Mathematics 3

Teacher's Guide

Course No. 1205070

Bureau of Instructional Support and Community Services
Florida Department of Education

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written by
Linda Walker
Sue Fresen

edited by
Sue Fresen

graphics by
Rachel McAllister

Curriculum Improvement Project
IDEA, Part B, Special Project

LEON COUNTY SCHOOLS

Exceptional Student Education

http://www.leon.k12.fl.us/public/pass/

Curriculum Improvement Project
Sue Fresen, Project Manager

Leon County Exceptional Student Education (ESE)
Ward Spisso, Director of Exceptional Education and Student Services
Diane Johnson, Director of the Florida Diagnostic and Learning Resources System (FDLRS)/Miccosukee Associate Center

Superintendent of Leon County Schools
William J. Montford

School Board of Leon County
Maggie Lewis, Chair
Joy Bowen
Dee Crumpler
J. Scott Dailey
Fred Varn

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Content Writer

Linda Walker, Mathematics Teacher
Cobb Middle School
Resource Teacher
Connected Mathematics
Leon County Schools
Tallahassee, FL

Copy Editor

Deborah Shepard, National Board of Professional Teaching Standards (NBPTS) Certified English Teacher
Lincoln High School
President, National Board Certified Teachers of Leon County
Tallahassee, FL

Review Team

Sally Andersen, National Board of Professional Teaching Standards (NBPTS) Certified Mathematics Teacher
Swift Creek Middle School
Co-President, Leon County Council of Mathematics Teachers (LCTM)
Tallahassee, FL

Steven Ash, National Board of Professional Teaching Standards (NBPTS) Certified Mathematics Teacher
Mathematics Curriculum Developer
Leon County Schools
Tallahassee, FL

Marilyn Bello-Ruiz, Project Director
Parents Educating Parents in the Community (PEP)
Family Network on Disabilities of Florida, Inc.
Clearwater, FL

Steven Friedlander, Mathematics Teacher
Lawton Chiles High School
Vice President, Leon County Council of Mathematics Teachers (LCTM)
Tallahassee, FL

Debbie Gillis, Mathematics Teacher
Department Chair
Okeechobee High School
Treasurer, Florida Council of Teachers of Mathematics (FCTM)
Okeechobee, FL

Review Team continued

Mark Goldman, Professor
Tallahassee Community College
Past President, Leon Association for Children with Learning Disabilities (ACLD)
Parent Representative, Leon County Exceptional Student Education (ESE) Advisory Committee
Tallahassee, FL

Edythe M. MacMurdo, Mathematics Teacher
Department Chair
Seminole Middle School
Plantation, FL

Daniel Michalak, Mathematics Teacher
Discovery Middle School
Orlando, FL

William J. Montford
Superintendent of Leon County Schools
Executive Board of Directors and Past President, Florida Association of District School Superintendents
Tallahassee, FL

Milagros Pou, Multicultural Specialist
Parent Educating Network (PEN)
Parent Training Information Center of Florida
Clearwater, FL

Pamela Scott, Mathematics Resource Teacher
FCAT Mathematics Development Team
Test Development Center
Tallahassee, FL

Cliff Sherry, Exceptional Student Education Teacher
Raa Middle School
Tallahassee, FL

Dr. Grayson Wheatley, Mathematics Professor
Florida State University
Author and Publisher
Mathematics Learning
Tallahassee, FL

Joyce Wiley, Mathematics Teacher
Department Chair
Osceola Middle School
President, Pinellas Council of Teachers of Mathematics (PCTM)
Seminole, FL

Production Staff

Sue Fresen, Project Manager
Rachel McAllister, Graphic Design Specialist
Curriculum Improvement Project
Tallahassee, FL

Foreword

Parallel Alternative Strategies for Students (PASS) books are content-centered packages of supplemental readings, activities, and methods that have been adapted for students who have disabilities and other students with diverse learning needs. *PASS* materials are used by regular education teachers and exceptional education teachers to help these students succeed in regular education content courses. They have also been used effectively in alternative settings such as juvenile justice educational programs and second chance schools, and in dropout prevention and other special programs that include students with diverse learning needs.

The content in *PASS* differs from standard textbooks and workbooks in several ways: simplified text; smaller units of study; reduced vocabulary level; increased frequency of drill and practice; concise directions; less cluttered format; and presentation of skills in small, sequential steps.

PASS materials are not intended to provide a comprehensive presentation of any course. They are designed to *supplement* state-adopted textbooks and other instructional materials. *PASS* may be used in a variety of ways to augment the curriculum for students with disabilities and other students with diverse learning needs who require additional support or accommodations in textbooks and curriculum. Some ways to incorporate this text into the existing program are as

- a resource to supplement the basic text
- a pre-teaching tool (advance organizer)
- a post-teaching tool (review)
- an alternative homework assignment
- an alternative to a book report
- extra credit work
- make-up work
- an outside assignment
- part of an individual contract
- self-help modules
- an independent activity for drill and practice
- general resource material for small or large groups
- an assessment of student learning

The initial work on *PASS* materials was done in Florida through Project IMPRESS, an Education of the Handicapped Act (EHA), Part B, project funded to Leon County Schools from 1981–1984. Four sets of modified content materials called *Parallel Alternate Curriculum* (*PAC*) were disseminated as parts two through five of *A Resource Manual for the Development and Evaluation of Special Programs for Exceptional Students, Volume V-F: An Interactive Model Program for Exceptional Secondary Students*. Project IMPRESS patterned the *PACs* after curriculum materials developed at the Child Service Demonstration Center at Arizona State University in cooperation with Mesa, Arizona, Public Schools.

A series of 19 *PASS* volumes was developed by teams of regular and special educators from Florida school districts who volunteered to participate in the EHA, Part B, Special Project, Improvement of Secondary Curriculum for Exceptional Students (later called the Curriculum Improvement Project). This project was funded by the Florida Department of Education, Bureau of Education for Exceptional Students, to Leon County Schools during the 1984 through 1988 school years. Regular education subject area teachers and exceptional education teachers worked cooperatively to write, pilot, review, and validate the curriculum packages developed for the selected courses.

Beginning in 1989 the Curriculum Improvement Project contracted with Evaluation Systems Design, Inc., to design a revision process for the 19 *PASS* volumes. First, a statewide survey was disseminated to teachers and administrators in the 67 school districts to assess the use of and satisfaction with the *PASS* volumes. Teams of experts in instructional design and teachers in the content area and in exceptional education then carefully reviewed and revised each *PASS* volume according to the instructional design principles recommended in the recent research literature. Subsequent revisions have been made to bring the *PASS* materials into alignment with the Sunshine State Standards.

The *PASS* volumes provide some of the text accommodations necessary for students with diverse learning needs to have successful classroom experiences and to achieve mastery of the Sunshine State Standards. To increase student learning, these materials may be used in conjunction with additional resources that offer visual and auditory stimuli, including computer software, videotapes, audiotapes, and laser videodiscs.

User's Guide

The *Mathematics 3 PASS* and accompanying *Teacher's Guide* are supplementary resources for teachers who are teaching mathematics to secondary students with disabilities and other students with diverse learning needs. The content of the *Mathematics 3 PASS* book is based on the *Florida Curriculum Frameworks* and correlates to the Sunshine State Standards.

The Sunshine State Standards are made up of *strands*, *standards*, and *benchmarks*. A *strand* is the most general type of information and represents a category of knowledge. A *standard* is a description of general expectations regarding knowledge and skill development. A *benchmark* is the most specific level of information and is a statement of expectations about student knowledge and skills. Sunshine State Standards correlation information for *Mathematics 3*, course number 1205070, is given in a matrix in Appendix D.

The *Mathematics 3 PASS* is divided into five units of study that correspond to the mathematics strands. The student book focuses on readings and activities that help students meet benchmark requirements as identified in the course description. It is suggested that expectations for student performance be shared with the students before instruction begins.

Each unit in the *Teacher's Guide* includes the following components:

- **Unit Focus:** Each unit begins with this general description of the unit's content and describes the unit's focus. This general description also appears in the student book. The Unit Focus may be used with various advance organizers (e.g, surveying routines, previewing routines, paraphrasing objectives, posing questions to answer, developing graphic organizers such as in Appendix A, sequencing reviews) to encourage and support learner commitment.

- **Suggestions for Enrichment:** Each unit contains activities that may be used to encourage, to interest, and to motivate students by relating concepts to real-world experiences and prior knowledge.

- **Unit Assessments:** Each unit contains an assessment with which to measure student performance.

- **Keys:** Each unit contains an answer key for each practice in the student book and for the unit assessments in the *Teacher's Guide*.

The appendices contain the following components:

- **Appendix A** describes instructional strategies adapted from the Florida Curriculum Frameworks for meeting the needs of students with disabilities and other students with diverse learning needs.

- **Appendix B** lists teaching suggestions for helping students achieve mastery of the Sunshine State Standards and Benchmarks.

- **Appendix C** contains suggestions for specific strategies to facilitate inclusion of students with disabilities and other students with diverse learning needs. These strategies may be tailored to meet the individual needs of students.

- **Appendix D** contains a chart that correlates relevant benchmarks from the Sunshine State Standards with the course requirements for *Mathematics 3*. These course requirements describe the knowledge and skills the students will have once the course has been successfully completed. The chart may be used in a plan book to record dates as the benchmarks are addressed.

- **Appendix E** contains the glossary from the *Florida Curriculum Framework: Mathematics*.

- **Appendix F** contains two sheets of graph paper that can be duplicated as needed.

- **Appendix G** lists reference materials and software used to produce *Mathematics 3.*

Mathematics 3 is designed to correlate classroom practices with the Florida Curriculum Frameworks. No one text can adequately meet all the needs of all students—this *PASS* is no exception. *PASS* is designed for use with other instructional materials and strategies to aid comprehension, provide reinforcement, and assist students in attaining the subject area benchmarks and standards.

Unit 1: Number Sense, Concepts, and Operations

This unit emphasizes how numbers and number operations are used in various ways to solve problems.

Unit Focus (pp. 1-2)

Number Sense, Concepts, and Operations

- Associate verbal names, written word, and standard numerals with decimals, numbers with exponents, numbers in scientific notation, radicals, and ratios. (A.1.3.1)
- Understand the relative size of decimals, numbers with exponents, numbers in scientific notation, radicals, and ratios. (A.1.3.2)
- Understand concrete and symbolic representations of rational numbers in real-world situations. (A.1.3.3)
- Understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, and radicals. (A.1.3.4)
- Understand and use exponential and scientific notation. (A.2.3.1)
- Understand and explain the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, mixed numbers, and decimals, including the inverse relationship of positive and negative numbers. (A.3.3.1)
- Select the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers, including the appropriate application of the algebraic order of operations. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use estimation strategies to predict results and to check the reasonableness of results. (A.4.3.1)
- Use concepts about numbers, including primes, factors, and multiples, to build number sequences. (A.5.3.1)

Measurement

- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)

Geometry and Spatial Relations

- Represent and apply geometric properties and relationships to solve real-world and mathematical problems. (C.3.3.1)

Algebraic Thinking

- Describe a wide variety of patterns, relationships, and functions through models. (D.1.3.1)

Data Analysis and Probability

- Understand and apply the concepts of range and central tendency (mean). (E.1.3.2)

Lesson Purpose

Lesson One Purpose (pp. 12-40)

- Associate verbal names, written word names, and standard numerals with decimals, numbers with exponents, numbers in scientific notation, radicals and ratios. (A.1.3.1)
- Understand the relative size of decimals, numbers with exponents, numbers in scientific notation, radicals, and ratios. (A.1.3.2)
- Understand and explain the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, mixed numbers, and decimals, including the inverse relationship of positive and negative numbers. (A.3.3.1)
- Select the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculators. (A.3.3.3)

Lesson Two Purpose (pp. 41-76)

- Understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, and radicals. (A.1.3.4)
- Understand and use exponential and scientific notation. (A.2.3.1)
- Understand and explain the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, mixed numbers, and decimals. (A.3.3.1)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use concepts about numbers, including primes, factors, and multiples, to build number sequences. (A.5.3.1)
- Represent and apply geometric properties and relationships to solve real-world and mathematical problems. (C.3.3.1)
- Describe a wide variety of patterns, relationships, and functions through models. (D.1.3.1)

Lesson Three Purpose (pp. 77-102)

- Associate verbal names, written word, and standard numerals with decimals, numbers with exponents, numbers in scientific notation, radicals, and ratios. (A.1.3.1)
- Understand that numbers can be represented in a variety of equivalent forms, including fractions, decimals, and exponents. (A.1.3.4)
- Understand and explain the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, mixed numbers, and decimals, including the inverse relationship of positive and negative numbers. (A.3.3.1)
- Select the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers. (A.3.3.2)

- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use estimation strategies to predict results and to check the reasonableness of results. (A.4.3.1)
- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)
- Describe a wide variety of patterns, relationships, and functions through models. (D.1.3.1)

Lesson Four Purpose (pp. 103-124)

- Understand concrete and symbolic representations of rational numbers in real-world situations. (A.1.3.3)
- Understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, and exponents. (A.1.3.4)
- Understand and use exponential and scientific notation. (A.2.3.1)
- Understand and explain the effects of addition, subtraction, multiplication, and division on whole numbers, fractions, mixed numbers, and decimals, including the inverse relationship of positive and negative numbers. (A.3.3.1)
- Select the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers, including the appropriate application of the algebraic order of operations. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Understand and apply the concepts of range and central tendency (mean). (E.1.3.2)

Suggestions for Enrichment

1. Have students cut strips of paper $8\frac{1}{2}$″ long and 1″ wide. Then have students make a set of fraction strips for each of the following, using number sense and folding.

   a. $\frac{1}{2}$
   b. $\frac{1}{4}, \frac{2}{4}, \frac{3}{4}$
   c. $\frac{1}{8}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}$
   d. $\frac{1}{3}, \frac{2}{3}$
   e. $\frac{1}{6}, \frac{2}{6}, \frac{3}{6}, \frac{4}{6}, \frac{5}{6}$
   f. $\frac{1}{9}, \frac{2}{9}, \frac{3}{9}, \frac{4}{9}, \frac{5}{9}, \frac{6}{9}, \frac{7}{9}, \frac{8}{9}$

2. Make a deck of 42 cards for playing an equivalent fraction game. Each card must contain one fraction. Construct two cards each of the following: $\frac{1}{2}, \frac{1}{4}, \frac{2}{3}, \frac{3}{2}, \frac{3}{5}, \frac{5}{4}$ and $\frac{1}{5}$. Then construct one card each of the following:
   $\frac{6}{12}, \frac{3}{6}, \frac{4}{8}, \frac{8}{16}, \frac{4}{16}, \frac{3}{12}, \frac{2}{8}, \frac{6}{24}, \frac{8}{12}, \frac{10}{15}, \frac{6}{9}, \frac{4}{6}, \frac{18}{12}, \frac{9}{6}, \frac{12}{8}, \frac{24}{16}, \frac{6}{10}, \frac{12}{20}, \frac{9}{15}, \frac{15}{25}, \frac{10}{8}, \frac{15}{12}, \frac{20}{16},$

   $\frac{30}{24}, \frac{3}{15}, \frac{4}{20}, \frac{2}{10},$ and $\frac{5}{25}$.

   Have groups of four students play to get two "books," with each book containing three cards: one with the fraction reduced to lowest terms and two cards with fractions equivalent to the first card. Each student is dealt six cards. Students take turns drawing and discarding cards until one student gets two books. When a student gets a book, those cards are placed face up on the table. The winner is the student who first collects two books. (Optional: Make other sets of cards to play using equivalent decimals and percentages.)

3. Have students find examples in the real world of fractions, decimals, percents, numbers expressed in words, numbers expressed in scientific notation, and numbers expressed as comparisons of relative size of numbers.

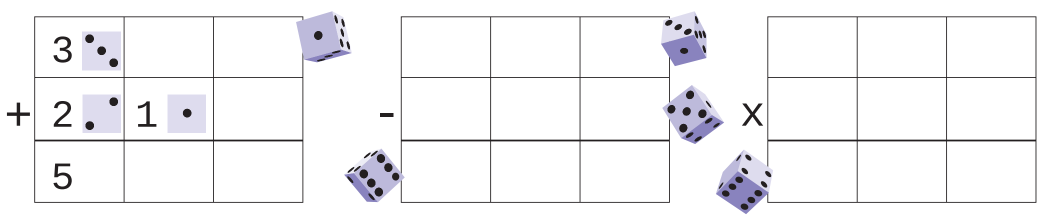
   Ask students to make a display of their examples to share with others.

4. Ask students to gather data on the number of students in their school in categories such as grade, race, and gender. Have students determine the percentages and display the data to share with others.

5. Have students pick five whole numbers. Multiply each whole number by 0.07. Next multiply each whole number by 0.47. Then multiply each whole number by 0.87. Ask students to write a sentence each time describing the relationship between the chosen number and the product. Example: When my whole number was multiplied by 0.07 the product was ______________ .
When my whole number was multiplied by 0.47 the product was ______________ .
When my whole number was multiplied by 0.87 the product was ______________ .

6. Decide which computation skill to practice: addition, subtraction, or multiplication. Ask students to draw 3 x 3 grids on their papers as you draw one on the board.

Example:



Roll a die and ask students to write the number rolled into any one of the top two rows. (The bottom row is for the answer.) Once a number is written in one of the top two rows of squares, it cannot be moved. Continue to roll the die until each of the top two rows are filled. Have students work the problems created on their grid. The object of the game is to get the highest number if adding or multiplying or the lowest number if subtracting.

You are also playing on the board, and the students are trying to beat your answers. Survey the class and write best answer on the board, awarding a point to anyone with that answer. (Grids can be adapted to students' levels.)

7. Roll four dice and post the numbers on the board. Ask students to find as many ways as possible to obtain 24 using the given numbers using any or all of the four operations.

8. Have students list in 10 minutes the different ways to produce a result of 100 using addition, subtraction, multiplication and/or division.

9. Write on the board, "The answer is 16. [Or any number you choose.] What is the question?" Set a time limit and ask students to write as many questions as possible to fit that answer.

10. Have groups of students play *Monopoly* with no cash, making journal entries instead to keep track of cash flow.

11. Have groups number off as person one, two, three, and four. Roll two dice and have all the number one people do the same computation as a journal entry; continue with the other numbered players. After playing a few rounds, have all the same-numbered people get together to post and compare their calculations.

12. Have students estimate the fraction of the day they spend eating, sleeping, talking on the phone, reading, watching television, showering or bathing, or using the computer at work or at school. Would these fractions add up to one whole? Why or why not? About how many hours does each fraction represent? How many hours a year do you spend sleeping or on the phone? If you needed more time for studying, what activities could most easily be adjusted? (Optional: Have students construct a circle graph of their day's activities.)

13. Construct Bingo grids that include five rows and five columns with one free middle space. Design each Bingo card with a random selection of fractions, decimals, and/or percents to reinforce equivalents (or any concept of choice). Create teacher-held flash cards that are designed to match equivalent answers on the students' Bingo cards. Keep track of cards revealed to aid in checking answers. Determine difficulty by regulating amount of student computation required to generate equivalents. Have students cover the quantity announced or its equivalent with a marker. First student with five in a row calls "Bingo" and, upon substantiation, wins the round.

14. Have groups of students plan and build the highest freestanding structure at the lowest cost using teacher-predetermined materials and costs (e.g., 20 plastic drinking straws @ $1.00 each; 20 small paper cups @ $1.00; 10 small paper clips @ $.20 each; 1 roll of masking tape @ $.20 an inch; 1 yard/meter stick).

    After the structure is built, ask students to discuss and answer the following: What was the most difficult part of building the structure? What problems did you have to solve? What changes did you have to make after beginning construction? If you could do it again, what changes would you make?

15. Have students access online recipes and convert all ingredient amounts into tablespoons or into teaspoons.

16. Have students increase or decrease ingredients in recipes by a specific amount. (Optional: Have students convert measurements—such as cups to pints, pounds to ounces.) Recipes can be found on the Internet.

17. Have students convert recipes to feed the class. For example, if there are 20 students in a class and if the recipe feeds eight, the conversion ratio is a ratio of the new yield (how many people you want to feed) divided by the old yield (how many people the recipe was written for). In this case, the ratio would be $\frac{20}{8} = 2\frac{1}{2}$, and everything in the recipe would need to be increased $2\frac{1}{2}$ times. A conversion may require the rounding off of some amounts (i.e., it would not be possible to have $2\frac{1}{2}$ eggs).

18. Have students use the newspaper food sections and convert recipes in standard measurements to their metric equivalents.

19. Select a recipe and list prices and sizes of all the ingredients. Have students determine preparation cost of the recipes based only on the amounts used in the recipe.

20. Discuss the history of Roman numerals using charts, photos, or pictures.

21. Have students make individual charts showing each Roman numeral symbol and its equivalent in Arabic numbers.

22. Discuss addition and subtraction in the Roman numeral system. Have students practice using Roman numerals to add and subtract.

23. Give students 20-30 flat toothpicks to form Roman numerals for given Arabic numerals.

24. Have students write Roman numerals for family members' birth years, number of students in the school, or other large numbers of interest to them.

25. Have students bring in examples or pictures of Roman numerals (e.g., book preface, book chapter, watch, a clock, building erection date, statue or monument, outline topic numbers).

26. Tell students to suppose they have $1,000 to spend only on things advertised in today's newspaper. Ask students to list the items they would purchase and add their total cost (including any sales tax), coming as close to $1,000 as possible.

