4 and 5

19. (a) 44 in.    (b) 154 in.$^2$

20. 8 cm

21. 36 cm$^3$

22. 125.6 cm$^3$

23. m∠a = 132°;
    m∠b = 48°;
    m∠c = 42°

24. −14

25. 1.1

26. 10

27. 40

28. 5

29. −24

30.

## INVESTIGATION 10

1. 0.5

2. 0.03

3. The ration $\frac{1}{13}$ is more precise than 0.08 because the decimal form is rounded.

4. 60%

5. 50%

6. 75%

7. 25%

8. $\frac{1}{3}$

9. 5 to 7

10. $\frac{2}{3}$

11. $\frac{3}{200}$ or 0.015

12. The insurance rates (premiums) for younger drivers are much higher than the rates for older drivers.

## MENTAL MATH:

a. 16

b. $3 \times 10^{-10}$

c. 0.06

d. −13°F

e. $60

f. $60

g. $4.50

## PROBLEM SOLVING:

## PRACTICE

a. $3x + 6 = 30$; 8

b. $\frac{1}{2}x - 10 = 30$; 80

c. $3x + 2x = 90°$; 36°

d. $x + 2x + 3x = 180°$;
   $x = 30°$;
   $2x = 60°$; $3x = 90°$

## PROBLEM SET 101

1. (a) 11.9
   (b) 11.8 and 11.9
   (c) 0.7

2. $22.50

3. 10 eggs
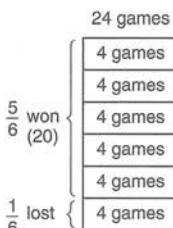
4. 72 words

5. 25 students

6. $14.40

7. $2x - 12$

8. 24 pints

9.

(a) 24 games
(b) $\frac{5}{1}$

10. 14 and 15

11. $<$
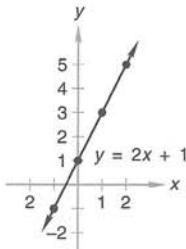
12. 84 cm$^2$

13. $6n - 3 = 45$; 8

14. $3.2 \times 10^7$

15. (a) $\frac{1}{50}$    (b) 2%
    (c) $\frac{1}{500}$    (d) 0.002

16. $-1, 1, 3, 5$

$y = 2x + 1$

17. (a) 64 in.$^3$    (b) 96 in.$^2$

18. (a) $18\pi$ cm    (b) $81\pi$ cm$^2$

19. 1 to 1

20. $x = 30°$; $2x = 60°$
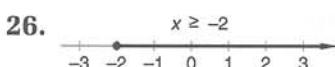
21. (a) $0.13\overline{6}$    (b) 0.137

22. 15 cm

23. (a) 72 cm    (b) 216 cm$^2$

24. $\frac{4}{10} \cdot \frac{3}{9} = \frac{2}{15}$

25. 28

26.
$x \geq -2$

27. 43

28. $5x - 2$

29. 16

30. $-14$

## LESSON 102

### MENTAL MATH:

a. $-1$

b. $6 \times 10^8$

c. $2\frac{1}{2}$

d. 0.5 L

e. $60

f. $100

g. 2

### PROBLEM SOLVING:

20 triangles; 3600°

## EXAMPLE 1

Three more pairs of corresponding angles in Example 1: $\angle b$ and $\angle f$, $\angle c$ and $\angle g$, $\angle d$ and $\angle h$

Pair of alternate exterior angles in Example 1: $\angle b$ and $\angle g$

Pair of alternate interior angles in Example 1: $\angle c$ and $\angle f$

### PRACTICE

a. $\angle s$ and $\angle u$, $\angle t$ and $\angle v$, $\angle w$ and $\angle y$, $\angle x$ and $\angle z$

b. $\angle t$ and $\angle y$, $\angle x$ and $\angle u$

c. $\angle s$ and $\angle z$, $\angle w$ and $\angle v$

d. $m\angle t, v, y = 80°$; $m\angle s, u, x, z = 100°$

e. 25

f. 45

g. $-15$

h. 4

i. 24

j. $-8$

### PROBLEM SET 102

1. (a) $\frac{1}{9}$    (b) 8 to 1

2. $3x - 12 = 36$; 16

3. (a) 36°    (b) 144°

4. 3150 adults

5. 4

6. 8 people

7. $40

8. $2n + 3 = -13$; $-8$

9. $x + 5 = 55°$;
   $3x - 25 = 125°$

10.
2000 voters
$\frac{7}{10}$ voted for incumbent (1400)
$\frac{3}{10}$ did not vote for incumbent

(a) 2000 voters
(b) 30%

11. 3

12. $<$

13. 625 cm$^2$

14. $75.22

15. $1.05 \times 10^{12}$

16. (a) $\angle g$    (b) $\angle d$
    (c) $\angle a$    (d) 70°
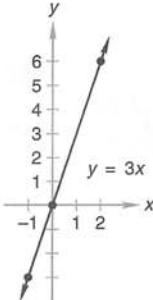
17. (a) 105    (b) 105

18. 3 to 2

19. 72 ft$^3$

20. (a) 44 m    (b) 154 m$^2$

21. $6, -3, 0$

$y = 3x$

22. (a) 56°    (b) 34°
    (c) 56°

23.

24.
$\frac{1}{4}$, 0.4, $\sqrt{4}$ ;

All three numbers are rational.