27. Have students look at entertainment listings from announcements, advertisements, and the newspaper and plan an entire day of entertainment. Have students calculate the amount of time and money the day would cost.

28. Have students choose 10 interesting newspaper advertisements, decide if they advertise goods or services, and then classify the products advertised as needs or wants in today's society. Then ask students to choose 10 items from their advertisements that they would like to own and calculate their total cost, including any sales tax.

29. Have students find a newspaper story containing numerical data. Ask students to consider what the data helps to describe or support and why it is important. Then have students write a word problem with this data.

30. Have students analyze advertisements for the same product and decide which stores offer the best buys. (Optional: Tell each student to use the classified advertisements to find the best used car for $1,000. Have students compare choices and present their reasons as to why the car they chose was the best.)

31. Have the students imagine that they work 40 hours a week and earn $2.00 per hour above minimum wage. Have students calculate their monthly income. Tell students they may spend between $\frac{1}{4}$ to $\frac{1}{3}$ of their monthly income for food. In groups have students brainstorm one week (7 days) of menus for three meals a day, then break down what food items they need to buy. Have students use the Internet to find the cost of each item, add the cost up for the week, and then multiply the total by four for the month.

32. Have students imagine they are high school graduates who have chosen to live together for a while before going on to postsecondary school. Have pairs use the classified ads to complete the activity.

- Look in the "help wanted" section for a job for a high school graduate and find a job and a monthly salary. What is the total monthly income for two roommates minus 25 percent for taxes?
- Use the total final income as a guide to find an affordable apartment in the "apartments for rent" section. List the number of bedrooms and rent for one month.
- Estimate the cost of water, electricity, and gas as 10 percent of the rent money. Plan to spend about $25 a month for a telephone without long distance calls.
- List the costs for one month.
- If you've run out of money here, go back and start over.
- How much furniture can you buy with the money left over after rent, utilities, and telephone costs are subtracted from the income figure? List the furniture, add their prices, and total the cost.
- How much money do you have left over for food and entertainment?

33. Have groups use the Internet or a map to track a trip from Tallahassee, Florida, northwest across the United States to Olympia, Washington, stopping at each state capital along the way, and record miles traveled from capital to capital on a chart or table. The group to reach Olympia, Washington in the fewest miles traveled wins.

    Then have groups calculate the following: At 23 miles per gallon of gas at $1.37, how much would gas for their trip cost? If rate of speed averaged 60 miles per hour (mph) and nine hours a day were spent driving, how many days would it take to make their trip? How long would the trip take traveling seven hours a day at 60 mph? Traveling nine hours a day, how much would food cost per person if breakfast cost $4.50, lunch cost $5.25, and supper cost $7.35? How much would hotel expenses be for the whole trip at $39.00 per person a night? What was the total cost of gas, meals, and hotel expenses one-way? Round trip? (Optional: Have students use the Internet to compare prices for flying coach from Tallahassee, Florida to Olympia, Washington. Considering all costs, what would have been the least expensive method of travel?)

34. Have students use the Internet to find the 100 top national advertisers to calculate percent increases (or percent decreases) rounded to the nearest tenth of a percent for the top 25 companies in terms of advertising dollars spent during the year.

35. Have students use baseball statistics to compute the percentage of each team's won-lost records; place teams in order based on won-lost records; arrange teams based on over .500 and under .500; compute total runs scored by teams; and determine pitchers' records and winning percentages.

36. Have students use the Internet to research population statistics pertaining to a country of their choice. Have students use this data to set up and solve ratios. (Optional: Have students calculate area comparisons between countries or make a travel brochure based on data collected for their country.)

37. Have groups create word problems using the classified section and commercial advertisements, news articles, and graphics from the newspaper.

38. Have students calculate payments on a $1,000 credit card bill with a minimum repayment term of 2.5 percent per month, 5 percent per month, and 10 percent per month. Ask students to obtain information about annual percentage rates (APR) and fees for various credit cards or provide them with the information.

    Have students make three tables with the following information. The tables will include an opening balance, the interest charge for the month (APR divided by 12), payment for the month (first table with 2.5 percent, second table with 5 percent, third table with 10 percent), and an ending balance. Have students do this for 12 months and then determine the following for each table.

    - How much debt was paid?
    - How much was paid in total?
    - How much was interest and principal?
    - What was the proportion of interest and principal to total payments?
    - Construct a pie chart for each table.
    - Find the total time it would take to pay off each credit card at the given payment rates.
    - Find the total amount of interest you paid to borrow $1,000 in each case.
    - Does it take four times as long to pay off a credit card at 2.5 percent each month as it does at 10 percent each month?
    - Discuss the pros and cons of credit cards.

39. Have students use the Internet to investigate certificate of deposit (CD) rates for $1,000 invested in a seven-year CD. Ask students to show their data in a table for the seven years and show total earnings including the $1,000. Then have students show earnings on a bar graph. (Optional: Calculate the difference if compound interest is paid monthly as opposed to annually.)

40. Have students discuss companies that manufacture popular products, such as running shoes or soft drinks. Ask students to choose a stock and follow its progress each day for a week (or longer). Have students calculate whether they would have earned or lost money if they sold their stock at the end of the week.

41. Have students use the Internet to research five foreign countries and their exchange rate in United States dollars. Ask students to create a graph that compares the value of the dollar in the five chosen foreign countries' currencies. Ask students to determine how much $1000 in United States currency would be worth today in each of their chosen countries.

42. Review concepts of the unit through a silent *Jeopardy* activity. Select 10 categories of topics, five for the first round and five for the second round. Have each student divide a piece of paper into the first and second round of *Jeopardy*. Assign point values of 1, 2, 3, 4, 5 for the first round and 2, 4, 6, 8, 10 for the second round. Randomly read questions from any topic and ask students to silently write the answers on the divided paper. After a set time, do a final *Jeopardy* question and allow students to wager for 0-10 points. Check papers and tally scores.

43. Have students design flowcharts that show correct sequencing for working problems (e.g., fractions, measurement).

44. Have groups select a mathematical term (e.g., decimals, fractions, percents) and outline the basic categories involved with the term (e.g., basic categories for decimals: meaning and purpose of decimals, changing decimals to common fractions, changing common fractions to decimals, adding and subtracting decimals, division with decimal fractions, multiplying with decimal fractions and/or percentages). Ask each group to determine the basic operating principle, concepts, and content for each category listed. Have groups design a lesson in the form of a poster or PowerPoint presentation on the chosen math concepts.

45. Have students interview a person who uses math in his or her occupation and find out how he or she uses math in this occupation. Ask students to obtain an example of a typical math problem (worked out with a solution).

46. Have students research famous female mathematicians on the Internet (http://www.agnesscott.edu/lriddle/women/women.htm). Ask students to present information (e.g., a poem, an interview, a puppet show) on a selected female mathematician's life, struggles, and desire to study math.

47. Have students use the Internet to research a famous mathematician (*female mathematicians*: Maria Gaetana Agnesi, Mary Everest Boole, Ada Byron, Emille du Chatelet, Winifred Edgerton, Sophie Germain, Caroline Herschel, Grace Murray Hopper, Hypatia, Sophia Kovalevskaya, Florence Nightingale, Elena Lucrezia Cornaro Piscopia, Mary Fairfax Somerville, Theano; *male mathematicians*: Archimedes, Charles Babbage, Rene Descartes, Euclid, Euler Leonhard, Leonardo Fibonacci, Johan Carl Friedrich Gauss, Hippocrates, William Jones, Ernest Eduard Kummer, John Napier, Blaise Pascal, Plato, Pythagoras, Robert Recorde, James Joseph Sylvester, John Wallis, Johannes Widman).

    Ask students to fill out a chart recording the following information.

    - year of mathematician's birth and death
    - country of birth or primary residence throughout life
    - notable contributions to the fields of mathematics
    - obstacles in early life that could have kept them from success
    - obstacles that occurred in later private life
    - prejudice faced (in regard to sex, religion, politics, or other matters)
    - whether they worked on mathematics (or taught mathematics) for an income or for a hobby

Optional: Have students enter the data into a class data bank (i.e., Filemaker Pro) with the above categories. Give each group a copy of the completed database to analyze the results and come up with answers to the following.

- Find mathematicians who faced similar obstacles in early life. Did they use similar approaches to solve those problems? Why or why not?
- Do you think there were mathematicians on the list who would have liked to earn an income teaching or researching mathematics, but who could not do so? Why couldn't they?
- Find a mathematician whose early life is in some way similar to yours (or who faced prejudices similar to those you have faced) and describe the comparison.
- Look at the dates of the lives of the mathematicians and their accomplishments and explain whose work depended upon the work of someone who came before him or her or whose work was parallel to someone else's work.

Have each group choose three mathematicians who shared at least one common trait and write a report on the mathematicians' similarities, differences, and contributions, and an oral report which includes visual aids, worksheets or other handouts, and a visual display of at least one mathematician's life and area of study.

48. Read *Math Curse* by John Sciesczka to the class and discuss the real and unrealistic math problems used to create a humorous story. Show how the illustrations enrich and expand the story. Allow groups to generate ideas about math problems and then review math concepts recently covered in class by creating their own illustrated books.

49. Have students select content-related activities and write the processes used to complete each activity. Have students scan the Sunshine State Standards and identify all standards that apply to the student behavior demonstrated in completing the selected activities. Ask students to then revise their written explanations to describe how each activity developed or reinforced each identified standard. Collect the students' work samples and the written reflections to form a student portfolio.

50. When giving a quiz, consider announcing a special number that is the sum of the answers to all the problems.

51. See Appendices A, B, and C for other instructional strategies, teaching suggestions, and accommodations/modifications.

Unit Assessment

Match each **item** *with its* **equivalent answer**. *Write the letter on the line provided.*

_______	1. 0.25	A. 2,500
_______	2. 3.2 million	B. 320,000
_______	3. 2^2 x 3	C. 25%
_______	4. $\frac{1}{10}$ x 220	D. 3,200,000
_______	5. 3.2 x 10^5	E. 22
_______	6. 50^2	F. 80
_______	7. 6^2	G. 36
_______	8. $8^2 + 4^2$	H. 12

Choose any **four** *of the following problems to answer. Explain how you solved the problem* **or** *show all your work.*

9. If 1.5 million American men served our country during the Korean War and 131 received the Congressional Medal of Honor, the ratio of men serving to honorees could be expressed as 1,500,000 to 131. It could also be expressed as _?_ to 1. What number, **rounded to the nearest whole**, should replace the question mark?

   Answer: ____________

   Explanation: ____

   ____

   ____

   or
   Show all your work.

10. The product of three different prime numbers is an odd number greater than 175 but less than 200. What is this product?

    Answer: ____________

    Explanation: ____

    ____

    ____

    or
    Show all your work.

11. In 1998 two baseball players (Mark McGuire and Sammy Sosa) hit a total of 136 home runs in 1,152 at bats. Home runs occurred what percent of the time when they were at bat? **Round your answer to nearest whole percent.**

Answer: ____________

Explanation: ____

____

____

or
Show all your work.

12. In the 1998 election for the governor of the state of Florida, 73,237 people voted in Leon County out of 129,994 registered voters. What percent of those registered to vote, voted? **Round your answer to the nearest whole percent.**

Answer: ____________

Explanation: ____

____

____

or
Show all your work.

13. Using the data provided in the table below, which branches of Leon County's government had a budget increase of more than 100% from 1990 to 2000?

____

Government Branches in Leon County

Branch	1990 Budget	2000 Budget
Administration	\$2.8 million	\$5.2 million
Construction Offices	\$22.2 million	\$46.9 million
Community Development	\$4.2 million	\$7.6 million
Judicial	\$283,166	\$2.1 million

Answer: __________

Explanation: ______________________________________

____

____

or
Show all your work.

14. If a new automobile costing $18,500 is purchased in Tallahassee with a sales tax of 7%, how much greater is the cost than if purchased at the same price in Portland, Oregon with no tax?

Answer: ____________

Explanation: ____

____

____

or
Show all your work. ______________________________________

Choose **two** *of the following problems to answer.*

Simplify the expression. Then write a story problem for which the expression could be meaningful in finding a solution.

15. 23 + 4 x 7 = ____________

____

____

____

____

____

16. $(42 + 15 + 13 + 2) \div 3 =$ ______________

17. $200 - 2 \times 15 =$ ______________

18. $14 \times 4^2 =$ ______________

Keys

Lesson One

Practice (p. 14)

1. Answers will vary.

Practice (p. 16)

1. 16.6
2. 166
3. 1,660
4. 16,600
5. 166,000
6. 1,660,000
7. 16,600,000
8. 166,000,000
9. 1,660,000,000
10. 16,600,000,000
11. Answers will vary.
12. sixteen billion, six hundred million

Practice (p. 18)

See table below.

Ratio of Girls to Boys

Ratio of Girls to Boys	Simplified Ratio of Girls to Boys
5 to 15	1 to 3
75 to 100	3 to 4
30 to 60	1 to 2
1,000 to 1,500	2 to 3 or 1 to 1.5
80 to 60	4 to 3
79 to 53	79 to 53
1,000,000 to 2,500,000	1 to 2.5 or 2 to 5

Practice (pp. 19-20)

1. data
2. whole number
3. scientific notation
4. product
5. power (of a number)
6. ratio
7. common factor
8. factor
9. fraction
10. denominator
11. numerator
12. pattern

Practice (p. 22)

See table below.

Rounding Numbers

Number	Rounded to Nearest 10	Rounded to Nearest 100	Rounded to Nearest 1,000	Rounded to Nearest 10,000
987,654	987,650	987,700	988,000	990,000
123,456	123,460	123,500	123,000	120,000
555,555	555,560	555,600	556,000	560,000
111,111	111,110	111,100	111,000	110,000
999,999	1,000,000	1,000,000	1,000,000	1,000,000

Practice (pp. 23-24)

1. See table below. The second column represents answers required.

Countries with Greatest Sales of Chocolate

Country	Sales in Dollars
United States	16,600,000,000
United Kingdom	6,500,000,000
Germany	5,100,000,000
Russia	4,900,000,000
Japan	3,200,000,000
France	2,100,000,000
Brazil	2,000,000,000

2. Answers will vary.
3. 7.2 billion or 7,200,000,000

Keys

Practice (pp. 25-26)

1. See table below. The <u>underlined</u> and **bolded** entries in the second column represent the answers required.

Ratio of Visitors to Population of Eight World Locations per Year

Location	Ratio of Visitors to Population
Palm Springs, California	**3,000,000** to 45,000
Shanghai, China	**1,500,000** to **13,500,000**
Puerto Montt, Chile	50,000 to 110,000
Nimes, France	550,000 to 138,000
Cape Verde, Africa	400,000 to 54,000
Antwerp, Belgium	477,000 to **1,500,000**
Toyko, Japan	**12,000,000** to 460,000
Houston, Texas	**1,800,000** to **19,800,000**

2. Palm Springs; Nimes; Cape Verde; Toyko
3. Answers should be rounded to the nearest whole number and include the following: Palm Springs 67 to 1; Nimes 4 to 1; Cape Verde 7 to 1; Tokyo 26 to 1.
4. 4 to 1; 7 to 1; 26 to 1; 67 to 1
5. 7 to 1

Practice (pp. 27-28)

1. Russia; 13,000; Brazil; 489,000
2. Nigeria; 129,000; Bangladesh; 340,000
3. 4.6
4. 2.1
5. China and Bangladesh
6. India and Indonesia

Practice (p. 29)

1. E
2. G
3. F
4. C
5. A
6. B
7. D

Practice (p. 30)

1. See table below. The last column of the table shows the required response.

1950 and 1996 Populations of the 10 Largest Cities in the United States

City, State	1996	1950	Amount of Increase or Decrease
New York, New York	7,380,906	7,891,957	**-511,051**
Los Angeles, California	3,553,638	1,970,358	**+1,583,280**
Chicago, Illinois	2,721,547	3,620,962	**-899,415**
Houston, Texas	1,744,058	596,163	**+1,147,895**
Philadelphia, Pennsylvania	1,478,002	2,071,605	**-593,603**
San Diego, California	1,171,121	334,387	**+836,734**
Phoenix, Arizona	1,159,014	106,818	**+1,052,196**
San Antonio, Texas	1,067,816	408,442	**+659,374**
Dallas, Texas	1,053,392	434,462	**+618,930**
Detroit, Michigan	1,000,272	1,849,568	**-849,296**

2. Los Angeles
3. Chicago

Practice (pp. 31-32)

1. Answers will vary.
2. Population in Thousands

Keys

Practice (p. 33)

1.-2. See table below. Last two columns of table show required responses.

Five States with the Highest Population in the United States

State	1997 Population as Reported	1997 Population Rounded to the Nearest Million	1997 Population in Millions
California	32,268,301	**32,000,000**	**32**
Texas	19,439,337	**19,000,000**	**19**
New York	18,137,226	**18,000,000**	**18**
Florida	14,653,945	**15,000,000**	**15**
Pennsylvania	12,019,661	**12,000,000**	**12**

3. 3,500,000; 4,499,999; 999,999

Practice (pp. 34-39)

1. 10
2. Answers matching solutions and teams will vary.
3. Additional suggestions will vary.

Practice (p. 40)

1. H
2. B
3. E
4. G
5. F
6. D
7. C
8. A

Lesson Two

Practice (p. 42)

The responses underlined represent the required answers.
2, 3, <u>5</u>, 7, <u>11</u>, <u>13</u>, 17, 19, <u>23</u>, 29, 31, <u>37</u>, <u>41</u>, <u>47</u>, <u>53</u>, 59, 61, <u>67</u>, <u>73</u>, <u>79</u>, 83, <u>89</u>, 97

Practice (p. 44)

1. 1
2. 64
3. 225
4. 484
5. 4
6. 81
7. 256
8. 529
9. 9
10. 100
11. 289
12. 576
13. 16
14. 121
15. 324
16. 625
17. 25
18. 144
19. 361
20. 36
21. 169
22. 400
23. 49
24. 196
25. 441

Practice (p. 47)

1. 10
2. 12
3. 1
4. 24
5. 5
6. 4
7. 11
8. 22
9. 7
10. 6
11. 15
12. 3
13. 8
14. 17
15. 14
16. 18
17. 9
18. 19
19. 23
20. 25
21. 21
22. 20

Keys

Practice (p. 48)

See table below. The answers required are found in the second and third columns.

Square Roots

The square root of	is greater than	but less than
27	**5**	**6**
55	**7**	**8**
125	**11**	**12**
86	**9**	**10**
12	**3**	**4**
69	**8**	**9**
200	**14**	**15**
600	**24**	**25**
350	**18**	**19**

Practice (p. 50)

1. 8
2. 81
3. 125
4. 1,296
5. 243
6. 2,500
7. 33
8. 73
9. 375

Practice (p. 51)

1. remainder
2. prime number
3. square root (of a number)
4. perfect square
5. integers
6. square (of a number)
7. even number
8. exponent

Practice (pp. 53-54)

1. 6; 7; 8; 9
2. 5; 6; 7
3. 2
4. 4; 3; 1
5. 12; Correct answers will be determined by the teacher.

Practice (pp. 55-56)

1. 5; Correct answers will be determined by the teacher.
2. a. $9 = 3^2$
   b. $36 = 6^2$
   c. $81 = 9^2$
   d. $144 = 12^2$
   e. $225 = 15^2$
3. $324 = 18^2$
4. 9

Practice (p. 57)

1. 291; Correct answers will be determined by the teacher.

Practice (pp. 59-61)

1. See table below. The entries in **bold** represent the answers required.

Using the Pythagorean Theorem

Length of Leg *a*	a^2	Length of Leg *b*	b^2	$a^2 + b^2$	Length of Hypotenuse
3	9	4	16	9 + 16 = 25	5
8	**64**	15	**225**	64 + 225 = **289**	**17**
6	**36**	8	**64**	36 + 64 = **100**	**10**
5	**25**	12	**144**	25 + 144 = **169**	**13**
27	**729**	36	**1,296**	729 + 1,296 = **2,025**	**45**
33	**1,089**	56	**3,136**	1,089 + 3,136 = **4,225**	**65**

2. 127
3. 32

Keys

Practice (p. 62)

1. hypotenuse
2. leg or side
3. leg or side
4. right
5. right
6. Pythagorean
7. side

Practice (p. 63)

1. leg
2. Pythagorean theorem
3. multiples
4. sum
5. irrational number
6. hypotenuse
7. right triangle

Practice (p. 64)

1. 571
2. yes; yes; yes; yes

Practice (p. 65)

37, 36, 27

Practice (p. 66)

753-961-2442

Practice (pp. 67-75)

1. 16
2. Answers matching solutions and teams will vary
3. Additional suggestions will vary.

Practice (p. 76)

1. H
2. I
3. C
4. F
5. C
6. G
7. B
8. A
9. E

Lesson Three

Practice (pp. 79-80)

1. 3,869; 9,609
2. $\frac{3,869}{9,609}$; 0.4026; 40%

Practice (pp. 81-83)

1. $16,600,000,000
2. $60,000,000,000
3. $\frac{16.6 \text{ billion}}{60 \text{ billion}} = .2\overline{76} \approx .28$ or
   $\frac{16,600,000,000}{60,000,000,000} = .2\overline{76} \approx .28$
4. 28%; Answers will vary but may include the following: 15 is $\frac{1}{4}$ of 60, so 16.6 is about $\frac{1}{4}$ of 60, and 28% is about $\frac{1}{4}$.
5. Conjectures will vary but should deal with place value. For example: My conjecture is because a billion is 1,000 times greater than a million, the answer to number 4 is 1,000 times greater than the answer to number 5; .028% x 1,000 = 28%.
6. 16,600,000
7. 60,000,000,000
8. $\frac{16.6 \text{ million}}{60 \text{ billion}}$ or $\frac{16,600,000}{60,000,000,000}$
9. $0.00027\overline{6}$
10. $.027\overline{6}\%$
11. Answers will vary.