25. 12

26. 15

27. 10

28. (a) $-6x^4y^3$

   (b) $-4x + y$

29. 90

30. 7

### LESSON 103

#### MENTAL MATH:

a. 0.5

b. $1.2 \times 10^{-6}$

c. 15

d. $-22°F$

e. $200

f. $400

g. $9 \times 10^6$

#### PROBLEM SOLVING:
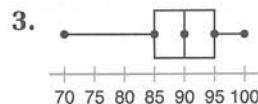
4; 5

#### PRACTICE

a. $-120$

b. 120

c. $-8$

d. 81

e. 81

f. $-1$

g. $2ab^2c$

h. $\frac{4y^2z^2}{3x}$

i. $\frac{3p}{5m}$
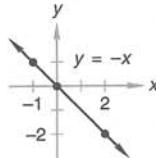
#### PROBLEM SET 103

1. $3.75

2. (a) 85     (b) 90

3. 
    70 75 80 85 90 95 100

4. 512 kilometers per hour

5. $43.75

6. 1600 meters

7. $\frac{2}{3}$

8. 5 units

9. $125

10. 70%

11. 80%

12. $18

13. (a) $\frac{1}{3}$     (b) $66\frac{2}{3}\%$

14. (a) 1080 inches

   (b) 90 feet

15. $20^3 = 8000$

16. $-2, 0, 1$



17. $2x - 3 = -7;\ -2$

18. (a) 54°     (b) 36°

   (c) 54°

19. (a) 9     (b) 0.75

20. 50°

21. (a) 6.28 ft     (b) 3.14 ft$^2$

22. C. $\sqrt{150}$

23. 54 units$^3$

24. 84.78 units$^3$

25. $\frac{1}{2}$

26. $\frac{3}{2}$

27. $\frac{3}{5}$

28. $5\frac{1}{3}$

29. (a) 1     (b) 0

30. (a) $3a^2b$     (b) $\frac{2xz^2}{3y}$

### LESSON 104

#### MENTAL MATH:

a. 0.5

b. $2.5 \times 10^{11}$

c. 25

d. 9 sq. ft

e. $50

f. $75

g. 9 miles

#### PROBLEM SOLVING:
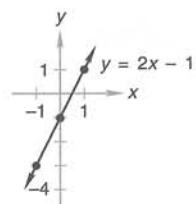
$4X = X + 60$

$X = 20$ ounces

#### PRACTICE

a. 29.42 cm

b. 44.13 cm$^2$

c. $2\pi$ cm$^2$

d. 11.14 cm

#### PROBLEM SET 104

1. $5.00

2. $\frac{5}{12}$

3. 90

4. 1.5¢ more per ounce

5. 5 hours

6. 54

7. 184 crawfish

8. (a) $W_P \times \$60 = \$45;$
    75%

   (b) $M = 0.45 \times \$60;$
    $27

9. (a) $144\pi$ units$^2$

   (b) $24\pi$ units

10. $48\pi$ units$^2$

11. (a) 240°

   (b) $16\pi$ units

12. $y = 2x - 1$

| x | y |
|---|---|
| $-1$ | $-3$ |
| 0 | $-1$ |
| 1 | 1 |



13. (a) $\frac{11}{500}$     (b) 0.022

14. 75 miles

15. $<$

16. $3.24 \times 10^5$

**17.** 32.13 cm$^2$

**18.** 21.42 cm

**19.** (a) 1728 in.$^3$

(b) 6 ft$^2$

**20.** 150°

**21.** 49°

**22.** (a) $6\frac{1}{2}$    (b) 2

(c) 4 times

**23.** 5

**24.** 16

**25.** 2

**26.** 30

**27.** (a) $\frac{3}{xy}$

(b) $5x^2 - 2x$

**28.** 3

**29.** $\frac{4}{9}$

**30.** (a) 12    (b) −2

### LESSON 105

#### MENTAL MATH:

**a.** 16

**b.** $1.6 \times 10^{-7}$

**c.** 12

**d.** −31°F

**e.** $100

**f.** $100

**g.** 2

#### PROBLEM SOLVING:
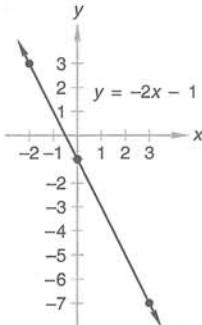
45°

#### PRACTICE

**a.** 192 m$^2$

**b.** 288 in.$^2$

**c.** 125.6 cm$^2$

**d.** 50 cm$^2$

**e.** 4, −4

**f.** 5

**g.** −2

### PROBLEM SET 105

**1.** (a) $22.50    (b) 75%

**2.** $1.91 \times 10^{10}$

**3.** 0.51

**4.** 6

**5.** $55.25

**6.** $18.60

**7.** 20°

**8.** 63 Tories

**9.** $W_P \times \$60 = \$3$; 5%

**10.** $W_F = \frac{1}{10} \times 4$; $\frac{2}{5}$

**11.** $2x - 12 = 86$; 49

**12.** $42

**13.** 5 units

**14.** <

**15.** 20 inches

**16.** $\frac{13}{52} \cdot \frac{12}{51} = \frac{1}{17}$

**17.** 1256 in.$^2$

**18.** $2.56 \times 10^{-13}$

**19.** 81.4 m

**20.** −7, 3, −1



**21.** (a) 125 mm$^3$

(b) 150 mm$^2$

**22.** 3140 cm$^3$

**23.** 1256 cm$^2$

**24.** 30°

**25.** (a) 4    (b) 1.5

(c) 2.25 times

**26.** 8

**27.** 1.3

**28.** $\frac{4}{5}$ or 0.8

**29.** (a) $xy$

(b) $3x - 12$

**30.** (a) −17    (b) 11

### LESSON 106

#### MENTAL MATH:

**a.** −125

**b.** $4 \times 10^{-1}$

**c.** 1.8

**d.** 18 sq. ft

**e.** $30

**f.** $30

**g.** $6.00

#### PROBLEM SOLVING:

$\frac{1}{4}$
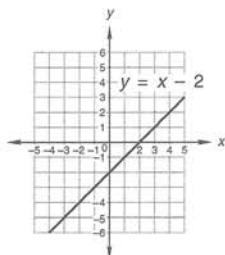
#### PRACTICE

**a.** $a = c - b$

**b.** $w = \frac{y}{x}$

**c.** $y = mx + b$

**d.** $b = \frac{A}{h}$

#### PROBLEM SET 106

**1.** $4.63

**2.** (a) 1 to 2    (b) 25%

**3.** 17.5¢ per ounce

**4.** 93

**5.** $\sqrt{29}$ units

**6.** 36 minutes

**7.** (a) 8 and −8

(b) −4

**8.** $W_N = 2.25 \times 40$; 90

**9.** (a)



(b) $|-2|, \frac{2}{2}, 2^2$

**10.** 36 visitors

**11.** $66 = \frac{2}{3} \times W_N$; 99

**12.** $0.75 \times W_N = 2.4$; 3.2

**13.** 64 students

**14.** (a) $1\frac{1}{20}$    (b) 1.05

**15.** See student work.


$y = x - 2$

**16.** 0.083

**17.** $2.88 \times 10^{-15}$

**18.** 30

**19.** 269 mm$^2$

**20.** 132 cm$^2$
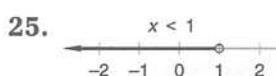
**21.** 31.4 in.$^3$

**22.** 40°

**23.** (a) $x = d - c$
(b) $n = \frac{b}{a}$

**24.** 5

**25.**
$x < 1$

-2  -1  0  1  2

**26.** 14

**27.** 12

**28.** 4x

**29.** $\frac{7}{12}$

**30.** -11

### LESSON 107

#### MENTAL MATH:

**a.** 10

**b.** $6.25 \times 10^{12}$

**c.** 3

**d.** -58°F

**e.** $45

**f.** $105

**g.** 6

#### PROBLEM SOLVING:

|  |  |
|---|---|
| sixteen | 1-by-1 |
| nine | 2-by-2 |
| four | 3-by-3 |
| + one | 4-by-4 |
| thirty | total |

### PRACTICE
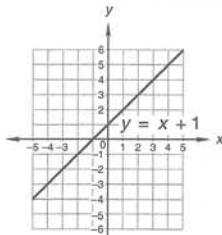
**a.** "Yards to Feet," 3;
"Feet to Yards," $\frac{1}{3}$

**b.** 1; $-\frac{1}{2}$

**c.** $\frac{1}{3}$; $-\frac{2}{3}$; 0; -2

### PROBLEM SET 107

**1.** $14

**2.** $2.5 \times 10^{10}$

**3.** (a) 11   (b) 16

**4.** 12 miles

**5.** 24 units

**6.** 100 earthworms

**7.** (a) 40°   (b) 50°
(c) 40°
(d) All three triangles are similar.

**8.** $60 = 1.25 \times W_N$; 48

**9.** $60 = W_P \times 25$; 240%

**10.** $60 = 2n + 4$; 28

**11.** $17,874

**12.** (a) $\frac{80}{100} = 80\%$
(b) $\frac{10}{100} \cdot \frac{9}{99} = \frac{1}{110}$

**13.** (a) $0.8\overline{3}$   (b) $83\frac{1}{3}\%$

**14.** =

**15.** $1.62 \times 10^5$

**16.** (a) 24 and 25
(b) $\sqrt{10}$ and $-\sqrt{10}$

**17.** (a) See student work.


$y = x + 1$

(b) 1

**18.** $24\pi$ cm$^2$

**19.** 160 in.$^2$

**20.** 502.4 cm$^3$

**21.** 251.2 cm$^2$

**22.** 30°

**23.** 2

**24.** (a) $x = z + y$
(b) $x = \frac{w}{y}$

**25.** 4.5

**26.** $\frac{1}{2}$

**27.** 67

**28.** 3x$^2$

**29.** $8\frac{1}{3}$

**30.** 21

### LESSON 108

#### MENTAL MATH:

**a.** 0

**b.** $1 \times 10^{-7}$

**c.** 8

**d.** 27 sq. ft

**e.** $180

**f.** $180

**g.** 210 mi

#### PROBLEM SOLVING:

100

#### PRACTICE

**a.** 5

**b.** 10

**c.** -40

### PROBLEM SET 108

**1.** $1.80

**2.** $1 \times 10^{-4}$

**3.** 4, 7, 8, 8, 8, 9, 9, 10, 12, 15; median = 8.5; mode = 8

**4.** $\frac{4}{52} \cdot \frac{3}{51} = \frac{1}{221}$

**5.** $160

**6.** 750 pounds

**7.** 420 beans

**8.** $W_N = 0.025 \times 800$; 20

**9.** $0.1 \times W_N = \$2500$; $25,000

**10.** $56 = 2x - 8$; 32

**11.** $117

**12.** $-\frac{2}{3}$
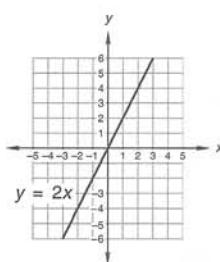
**13.** 180 ft²

**14.** $x = 45°$; $2x = 90°$

**15.** $2.24 \times 10^{-2}$

**16.** 30.48 cm

**17.** See student work.



$y = 2x$

**18.** 20.28 in.

**19.** 600 in.²

**20.** 392.5 cm³

**21.** 30°

**22.** (a) 15 cm  (b) 1.5
(c) 2.25 times

**23.** 8 cm

**24.** 314 in.²

**25.** 12

**26.** $2x^2 + 2x$

**27.** $2ay$

**28.** 1331

**29.** 1

**30.** (a) 39   (b) 0

### LESSON 109

### MENTAL MATH:

**a.** $\frac{1}{4}$

**b.** $1.44 \times 10^{24}$

**c.** 1
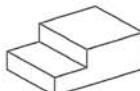
**d.** 1.5 m

**e.** $10

**f.** $70

**g.** 40

### PROBLEM SOLVING:



### PRACTICE

**a.** 6, −6

**b.** $\sqrt{6}, -\sqrt{6}$

**c.** −9

**d.** $\sqrt{3}$

**e.** 6, −6

### PROBLEM SET 109

**1.** 0.04

**2.** (a) $\angle z$    (b) $\angle w$
(c) $\angle y$    (d) 135°

**3.** 1.5

**4.** 1,000,000 m²

**5.** $\frac{2}{5}$

**6.** 15 minutes

**7.** 50

**8.** $27

**9.** $60 = 1.5 \times W_N$; 40

**10.**



(a) 702 cards
(b) 468 cards

**11.** >

**12.** $\left(\frac{1}{2}\right)^5 = \frac{1}{32}$

**13.** 36 cm²

**14.** 54 in.³

**15.** 56.52 in.²
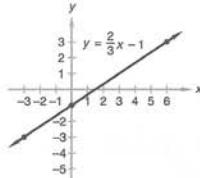
**16.** (a) $2.34   (b) $38.34

**17.** (a) $\frac{1}{200}$   (b) 0.005

**18.** 80

**19.** $4.8 \times 10^{-3}$

**20.** 3, −1, −3



$\frac{2}{3}$

**21.** 42°

**22.** 36°

**23.** $\sqrt{29}$ units

**24.** 4, −4

**25.** 2

**26.** 0

**27.** $2x^2y$

**28.** $\frac{7}{8}$

**29.** 8.7

**30.** (a) 4      (b) 5

### LESSON 110

### MENTAL MATH:

**a.** $\frac{1}{4}$

**b.** $5.4 \times 10^{16}$

**c.** $\frac{5}{2}$

**d.** 1500 mL

**e.** $90

**f.** $90

**g.** 10

### PROBLEM SOLVING:

135°

### EXAMPLE 1

10 yr, $2593.74;
20 yr, $6727.50

No. This keystroke sequence multiplies the displayed number by 1000, the first number entered, and not by 1.1.

### PRACTICE
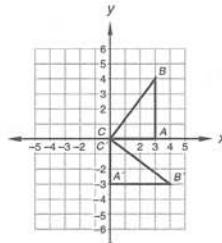
a. $132,528.15

b. $6320; $\frac{8}{12}$ or $\frac{2}{3}$

c. $192

### PROBLEM SET 110

1. $1.08

2. $16.20

3.



A′ (0, −3), B′ (4, −3),
C′ (0, 0)

4. 3.5 miles
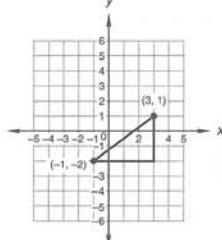
5. $12.25

6. 32 in.

7. 20

8. $150 = W_P \times 60$; 250%

9. $0.6 \times W_N = 150$; 250

10. $(-x)^2 + 6 = 150$; −12

11.
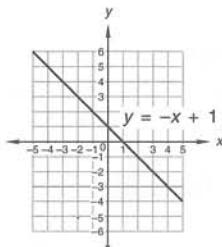


5 units

12. $80

13. 5 inches

14. 8 and 9

15. See student work.;



−1

16.


$x \geq -2$

17. $5.67 \times 10^5$

18. $y = 2x + 4$

19. $5180.12

20. (a) 6 in.     (b) 0.75

21. 960 in.$^3$

22. 672 in.$^2$

23. 110°

24. 6, −6

25. 3, −3

26. 10

27. $4b$

28. $9\frac{2}{3}$

29. $7\frac{1}{5}$

30. 1

### INVESTIGATION 11

#### ACTIVITY

This problem-solving activity asks students to design their on patterns for cubes. The activity is time consuming and may be assigned as out-of-class work prior to addressing the questions in this investigation.

1, 2, 3, 4

6, 24, 54, 96

1, 8, 27, 64

1. 2 times

2. 4 times

3. 8 times

4. 2 times

5. 4 times

6. 8 times

7. 3 times

8. 9 times

9. 27 times

10. 3 times

11. 9 times

12. 27 times

13. (a) 216 cm$^2$
    (b) 216 cm$^3$

14. 9 times

15. 27 times

16. (a) 4     (b) $4^2 = 16$
    (c) $4^3 = 64$

17. (a) $2^3 = 8$
    (b) $3^2 = 9$

18. (a) 2     (b) $2^2 = 4$

19. Scale
    factor: $1.5^2 = 2.25$;

    Price:   $10.00
           ×    2.25
           ─────────
             $22.50

20. (a) 100
    (b) $100^2 = 10,000$
    (c) $100^3 = 1,000,000$

21. 96 cm$^2$

22. $8 \times 24$ cm$^2$ = 192 cm$^2$

23. $64 \times 6$ cm$^2$ = 384 cm$^2$

24. Although the volumes are the same, the small cubes will melt sooner than the large block because a much greater surface area is exposed to the warmer surroundings.