Practice (p. 84)

169,176

Practice (pp. 85-87)

1. $18\frac{1}{2}$; yes
2. $18.\overline{5}$; yes
3. $1.\overline{378}$; 138%; yes
4. tin; newspaper; plastic
5. 56%

Keys

Practice (pp. 88-89)

1. $1.032B = \$\,7.74$;
2. \$7.50
3. 32%
4. 64%
5. 97%
6. 130%

Practice (pp. 90-91)

1. \$35.65
2. Another way to solve problem will vary.
3. $\frac{1}{4}$

Practice (p. 92)

See table below. The Retail Price column represents the required responses.

Clothing Retail Prices

Wholesale Price	Retail Price
\$12.00	**\$15.60**
\$20.00	**\$26.00**
\$54.00	**\$70.20**
\$29.50	**\$38.35**
\$46.75	**\$60.78**
\$17.50	**\$22.75**
\$99.99	**\$129.99**

Practice (p. 93)

See table below. The amount in **bold** are the required responses.

Amounts Saved on Percentages off Original Price

Original Price	Amount Saved at 10% off	Amount Saved at 20% off	Amount Saved at 30% off	Amount Saved at 40% off	Amount Saved at 50% off
\$ 25.00	**\$2.50**	\$5.00	**\$7.50**	**\$10.00**	**\$12.50**
\$ 40.00	**\$4.00**	**\$8.00**	\$12.00	**\$16.00**	**\$20.00**
\$ 75.00	**\$7.50**	**\$15.00**	**\$22.50**	\$30.00	**\$37.50**
\$100.00	**\$10.00**	**\$20.00**	**\$30.00**	**\$40.00**	\$50.00

1. Patterns observed will vary. Hopefully students will see that 10% is the same as one-tenth. Also, that 10% of an amount moves the decimal one place to the left. So, 10% of 25 is 2.50. Finding 10% and then doubling, tripling, etc. may be observed.
2. Answer will vary but may include the following: To find 40%, one might find 10% and multiply by 4 (**or** find 10% and double it and double it again) **or** find 50% or $\frac{1}{2}$ and subtract 10% or $\frac{1}{10}$.

Keys

Practice (p. 94)

See table below. The amounts in **bold** are the required responses.

	Cost of Item with Tax			
Cost of Item without Tax	Cost of Item with 1% Tax	Cost of Item with 3% Tax	Cost of Item with 5% Tax	Cost of Item with 7% Tax
$ 5.00	**$5.05**	$5.15	**$5.25**	**$5.35**
$ 25.00	**$25.25**	**$25.75**	**$26.26**	$26.75
$ 125.00	**$126.25**	**$128.75**	**$131.25**	**$133.75**
$ 625.00	**$631.25**	**$643.75**	$656.25	**$668.75**
$3,125.00	$3,156.25	**$3,218.75**	**$3,281.25**	**3,343.75**

Practice (pp. 95-102)

1. $16,105.10
2. Answers matching solutions and teams will vary.
3. Additional suggestions will vary.

Lesson Four

Practice (pp. 104-106)

1. $14.50; Answers will vary.
2. 96; Answers will vary.
3. $340; Answers will vary.
4. $22; Answers will vary.

Practice (pp. 109-110)

1. 10
2. 0
3. 85
4. 5
5. 25
6. 7,225
7. 6
8. 14
9. 3
10. $29\frac{2}{3}$
11. Answers will vary.

Practice (pp. 111-116)

1. 5
2. $102,300
3. 223
4. 360
5. 45
6. 0.2804
7. $19.50
8. 0.875375
9. 30%
10. $1\frac{1}{4}$ or 1.25
11. 3,507,000,000 miles
12. Estimates will vary between 100 to 110.

Practice (pp. 117-123)

1. 4
2. Answers matching solutions and teams will vary.
3. Additional suggestions will vary.

Practice (p. 124)

1. F
2. G
3. E
4. A
5. H
6. C
7. D
8. B

Keys

Unit Assessment (pp. 17-22TG)

1. C
2. D
3. H
4. E
5. B
6. A
7. G
8. F
9. 11,450; Answers will vary.
10. 195 (3 x 5 x 13); Answers will vary.
11. 12%; Answers will vary.
12. 56%; Answers will vary.
13. Construction Officers, Judicial; Answers will vary.
14. $1,295; Answers will vary.
15. 51; Problems will vary.
16. 24; Problems will vary.
17. 170; Problems will vary.
18. 224; Problems will vary.

Scoring Recommendations for Unit Assessment

Item Numbers	Assigned Points	Total Points
1-8	4	32 points
9-14	12	student to choose any 4 out of 6 = 48 points
15-18	10	student to choose any 2 out of 4 = 20 points
		Total = 100 points

Benchmark Correlations for Unit Assessment

Benchmark	Addressed in Items
A.1.3.1	1-14
A.1.3.2	1-8
A.1.3.4	9-14
A.2.3.1	9-14
A.3.3.1	9-10, 15-18
A.3.3.2	1-8, 15-18
A.3.3.3	1-8, 15-18
A.5.3.1	1-8
D.1.3.1	13

Unit 2: Measurement

This unit emphasizes how estimation and measurement are used to solve problems.

Unit Focus (pp. 125-126)

Number Sense, Concepts, and Operations

- Understand the relative size of fractions and decimals. (A.1.3.2)
- Understand the structure of the number systems other than the decimal system. (A.2.3.2)
- Select the appropriate operation to solve problems involving addition, subtractions, multiplication and division of rational numbers, including the appropriate application of the algebraic order of operations. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)

Measurement

- Use concrete and graphic models to derive formulas for finding surface area and volume of rectangular solids and cylinders. (B.1.3.1)
- Use concrete and graphic models to derive formulas for finding rates, distance, time and angle measures. (B.1.3.2)
- Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume. (B.1.3.3)
- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)

- Use direct (measured) and indirect (not measured) measures to compare given characteristic in either metric or customary units. (B.2.3.1)

- Solve problems involving units of measure and converts answers to a larger or smaller unit within either the metric or customary system. (B.2.3.2)

- Solve real-world and mathematical problems involving estimates of length, areas, and volume in either customary or metric system. (B.3.3.1)

- Select appropriate units of measurement. (B.4.3.1)

- Select and use appropriate instruments and techniques to measure quantities. (B.4.3.2)

Geometry and Spatial Relations

- Understand the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in three dimensions. (C.1.3.1)

Algebraic Thinking

- Describe a wide variety of patterns, relationships, and functions through models, such as manipulatives, tables, expressions, and equations. (D.1.3.1)

Lesson Purpose (pp. 134-160)

Lesson One Purpose

- Understand the structure of number systems other than the decimal system. (A.2.3.2)

- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)

- Use concrete and graphic models to derive formulas for finding surface area and volume of rectangular solids. (B.1.3.1)

- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)
- Select and use appropriate instruments and techniques to measure quantities. (B.4.3.2)
- Understand the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in three dimensions. (C.1.3.1)

Lesson Two Purpose (pp. 161-176)

- Understand the structure of number systems other than the decimal system. (A.2.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use concrete and graphic models to derive formulas for finding surface area and volume of cylinders. (B.1.3.1)
- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)
- Select and use appropriate instruments and techniques to measure quantities. (B.4.3.2)
- Understand the basic properties of, and relationships pertaining to, regular geometric shapes in three dimensions. (C.1.3.1)

Lesson Three Purpose (pp. 177-187)

- Understand the relative size of fractions and decimals. (A.1.3.2)
- Understand the structure of number systems other than the decimal system. (A.2.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)

- Use concrete and graphic models to derive formulas for finding surface area and volume of rectangular solids. (B.1.3.1)
- Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume. (B.1.3.3)
- Solve real-world and mathematical problems involving estimates of length, areas, and volume in either customary or metric system. (B.3.3.1)
- Select appropriate units of measurement. (B.4.3.1)
- Describe a wide variety of patterns, relationships, and functions through models, such as manipulatives, tables, expressions, and equations. (D.1.3.1)

Lesson Four Purpose (pp. 188-202)

- Understand the structure of number systems other than the decimal system. (A.2.3.2)
- Select the appropriate operation to solve problems involving addition, subtractions, multiplication and division of rational numbers, including the appropriate application of the algebraic order of operations. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use concrete and graphic models to derive formulas for finding surface area and volume of cylinders. (B.1.3.1)
- Use concrete and graphic models to derive formulas for finding rates, distance, time and angle measures. (B.1.3.2)

- Use direct (measured) and indirect (not measured) measures to compare in given characteristic in either metric or customary units. (B.2.3.1)

- Solve problems involving units of measure and converts answers to a larger or smaller unit within either the metric or customary system. (B.2.3.2)

Suggestions for Enrichment

1. Have students play Bingo with math vocabulary words. Make a transparency master of a large square divided into 25 equal squares. Give each student a copy for a blank game board. Put the vocabulary terms on the chalkboard or transparency. Ask students to fill in the game board writing one term per square in any order. Play a Bingo game by calling out the definitions or asking questions for which the terms are answers. Ask students to put markers on the terms that are the correct answers. Answers can be verified and discussed after each definition or question. When a student gets five markers in a row, have the student shout out "Payday" or some mathematical reward term. Keep a record of the terms used and continue to play another round.

2. Have groups use a metric ruler to measure and record the length of each person's smile (or hair length) in their group. Record the measurements on the board. Have students order all the measurements from least to greatest and graph the results. Then have students find the sum of the length all the smiles and create one smile out of construction paper that is the length of all the smiles in the room.

3. Have students use the Internet and choose six cities (in logical order for visitation), one on each of the six major continents. Have students find distances for each segment of their journey and then convert the distance to a percentage of the total journey. They must call home at noon from each of the six cities and determine what the local time in each of their cities will be when they place the calls. They will have $30 to spend on souvenirs in each city and need to convert the amount to the local currency of the day. (Optional: Do the same activity and have the student come as close as possible to a specific total distance (such as 30,000 miles).

4. Have students work in pairs to measure the trunk, crown, and height of a tree using vertical and horizontal measurements and graph their findings. Trunk: Ask students to measure 4½ feet high on the trunk. At that height, use a string to measure the trunk's circumference and then measure the length of the string. Round to the nearest inch and record. Crown: Ask students to find the tree's five longest branches and mark the ground beneath the tip of the longest branch. Find the branch opposite the longest branch and mark its tip on the ground. Measure along the ground between the two markers. Record the number. Height: Ask students to have their partner stand at the base of the tree. Have the first student back away from the tree holding a 12" ruler straight out in front of him or her in a vertical position. Tell the student to stop when the tree and ruler appear to be the same size. (Closing one eye helps to line up the tree and ruler.) Next ask the student to turn one wrist until the ruler looks level to the ground and is in a horizontal position, keeping that arm straight. Keeping sight of the base of the ruler at the base of the tree, students will ask their partners to walk to the spot that they see as the top of the tree. Measure how many feet the partner walked to determine the tree's height. Round to the nearest foot. Have groups compare answers and remeasure as necessary. Ask students to make bar graphs with their information. Have students locate the biggest tree and smallest tree of the same species.

5. Have students use weights, measures, and distances they find on the sports page to make interesting comparisons (e.g., instead of just saying a family uses 5,000 gallons of water a month, compare that amount to filling an Olympic-size swimming pool or to a certain number of two-minute showers).

6. Have students use the sports section of the newspaper to list all the units of measurement they can find and indicate which ones are metric.

7. Divide class into groups, and give each group an inexpensive kickball and newspaper. Ask students to cut several strips of paper into 1" x 4" strips and cover the kickball, pasting the strips down and counting the number of strips used. By multiplying the number of strips by the area of each strip, students can approximate the surface area of a sphere.

8. Next have students find the radius of the kickball by rolling the ball on the floor and measuring the distance from the starting point to the ending point of one complete revolution. Discuss diameter and radius, and help students develop formulas for finding the surface area of spheres.

9. Have students use the Internet to find data in both kilometers and miles for two planets. Have students list the names of the two planets and the following information about each planet: diameter, minimum and maximum distance from the sun and from Earth, length of day and year, temperature, and number of satellites. Next have students answer the following.

   - What is the diameter of each planet in yards?
   - Which planet is bigger? How much bigger?
   - Which planet is closer to the sun? How much closer?
   - Which planet has a shorter year? How much shorter?
   - Which planet has a longer day? How much longer?
   - If the space shuttle must reach a speed of 25,000 mph in order to escape Earth's gravitational field and if it were to maintain that speed, how long would it take to travel from Earth to each of your planets?
   - List any other differences between your planets.

10. Give groups various sizes of rectangular boxes to measure the dimensions to the nearest millimeter. Have students create a table or chart with columns for length, width, height, total surface area, and volume to record the original box and a "mini-box" scale model they will create. Ask students to measure and record the length, width, and height in millimeters of the original box. Have students create a scale drawing on graph paper of the original box. Ask students to record the measurement for the mini-box in millimeters, then cut out, fold, and tape the scale drawing together. Then have students calculate the total surface area and volume for the two

rectangular boxes. Ask students to find scale factors for length, surface area, and volume and write conclusions about the findings. Discuss the findings about scale factors for similar objects with regard to the length, area, and volume. Discuss careers in which scale drawings are used.

11. Choose a concept such as area, volume, or geometric figures and develop an information sheet for students. Then have students make up word problems on the concept chosen.

12. See Appendices A, B, and C for other instructional strategies, teaching suggestions, and accommodation/modifications.

Unit Assessment

Answer the following. Refer to Appendix A in student book for **formula** *and* **equivalent measures** *as needed. Show all your work.*

1. On August 19, 2000, a natural gas pipeline ruptured, triggering an explosion near a campsite in New Mexico. It blasted a hole 86 feet long, 46 feet wide, and 20 feet deep, according to published reports. If the length, width, and depth were uniform, what was the volume of the hole in cubic feet?

   Answer: ________________________
   Show all your work.

2. If a bag filled with garbage is 2 feet wide, 2 feet long, and 3 feet deep, how many of these bags of garbage would it take to fill the hole described in problem 1? (If the answer is *not* a whole number, you will need to *round up* any fractional part to a whole number if the hole is to be completely full.)

   Answer: ________________________
   Show all your work.

3. If an acre of land is equal to 43,560 square feet, how much less than an acre is a piece of land 205 feet wide and 210 feet long?

   Answer: ______________________

   Show all your work.

Use the following information to answer numbers 4-9. Show all your work.

A business that packages items for mailing has packaging of many sizes and shapes. The following two examples will be used.

- Package A: A box that measures 10 inches long, 10 inches wide, and 10 inches long.
- Package B: A round hat box or cylinder having a diameter of 10 inches and a height of 10 inches.

4. The volume of Package A is ______________________ cubic inches.

   Show all your work.

5. The surface area of Package A is ________________________ square inches.

   Show all your work.

6. The volume of Package B is ________________________ cubic inches.

   Show all your work.

7. The surface area of Package B is ________________________ square inches.

   Show all your work.

8. Which package has the greater volume? ____________________
Make scale drawings of each of the bases to help demonstrate why this is true.

Show all your work.

9. Which package has the greater surface area? ____________________
Make a scale drawings to illustrate finding the surface area for each package.

Show all your work.

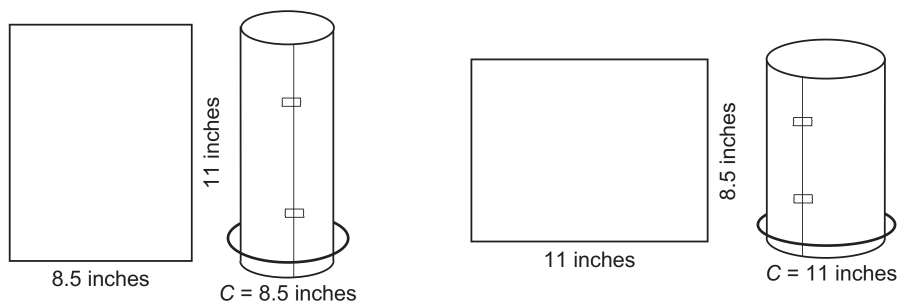
10. If we doubled the length, width, and height of Package A, the new volume would be how many times the original volume?

Answer: ____________________
Show all your work.

Use the following to answer numbers 11 and 12.

A student took two sheets of paper, each measuring 8.5 by 11 inches. He made a cylinder out of one so that it was 11 inches tall and had a circumference of 8.5 inches. He made a cylinder out of the other so that it was 8.5 inches tall and had a circumference of 11 inches. He wondered if they had the same volume or if one had a greater volume than the other.

Show all your work as you answer the following questions.



11. What is the volume of the cylinder 11 inches tall with a circumference of 8.5 inches? (When determining the diameter of the circle, round it to the nearest tenth.)

    Answer: ______________________
    Show all your work.

12. What is the volume of the cylinder 8.5 inches tall with a circumference of 11 inches? (When determining the diameter of the circle, round it to the nearest tenth.)

    Answer: ______________________
    Show all your work.

13. What is the difference in their volumes, if any difference exists?

Answer: ______________________

Show all your work.

14. A jogger ran a distance of 6 miles at an average rate of 4 miles per hour and an additional 4 miles at an average rate of 3 miles per hour. How long was his run in hours and minutes?

Answer: ______________________

Show all your work.

Keys

Lesson One

Practice (p. 135)

Paper model for 1 cubic inch.

Practice (pp. 137-138)

1. Actual size rectangle 1.75 inches by 5 inches should be drawn.
2. 8.75
3. 70
4. 70
5. Actual size rectangle 2.75 inches by 8.25 inches should be drawn.
6. 22.6875
7. 272.25
8. 272.25

Practice (p. 139)

1. B
2. A
3. G
4. F
5. E
6. C

Practice (p. 140)

1. square units
2. face
3. product
4. width (*w*)
5. length (*l*)
6. formula
7. height (*h*)

Practice (pp. 141-142)

1. Actual size or scale drawing rectangle 4.25 inches by 9.75 inches should be drawn.
2. 41.4375
3. 186.46875
4. 186.46875
5. Actual size or scale drawing rectangle 2.25 inches by 6 inches should be drawn.
6. 13.5
7. 124.875
8. 124.875
9. Actual size or scale drawing rectangle 2.5 inches by 5 inches should be drawn.
10. 12.5
11. 109.375
12. 109.375

Practice (pp. 143-144)

1. Actual size rectangle 5 inches by 8 inches and another 1.75 inches by 8 inches should be drawn.
2. 8.75; 40; 14
3. 62.75; 125.5
4. 125.5
5. 70; 17.0; 102
6. 32

Practice (p. 145)

1. H
2. A
3. F
4. G
5. D
6. B
7. C
8. E

Practice (pp. 146-148)

1. Scale drawings of rectangles 8.25 inches by 12 inches and 2.75 inches by 12 inches should be drawn.
2. 22.6875; 99; 33
3. 154.6875; 309.375
4. 309.375
5. 274.625; 253.5
6. 55.875
7. Scale drawings of rectangles 9.75 inches by 4.25 inches and 4.25 inches by 4.5 inches should be drawn.

Keys

8. 41.4375; 43.875; 19.125
9. 104.4375; 208.875
10. 208.875
11. 175.616; 188.16
12. 20.715

Practice (pp. 149-151)

1. Scale drawings of rectangles 6 inches by 9.25 inches and 2.25 inches by 9.25 inches should be drawn.
2. 13.5; 55.5; 20.8125
3. 89.8125; 179.625
4. 179.625
5. 125; 150
6. 29.625
7. Scale drawing of rectangles 5 inches by 8.75 inches and 2.5 inches by 8.75 inches should be drawn.
8. 12.5; 43.75; 21.875
9. 78.125; 156.25
10. 156.25
11. 110.592; 138.24
12. 18.01

Practice (p. 152)

Answers will vary.

Practice (pp. 153-160)

1(a) a
1(b) c, d, a, b
2. Answers matching solutions and teams will vary.
3. Additional suggestions will vary.

Lesson Two

Practice (pp. 162-163)

1. A circle with a diameter of 3.5 inches should be drawn.
2. 9.61625
3. 64.9096875
4. 64.9096875
5. A circle with a diameter of 4 inches should be drawn.
6. 12.56
7. 87.92
8. 87.92

Practice (p. 164)

1. A circle with a diameter of 5 inches should be drawn.
2. 19.625
3. 166.8125
4. 166.8125 cubic inches
5. A circle with a diameter of 2.75 inches should be drawn.
6. 5.9365625
7. 35.619375
8. 35.619375

Practice (p. 166)

Paper model for cylinder.