25. Because the surface area of a smaller animal is greater for its volume than it is for a larger animal, smaller animals work harder to regulate body temperature than larger animals in the same environment. So

smaller animals, like sparrows, need to eat a greater percentage of their weight in food than do larger animals, like hawks.

### LESSON 111

### MENTAL MATH:

a. 0.05

b. $6.4 \times 10^{-7}$

c. 60

d. 144 in.$^2$

e. $50

f. $100

g. $16.00

### PROBLEM SOLVING:

$3600

### PRACTICE

a. $1.8 \times 10^6$

b. $3 \times 10^{-6}$

c. $1.5 \times 10^{-4}$

d. $4 \times 10^4$

e. $5 \times 10^7$

f. $5 \times 10^{-9}$

g. $6 \times 10^{-7}$

h. $2 \times 10^5$

### PROBLEM SET 111

1. 51 years (1859 should be counted.)

2. 55

3. (a) $\frac{7}{10}$    (b) $\frac{3}{7}$

4. $A'$ (−1, 2), $B'$ (−1, −1), $C'$ (3, −1)

5. (a) $2^{10}$    (b) 32

6. (a) 30°    (b) 12 sides
   (c) dodecagon

7. $80

8. (a) $\frac{1}{22}$    (b) $\frac{1}{22}$

9. $2x + 6 = 36$; 15

10. 45°
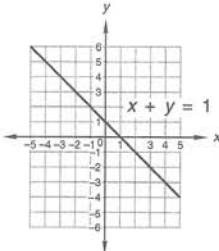
11. $c^2 = a^2 + b^2$

12. (a) 105°    (b) 75°
    (c) 75°    (d) 105°

13. 63

14. 57 in.$^2$

15. See student work.



16. (a) −1    (b) (0, 1)

17. 18.84 ft$^2$

18. 9.42 ft$^3$

19. (a) 3, −3
    (b) $\sqrt{10}, -\sqrt{10}$

20. 12 units

21. $6381.41

22. (a) 25 cm    (b) 12 cm

23. (a) $6 \times 10^1$
    (b) $3 \times 10^{-2}$

24. 130°

25. 3

26. 0.048

27. (a) 0    (b) −10

28. (a) $6a^2b^2$    (b) $x^2$

29. −15

30. 250

### LESSON 112

### MENTAL MATH:

a. −900

b. $2 \times 10^3$

c. 10, −10

d. 122°F

e. $500

f. $2500

g. $2\frac{1}{2}$

### PROBLEM SOLVING:

60 pages

### PRACTICE

a. 10 feet, 11 inches

b. 200 feet

### PROBLEM SET 112

1. $3779.14

2. 5

3. (a) 90    (b) 95

4. 80 kilometers per hour

5. $42

6. $0.25

7. $\frac{3}{2}$

8. 13 units

9. $64

10. 70 inches

11. 80%

12. $1.50

13. 1 to 15

14. $180
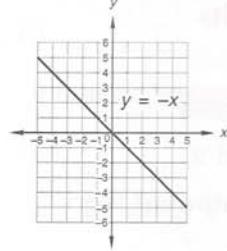
15. (a) 0.625    (b) 62.5%

16. (a) $2.5 \times 10^4$
    (b) $3 \times 10^{-5}$

17. 300,000 grams

18. $t = \frac{d}{r}$

19. See student work.



20. 91.4 cm

21. 468 ft$^2$

22. (a) $2^{12} \cdot 5^{12}$
    (b) 1,000,000

23. (a) 6 cm    (b) 1.5

24. 7.5

**25.** 9

**26.** 23

**27.** $1\frac{5}{12}$

**28.** $\frac{5}{6}$

**29.** −110

**30.** 600 square centimeters

## LESSON 113

### MENTAL MATH:

**a.** −0.25

**b.** $2 \times 10^{-4}$

**c.** 0.6
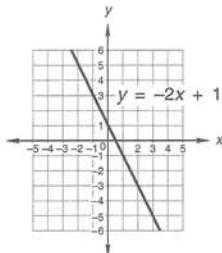
**d.** 288 in.$^2$

**e.** $1600

**f.** $800

**g.** $2\frac{1}{2}$ hr

### PROBLEM SOLVING:

5 and 12

### PRACTICE

**a.** $\frac{1}{3}$

**b.** $\frac{2}{3}$

**c.** $\frac{2}{3}$

**d.** $\frac{1}{3}$

**e.** All of the box would be filled. $\left(\frac{1}{3} + \frac{2}{3} = 1\right)$

**f.** 1728 in.$^3$; 576 in.$^3$

**g.** $18\pi$ in.$^3$

**h.** $36\pi$ in.$^3$

### PROBLEM SET 113

**1.** $13.50

**2.** $9.02 \times 10^9$

**3.** 0.94

**4.** $4.80 per hour; $5.50 per hour; $0.70 more per hour

**5.** $54.25

**6.** 1100 yards

**7.** $\frac{1}{16}$

**8.** $W_P \times \$30 = \$1.50$; 5%

**9.** $\frac{1}{2} \times W_N = 2\frac{1}{2}$; 5

**10.** $1298.56

**11.** $9.60

**12.** 6 units$^2$

**13.** $\sqrt{13}$ units

**14.** 3 inches

**15.** 110 cm$^3$

**16.** $4.41 \times 10^4$

**17.** 20 yards

**18.** (a) $h = \frac{2A}{b}$ (b) 4

**19.** See student work; −2



**20.** 16,000 m$^3$

**21.** 6280 cm$^3$

**22.** (a) 60° (b) 60°
(c) 30°

**23.** 12 cm

**24.** 4.8

**25.** 20

**26.** 15

**27.** $22\frac{ft}{s}$

**28.** $\frac{7}{12}$

**29.** $1\frac{5}{23}$

**30.** 4

## LESSON 114

### MENTAL MATH:

**a.** −18

**b.** $1.6 \times 10^{17}$

**c.** 9

**d.** 140°F

**e.** $4500

**f.** $7500

**g.** 2

### PROBLEM SOLVING:

$X + 500 = 3X + 250$

$X = 125$ g

### PRACTICE

**a.** $\frac{1}{25}$

**b.** $\frac{1}{81}$

**c.** $\frac{1}{32}$

**d.** $\frac{1}{100}$

**e.** 1

**f.** $\frac{3}{8}$

**g.** 0.01

**h.** $7.5 \times 10^{-4} = 7.5 \times \frac{1}{10,000}$

$= \frac{7.5}{10,000} = 0.00075$

### PROBLEM SET 114

**1.** $62.06
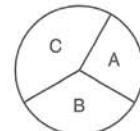
**2.** 96

**3.** (a) $\frac{4}{9}$ (b) $33\frac{1}{3}\%$
(c) 7 to 2

**4.** $7\frac{1}{2}$¢ per pencil

**5.** $200

**6.** (a) Class Test Scores



(b) 10 students

**7.** 2500 cars

**8.** 32 ft$^3$

**9.** $W_N = 1.2 \times \$240$; $288

**10.** $60 = W_P \times 150$; 40%

**11.** (a) 26 units$^2$
(b) 22 units

**12.** (a) −6, 0.6, $\sqrt{6}$, $6^2$
(b) $6^2$, −6, 0.6

**13.** (a) 1.8 (b) 180%

**14.** (a) $2.5 \times 10^{-3}$
(b) $4 \times 10^2$
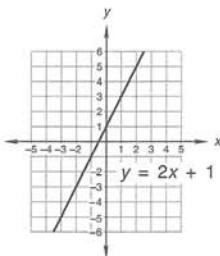
**15.** 1

**16.** 30.48 centimeters

**17.** (a) $d = \frac{C}{\pi}$  (b) 20

**18.** See student work; 2


$y = 2x + 1$

**19.** 27.42 cm

**20.** (a) 54 ft$^2$  (b) 9 ft$^3$

**21.** 235.5 m$^3$

**22.** (a) 50°  (b) 40°
    (c) 80°

**23.** 8000 cm$^3$

**24.** 9

**25.**

$x < 2$

**26.** 1

**27.** 950 grams

**28.** 1

**29.** $1\frac{1}{12}$

**30.** 31

### LESSON 115

#### MENTAL MATH:

**a.** $\frac{1}{100}$

**b.** 1

**c.** 1

**d.** 2.5 m

**e.** $800

**f.** $800

**g.** 100¢

#### PROBLEM SOLVING:

$\frac{2}{3}$ (See Lesson 113)

#### PRACTICE

**a.** 2 kg

**b.** 3000 cm$^3$

**c.** 1000 milliliters

**d.** 2 liters

### PROBLEM SET 115

**1.** $420

**2.** (a) $\frac{1}{4}$  (b) 25%
    (c) 1 to 3

**3.** $448\frac{\text{mi}}{\text{day}}$

**4.** $1\frac{1}{2}$¢ more per ounce

**5.** 25 minutes

**6.** 70 guinea pigs

**7.** 40

**8.** $2268

**9.** $48

**10.** (a) 24 units$^2$
    (b) 24 units

**11.** 10 kg

**12.** (a) $\frac{7}{8}$  (b) $87\frac{1}{2}$%
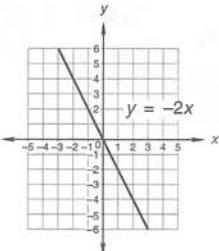
**13.** <

**14.** (a) $5.12 \times 10^{-1}$
    (b) $8 \times 10^{13}$

**15.** 91.44 centimeters

**16.** (a) $b = \frac{2A}{h}$  (b) 8

**17.** See student work; −2


$y = -2x$

**18.** 29.72 mm$^2$

**19.** (a) 60,000 cm$^2$
    (b) 1,000,000 cm$^3$
    (c) 1 m

**20.** (a) $6750\pi$ in.$^3$
    (b) $4500\pi$ in.$^3$

**21.** (a) 55°  (b) 35°
    (c) 55°

**22.** 8 cm

**23.** 72 in.$^3$

**24.** 17

**25.** 14

**26.** 7

**27.** 2 yd, 11 in.

**28.** $7\frac{1}{2}$ or 7.5

**29.** $3\frac{5}{8}$ or 3.625

**30.** −20

### LESSON 116

#### MENTAL MATH:

**a.** $4\frac{1}{4}$

**b.** $2.5 \times 10^3$

**c.** 0.4

**d.** 10,000 cm$^2$

**e.** $500

**f.** $500

**g.** $3.60

#### PROBLEM SOLVING:



#### PRACTICE

**a.** $(2)(2)(2)mmn$

**b.** $(2)(2)(3)mnn$

**c.** $(2)(3)(3)xxxyy$

**d.** $4mn(2m + 3n)$

**e.** $4xy(2y - 1)$

**f.** $3a^2b^2(2b + 3a + 1)$

#### PROBLEM SET 116

**1.** (a) 0.11  (b) 25%
    (c) 1 to 35

**2.** 1024 bytes

**3.** The better sale seems to
    be the "40% of" sale
    which is 60% off the
    regular price instead of
    40% off the regular price.

**4.** (a) $1\frac{3}{4}$  (b) 1.75
    (c) $0.08\overline{3}$  (d) $8\frac{1}{3}$%

**5.** $A'$ (0, −3), $B'$ (0, 0),
    $C'$ (−4, 0)

**6.** 18°; 162°

**7.** $18

8. (a) 24 liters
   (b) 24 kg

9. 52.8 lb

10. $2x - 6 = 48; 27$

11. $64°$

12. $C = \frac{F - 32}{1.8}$

13. 195 in.

14. 1500 cm$^2$

15. 3000 cm$^3$

16. (a) 1; $(0, -2)$
    (b) $-2$; $(0, 4)$

17. 120 cm$^2$

18. $\sqrt{15}, -\sqrt{15}$

19. (a) $2 \times 10^{-12}$
    (b) $5 \times 10^{11}$

20. The product is 1 because the numbers are reciprocals.

21. (a) $(3)(3)xxy$
    (b) $5ab(2a + 3ab + 4c)$

22. 904 in.$^3$

23. (a) $65°$    (b) $65°$
    (c) $25°$
    (d) The three triangles are similar.

24. $CD$

25. $-8$

26. 13

27. $bc - ac$ or $-ac + bc$

28. $4x^4$

29. (a) 23    (b) 0

30. 0.45 units

### LESSON 117

### MENTAL MATH:

a. $-6$

b. $3.5 \times 10^2$

c. $5, -5$

d. $212°F$

e. $500

f. $3500

g. $-1$

### PROBLEM SOLVING:

```
 36   1-by-1
 25   2-by-2
 16   3-by-3
  9   4-by-4
  4   5-by-5
+ 1   6-by-6
─────
 91   total
```

### PRACTICE
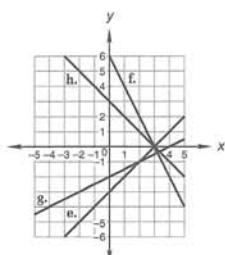
a. $y = -2x + 3$

b. $y = x + 3$

c. $y = -2x + 3$

d. $y = -2x + 4$

e., f., g., h.



### PROBLEM SET 117

1. $3107.96

2. (a) $\frac{1}{4}$    (b) 1 to 3

3. 81%

4. (a) $1\frac{2}{5}$    (b) 140%
   (c) $0.91\overline{6}$    (d) $91\frac{2}{3}\%$

5. $A'$ (1, 3), $B'$ (3, 0),
   $C'$ (0, $-2$)

6. (a) $45°$    (b) $135°$
   (c) 5 diagonals

7. 25%

8. (a) 500 cubic centimeters
   (b) 0.5 kilograms

9. 60 yd$^2$

10. $3x^2 + 6 = 81; 5, -5$

11. $50°$

12. $c^2 = b^2 + a^2$ or
    $c^2 = a^2 + b^2$

13. (a) 0.25    (b) $33\frac{1}{3}\%$
    (c) 1 to 5

14. (a) 5 units
    (b) 20 units
    (c) 25 units$^2$

15. (a) $72\pi$ in.$^3$
    (b) $24\pi$ in.$^3$

16. (a) $h = \frac{V}{lw}$
    (b) 10 cm

17. (a) 2    (b) $(0, 4)$
    (c) $y = 2x + 4$

18. (a) $y = x - 5$
    (b) $y = -2x + 4$

19. (a) $(2)(2)(2)(3)xyy$
    (b) $3x(x + 2y - 3)$
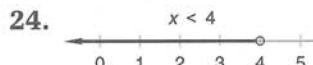
20. (a) $2.5 \times 10^7$ mm$^2$
    (b) 25,000,000 mm$^2$

21. 25 m$^2$

22. (a) side $BD$
    (b) side $AD$

23. $\frac{5}{12}$ in.