Practice (pp. 167-168)

1. 9.61625
2. 10.99
3. 74.1825
4. 9.61625; 9.61625; 74.1825; 93.415
5. 12.56
6. 12.56
7. 87.92
8. 12.56; 12.56; 87.92; 113.04

Practice (p. 169)

1. 19.625
2. 15.7
3. 133.45
4. 19.625; 19.625; 133.45; 172.7
5. 19.625
6. 15.7
7. 94.2
8. 19.625; 19.625; 94.2; 133.45

Keys

Practice (p. 170)

1. A
2. G
3. H
4. C
5. I
6. B
7. E
8. J
9. F
10. D

Practice (pp. 171-176)

1. a. 12.56
   b. 16
   c. 631.0144 *or* 631
   d. 803.84
   e. cylinder

Lesson Three

Practice (p. 178)

1. See table below. The amounts in **bold** are the required responses.

Possible Dimensions of a Prism

Length in Units	Width in Units	Height in Units	Volume in Cubic Units	Length in Units	Width in Units	Height in Units	Volume in Cubic Units
2	3	5	30	4	3	5	60
2	3	5	30	6	3	5	**90**
2	3	5	30	8	3	5	**120**
2	3	5	30	10	3	5	**150**
2	3	5	30	1	3	5	**15**

2. 2
3. 3
4. 4
5. 5
6. $\frac{1}{2}$

Practice (p. 179)

1. See table below. The amounts in **bold** are the required responses.

Possible Dimensions of a Prism

Length in Units	Width in Units	Height in Units	Volume in Cubic Units	Length in Units	Width in Units	Height in Units	Volume in Cubic Units
2	3	5	30	4	6	5	120
2	3	5	30	6	9	5	**270**
2	3	5	30	8	12	5	**480**
2	3	5	30	10	15	5	**750**
2	3	5	30	1	1.5	5	**7.5**

2. 4
3. 9
4. 16
5. 25
6. $\frac{1}{4}$

Keys

Practice (p. 180)

1. See table below. The amounts in **bold** are the required responses.

Possible Dimensions of a Prism

Length in Units	Width in Units	Height in Units	Volume in Cubic Units	Length in Units	Width in Units	Height in Units	Volume in Cubic Units
2	3	5	30	4	6	10	240
2	3	5	30	6	9	15	**810**
2	3	5	30	8	12	20	**1920**
2	3	5	30	10	15	25	**3750**
2	3	5	30	1	1.5	2.5	**3.75**

2. 8
3. 27
4. 64
5. 125
6. $\frac{1}{8}$

Practice (pp. 181-187)

1.a. $0.45; Answers will vary.
 b. $7.20; Answers will vary.
 c. $28.80; Answers will vary.
2. Answers matching solutions and teams will vary.
3. Additional suggestions will vary.

Lesson Four

Practice (pp. 190-191)

1. 60,000 pounds
2. 113 inches
3. 132 inches
4. 78 pounds
5. 38,500 people

Practice (pp. 192-194)

1. 150 degrees
2. $\frac{5}{12}$
3. 47 square inches
4. 8
5. $26.50
6. $28.10
7. $14.05
8. $2.00

Practice (p. 195)

1. 4
2. 3
3. 2
4. $\frac{1}{4}$; 15
5. $\frac{1}{3}$; 20
6. $\frac{1}{2}$; 30
7. 190 minutes

Practice (pp. 196-198)

1. 57,600
2. 3.14
3. 6,280
4. 11 percent
5. 16 feet 14 inches or 17 feet 2 inches
6. 206
7. 206
8. pi (3.14 or $\frac{22}{7}$) times diameter or πd or $2\pi r$; 3.14 or pi or π
9. 66

Practice (p. 199)

1. E
2. D
3. A
4. C
5. G
6. F
7. B

Keys

Practice (p. 200)

1. volume (V)
2. surface area
3. scale model
4. base (b)
5. cylinder
6. circumference (C)
7. difference

Practice (p. 201)

1. I
2. C
3. H
4. D
5. B
6. A
7. G
8. F
9. E

Unit Assessment (pp. 39-44TG)

1. 79,120 cubic feet
2. 6,594 bags
3. 510 square feet
4. 1,000 cubic inches
5. 600 square inches
6. 785 cubic inches
7. 471 square inches
8. A
9. A
10. 8
11. 62.9 cubic inches
12. 81.7 cubic inches
13. 18.8 cubic inches
14. 2 hours 50 minutes

Scoring Recommendations for Unit Assessment

Item Numbers	Assigned Points	Total Points
1-7, 10-12, 14	8*	88 points
8, 9, 13	4	12 points
		Total = 100 points

* Note for item number 2: Missing item number 1 should not create double jeopardy for item number 2. Check for correctness of procedures and work in item number 2.

Benchmark Correlations for Unit Assessment

Benchmark	Addressed in Items
B.1.3.1	1-7, 11, 12
B.1.3.2	14
B.1.3.3	10
B.1.3.4	8, 9
B.2.3.1	8, 9, 13
B.2.3.2	14
B.4.3.1	11, 12
A.1.3.2	11, 12
A.2.3.2	1-14
A.3.3.2	2, 11, 12
A.3.3.3	1-7, 11-14

Unit 3: Geometry

This unit emphasizes geometry, the branch of mathematics that deals with points, lines, angles, surfaces, and solids.

Unit Focus (pp. 203-206)

Number Sense, Concepts, and Operations

- Associate verbal names, written words, and standard numerals with fractions, radicals, and ratios. (A.1.3.1)
- Understand concrete and symbolic representations of rational and irrational numbers in real-world situations. (A.1.3.3)
- Understand that numbers can be represented in a variety of equivalent forms including integers, exponents, and radicals. (A.1.3.4)
- Select the appropriate operation to solve problems involving ratios and proportions. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use estimation strategies to predict results and to check the reasonableness of results. (A.4.3.1)

Measurement

- Use concrete and graphic models to derive formulas for finding perimeter, area, and volume of two- and three-dimensional shapes. (B.1.3.1)
- Use concrete and graphic models to derive formulas for finding angle measures. (B.1.3.2)
- Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume. (B.1.3.3)

- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)
- Use direct (measured) and indirect (not measured) measures to compare a given characteristic in customary units. (B.2.3.1)
- Solve real-world and mathematical problems involving estimates of measurements, including length and area. (B.3.3.1)

Geometry and Spatial Relations

- Understand the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two and three dimensions. (C.1.3.1)
- Understand the geometric concepts of congruency, similarity, and transformations, including flips, slides, and turns. (C.2.3.1)
- Predict and verify patterns involving tessellations (a covering of a plane with congruent copies of the same pattern with no holes and no overlaps, like floor tiles). (C.2.3.2)
- Represent and apply geometric properties and relationships to solve real-world and mathematical problems. (C.3.3.1)
- Identify and plot ordered pairs in all four quadrants of a rectangular coordinate system (graph) and apply simple properties of line. (C.3.3.2)

Algebraic Thinking

- Describe relationships through expressions and equations. (D.1.3.1)
- Create and interpret tables, equations, and verbal descriptions to explain cause-and-effect relationships. (D.1.3.2)
- Represent problems with algebraic expressions and equations. (D.2.3.1)

Lesson Purpose

Lesson One Purpose (pp. 220-253)

- Understand concrete and symbolic representations of irrational numbers in real-world situations. (A.1.3.3)
- Understand that numbers can be represented in a variety of equivalent forms including integers, exponents, and radicals. (A.1.3.4)
- Select the appropriate operation to solve problems involving ratios and proportions. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use estimation strategies to predict results and to check the reasonableness of results. (A.4.3.1)
- Use concrete and graphic models to derive formulas for finding area of two-dimensional shapes. (B.1.3.1)
- Use concrete and graphic models to derive formulas for finding angle measures. (B.1.3.2)
- Construct, interpret, and use scale drawings to solve real-world problems. (B.1.3.4)
- Solve real-world and mathematical problems involving estimates of measurement, including length and area. (B.3.3.1)
- Understand the basic properties, of and relationships pertaining to, regular and irregular geometric shapes in two dimensions. (C.1.3.1)
- Represent and apply geometric properties and relationships to solve real-world and mathematical problems. (C.3.3.1)

Lesson Two Purpose (pp. 254-278)

- Select the appropriate operation to solve problems involving ratios and proportions. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use concrete and graphic models to derive formulas for finding perimeter, area, and volume of two- and three-dimensional shapes. (B.1.3.1)
- Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affect its other measurements such as perimeter, area, surface area, and volume. (B.1.3.3)
- Use direct (measured) and indirect (not measured) measures to compare a given characteristic in customary units. (B.2.3.1)
- Understand the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two and three dimensions. (C.1.3.1□)
- Understand the geometric concepts of congruency and similarity. (C.2.3.1)
- Represent and apply geometric properties and relationships to solve real-world and mathematical problems. (C.3.3.1)
- Represent problems with algebraic expressions and equations. (D.2.3.1)

Lesson Three Purpose (pp. 279-293)

- Associate verbal names, written word names and standard numerals with fractions, radicals, and ratios. (A.1.3.1)
- Understand concrete and symbolic representations of rational numbers in real-world situations. (A.1.3.3)

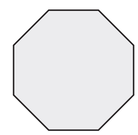
- Select the appropriate operation to solve problems involving ratios and proportions. (A.3.3.2)
- Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Use concrete and graphic models to derive formulas for finding perimeter and area. (B.1.3.1)
- Understand the basic properties of, and relationships pertaining, to regular and irregular geometric shapes in two dimensions. (C.1.3.1)
- Represent and apply geometric properties and relationships to solve real-world and mathematical problems. (C.3.3.1)

Lesson Four Purpose (pp. 294-328)

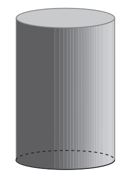
- Understand the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two dimensions. (C.1.3.1)
- Understand the geometric concepts of transformations including flips, slides, and turns. (C.2.3.1)
- Predict and verify patterns involving tessellations (covering of a plane with congruent copies of the same pattern with no holes and no overlaps). (C.2.3.2)
- Identify and plot ordered pairs in all four quadrants of a rectangular coordinate system graph and apply simple properties of lines. (C.3.3.2)
- Describe relationships through expressions and equations. (D.1.3.1)
- Create and interpret tables, equations, and verbal descriptions to explain cause-and-effect relationships. (D.1.3.2)

Suggestions for Enrichment

1. Ask students to look for two-and three-dimensional figures as they walk, ride a bike, or travel by car or bus. Have students make a quick sketch of the figures and note their use.
   Example: The octagon is used as a stop sign. The cylinder is used as a trash can.
   Ask students to find at least 15 figures.



octagon



cylinder

2. Have students break pieces of uncooked spaghetti in lengths of 1″, 2″, 3″, 4″, 5″, 6″, 7″, 8″, 9″, and 10″ and make at least 2 of each length. Have students try to make triangles using different combinations of spaghetti sides. Have them find at least two combinations that will and will not form triangles. Ask students to use glue or tape to make a display of their work. Have students record results. Then write a short summary explaining why some combinations work and some do not.

work	won't work

3. Ask students to develop a creative way to demonstrate why a square is also a rhombus, a rectangle, a parallelogram, and a quadrilateral.

4. Allow students access to a computer and software with sketching capability and have them create a figure and record the set of commands required to create the figure. Have student share the results with the class. (*Logo* is an example of the software needed.)

5. To emphasize the properties of the sides and the angles of a square, rectangle, parallelogram, rhombus, and trapezoid, cut out the bottom of a rectangular shoe box and a square box, so the boxes can now bend at the corners. Hold the rectangle box so as to view the open face and bend the quadrilateral into a parallelogram. Bending the shoe box illustrates the change in angles and the fact the length of the sides have not changed. Bend the square box, and the quadrilateral becomes a rhombus.

6. Bring in various foods shaped like polygons having three or more sides (e.g., triangular-shaped chips, square-shaped crackers). Give students one of each type of food and have them measure length of sides and calculate perimeter. Ask students to name and classify the polygons based on the number of sides and length of sides. Classify the three-sided polygon according to the measure of its angles, list the characteristics used to classify the four-sided polygon, and name the food represented by the polygon. (Optional: Bring in soda and paper cups to talk about volume and figure out the amount of liquid that each cup holds. Talk about capacity.)

7. Have students use math vocabulary and definitions to create crossword puzzles to trade with other students and solve each others' puzzles.

8. Have students create a simple design on grid paper. Ask students to enlarge the design so that the perimeter of the enlargement is twice the perimeter of the original. Ask students to be sure that corresponding angles are congruent and that ratios of corresponding sides are equal.

9. Have students cut out a photograph from a magazine and trim it to whole-number dimensions in centimeters (e.g., 10 centimeters by 15 centimeters or 8 centimeters by 13 centimeters) to create realistic "blowup" or enlargement drawings of the photograph. Have students mark off centimeters on all four sides of their photographs and connect the line in ink to form a grid. Have students mark off 10-centimeter increments on their blowup frame on a plain sheet of paper and draw a grid in pencil. Ask students to find a point on a feature in the magazine photograph. Measure the distance from the square's top and side to that point. Multiply these two measurements by 4. Find the corresponding point on the corresponding blowup square and mark it. Continue to mark several points and draw a feature by connecting the dots. After drawing the feature, color the picture and erase the pencil grid marks. Display the blowup drawings next to photographs. (Optional: Have students measure something big and make a scale model of it.)

10. Have students explore shapes and patterns using tangram pieces. Ask students to fold and cut a square piece of paper following these directions.

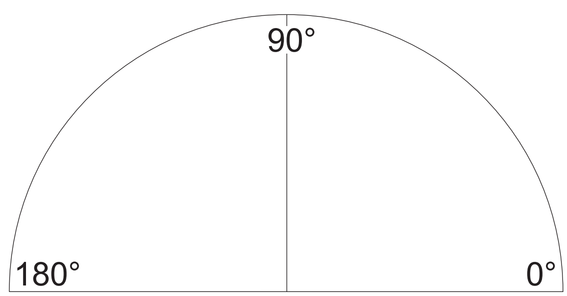
- Fold the square sheet in half along the diagonal, unfold, and cut along the crease. What observations can be made and supported about the two pieces?
- Take one of the halves, fold it in half, and cut along the crease. What observations can be made and supported?
- Take the remaining half and lightly crease it to find the midpoint of the longest side. Fold it so that the vertex of the right angle touches that midpoint and cut along the crease. What observations can be made and supported? Discuss congruent and similar triangles and trapezoids.
- Take the trapezoid, fold it in half, and cut along the crease. What shapes are formed? (trapezoids) What relationships do the pieces cut have? Can you determine the measure of any of the angles?
- Fold the acute base angle of one of the trapezoids to the adjacent right base and cut on the crease. What shapes are formed? How are these pieces related to the other pieces?
- Fold the right base angle of the other trapezoid to the opposite obtuse angle and cut on the crease. (Students should now have seven tangram pieces.) What other observation can be made?

  Have students put the pieces together to form the square they originally started with. Have students order the pieces from smallest to largest based on area, using the small triangle as the basic unit of area. Ask students what the areas of each of the pieces are in triangular units.

Have students create squares using different combinations of tangram pieces and find the area of squares in triangle units. (e.g., one square with one tangram piece: two triangle units in area; two tangram pieces of the two small triangles: two triangular units; or the two large triangles: eight triangular units in area.)

Have students try to form squares with three pieces, four pieces, five pieces, six pieces, and all seven pieces. Ask students: Are there multiple solutions for any? Are there no solutions for any? Do you notice any patterns? (Possible questions from tangram folding to ask: If the length of a side of the original square is two, what are the lengths of the sides of each of the tangram pieces cut? Possible conjectures based on finding from square making activity: Areas of the squares appear to be powers of two; they are unable to make a six-piece square; when all combinations six-pieces are considered, the possible areas are not powers of two.)

11. Ask students to cut a semicircle from a piece of stiff paper. Then have students fold the semicircle in half to make a quarter circle and mark the center. Have students mark a 0˚, 90˚, and 180˚ as shown. This is a quick way to make a protractor to help estimate the measure of angles.



12. Have students determine the optimum angle to achieve the greatest distance. Attach a hose to an outside tap and adjust the flow of water to a constant pressure. Start at an angle of zero degrees to the ground. Measure and record the distance the streams travels in a horizontal direction along the ground. Repeat this process at 20, 30, 45, 60, and 75 degrees. Ask students the following: Which angle allowed you to achieve the maximum distance? Describe a method to determine the maximum height the water achieved at the

optimum angle. Draw the approximate path the water followed in its flight. What is the shape of the path? If the pressure on the hose increased, what effect would it have on the angle you would use to achieve maximum distance at the new pressure? Do you think that a shot put or a javelin would need to be thrown at a different angle to achieve its maximum distance?

13. Draw a very large circle (on a rug, use yarn, or on concrete, use chalk). To draw a perfect circle, use a marker tied to a piece of string taped to the floor. Draw the diameter, a radius, and the chord of the circle to help teach pi, area, and circumference. Define each part with the students. Then have students count their steps as they pace off each part and record their data on a chart. Ask students to note that their walk around the circle took about three times as many steps as the walk across the circle to help them remember what pi means.

14. Have groups make a table or chart with columns for names or number of objects, circumference, diameter, and a column with a question mark (?). Give students round objects such as jars and lids to measure. Have students measure and record each object's circumference and diameter, then divide the circumference by the diameter and record the result in the ? column. Ask students to find the average for the ? column. Record the group's averages on the board, and have students find the average number for the class. Explain to students they have just discovered pi (π). Then have students come up with a formula to find the circumference of an object knowing only the diameter of that object and the number that represents pi. Ask students to verify that their formula works by demonstrating and by measuring to check their results. Have students write conclusions for the activities they have just performed. Give students three problems listing only the diameter of each object and have them find the circumference.

15. Design a large *Jeopardy* board with six categories going across the top and values of 10, 20, 30, 40, and 50 going down the left side. Write the skill to be reviewed under each of the six categories and then fill in your master game sheet so that under each category, problems range from easiest to hardest. Divide so that each team represents varying abilities and distribute a blank *Jeopardy* game to each student to be collected later for assessment. One student is

selected to be the group scorekeeper and write point amounts for their team on the board and to write problems in the correct category box on the board.

JEOPARDY						
Value	Category #1 Estimation	Category #2 Proportions	Category #3 Subtraction	Category #4 Geometry	Category #5 Division	Category #6 Equations
10			Problem from easiest to hardest levels of difficulty.			
20			easiest			
30						
40						
50			hardest			

One student from the first team goes to the board and selects a category and a point amount. All students in the class then write the problem on their game sheet and solve it showing all work. The teacher calls on a student from the team whose turn it is to answer. If correct, the student must explain the steps necessary to solve the problem. The team's scorekeeper writes the correct problem on the class-size game board and places an "x" through the problem. The game continues until all students on all the teams have a turn. You may secretly place double *Jeopardy* points in selected boxes to be revealed only upon being chosen. Tally team points to determine a winner.

16. Have students research M. C. Escher and his art. Ask students to create their own Escher-like tessellation. Have students use shape sets to realize significant properties of polygons, then take photographs of tessellations around their school.

17. Have students use pattern blocks to discover how many ways these blocks can be put together to make different polygons (e.g., a rhombus and equilateral triangle can form a trapezoid). Then have students create their own tessellations, or forms of repeating shapes that fill a plane without gaps or overlapping, and color them. (Optional: You could show representations of tessellations in tile patterns and wallpaper.)

18. See Appendices A, B, and C for other instructional strategies, teaching suggestions, and accommodations/modifications.

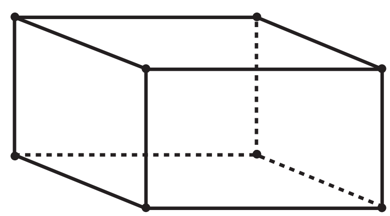
Unit Assessment

Answer the following. Student may use the **Mathematics Reference Sheet** *in* **Appendix A** *of the student book as needed.*

Three geometric solids are illustrated below. Name and describe each of the figures using geometric terminology, including the following terms.

base	**face**	**rectangular prism**
circle	**pyramid**	**triangle**
cylinder	**rectangle**	**vertex (vertices)**
edge		

1. Figure One



Name: ______________________________

Description: ______________________________

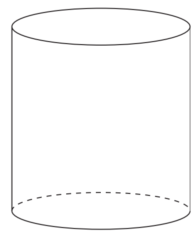
____

____

____

____

2. Figure Two



Name: ____

Description: ____

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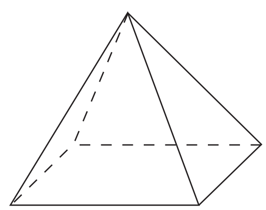
____

3. Figure Three



Name: ____

Description: ____

____

____

____

____

Use the list below to complete the following statements. **One or more terms will be used more than once.**

congruent	**parallel**
hypotenuse	**perpendicular**
obtuse	**proportional**

4. In a parallelogram, opposite sides are ______________________ and ______________________ ; adjacent sides may be ______________________ .

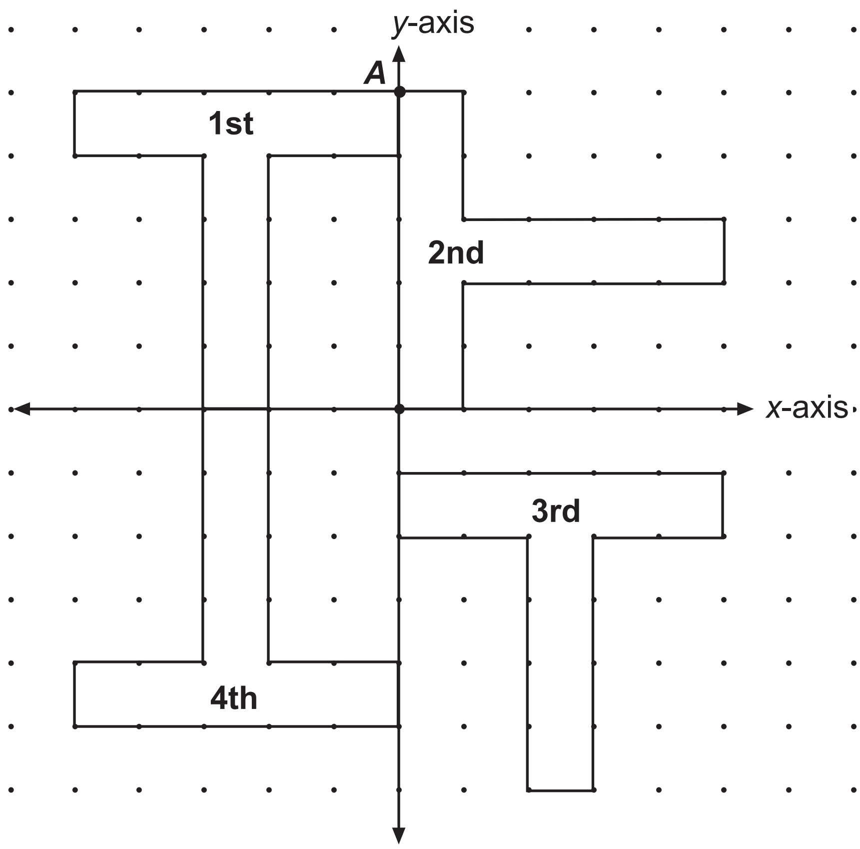
5. The number of degrees in an ______________________ angle must be less than 180 and greater than 90.