24. 
    $x < 4$
    

25. 9

26. $3x^2 + 2x^2y$

27. $2\frac{1}{2}$

28. $-19$

29. $3 \times 10^{-10}$

30. $3ab$

### LESSON 118

### MENTAL MATH:

a. $9\frac{1}{9}$

b. $1.5 \times 10^{-3}$

c. 22

d. 7.5 kg

e. $6000

f. $10,000

g. 1 hr, 20 min

**PROBLEM SOLVING:**

The frame will not fit flat but it will fit slanted. By the Pythagorean theorem we find that the diagonal dimension of the box is 15 in. $(9^2 + 12^2 = 15^2)$, which is long enough to hold the frame despite its thickness.
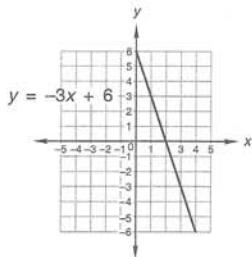
**PRACTICE**

a. See student work.

b. See student work.

**PROBLEM SET 118**

1. 5%

2. 15 meters

3. Armando can select a Pythagorean triplet like 3-4-5 to verify when he has formed a right angle. For example, he can measure and mark from a corner 3 meters along one line and 4 meters along a proposed perpendicular line. Then he can check if it is 5 meters between marks.

4. 49 feet

5. 225 ft$^2$

6. (a) $\frac{1}{9}$     (b) $8\frac{1}{3}\%$
   (c) 1 to 17

7. 13 units

8. (a) 2000 cubic centimeters
   (b) 2 kilograms

9. $\frac{1}{2}x - \frac{2}{3} = \frac{5}{6}$; 3

10. 80°

11. $y = -3x + 6$



12. 50°
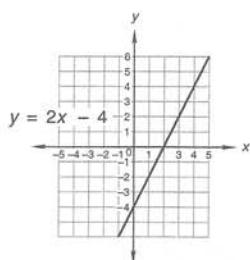
13. 2112 cubic inches

14. $\overline{AD} = c - 12$

15. $x = 16$; $y = 9$

16. $A = 4\pi r^2$
    $\approx 4 \cdot 3(4 \text{ cm})^2$
    $\approx 192 \text{ cm}^2$

17. $y = 2x - 4$



18. (a) $\frac{1}{2}$     (b) $-1$
    (c) $y = \frac{1}{2}x - 1$

19. See student work.

20. $34\frac{1}{2}$ in.

21. $\dfrac{1 \times 10^3}{1 \times 10^{-3}}$
    $= 1 \times 10^6$ dimes

22. (a) $x(x + 1)$
    (b) $6mn^2(2mn + 3 - 4m)$

23. $-2$

24. $4, -4$

25. 0

26. 0.08 or $\frac{2}{25}$

27. 31

28. $3x^2y^2z$

29. $x^2 + 4x + 4$

30. 22 mm and 23 mm

**LESSON 119**

**MENTAL MATH:**

a. 1

b. $1 \times 10^{-4}$

c. 0

d. 500 mm$^2$

e. $400

f. $400

g. $\frac{1}{4}$

**PROBLEM SOLVING:**

$\sqrt{3}$ cm

**PRACTICE**

a. A typical error message display is (E   0). Error messages vary.

b. $0 \div 0 = 7$ is not a fact because division by zero is not possible.

c. $w \neq 0$

d. $x \neq 1$

e. $w \neq 0$

f. $y \neq 3$

g. $x \neq 2, -2$

h. $c \neq 0$

**PROBLEM SET 119**

1. 4%

2. 25%

3. 

4. 360°

5. (a) $\frac{1}{200}$     (b) 0.005
   (c) 0.8     (d) $88\frac{8}{9}\%$

6. (a) 
   (b) 45°     (c) 14 cm

7. $4 \times 10^7$

8. (a) $x(2x + 1)$
   (b) $3a(ab - 4a + 3b^2)$

9. 18 cm$^3$

**10.** 48 cm$^2$

**11.** $h = \frac{2A}{b}$; 1.8 m

**12.** $37\frac{1}{2}\%$

**13.** 8 ft

**14.** (a) $y = 2x - 4$
(b) $y = -\frac{1}{2}x + 1$

**15.** The product of the slopes is –1. The slopes are negative reciprocals.

**16.** $10,099.82

**17.** 139 square yards

**18.** (a) $w \neq 0$  (b) $m \neq -3$

**19.** $\overline{DA} = c - x$

**20.** 54 in.$^2$

**21.** 14,130 cm$^3$

**22.** See student work.

**23.** $\frac{1}{2}$

**24.** –8

**25.** 4

**26.** $\sqrt{10}, -\sqrt{10}$

**27.** 300

**28.** $x^2 + 3x - 10$

**29.** $3x^2y^3$

**30.** $\frac{2}{15}$ or $0.1\overline{3}$

**LESSON 120**

**MENTAL MATH:**

**a.** 1

**b.** $2.5 \times 10^{-9}$

**c.** 4, –4

**d.** 32°F

**e.** $25

**f.** $275

**g.** 1

**PROBLEM SOLVING:**

3 cones

**PRACTICE**
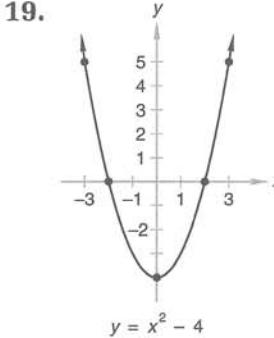
**a.** See student work.

**b.** See student work.

**c.** See student work.

**d.** See student work.

**PROBLEM SET 120**

**1.** 1 to 5

**2.** $2.50

**3.** insufficient information

**4.** 100°; 80°; 80°

**5.** (a) $\frac{1}{1000}$  (b) 0.001
(c) 1.6  (d) 160%

**6.** (a) $\sqrt{3}$ cm  (b) 1.7 cm

**7.** $3 \times 10^{-12}$

**8.** (a) $y(3y - 1)$
(b) $3w(2w + 3x - 4)$

**9.** $\frac{1}{3}$

**10.** 113 cm$^2$

**11.** $m = \frac{E}{c^2}$

**12.** $\frac{2}{3}$

**13.** line $m$: $y = -\frac{2}{3}x + 2$;
line $n$: $y = \frac{3}{2}x - 2$

**14.** The product of the slopes is –1. The slopes are negative reciprocals.

**15.** 4 years

**16.** 21 in.
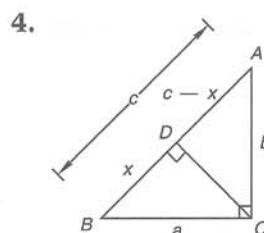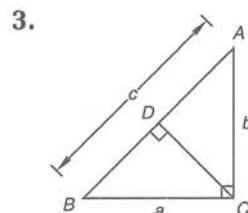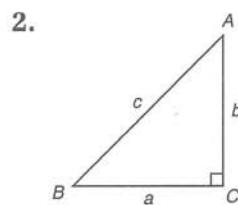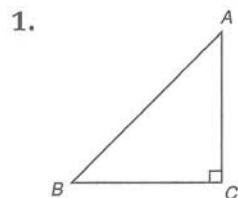
**17.** (a) 378 cubic feet
(b) 14 cubic yards

**18.** (a) $m \neq 2$  (b) $y \neq -5$

**19.**

$y = x^2 - 4$

**20.** $y$

**21.** 113 in.$^2$

**22.** 0.25 liters

**23.** 16

**24.** 27

**25.** 6, –6

**26.** 240

**27.** $x^2 - 7x + 10$

**28.** $6x^2y$

**29.** –39

**30.** 230

**INVESTIGATION 12**

**1.**


**2.**


**3.**


**4.**


**5.** 90°; The sum of the measures of all three angles is 180°. The right angle of the triangle removes 90° from this total leaving 90° to be shared by the remaining two acute angles.