6. If two figures are similar, corresponding angles are ______________________ , and corresponding sides are ______________________ .

7. The longest side of a right triangle is called the ______________________ .

Answer the following.

In the illustration below some **transformations** have been performed on the first T.



8. The second T is the image of the first T after a counterclockwise turn about point A of ____________ degrees.

9. The third T is the image of the first T after a slide defined by the ordered pair (____________ , ____________).

10. The fourth T is the image of the first T after a flip over the ____________ axis.

Use one or more of the **shapes** *on the next page to do the following.*

Your teacher will instruct you to either

- trace the shapes and cut them out

or

- cut the shapes directly from the page.

11. Illustrate a tessellation **and** explain why the shape(s) chosen will tessellate.

    Explanation: ____

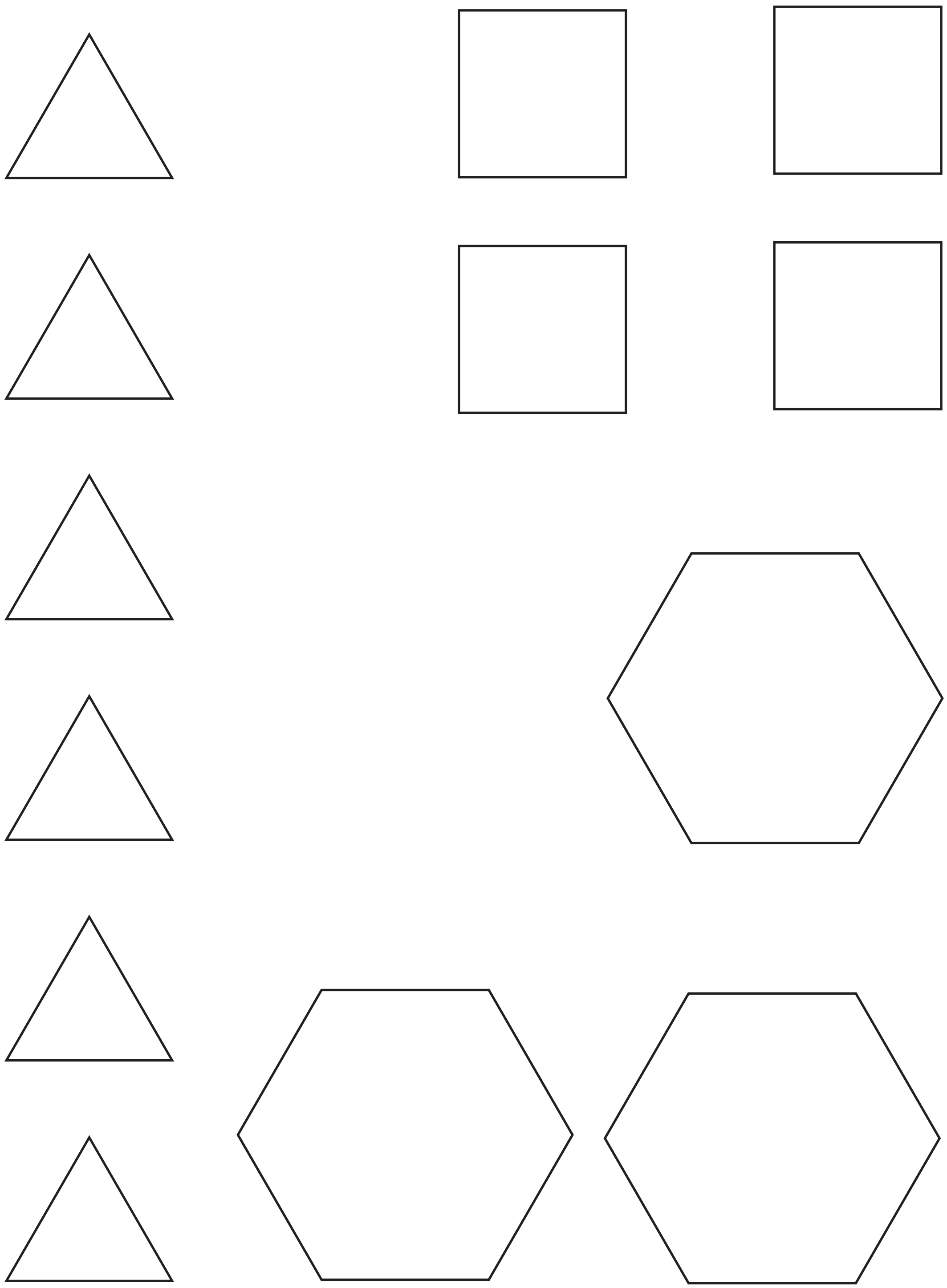
    ____

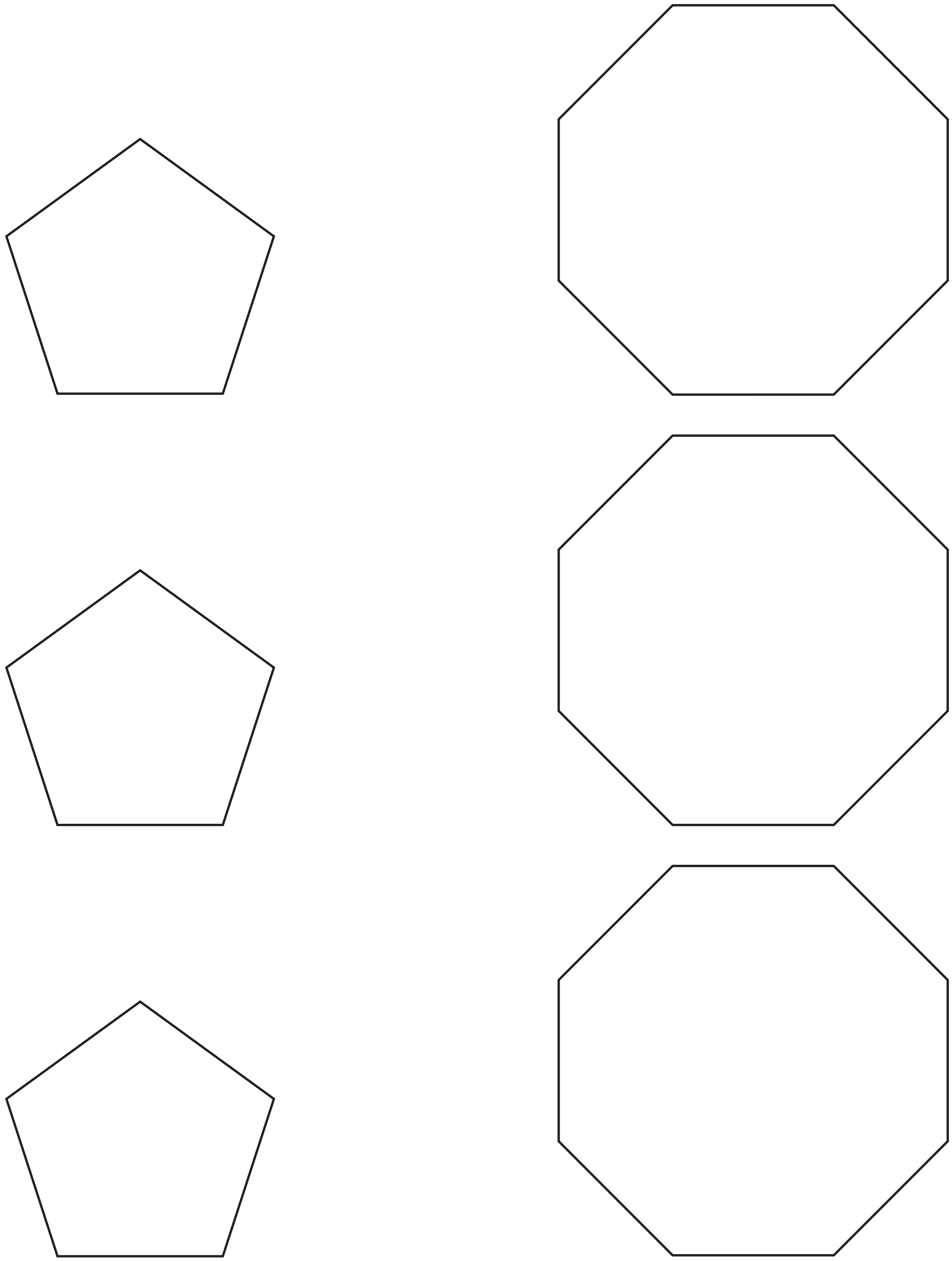
    ____

    ____

    Illustration:

Shapes for tessellation.





12. Illustrate **or** explain why a tessellation is **not** possible.

Explanation: ____

____

____

____

____

or

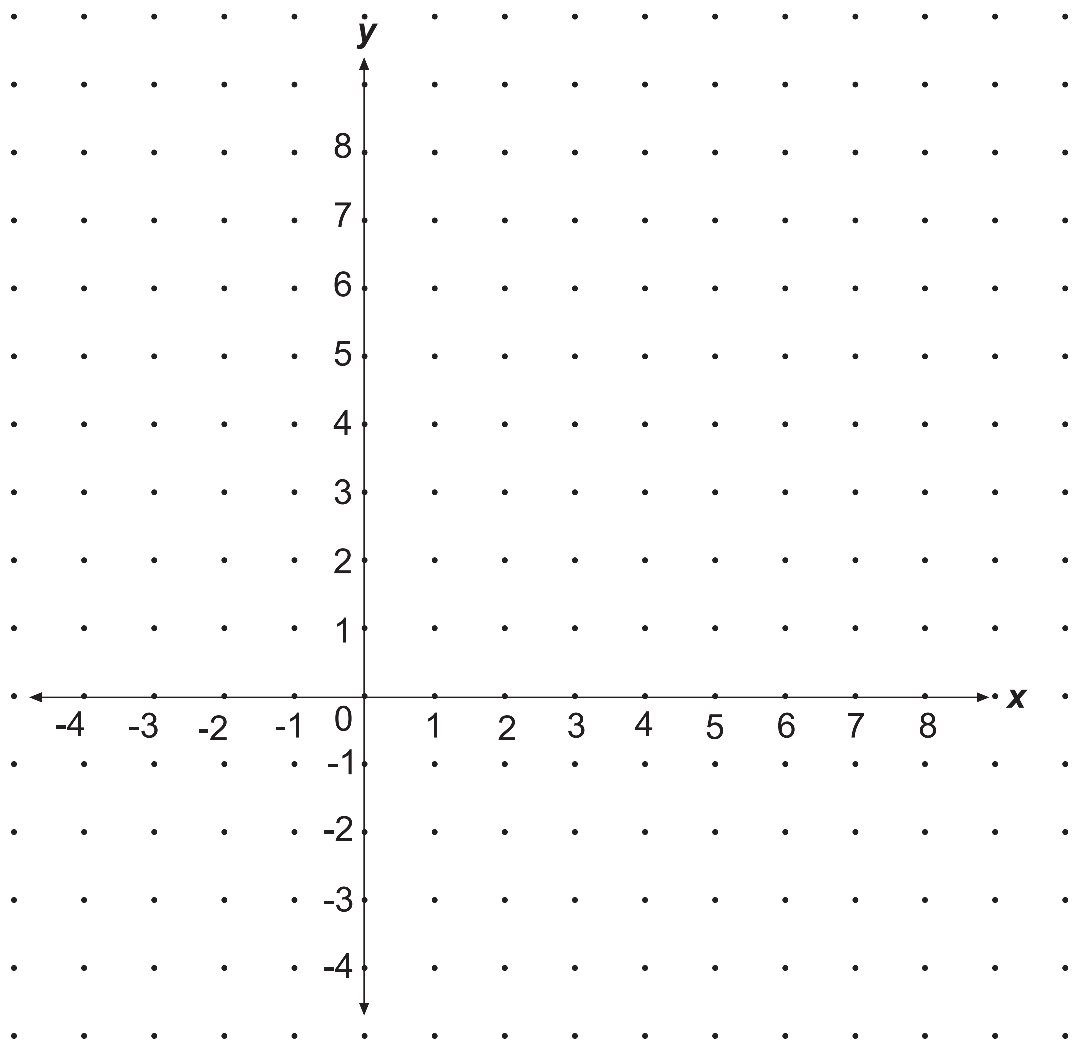
Illustration:

Use the **coordinate grid** *below to answer the following.*

13. Plot the points of triangle *ABC* and connect them.

    The coordinates for triangle *ABC* are as follows.

    A: (1, 1) *B*: (1, -2) *C*: (5, -2).



14. On the same grid, draw triangle *DEF* similar to triangle *ABC* using a scale factor of 2.

    Label your corresponding vertices *D*, *E*, and *F*. Give the coordinates of your vertices.

    D: (_______ , _______) *E*: (_______ , _______) *F*: (_______ , _______)

15. The area of triangle *ABC* is _______ square units, and the perimeter is

    _______ units.

16. The area of triangle *DEF* is _______ square units, and the perimeter is

    _______ units.

17. When a scale factor of 2 was applied to the dimensions of triangle

    ABC, what was the effect on the area? ____________________________

    ____

    ____

18. When a scale factor of 2 was applied to the dimensions of triangle

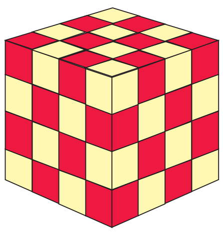
    ABC, what was the effect on the perimeter? ______________________

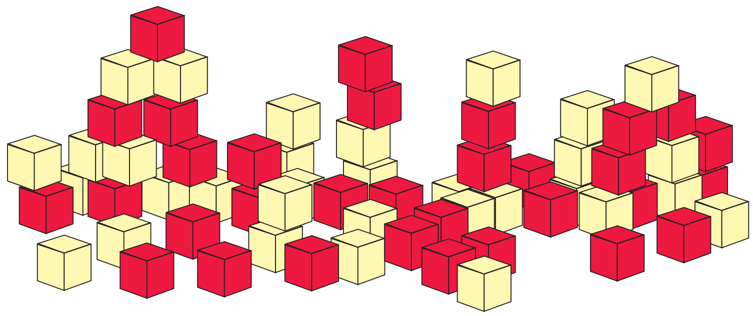
    ____

    ____

Choose any **two** *problems of numbers 19-20.*

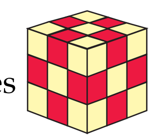
19. A cube with edge lengths of 4 (4 x 4 x 4) is cut into unit cubes (1 x 1 x 1). The original (4 x 4 x 4) cube can now be taken apart and rearranged.

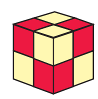


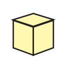


4 x 4 x 4 = 64 unit cubes

Using all 64 unit cubes, what is the *smallest* number of cubes that could result?

__________ cube(s) of 3 x 3 x 3 using __________ unit cubes 

__________ cube(s) of 2 x 2 x 2 using __________ unit cubes 

__________ cube(s) of 1 x 1 x 1 using __________ unit cube 

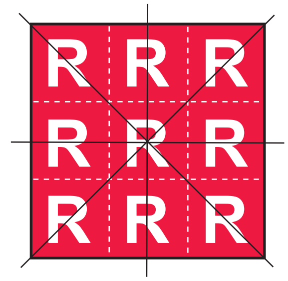
__________ = smallest number of cubes using 64 unit cubes

20. Henrietta is making a spinner. Radii divide the circular spinner into parts, and the central angles differ by 10 degrees. She draws two radii forming a central angle of 10 degrees for section A. She then draws a third radii forming a new central angle of 20 degrees. She continues this process until all of the circle is used.

    What is the number of degrees in the largest section? __________

    Hint: The total number of degrees in a circle is __________ .

21. A quilt maker has a supply of squares. Each square is either red, white, or blue. Nine small squares are to be sewn together to form a 3 by 3 square. If all of the nine squares used are the same color, the larger square will have four lines of symmetry.

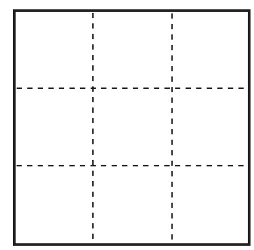


all nine unit squares above are the same color

a. Find at least one way a 3 by 3 square could be made if the square has one line of symmetry and 3 squares of each color are used?

Answer: ____________

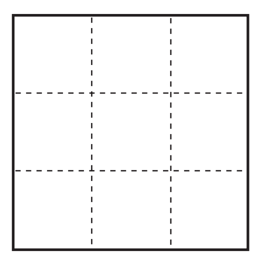
Show all your work.



b. Find at least one way a 3 by 3 square could be made if the square has two lines of symmetry and at least two different colors are used.

Answer: ____________

Show all your work.



c. If the edge length of each of the original 9 small squares was 1 foot, what is the length of a diagonal of this quilt? Round to nearest whole number.

Answer: ____________

Show all your work.

22. To estimate the height of a utility pole, a construction worker measured the length of the shadow cast by the pole. At the same time, he found the measure of the shadow of a meter stick positioned by the pole. If the length of the shadow cast by the meter stick was 18 centimeters and the length of the shadow cast by the utility pole was 90 centimeters, what is the height of the utility pole? Illustrate the information provided in the problem.

Answer: ____________

Illustration:

Keys

Lesson One

Practice (p. 223)

1. parallel (||)
2. parallel lines
3. perpendicular (⊥)
4. perpendicular lines
5. opposite sides
6. adjacent sides
7. perpendicular bisector
8. intersect
9. vertex

Practice (p. 225)

1. D
2. E
3. G
4. F
5. C
6. A
7. B

Practice (p. 228)

1. degree (°)
2. measure of an angle
3. vertex
4. endpoint (•—•)
5. ray (•→)
6. side
7. angle (∠)

Practice (p. 231)

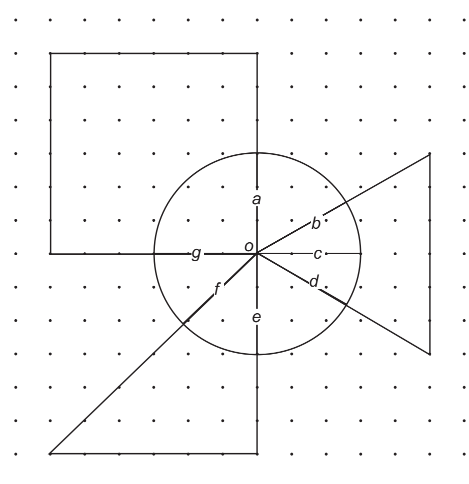
1. A
2. C
3. B
4. D
5. C
6. A
7. B
8. C
9. A
10. B

Practice (p. 234)

1. triangle
2. height (h) or altitude
3. base (b)
4. product
5. hypotenuse
6. leg
7. area (A)
8. congruent (≅)

Practice (pp. 235-236)

1. See drawing below of circle and square.
2. See drawing below of circle, square, and isosceles right triangle.
3. See drawing below of circle, square, isosceles right triangle, and isosceles triangle.



Keys

Practice (pp. 237-239)

1. Answers for the square are as follows:
   a. True
   b. True
   c. True
   d. True
   e. True
   f. True
   g. False
   h. True
2. Answers for the isosceles triangle are as follows:
   a. True
   b. True
   c. True
   d. True
   e. True
   f. False
   g. True
   h. True
3. Answers for the isosceles right triangle are as follows:
   a. True
   b. True
   c. True
   d. True
   e. True
   f. True
   g. True
   h. True
   i. False
4. b
5. c

Practice (pp. 243-245)

1. $\sqrt{72}$ or $6\sqrt{2}$ or about 8.5
2. 5
3. $\sqrt{72}$ or $6\sqrt{2}$ or about 8.5
4. The area of the isosceles right triangle is one-half the area of the square.
5. See table below.