**6.** $90° - m$

**7.** (a) $90° - m$
(b) $m$

8. All three triangles are similar because each triangle has degree angle measures of 90, $m$, and $90° - m$. Since their corresponding angle measures are equal, their angles are congruent, and the triangles are similar.

9. $\frac{c}{a} = \frac{a}{x}$

10. $\frac{c}{b} = \frac{b}{c - x}$

11. From 9:

$$\frac{c}{a} = \frac{a}{x}$$
$$cx = a^2$$

or

$$a^2 = cx$$

From 10:

$$\frac{c}{b} = \frac{b}{c - x}$$
$$c^2 - cx = b^2$$

or

$$b^2 = c^2 - cx$$

12. $c^2 - a^2 = b^2$

or

$$b^2 = c^2 - a^2$$

13. $\qquad c^2 = a^2 + b^2$
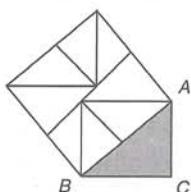
or

$$a^2 + b^2 = c^2;$$

Pythagorean theorem

## ACTIVITY

One solution:

### SUPPLEMENTAL PRACTICE FOR LESSON 3

1. 26
2. 66
3. 12
4. 128
5. 54
6. 18
7. 8
8. 18
9. 9
10. 54
11. 6
12. 48
13. 7
14. 9

### SUPPLEMENTAL PRACTICE FOR LESSON 6

1. 1, 2, 3, 4, 6, 9
2. 1, 2, 3, 4, 5, 6, 8, 9, 10
3. 1, 2, 5, 7, 10
4. 1, 2, 3, 6
5. 1, 2, 3, 4, 5, 6, 8, 9, 10
6. 1, 2, 5, 10
7. 1, 2, 3, 4, 5, 6, 8, 10
8. 1, 2, 4, 5, 7, 10
9. 1, 2, 3, 5, 6, 9, 10
10. 1, 2, 3, 5, 6, 10
11. 1, 2, 4, 5, 8, 10
12. 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

### SUPPLEMENTAL PRACTICE FOR LESSON 15

1. $\frac{3}{4}$
2. $\frac{1}{3}$
3. $\frac{3}{8}$
4. $\frac{2}{3}$
5. $\frac{4}{5}$
6. $\frac{1}{2}$
7. $\frac{2}{3}$

8. $\frac{4}{5}$
9. $3\frac{5}{6}$
10. $6\frac{3}{4}$
11. $8\frac{3}{5}$
12. $4\frac{9}{16}$

### SUPPLEMENTAL PRACTICE FOR LESSON 19

1. 64 in.
2. 58 in.
3. 82 in.
4. 86 in.

### SUPPLEMENTAL PRACTICE FOR LESSON 20

1. 64
2. 64
3. 27
4. 100,000
5. 17
6. 9
7. 64
8. 225
9. 10
10. 8
11. 500
12. 625
13. 9
14. 11
15. 7
16. 12
17. 30
18. 25
19. 14
20. 21

### SUPPLEMENTAL PRACTICE FOR LESSON 21

1. $3 \times 3 \times 3 \times 3$
2. $2 \times 2 \times 3 \times 5 \times 5$

3. $2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5$
4. $5 \times 5 \times 5 \times 5$
5. $2 \times 3 \times 3 \times 5 \times 5$
6. $2 \times 2 \times 2 \times 2 \times 3 \times 5 \times 5$
7. $2 \times 2 \times 2 \times 5 \times 11$
8. $2 \times 3 \times 5 \times 5 \times 5$
9. $2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5$
10. $2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$
11. $2 \times 2 \times 3 \times 5 \times 13$
12. $2 \times 2 \times 5 \times 7 \times 11$

### SUPPLEMENTAL PRACTICE FOR LESSON 23

1. $8\frac{2}{5}$
2. $8\frac{3}{4}$
3. 6
4. $9\frac{1}{2}$
5. $12\frac{1}{2}$
6. $11\frac{1}{3}$
7. $4\frac{3}{4}$
8. $1\frac{3}{4}$
9. $3\frac{2}{5}$
10. $3\frac{2}{3}$
11. $2\frac{3}{5}$
12. $3\frac{1}{3}$

### SUPPLEMENTAL PRACTICE FOR LESSON 26

1. $1\frac{1}{2}$
2. 7
3. 6
4. $18\frac{2}{3}$
5. 2
6. $3\frac{3}{5}$
7. $1\frac{1}{6}$
8. $3\frac{2}{3}$
9. $\frac{9}{16}$