Approximate Values of Square Roots

Square Root Expression	Value Lies between ___ and ___	Approximate Value
$\sqrt{22}$	4 and 5	4.7
$\sqrt{14}$	3 and 4	3.7
$\sqrt{27}$	5 and 6	5.2
$\sqrt{39}$	6 and 7	6.2
$\sqrt{57}$	7 and 8	7.5
$\sqrt{68}$	8 and 9	8.2
$\sqrt{85}$	9 and 10	9.2
$\sqrt{99}$	9 and 10	9.9
$\sqrt{140}$	11 and 12	11.8
$\sqrt{110}$	10 and 11	10.5

6. See table below.

Dimensions of Right Triangles

Length of *a*	Length of *b*	Length of *c*
16 units	25 units	29.7 units
20 units	21 units	29 units
5 units	12 units	13 units
72 units	65 units	97 units
133 units	156 units	205 units
8 units	15 units	17 units

Keys

Practice (pp. 246-248)

1. 90; the angles of a square are right angles and measure 90 degrees.
2. 60; the angles of an equilateral triangle are congruent and each measures 60 degrees.
3. 30; the altitude of an equilateral triangle bisects the angle and divides the triangle into two congruent parts.
4. same as #3
5. 45; this isosceles right triangle has one right angle and two congruent angles which measure 45 degrees each.
6. 90 degrees; the angle is a right angle because it is vertical to angle *aog*
7. 60; when the measure of angle *cod* which is 30 degrees is subtracted from the measure of angle *coe* which is 90 degrees, the difference is 60.
8. 45; angle *goe* is a right angle and when the measure of angle *foe* is subtracted from 90, the difference is 45.
9. 360; all of the angles together form a circle.
10. 25
11. 36
12. 28.3
13. 15
14. 18
15. Correct answers will be determined by the teacher.

Practice (p. 249)

1. Pythagorean theorem
2. bisect
3. sum
4. isoceles right triangle
5. square
6. length (*l*)
7. formula

Practice (pp. 250-253)

1. Answers will vary but considerations that may be cited by students in this problem solving opportunity are as follows:

   The square has more area than the circle, or either triangle. When part of the square yields to the circle, the area becomes $36 - \frac{1}{4}(28.3)$ or 28.9. This area is still greater than the circle or the triangles. The square has 80% of its area when sharing with the circle.

   The equilateral triangle has the smallest area for performing and when its area of 15.6 square centimeters is reduced by $\frac{1}{6}(28.3)$ when yielding to the circle, the area is 10.9 square centimeters. The equilateral triangle has 70% of its area when sharing with the circle.

   The isosceles right triangle has an area of 18 square centimeters and loses $\frac{1}{8}(28.3)$ when yielding to the circle for a total reduced area of 14.5 square centimeters. The isosceles right triangle has 81% of its area when sharing with the circle.

   If acts are assigned to stages based on area required by the performers and performances, then rotation from one stage to another is unlikely.

   Area is only one aspect of visibility.
2. Answers matching solutions will vary.
3. Additional suggestions will vary.

Keys

Lesson Two

Practice (pp. 261-262)

1. Students should draw a rectangle that is 8 units by 4 units.
2. Students should draw a rectangle that is 12 units by 6 units.
3. Students should draw a rectangle that is 6 units by 3 units.
4. Students should draw a rectangle that is 2 units by 1 unit.
5. Students should draw a rectangle with dimensions that are not in the ratio of 2 to 1.
6. 4
7. 9
8. 2.25 or $2\frac{1}{4}$
9. .25 or $\frac{1}{4}$

Practice (p. 263)

1. rectangular prism
2. octagon
3. parallelogram
4. face
5. rectangle
6. edge
7. pyramid
8. cylinder

Practice (p. 264)

1. vertex
2. edge
3. face
4. base
5. rectangular prism
6. pyramid

Practice (p. 265)

1. B
2. F
3. E
4. D
5. C
6. A
7. G
8. H

Practice (pp. 266-267)

1. A right triangle should be drawn with legs measuring 12 units and 8 units.
2. A right triangle should be drawn with legs measuring 18 units and 12 units.
3. A right triangle should be drawn with legs measuring 9 units and 6 units.
4. A right triangle should be drawn with legs measuring 3 units and 2 units.
5. A triangle should be drawn that is not similar to the above.
6. 4
7. 9

Practice (p. 270)

1. $x = 9$
2. $x = 1.5$
3. $x = 5$
4. $x = 4.5$

Practice (pp. 271-272)

1. 4.5 inches by 7.5 inches
2. 2 inches by 2.5 inches
3. 129%
4. 600

Keys

Practice (pp. 273-278)

1. The 5 by 7 photo enlargement will *not* be similar and the cost will be $3.50.

   The 8 by 10 enlargement will *not* be similar and the cost will be $8.00.

   The 12 by 16 enlargement will *not* be similar and the cost will be $19.20.

   The 16 by 24 enlargement will be similar and the cost will be $38.40.

   The maximum spent would be $69.10 if he starts with the 5 by 7 and keeps going to the next larger one until he gets a satisfactory print.

   The minimum cost would be $38.40 if he chooses 16 by 24 first.
2. Answers matching solutions and teams will vary.
3. Additional suggestions will vary.

Lesson Three

Practice (pp. 281-283)

1. The sum of the perimeters of the four smaller triangles is 36 units. Each is an equilateral triangle with side length measure of 3 units.
2. 14.13 + 25.12 = 39.25

   39.25 = 39.25

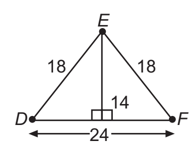
   They determined their conjecture was true. The area of a semicircle with a diameter the length of the hypotenuse of a right triangle is equal to the sum of the areas of the two semicircles with diameters of lengths of the legs of the right triangle.
3. Each of the eight congruent cubes will have an edge measure of 2 units.

Practice (p. 288)

1. 30
2. 100
3. 50; 180
4. 50

Practice (pp. 289-292)

1. $\frac{4}{9}$
2. a. 90
   b. 15
3. 18 units



4. a. 25
   b. True
   c. 24
   d. 49
5. A circular spinner should be drawn with four congruent sections, each determined by a 60 degree angle and one larger section determined by a 120 degree angle.

Practice (p. 293)

1. E
2. F
3. B
4. C
5. D
6. A

Keys

Lesson Four

Practice (p. 296)

See table below.

Dimensions of Regular Polygons

Regular Polygon	Number of Sides	Number of Angles	Sum of Angle Measures	Measure of One Angle
equilateral triangle	3	3	180 degrees	60 degrees
square	4	4	360 degrees	90 degrees
pentagon	5	5	540 degrees	108 degrees
hexagon	6	6	720 degrees	120 degrees
heptagon	7	7	900 degrees	128.6 degrees
octagon	8	8	1,080 degrees	135 degrees
nonagon	9	9	1,260 degrees	140 degrees
decagon	10	10	1,440 degrees	144 degrees

Practice (p. 297)

1. G
2. B
3. F
4. D
5. C
6. E
7. A

Practice (pp. 300-302)

1. It is correct if students have answers for a and b as shown or if they have them reversed.
   a. Squares; 90; 4; squares
   b. Hexagons; 120; 3; hexagons
2. a. $a = 120$; $b = 90$;
   $c = 60$; $d = 90$
   $120 + 90 + 60 + 90 = 360$
   b. $a = 90$; $b = 60$; $c = 60$; $d = 60$;
   $e = 90$
   $90 + 60 + 60 + 60 + 90 = 360$
   c. $a = 90$; $b = 60$; $c = 60$;
   $d = 90$; $e = 60$
   $90 + 60 + 60 + 90 + 60 = 360$
   d. $a = 135$; $b = 90$; $c = 135$
   $135 + 90 + 135 = 360$

Practice (p. 303)

Correct answers will be determined by the teacher.

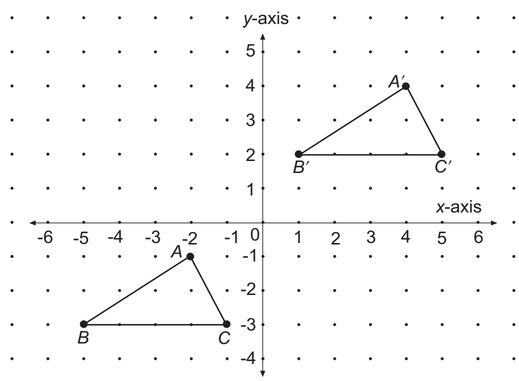
Practice (pp. 306-307)

1. *x*-coordinate
2. *y*-coordinate
3. quadrant
4. intersection
5. coordinates or ordered pair
6. origin
7. axes (of a graph)
8. *y*-axis
9. *x*-axis
10. number line
11. ordered pair or coordinates
12. coordinate grid

Keys

Practice (p. 310)

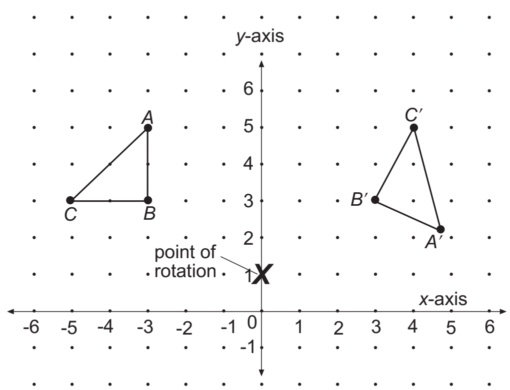
1. See coordinated grid below.



translation (6, 5)

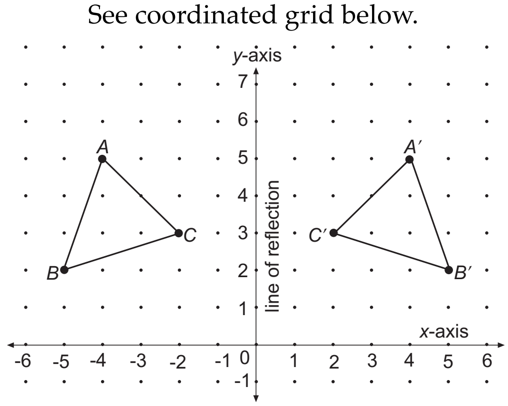
Practice (pp. 314-315)

1. See coordinated grid below.



Practice (p. 319)

See coordinated grid below.



Practice (p. 320)

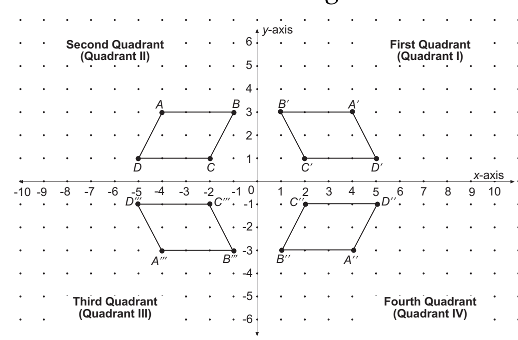
1. tessellation
2. flip
3. slide
4. rotation
5. factor
6. transformation
7. perpendicular bisector
8. line of symmetry

Practice (p. 321)

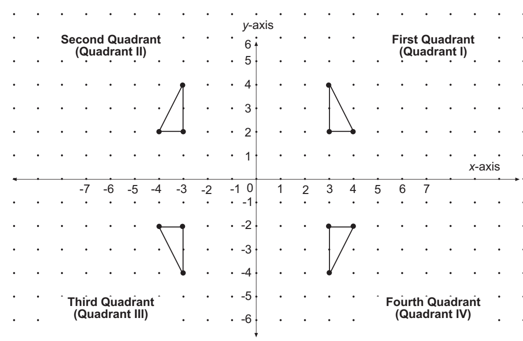
1. B
2. C
3. A

Practice (pp. 322-325)

1. a. No, it results in a flip of the figure in Quadrant II.
   b. The shape is the same but the vertices are located differently. See coordinated grid below.

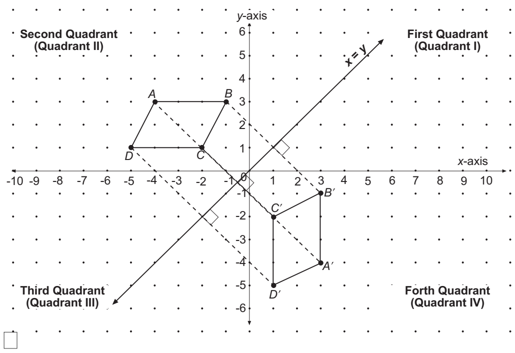


   c. No; See coordinated grid below.



2. a. See coordinated grid below.

Keys



b. See table below.

Coordinates of Vertices			
Vertex on Original figure	Coordinates	Vertex on Image	Coordinates
A	(-4, 3)	*A*′	(4, -4)
B	(-1, 3)	*B*′	(4, -1)
C	(-2, 1)	*C*′	(1, -2)
D	(-5, 1)	*D*′	(1, -5)

c. Juan and Juanita discovered that the members of each ordered pair reverse when a figure is reflected over the line of $y = x$. The value of x on the original becomes the value of y on the image and the value of y on the original becomes the value of x on the image.

Practice (p. 326)

1. vertex
2. base (*b*)
3. cylinder
4. rectangular prism
5. pyramid
6. face
7. edge

Practice (p. 327)

1. C
2. A
3. E
4. F
5. B
6. D
7. C
8. E
9. D
10. A
11. B

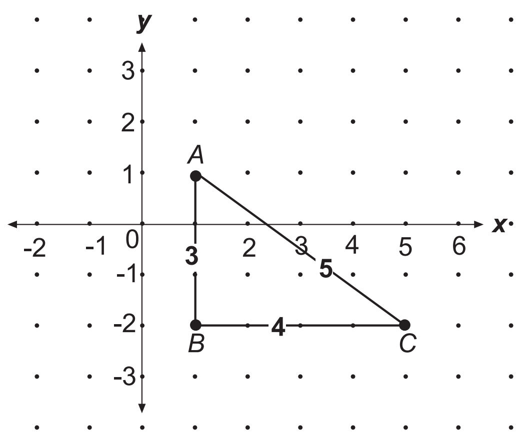
Unit Assessment (pp. 63-78TG)

1. Figure 1: Students should name and describe the rectangular prism using geometric terms including those listed in the question.
2. Figure 2: Students should name and describe the cylinder using geometric terms including those listed in the question.
3. Figure 3: Students should name and describe the pyramid using geometric terms including those listed in the question.
4. parallel and congruent or congruent and parallel; perpendicular
5. obtuse
6. congruent; proportional
7. hypotenuse
8. 90
9. (5,-6)
10. x
11. Students should illustrate how triangles, quadrilaterals, **or** how hexagons will tessellate and explain that the sum of the angles sharing a common vertex must be 360 degrees. They may combine shapes if they choose.
12. Students should illustrate **or**

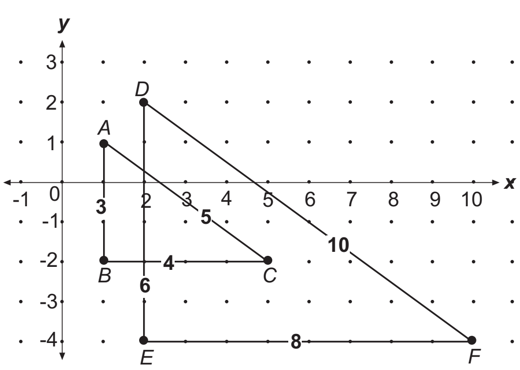
Keys

explain how shapes such as pentagons will not tessellate since the sum of the angles will not add to 360 degrees. The measure of the angles in the other polygons will not be a factor of 360. There can be no overlap or gaps in a tessellation.

13. A right triangle *ABC* should be drawn with side lengths of 3, 4, and 5. See coordinated grid below.



14. The coordinates of the points should be provided and will vary. The triangle with side lengths of 6, 8, and 10 should be labeled *DEF* and segment *DF* should be the hypotenuse. See coordinate grid below.



15. 6; 12

16. 24; 24

17. The area of triangle *DEF* is 4 times as great as the area of triangle *ABC*. When the dimensions doubled, the area quadrupled.

18. The perimeter is twice as great. Students choose two of the four problems to solve from numbers 19-22.

19. **<u>2</u>** cube(s) of 3 x 3 x 3 using **<u>54</u>** unit cubes
    <u>1</u> cube(s) of 2 x 2 x 2 using **<u>8</u>** unit cubes
    <u>2</u> cube(s) of 1 x 1x 1x 1 using **<u>2</u>** unit cubes
    <u>5</u> = smallest number of cubes using 64 unit cubes

20. Since 10 + 20 + 30 + 40 + 50 + 60 + 70 + 80 = 360, the largest section would be determined by an angle of 80 degrees; 360.

21. a. Possible solution for three of each color and one line of symmetry:

R	W	R
W	B	W
B	R	B

b. Possible solution for two lines of symmetry and at least two colors:

R	W	R
R	W	R
R	W	R

c. $\sqrt{18}$ or $3\sqrt{2}$ or about 4.2

22. $\frac{18}{100} = \frac{90}{x}$ or $\frac{100}{18} = \frac{x}{90}$ or $\frac{18}{90} = \frac{100}{x}$
    $x = 500$
    The pole is 500 cm or 5 meters tall. An illustration should accompany answer showing two similar right triangles – the meter stick and its shadow – the pole and its shadow.

Keys

Scoring Recommendations for Unit Assessment

Item Numbers	Assigned Points	Total Points
1, 2, 3, 12	5	20 points
4, 5, 6, 7	2	14 points
8, 9, 10, 13	3	12 points
11	10	10 points
14	6 for similar triangle; 3 for correct labeling of vertices; 3 for correct ordered pairs	12 points
15, 16	1 (per blank)	4 points
17, 18	2	4 points
19, 20, 21, 22	12	student to choose any 2 out of 4 24 points

Benchmark Correlations for Unit Assessment

Benchmark	Addressed in Items
C.1.3.1	1-7, 20, 22
C.2.3.1	4-12, 14, 21
C.2.3.2	11, 12
C.3.3.1	19-22
C.3.3.2	13, 14
A.3.3.2	22
A.3.3.3	15, 22
A.4.3.1	22
B.1.3.1	15, 16, 19
B.1.3.2	17, 18, 22
B.1.3.3	17, 18
B.1.3.4	22
B.2.3.1	22
B.3.3.1	22
D.1.3.1	19
D.1.3.2	19
D.2.3.1	22

Unit 4: Creating and Interpreting Patterns and Relationships

This unit emphasizes how patterns of change and relationships are used to describe, and summarize information with algebraic expressions or equations to solve problems.

Unit Focus (pp. 329-330)

Number Sense, Concepts, and Operations

- Understand that numbers can be represented in a variety of equivalent forms. (A.1.3.4)
- Understand and use exponential notation. (A.2.3.1)
- Add, subtract, multiply, and divide whole numbers and decimals to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculators. (A.3.3.3)
- Use concepts about numbers to build number sequences. (A.5.3.1)

Algebraic Thinking

- Describe a wide variety of patterns, relationships, and functions through models, such as tables, graphs, and equations. (D.1.3.1)
- Create and interpret tables, graphs, equations, and verbal descriptions to explain cause-and-effect relationships. (D.1.3.2)
- Represent and solve real-world problems graphically and with algebraic equations. (D.2.3.1)
- Use algebraic problem-solving strategies to solve real-world problems involving linear equations. (D.2.3.2)

Data Analysis and Probability

- Organize and display data. (E.1.3.1)

Lesson Purpose

Lesson One Purpose (pp. 340-369)

- Describe a wide variety of patterns and relationships through models. (D.1.3.1)
- Create and interpret tables and verbal descriptions to explain cause-and-effect relationships. (D.1.3.2)
- Organize and display data. (E.1.3.1)

Lesson Two Purpose (pp. 370-396)

- Add, subtract, multiply and divide whole numbers, decimals, and fractions to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Interpret equations to explain cause-and-effect relationships. (D.1.3.2)
- Solve real-world problems with algebraic equations. (D.2.3.1)
- Use algebraic problem-solving strategies to solve real-world problems involving linear equations. (D.2.3.2)

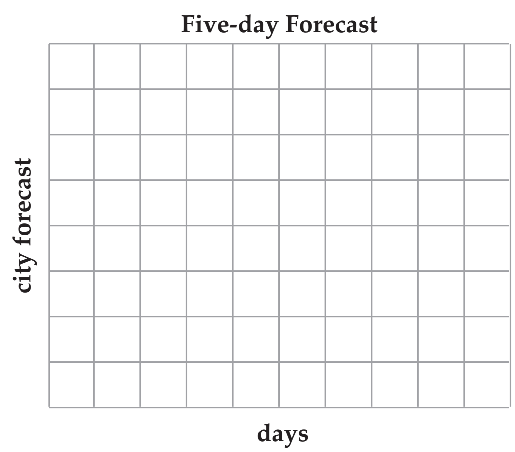
Lesson Three Purpose (pp. 397-422)

- Understand that numbers can be represented in a variety of equivalent forms. (A.1.3.4)
- Understand and use exponential notation (A.2.3.1)
- Add, subtract, multiply and divide whole numbers and decimals to solve real-world problems using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)

- Use concepts about numbers to build number sequences. (A.5.3.1)
- Describe a wide variety of patterns, relationships and functions through models, such as tables, graphs, and equations. (D.1.3.1)
- Create and interpret tables, graphs, and equations to explain cause-and-effect relationships. (D.1.3.2)
- Represent and solve real-world problems graphically and with algebraic equations. (D.2.3.1)
- Use algebraic problem-solving strategies to solve real-world problems involving linear equations. (D.2.3.2)

Suggestions for Enrichment

1. Have students access the Internet to find information on the past baseball season's American and National leagues' attendance and win statistics. Have students calculate an attendance-to-win ratio (attendance/win rounded to the nearest whole number) for each of the 28 major league teams and determine if winning always leads to good attendance. Then have students plot points for wins on the horizontal axis and attendance on the vertical axis. Do more wins result in greater attendance and why?
2. Have students choose a city and use the Internet to find the five-day forecast of that city's temperature and graph the information.



3. Have students access the Internet to find the statistics on all the roller coasters at Six Flags in Georgia. Ask students to calculate which is the highest and fastest roller coaster at Six Flags by computing the average speed rate = distance/time ($r = d/t$) and converting feet/minute to miles/hour. Have students record other interesting facts.

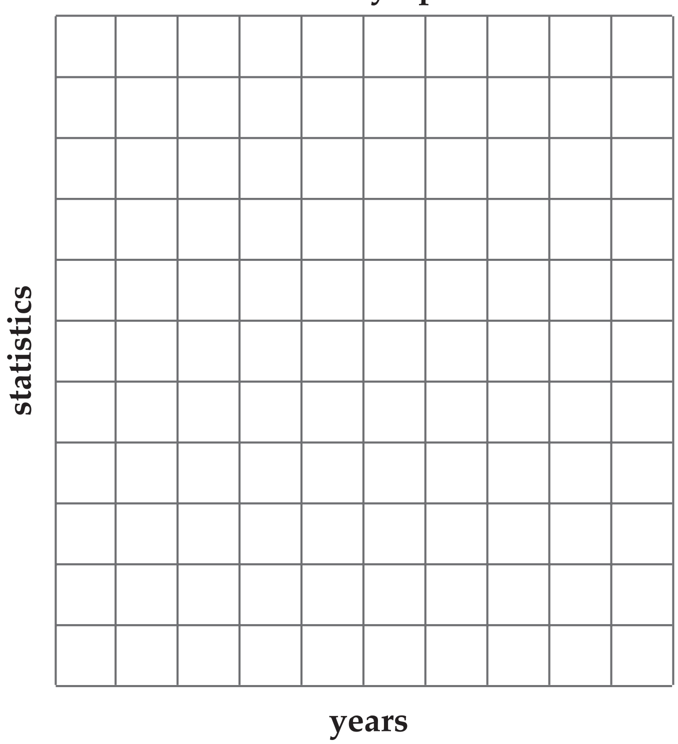
   Have students display data in a summary table as follows.

Six Flags Coaster Computation				
	ride name	ride name	ride name	ride name
height				
length				
distance				
feet/minute				
miles/hour				
extra information				

   Ask students to answer the following: What coaster has the highest drop? What coaster has the highest top speed? What coaster has the slowest average speed? What is the difference between the highest and lowest average speeds? What is the highest average speed of the coasters at Six Flags? What is your favorite coaster? Why (in terms of this activity)?

4. Have students use the Internet to compare records of Olympic gold medalists in one event for the last 100 years or provide them with a set of medalists. Ask students to plot the event on a two-dimensional graph with years on the horizontal axis and statistics on the vertical axis. Then have students answer the following: What trends or patterns did you notice? Were there any years that did not fit the overall picture? Did your trends match other students' trends? Did they have data that did not fit their pattern? Explain your pattern and why you think it happened. Construct an equation that describes the pattern of your data.

Gold Medal Olympic Winners



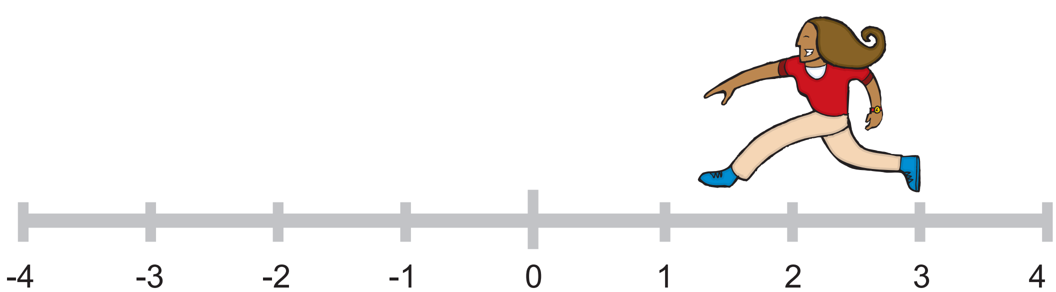
5. Show students a unit cube and ask them to describe the cube (e.g., eight corners, six faces, 12 edges). Have students build a second cube around the first cube so that first cube is encased by the second and then describe it in writing. Ask students how many unit cubes it will take to build a third cube around the second cube, a fourth cube around the third, and so on up to a tenth cube.

To extend the activity: Ask students to imagine that the entire outside of the tenth cube has been painted. If the cube is taken apart into unit cubes, how many faces of cubes are painted on three faces, two faces, one face, no faces? Have students chart their finding for each cube, first through tenth, and look for patterns.

Have students write exponents for the number of cubes needed and painted on three faces, two faces, one face, or no faces. Then have students graph their findings for each dimension of cube, first through tenth, and look for graph patterns.

6. Spray paint lima beans red on one side only. Give each student 10 painted lima beans and a cup for storing and tossing the beans. Have students decide which color will stand for negative and which positive. Working in pairs, one student will toss the beans and the other will record the score. The score is obtained by pairing the white and red beans to make zeros and counting what is left (For example, if the white side is positive, and there is a toss of seven whites and three reds, the three reds pair up with the three whites to make zeros, with four whites left. The score is +4 because +7 + -3 = +4). Have students play at least 15 rounds in order to see some patterns and arrive at a set of rules that can be used with all examples. This will enable them to predict outcomes correctly (e.g., you can find the difference between the units and use the sign of the greater number of units). Discuss. Record on the board several examples written as equations. (Optional: Extend the activity. Subtract, multiply, and divide using lima beans.)

7. Create a number line on the classroom floor using masking tape. Indicate zero (0), the directions of positive (+) and negative (-), and mark integers at intervals of about two feet. Have students take forward steps for positive and backward steps for negative on the line to solve addition of integers. Record movement on number lines on paper.



8. Tell students to imagine that they have been asked to choose between two salary options.

- One cent on the first day, two cents on the second day, and double their salary every day thereafter for thirty days; or
- $1,000,000 after 30 days.

After choosing an option, ask students to complete a table for the first option with columns for day number, pay for the day, and total pay in dollars. (In 30 days, this option increases from one penny to over 10 million dollars!)

Option #1 of Pay

Day Number	Pay for That Day	Total Pay (in dollars)
1	.01	.01
2	.02	.03
3	.04	.07
4	.08	.15
etc.	etc.	etc.

9. Ask students which they would choose to receive.

- $4.50 per day for 30 days; or
- one penny the first day, two the second day, four the third day, with the amount doubling every day for 30 days.

Ask the students to compare the two methods on a spreadsheet and graph the results.

10. Pose the following question to students.

- You have taken a sip from a friend's soda and picked up a bacterium from your friend. If the bacterium divides once every 20 minutes, how many potential bacteria could you host in 24 hours? In 48 hours?

Have students use spreadsheets to explore exponential growth. Have students research growth rates for different species such as bacteria, flies, cats, dogs, or people and transfer the information to a spreadsheet and then graph it. For example, census data can be found in the *World Almanac* or from the United States Bureau of Census (http://www.census.gov). The population data can be used to make projections and then compared to professional projections.

11. See Appendices A, B, and C for other instructional strategies, teaching suggestions, and accommodations/modifications.

Unit Assessment

Answer the following.

1. Archie would like to lose weight and begins a program of diet and exercise.

   a. If the pattern reflected in the table continues, what weight is expected at the end of 10 weeks?

   Answer: ____________________

   Archie's Weight Loss

Week	Weight
0	131
1	129.5
2	128
3	126.5
4	125

   b. Which equation describes the relationship between Archie's program of diet and exercise and his weight?

   $W = 131 - 1.5$
   $W = 131 – 1.5x$
   $W + 131(98.5^x)$

   Where W represents weight and x represents number of weeks.

   Answer: ____________________

2. Three rules, three tables of values, and three graphs are provided. For each table and each graph, write the rule for the relationship displayed.

Rules:
$y = 3x$
$y = x + 3$
$y = x^3$

Use the rules above to write the correct rule for each table below on the line provided.

Table One

X	Y
1	1
3	27
5	125

Rule: ______________________________

Table Two

X	Y
1	3
3	9
5	15

Rule: ______________________________

Table Three

X	Y
1	4
3	6
5	8

Rule: ______________________________

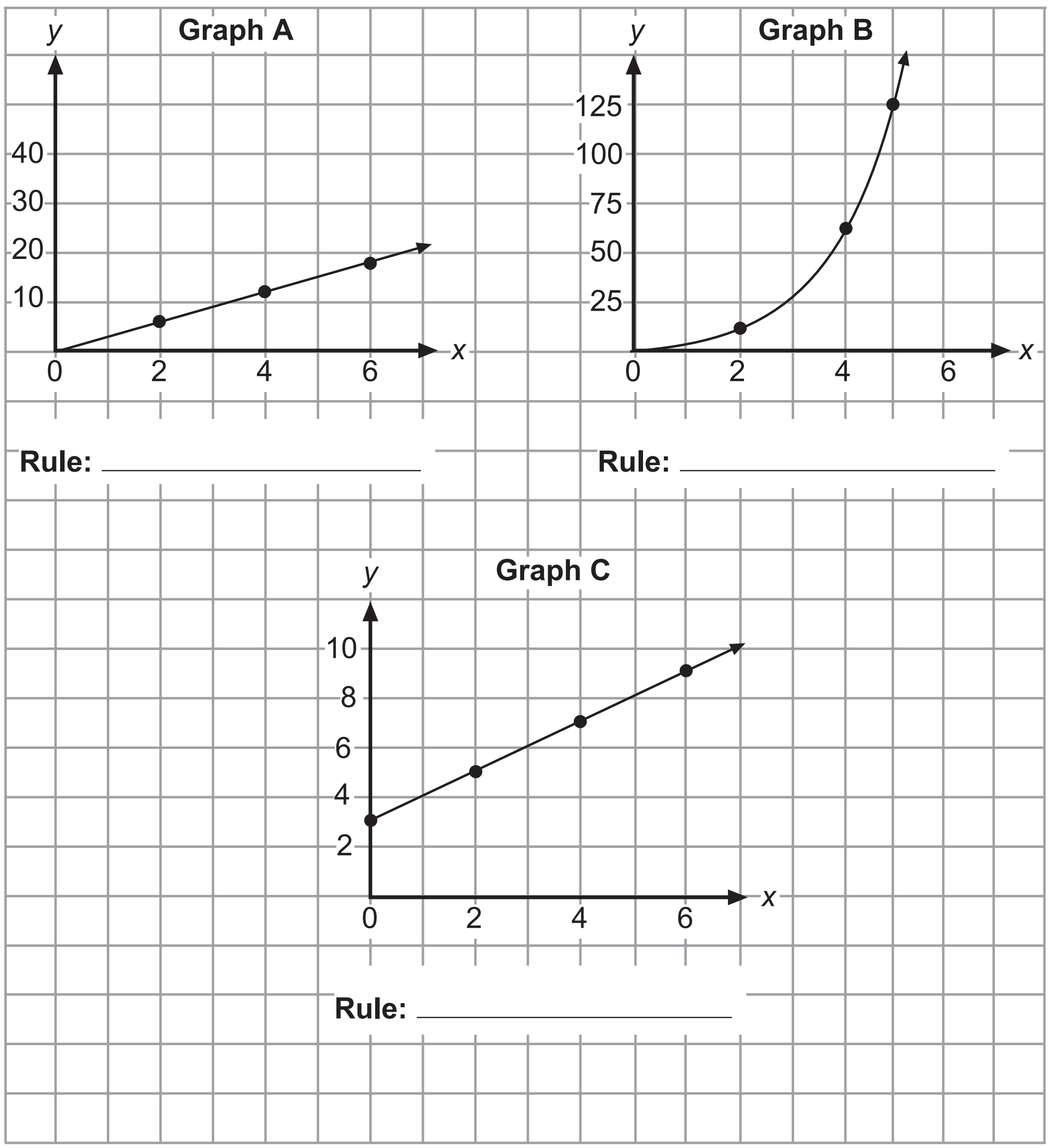
Rules:

$y = 3x$

$y = x + 3$

$y = x^3$

Use the rules above to write the correct rule for each graph below on the line provided.



3. Charla has opened a savings account with a deposit of $200. If she adds no money to the account and earns an interest rate of 4% per year, what amount will be in the account at the end of 4 years? **Round your answer to the nearest cent.**

   a. Which equation does *not* represent the information in the problem? ______________________________

   $A = 200 + 4(0.04)$
   $A = 200(1.04)(1.04)(1.04)(1.04)$
   $A = 200(1.04)^4$

   b. Answer the original question. ____________________

4. A family has four children, two girls and two boys. Make a list of all possible birth orders. Write the birth orders going across the table.

Family of Four's Possible Birth Order

First Child	Second Child	Third Child	Fourth Child

5. Choose one equation that is *true* for the situation described in words. Write the equation in the space provided. Then use the equation to solve the problem. You may *choose any five* of the six to complete.

Equations:
$T = 2 + (.07)2$
$A = h + 2$
$A = 2h$
$T = 2 + .50m$
$T = c + 0.20c$
$T = c - 0.20c$

a. Amelia's arm span (A) is two inches *greater than* her height (h). If her armspan is 62 inches, what is her height?

Equation: ____

Solution: ___________

b. Alex's earnings (A) are *twice as much* than they were two years ago (h). If his earnings were $12,000 two years ago, what are they now?

Equation: ____

Solution: ___________

c. Bahia pays $2.00 *plus fifty cents* per mile (m) for a taxi ride (T). If the taxi takes her a total distance of six miles, what is the cost of the taxi ride?

Equation: ____

Solution: ___________

d. Bertram pays $2.00 plus 7% tax for a taco. What is the *total amount* (T) Bertram pays?

Equation: ____

Solution: ___________

e. The total (T) paid by Catrice is the original cost (c) of a shirt less a 20% discount. If the original cost of the shirt was \$18, what was the *total amount* Catrice paid?

Equation: ______________________________________

Solution: __________

f. The total (T) paid by Calhoun is the cost (c) of his meal plus a 20% tip. If the cost of his meal was \$12.50, what was the *total amount* paid by Calhoun?

Equation: ______________________________________

Solution: __________

6. Extend each pattern as directed. You may *choose any five* of the six.

a. (1, 3, 6, 10, 15, ______ , ______)

b. (209, 198, 187, 176, ______ , ______)

c. (20, 24, 28, 32, ______ , ______)

d. (4, 9, 16, 25, 36, ______ , ______)

e. (9, 27, 81, 243 ______ , ______)

f. (1, 2, 2, 3, 3, 3, 4, 4, ______ , ______)

Keys

Lesson One

Practice (pp. 341-343)

See table below.

Possible Number of Paths

Size of Square	Number of Paths from *B* to *E*
1 x 1	2
2 x 2	6
3 x 3	20
4 x 4	70
5 x 5	252

Practice (pp. 344-346)

See table below.

Possible Birth Order

Number of Children	Boys or Girls	Birth Order	Total Number of Outcomes
1	1 boy or 1 girl	B G	2
2	2 boys 1 boy and 1 girl 2 girls	BB BG GB GG	4
3	3 boys 2 boys and 1 girl 1 boy and 2 girls 3 girls	BBB BBG BGB GBB BGG GBG GGB GGG	8
4	4 boys 3 boys and 1 girl 2 boys and 2 girls 1 boy and 3 girls 4 girls		16

2. GBG; GGB; 3
3. 8
4. 6
5. 16
6. 16
7. 32
8. $\frac{1}{64}$

Practice (pp. 347-349)

1. See table below.

Wearing Tennis Shoes or Sandals

Monday	Tuesday	Wednesday	Thursday
S	S	S	S
S	S	S	T
S	S	T	S
S	T	S	S
T	S	S	S
S	S	T	T
S	T	S	T
T	S	S	T
S	T	T	S
T	S	T	S
T	T	S	S
T	T	T	S
T	T	S	T
T	S	T	T
S	T	T	T
T	T	T	T

Keys

2. The number of outcomes for heads/tails or tennis shoes/sandals for four days is the same as the number of outcomes for four children being born in a family. We have heads or tails in one situation and boy or girl in the other.

3. See table below.

Possible True or False Statements

Statement 1	Statement 2	Statement 3
T	T	T
T	T	F
T	F	T
F	T	T
F	F	T
F	T	F
T	F	F
F	F	F

4. This is like a family of three children. It is also like flipping a coin for 3 days. There are 8 outcomes for a family of 3 children and 8 outcomes if a coin is flipped 3 times.

Practice (pp. 351-354)

1. 1, 1, 1,…1; 1
2. 1, 2, 3,…8; 9; 11
3. 1, 1, 1,…1; 1
4. 1, 2, 3,…8; 9; 11
5. 1, 3, 6, 10, 15, 21, 28; 36
6. 1, 3, 6, 10, 15, 21, 28; 36
7. yes
8. yes
9. See table below.

Sums on Rows

Row	Sum of Numbers on the Row
1	2
2	4
3	8
4	16
5	32
6	64
7	128
8	256
9	512
10	1,024
11	2,048

10. 1; 4; 6; 4; 1 They are the same.
11. 1; 4; 6; 4; 1
12. The third row of Pascal's triangle is the same as found in the analysis of three true or false answers.

Practice (pp. 355-356)

1. 1
2. 2; yes
3. yes
4. yes
5. 1; 5; 10; 10; 5; 1; 32

Practice (pp. 357-359)

Answers will vary but should include the following: Illustration of paths from *B* to any intersection they selected as long as more than 6 paths are possible.

Practice (pp. 360-368)

1. 210
2. Answers and team matching will vary.
3. Additional suggestions will vary.

Keys

Practice (p. 369)

1. pattern
2. intersection
3. outcome
4. table (or chart)
5. Pascal's triangle
6. sum
7. power (or a number)
8. grid

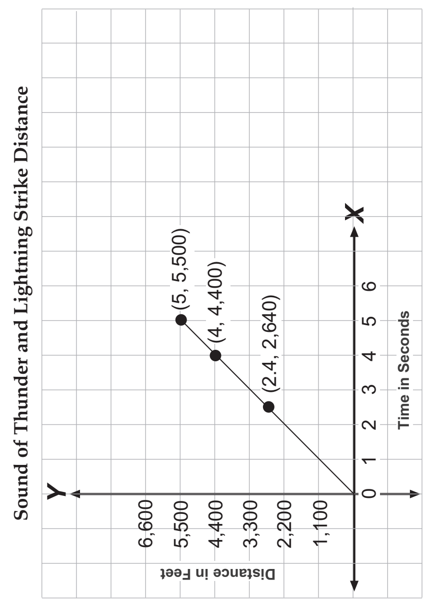
Lesson Two

Practice (pp. 371-374)

1. a. If $C = d + 12a$, then the cost of an item is equal to the sum of the down payment and total amount of 12 monthly payments.
   b. $1500 = 420 + 12a$; $a = 90$
   c. Correct answers will be determined by the teacher.
2. a. The height of a male is the sum of 69.089 cm and the product of the length of the femur in cm and 2.238. The height of a female is the sum of 61.412 cm and the product of the length of the femur in cm and 2.317.
   b. $h = 61.412 + 2.317(44.56)$;
   $h = 164.65752$
   c. $h = 69.089 + 2.238(47.32)$;
   $h = 174.99116$
3. a. The height of a person after age 30 is equal to the difference in height at 30 and the product of 0.06 and current age less 30.
   b. $L = 162.5 - 0.06(65 - 30)$;
   $L = 160.4$
4. a. The product of Mrs. Schubert's rate of 60 and her time (t) will equal Mrs. Naidoo's distance (70)(4.5)
   b. $60t = 70(4.5)$; $t = 5.25$

Practice (pp. 375-380)

1. In the equation $D = 1{,}100s$, the distance between lightning and a person is equal to the product of 1,100 and the number of seconds between the lightning flash and the sound of thunder.
2. $D = 1{,}100(4)$; $d = 4{,}400$
3. $\frac{5280}{2} = 1{,}100s$; $s = 2.4$
4. See graph below.



5. yes
6. linear equations

Practice (p. 381)

1. product
2. rule
3. data
4. graph
5. variable
6. nonlinear equation
7. linear equation
8. equation
9. parallel (||)

Keys

Practice (p. 382)

1. E
2. A
3. I
4. F
5. B
6. G
7. H
8. D
9. C

Practice (p. 383)

1. ordered pair
2. origin
3. *x*-coordinate
4. *y*-coordinate
5. function
6. value

Practice (pp. 387-391)

1.a. In the equation, Lela's age is represented as $L + 1$ because L represents Lina's age and Lela is a year older than Lina. Lora's age is $L - 1$ because she is a year younger than Lina. The sum of their ages is 42.
  b. $L = 14$
  c. $L = 13$
  d. Answers will vary but should include the following: In the first equation, L represents the age of Lina which we are asked to find. In the first equation the plus 1 and minus 1 cancel each other out and saves one step in solving the equation.

2. a. 8; \$7.50
  b. 3; 2
  c. $8(7.50) = 3(2)r$
  d. Her current salary of 8(7.50) is equal to an hourly rate for tutoring 3 students 2 hours each.
  e. $r = 10$

3. a. $T = C - \frac{d}{150}$
  $T = 21 - (\frac{4572}{150})$;
  $T = -9.48$ degrees Celsius
  b. $T = 21 - (\frac{9144}{150})$;
  $T = -39.96$ degrees Celsius

4. a. True
  b. True
  c. False
  d. False

Practice (pp. 392-395)

1. $12\frac{1}{6}$
2. Answers and team matching will vary.
3. Additional suggestions will vary.

Practice (p. 396)

1. G
2. F
3. H
4. E
5. B
6. A
7. D
8. C

Lesson Three

Practice (pp. 401-402)

1. See the table below.

Plan #1

Year	Amount of Monthly Benefit Check
1995	\$950.
1996	\$978.50
1997	\$1,007.86
1998	\$1,038.10
1999	\$1,069.24
2000	\$1,101.32

Keys

2. a. See the table below.