10. $1\frac{19}{21}$

11. $1\frac{2}{3}$

12. $\frac{5}{28}$

### SUPPLEMENTAL PRACTICE FOR LESSON 30

1. $\frac{9}{10}$

2. $1\frac{5}{8}$

3. $4\frac{1}{3}$

4. $1\frac{7}{12}$

5. $1\frac{19}{24}$

6. $6\frac{4}{15}$

7. $\frac{1}{8}$

8. $2\frac{1}{3}$

9. $3\frac{5}{12}$

10. 0

11. $3\frac{4}{15}$

12. $3\frac{5}{12}$

### SUPPLEMENTAL PRACTICE FOR LESSON 31

1. sixteen and one hundred twenty-five thousandths

2. five and three hundredths

3. one hundred five and one hundred five thousandths

4. one thousandth

5. one hundred sixty and one hundred sixty-five thousandths

6. four thousand and three hundred twenty-one thousandths

7. 0.123

8. 100.023

9. 120.003

10. 0.05

11. 20.09

12. 29.5

### SUPPLEMENTAL PRACTICE FOR LESSON 33

1. 23

2. 164

3. 87

4. 12.83

5. 6.02

6. 0.11

7. 0.083

8. 0.455

9. 3.142

10. 300

11. 283.57

12. 130

### SUPPLEMENTAL PRACTICE FOR LESSON 35

1. 50.94

2. 2.2

3. 9.544

4. 34.12

5. 11.11

6. 283.135

7. 7.827

8. 1.13

9. 2.179

10. 5.24

11. 0.081

12. 0.063

13. 0.036

14. 22.5

15. 0.096

16. 0.024

17. 144

18. 0.12

19. 0.018

20. 0.009

### SUPPLEMENTAL PRACTICE FOR LESSON 37

1. 96 cm$^2$

2. 150 cm$^2$

3. 24 cm$^2$

4. 120 cm$^2$

5. 35 cm$^2$

6. 108 cm$^2$

7. 124 cm$^2$

8. 104 cm$^2$

9. 228 cm$^2$

10. 76 cm$^2$

### SUPPLEMENTAL PRACTICE FOR LESSON 43

1. $\frac{12}{25}$

2. $3\frac{3}{4}$

3. $\frac{1}{8}$

4. $12\frac{3}{5}$

5. $\frac{1}{40}$

6. $1\frac{2}{25}$

7. 0.625

8. $0.\overline{3}$

9. 2.4

10. $6.1\overline{6}$

11. 0.55

12. $5.\overline{5}$

### SUPPLEMENTAL PRACTICE FOR LESSON 45

1. 0.3

2. 240

3. 45

4. 6.25

5. 312.5

6. 240

7. 430

8. 12.5

9. 5

10. 1.8

 *Math 87, Second Edition*

11. 200

12. 25

1. $0.8\overline{3}$

2. $83\frac{1}{3}\%$

3. $1\frac{1}{5}$

4. 120%

5. $\frac{2}{25}$

6. 0.08

7. 1.6

8. 160%

9. $\frac{3}{40}$

10. $7\frac{1}{2}\%$

11. $1\frac{1}{4}$

12. 1.25

1. 3 feet, 4 inches

2. 3 minutes, 20 seconds

3. 4 ft, 9 in.

4. 3 hr, 30 min

5. 5 yd 1 ft 3 in.

6. 8 hr 4 min 11 s

7. 12 lb 2 oz

8. 6 gal 2 qt

1. 288 in.

2. 8 yd

3. 5 hr

4. 18,000 s

5. 5 m

6. 5000 mm

7. 1600 oz

8. $\frac{1}{20}$ ton

1. 19

2. 33

3. 55

4. 15

5. 11

6. 1

7. 52

8. 29

9. 46

10. $\frac{3}{8}$

11. 0.55

12. −2

1. 1 ft, 9 in.

2. 6 min, 45 s

3. 3 yd, 10 in.

4. 45 min, 20 s

5. 6 yd 2 ft 7 in.

6. 28 min 47 s

1. $W_N = \frac{3}{4} \times 24$; 18

2. $\frac{3}{5} \times 60 = W_N$; 36

3. $W_N = 0.4 \times 80$; 32

4. $0.6 \times 60 = W_N$; 36

5. $W_N = 0.3 \times 120$; 36

6. $0.06 \times 250 = W_N$; 15

7. $W_N = \frac{5}{6} \times 300$; 250

8. $\frac{2}{3} \times 90 = W_N$; 60

9. $W_N = 0.5 \times 50$; 25

10. $0.7 \times 140 = W_N$; 98

11. $W_N = 0.75 \times 400$; 300

12. $0.8 \times 400 = W_N$; 320

1. 18

2. −41

3. −3

4. 13

5. −23

6. 26

7. 0

8. 5

9. $-5\frac{3}{4}$

10. $1\frac{1}{2}$

11. −6.7

12. −1.67

1. 125.6 cm

2. 44 cm

3. $12\pi$ cm

4. 31.4 cm

5. 88 cm

6. $15\pi$ cm

1. 5

2. 8

3. 23

4. −12

5. −2

6. 2

7. 5

8. 3

9. 9

10. 11

11. 4

12. −8

### SUPPLEMENTAL PRACTICE FOR LESSON 69

1. $1.5 \times 10^6$
2. $4.8 \times 10^{-7}$
3. $2 \times 10^6$
4. $7.2 \times 10^{-5}$
5. $1.25 \times 10^{11}$
6. $2.25 \times 10^{-5}$
7. $1.75 \times 10^{11}$
8. $3.75 \times 10^{-9}$

### SUPPLEMENTAL PRACTICE FOR LESSON 75

1. $94 \text{ cm}^2$
2. $108 \text{ cm}^2$
3. $160 \text{ cm}^2$
4. $168 \text{ cm}^2$

### SUPPLEMENTAL PRACTICE FOR LESSON 77

1. $W_P \times 75 = 60$; 80%
2. $60 = 0.75 \times W_N$; 80
3. $30 = W_P \times 90$; $33\frac{1}{3}$%
4. $30 = 1.5 \times W_N$; 20
5. $W_P \times 40 = 50$; 125%
6. $0.2 \times W_N = 50$; 250
7. $W_P \times \$5.00 = \$3.50$; 70%
8. $12 = \frac{2}{3} \times W_N$; 18

### SUPPLEMENTAL PRACTICE FOR LESSON 82

1. $1256 \text{ cm}^2$
2. $616 \text{ cm}^2$
3. $16\pi \text{ cm}^2$
4. $314 \text{ cm}^2$
5. $154 \text{ cm}^2$
6. $64\pi \text{ cm}^2$

### SUPPLEMENTAL PRACTICE FOR LESSON 83

1. $3.6 \times 10^{11}$
2. $1.8 \times 10^{10}$

3. $1.05 \times 10^{21}$
4. $1.0 \times 10^{13}$
5. $8 \times 10^{-11}$
6. $2.4 \times 10^{-11}$
7. $1.3 \times 10^{-11}$
8. $2.4 \times 10^5$
9. $1.12 \times 10^{-11}$
10. $2.1 \times 10^{-3}$
11. $1.12 \times 10^3$
12. $3 \times 10^{-1}$

### SUPPLEMENTAL PRACTICE FOR LESSON 93

1. 15
2. 17
3. 24
4. 24
5. 9
6. 14
7. 3
8. 6
9. 96
10. 27
11. 3
12. −9

### SUPPLEMENTAL PRACTICE FOR LESSON 101

1. $2n + 6 = 72$; 33
2. $8n - 5 = 27$; 4
3. $\frac{1}{2}n - 10 = 50$; 120
4. $n = (6 \times 4) + 12$; 36
5. $n + 6 = 12 - 5$; 1
6. $\frac{3}{4}n = 60 - 12$; 64

### SUPPLEMENTAL PRACTICE FOR LESSON 102

1. 12
2. 30
3. 16
4. 8

5. $2x + 3x + 4x = 180$; $9x = 180$; $x = 20$; So, $2x = 40$; The smallest angle measures 40°.

6. $2x + x + 20 + x - 2 = 180$; $4x = 180$; $x = 45$; So, $2x = 90$; The largest angle measures 90°.

### SUPPLEMENTAL PRACTICE FOR LESSON 111

1. $2 \times 10^4$
2. $2 \times 10^{-3}$
3. $1.8 \times 10^{-6}$
4. $4 \times 10^3$
5. $3 \times 10^4$
6. $7.5 \times 10^1$
7. $6 \times 10^{-4}$
8. $5 \times 10^{-5}$
9. $3 \times 10^{-5}$
10. $1.5 \times 10^5$
11. $7 \times 10^3$
12. $8 \times 10^{-5}$

### SUPPLEMENTAL PRACTICE FOR LESSON 114

1. $\frac{1}{16}$
2. $\frac{1}{8}$
3. 1
4. 3
5. $\frac{1}{32}$
6. $\frac{1}{2}$
7. $\frac{1}{10}$
8. $\frac{1}{9}$
9. 0.001
10. $2^2$ or 4