Plan #2

Year	Amount of Monthly Benefit Check
1995	$950.
1996	$978.50
1997	$1,007.
1998	$1,035.50
1999	$1,064.
2000	$1,092.50

b. Mr. Sawyer's benefit is greater when he gets 3% of the original, as well as previous increases, than when he gets 3% of the original amount year after year.

c. above; The graph of an increase of 3% each year would become a curve rising above a line graph of a fixed amount as described in the problem because the increase is greater.

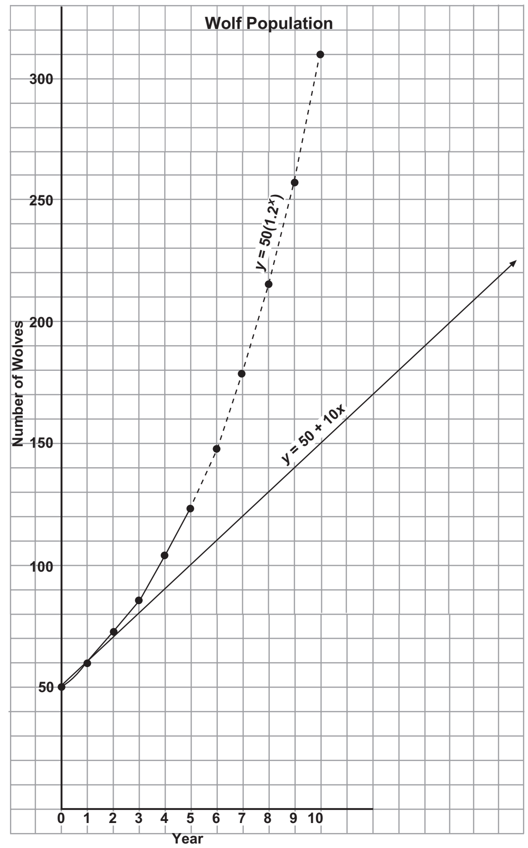
Practice (pp. 403-405)

1. See table below.

Wolf Population

Year	Number of Wolves
0	50
1	60
2	72
3	86
4	103
5	124

2. See graph below.



3. The graph of a fixed increase of 10 wolves per year would be a line that would lie below the curve as it rises gently.

Keys

Practice (pp. 406-410)

1. 3; If students completed a table, the table shows school's enrollment would have increased from 980 to 1,049 to 1,122 to 1,201. See table below.

School Population

Year	Number of Students
Current Year	980
1	1,049
2	1,122
3	**1,201**
4	1,285
5	1,375

2\. a. See the table below.

Frankenmuth Twin's Inheritance

Age of Twins	Amount in Account
10	$15,000
11	$15,825
12	$16,695
13	$17,613
14	$18,582
15	$19,604
16	$20,682
17	$21,820
18	$23,020

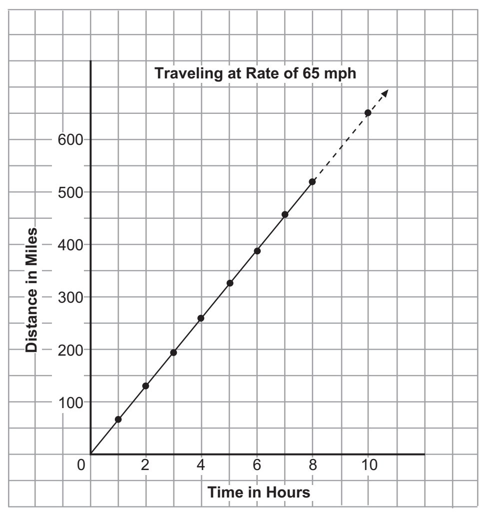
b. $\frac{1}{2}$ of 23,020 or $11,510

3\. See table below.

Distance Traveled by Mr. Johnson

Time in Hours	Distance Traveled in Miles
1	65
2	130
3	195
4	260
5	325
6	390
7	455
8	520

b. See graph below.



4\. a. The pattern for distance is an increase of 65 miles for each hour traveled and is linear. The pattern for wolf population increases by 20% of the previous population is an exponential relationship.

b. The increase in wolves is not constant like the distance-time relationship, but the wolf population is still greater each year. The distance-time relationship is linear. The wolf population relationship is an exponential relationship.

Keys

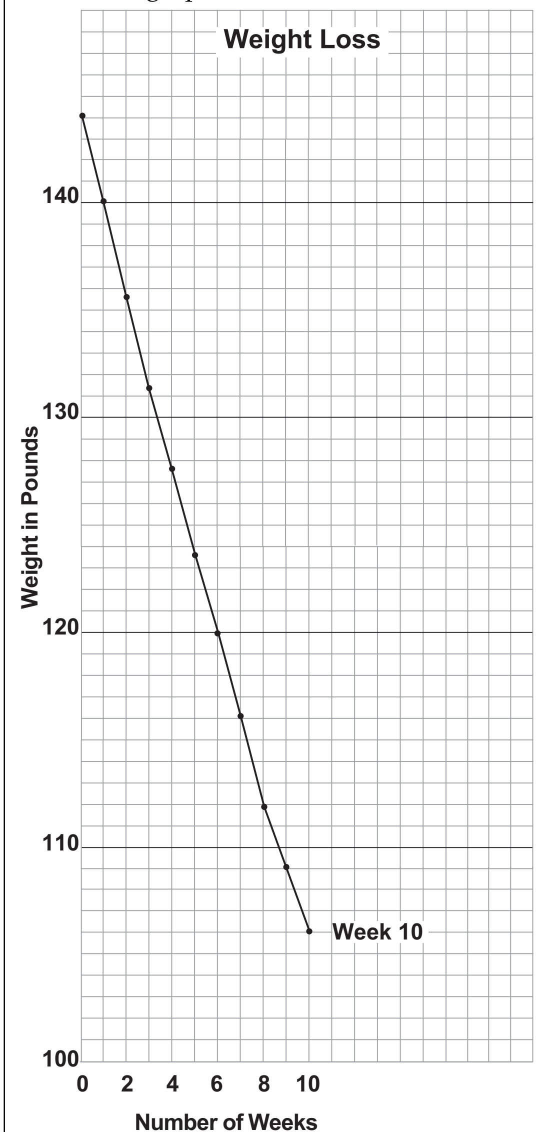
Practice (pp. 411-414)

1. a. See the table below.

Weight Loss

Week	Weight
0	144.
1	139.7
2	135.5
3	131.4
4	127.5
5	123.7
6	120.0
7	116.4
8	112.9
9	109.5
10	106.2

b. See graph below.



2. a. The table for number 1 shows decreases that gradually get smaller. The table for the wolf population (in the practice on pages 403-405) shows increases that gradually get larger.

Keys

2.b. The graph in number 2 shows an initial amount decreasing and is a curve since it is exponential decay. The graph for the wolf population (in the practice on pages 403-405) shows an initial amount increasing and is a curve since it represents exponential growth.

Practice (pp. 415-419)

Part One

1. C
2. B
3. A
4. D

Part Two

See key from graph below.

key	
●	C
□	A
⦿	B
X	D

Part Three

Columns in table are in order of C; B; A; D.

Part Four

1. The bank is taking 5% of 100, then 5% of 95, and so on, while the amount charged for inactivity gets smaller. A fixed amount of $5. per year from the cookie jar does *not* change.
2. The bank is paying 5% of 100, then 5% of 105, and so on, while the amount the bank pays is getting larger. Adding $5.00 to the cookie jar remains the same each time.

Practice (p. 420)

1. exponential growth
2. interest-bearing account
3. rounded number
4. exponential decay
5. growth factor
6. growth rate
7. decay factor
8. percent (%)
9. decay rate

Practice (p. 421)

1. G
2. C
3. F
4. H
5. A
6. D
7. E
8. B

Keys

Unit Assessment (pp. 97-102TG)

1. a. 116
   b. $W = 131 - 1.5x$
2. Table One: $y = x^3$
   Table Two: $y = 3x$
   Table Three: $y = x + 3$
   Graph A: $y = 3x$
   Graph B: $y = x^3$
   Graph C: $y = x + 3$
3. a. $A = 200 + 4(0.04)$
   b. 233.97
4. G G B B; G B G B; G B B G;
   B G G B; B G B G; B B G G
5. Student chooses any five:
   a. $A = h + 2$; $h = 60$
   b. $A = 2h$; $A = \$24{,}000$
   c. $T = 2 + 0.50m$; $T = \$5$
   d. $T = 2 + (0.07)2$; $T = \$2.14$
   e. $T = c - 0.20c$; $T = \$14.40$
   f. $T = c + 0.20c$; $T = \$15$
6. Student chooses any five:
   a. 21; 28
   b. 165; 154
   c. 36; 40
   d. 49; 64
   e. 729; 2,187
   f. 4; 4

Scoring Recommendations for Unit Assessment

Item Number	Assigned Points	Total Points
1	10	5 points for each part
2	18	3 points for each part
3	10	5 points for each part
4	12	2 points for each way
5	40	3 points for each equation, 5 for each solution
6	10	2 points each
		Total = 100 points

Benchmark Correlations for Unit Assessment

Benchmark	Addressed in Items
D.1.3.1	2, 4, 6
D.1.3.2	1, 5
D.2.3.1	3, 5
D.2.3.2	5
A.2.3.1	2
A.3.3.3	3
A.5.3.1	6
E.1.3.1	4

Unit 5: Probability and Statistics

This unit emphasizes how statistical methods and probability concepts are used to gather and analyze data to solve problems.

Unit Focus (pp. 423-424)

Numbers Sense, Concepts, and Operations

- Add, subtract, multiply, and divide whole numbers, decimals, and fractions to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)

Measurement

- Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, and volume. (B.1.3.3)

Geometry and Spatial Relations

- Represent and apply geometric properties and relationships to solve mathematical problems. (C.3.3.1)
- Plot ordered pairs in a rectangular coordinate system. (C.3.3.2)

Algebraic Thinking

- Create and interpret tables, graphs, and vertical descriptions to explain cause-and-effect relationships. (D.1.3.2)

Data Analysis and Probability

- Collect, organize, and display data in a variety of forms. (E.1.3.1)
- Understand and apply the concepts of range and central tendency (mean, median, and mode). (E.1.3.2)
- Analyze real-world data by applying appropriate formulas for measures of central tendency and organizing data in a quality display, using appropriate technology, including calculators and computers. (E.1.3.3)
- Compare experimental results with mathematical expectations of probabilities. (E.2.3.1)
- Determine the odds for and the odds against a given situation. (E.2.3.2)
- Formulate hypotheses, design experiments, collect and interpret data, and evaluate hypotheses by making inferences and drawing conclusions based on statistics, tables, graphs, and charts. (E.3.3.1)
- Identify the common uses and misuses of probability and statistical analysis in the everyday world. (E.3.3.2)

Lesson Purpose

Lesson One Purpose (pp. 434-482)

- Add and subtract whole numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume. (B.1.3.3)
- Represent and apply geometric properties and relationships to solve mathematical problems. (C.3.3.1)

- Plot ordered pairs in a rectangular coordinate system. (C.3.3.2)
- Understand and apply the concepts of range and central tendency (mean, median, and mode). (E.1.3.2)
- Analyze real-world data by applying appropriate formulas for measures of central tendency and organizing data in a quality display, using appropriate technology, including calculators and computers. (E.1.3.3)
- Compare experimental results with mathematical expectations of probabilities. (E.2.3.1)
- Determine the odds for and against a given situation. (E.2.3.2)

Lesson Two Purpose (pp. 483-509)

- Add and subtract whole numbers to solve real-world problems using appropriate methods of computing such as mental mathematics, paper and pencil and calculator. (A.3.3.3)
- Represent and apply geometric properties and relationships to solve mathematical problems. (C.3.3.1)
- Create and interpret tables, graphs, and verbal descriptions to explain cause-and-effect relationships. (D.1.3.2)
- Collect, organize, and display data in a variety of forms. (E.1.3.1)
- Understand and apply the concepts of range and central tendency (mean, median, and mode). (E.1.3.2)
- Analyze real-world data by applying appropriate formulas for measures of central tendency and organizing data in a quality display, using appropriate technology, including calculators and computers. (E.1.3.3)
- Formulate hypotheses, design experiments, collect and interpret data, and evaluate hypotheses by making inferences and drawing conclusions based on statistics, tables, graphs, and charts. (E.3.3.1)
- Identify the common uses and misuses of probability and statistical analysis in the everyday world. (E.3.3.2)

Lesson Three Purpose (pp. 510-522)

- Add, subtract, multiply, and divide whole numbers to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator. (A.3.3.3)
- Analyze real-world data by applying appropriate formulas for measure of central tendency and organizing data in a quality display, using appropriate technology, including calculators and computers. (E.1.3.3)
- Formulate hypotheses, design experiments, collect and interpret data, and evaluate hypotheses by making inferences and drawing conclusions based on statistics, tables, graphs, and charts. (E.3.3.1)

Suggestions for Enrichment

1. Have pairs of students (player A and player B) play the game *Rock, Scissors, Paper* 18 times, recording the wins for each player. Use a grid on the overhead projector to graph the wins of player A in one color and player B in another color. Have students determine the range, mode, and mean for each set of data and compare results.

   Do a tree diagram to determine possible outcomes. Have students answer the following to determine if the game is fair.

   - How many outcomes does the game have? (9)
   - Label each possible outcome on the tree diagram as to a win for A, B, or tie.
   - Count wins for A. (3)
   - Find the probability that A will win in any round ($\frac{3}{9} = \frac{1}{3}$). Explain what probability means. (favorable outcomes / possible outcomes)
   - Count wins for B. (3)
   - Find the probability that B will win in any round. ($\frac{3}{9} = \frac{1}{3}$)
   - Is the game fair? Do both players have an equal probability of winning in any round? (yes)

Have students compare the mathematical model with what happened when students played the game.

Now play the game again using three students and the following rules.

- A wins if all three hands are the same.
- B wins if all three hands are different.
- C wins if two hands are the same.

There will be 27 outcomes this time. Three to the third power (3^3) ($3 \times 3 \times 3 = 27$).

2. Discuss different ways you can order a hamburger. Have students choose three different toppings, discuss ways to find all the different combinations that could be ordered (e.g., list, picture, chart), and determine the number of different combinations. Have students estimate and then determine how many different ways a hamburger could be served if there were four toppings from which to choose.

3. Have students individually predict how many total eyelets there are in the students' shoes in class, without looking at other students' shoes. Tell students that there are usually 12 eyelets in one running shoe, about 24 in one hightop or boot, and some shoes do not have any. Have groups discuss their individual predictions. Tell students to count the eyelets in their group's shoes and then predict or estimate how many eyelets are in the class.

   Give each group a different color strip of construction paper. One inch will equal 100 eyelets. Ask the group to discuss their data and cut the strip to the length equivalent to their prediction. Have a member from each group glue their strip to your master graph on a poster board.

   Ask each group to tell you the total of eyelets in their own group. Total the figures to get an actual sum of eyelets in the classroom. Have groups discuss methods used for predictions. Discuss which method seemed to work the best. (Optional: graph types of shoes in the class or how many eyelets there are for each type of shoe.)

4. Give students pizza menus to look at to create a table and a circle graph on the classes' favorite one-topping pizza. Discuss how to efficiently gather the statistics for each student's favorite one-topping pizza and then gather the data. Have students write the data in fraction form and then calculate the percentage. Discuss how to determine this and how to transfer the information into degrees using a protractor. Ask students to create a chart of the fraction, decimal, percent, and degree equivalents for their circle graph. Have students share their graphs.

5. Have students look through newspaper or magazines to cut out examples of charts and graphs (e.g., circle, bar, line graphs). Interpret some of these in class.

6. To have students gain a conceptual understanding of the measure of central tendency, have an odd number of students stand and arrange themselves according to height. The height of the person in the middle is the median height. Repeat this activity with an even number of students. The median will be halfway between the heights of the two students in the middle. Have students define median in their own words.

   If there are some students who are the same height, then the height that occurs most frequently is the mode. (It is possible that no two students will be the same height. It is also possible to have more than one mode.) Have students define mode in their own words.

   Convert the height of the students to inches and then have students add heights and divide by the number of students in the sample to get the mean. Now have everyone except the tallest and shortest students in the group sit down. Measure the distance from the top of one of their heads to the top of the other person's head and guide students to tell you that subtraction can be used to find the range.

7. Have students estimate the circumference of the Earth and find the range, mean, median, and mode of class estimations.

8. Distribute small bags of M&Ms to each student. Before they open the bags, ask students to write down on a chart (see below) how many M&Ms they predict are in their bag (for a total and how many M&Ms they predict for each color). Have students open the bags, count the actual number, and write the total on the chart and on a sticky note.

Bag of M&Ms		
	**Estimation Total**	**Actual Total**
colors	**prediction**	**actual amount**
red		
orange		
yellow		
green		
blue		
brown		
total		

Construct a grid for a class line plot on the board (see below) and have students post the sticky notes of their total. Have students find the mode, median, mean, and range. Discuss range and extremes.

Class M&Ms

18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33

total number ________________ mean ________________

mode ________________ range ________________

median ________________

Use the chart for one color at a time. Ask students to count their total number of M&Ms by color, and write the number on a sticky note to post on a class line plot (see below). A separate chart will be used for each color.

Class M&Ms by Color

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15

color ____________________ median ____________________

total of color ____________________ mean ____________________

mode ____________________ range ____________________

Have students find the mode, median, mean, and range for each color. Then find the ratio (as a fraction in lowest terms) (e.g., find the ratio of red to total, and so on) and percentage for each color and post answers on a class chart on the board (see below). Create a class circle graph with the percentages.

Class M&Ms per Color			
colors	**number per color**	**ratio per color** (as a fraction in lowest terms)	**percentage per color**
red			
orange			
yellow			
green			
blue			
brown			
total			

Note: Discuss with the students whether the median or mean should be used for determining ratios or percentages.

Have students make a bar graph (see below) using the original data they collected upon opening their M&M bags.

Student Bags of M&Ms per Color

12						
11						
10						
9						
8						
7						
6						
5						
4						
3						
2						
1						
	red	orange	yellow	green	blue	brown

Ask students to use their bar graph information to convert each color to a ratio (as a fraction in lowest terms) and then a percentage (see below). Have students create circle graphs with the percentages.

Discuss whether the class or student charts should be used for best results.

Student Bags of M&Ms per Color			
colors	**number per color**	**ratio per color** (as a fraction in lowest terms)	**percentage per color**
red			
orange			
yellow			
green			
blue			
brown			
total			

Ask students to note the ratio of each color of M&M and predict the following.

- probability of selecting a particular color at random from a large bag
- number of each color they might find in a handful of 10 M&Ms
- number of each color they might find in a handful of 20 M&Ms

(Optional: Ask students why they think the makers of M&Ms make more of one color than another. Why there were periods of years that no red M&Ms were made? Do the same activity using various holiday candies at other times of the year or small packages of raisins for total number exercise only. Charts can be saved from each activity to make comparisons and predictions.)

9. Give pairs of students one measured tablespoon of uncooked rice to count and report findings to the class. Have each pair record the class data, arrange the data from least to greatest, and then calculate the range, mean, median, and mode.

   Have students use the class mean to compute the number of tablespoons in 1,000,000 grains using an equivalency table to convert tablespoons to a more appropriate measure. Then have students determine a suitable size of container for 1,000,000 grains of rice. Next have students compute the approximate number of grains of rice the average American eats per year if he or she consumes $16\frac{1}{2}$ pounds or $34\frac{1}{4}$ cups of rice per year (weight and measure is for uncooked rice). (Optional: How would you determine the appropriate container to hold 1,000,000 pieces of popped popcorn?)

10. Have students gather and display data of interest to them (e.g., number of potatoes or onions in different packages of same weight; number of raisins in different brands of cereals with raisins; comparison of a person's foot length to a person's height for a number of people; comparison of a person's arm span and a person's height for a number of people; number of letters in names of students in the class).

11. Have students provide a listing of their own personal data (e.g., height in centimeters; weight in kilograms; age in months; gender; right or left handed; hair color; eye color; number of brothers; number of sisters; number of furry pets; number of other pets; number of cities lived in; monthly allowance; shoe size). Have students brainstorm ways to display data so that each member of the class will receive a complete listing of combined student data.

    Have students determine range, scale, and interval for each of the categories. (Introduce open-ended categories, e.g., such as hair color and gender). Ask students to create frequency tables which include the data intervals, the tally, and the number of frequency. Ask students to create line plots and/or double line plots (male/female) in height, weight, age, and shoe size. Have students determine the mean, median, and mode for all selected categories of data and which measure of central tendency best represents the data as it represents their class. In groups have students determine the best method to represent their statistical averages (e.g., bar graphs, pie graphs, pictograms, composite posters, model of an average student).

12. Have students collect and analyze data about right- and left-handedness. For 30 seconds have students use their right hand to put a check mark in each square of grid paper, as fast as possible. Have them count the number of checks. Then for 30 seconds, have students do the same with their left hand and count the checks.

Record each student's checks for each hand on a table.

Right Hand / Left Hand		
name of student	**Number of Checks (Right Hand) (x)**	**Number of Checks (Left Hand) (y)**

Then have students graph the data by plotting the points, letting the x-axis represent the number of right-handed checks and the y-axis represent the number of left-handed checks. Draw the ambidextrous line, or $x=y$. What do the points above the line and below the line represent? What is the significance of points near the line? What percentage of the class is left-handed? Research what percentage of the population is left-handed.

(Optional: Count how many times you can jump on one foot before falling. Graph the data as before. Find a correlation between the data sets to evaluate whether right-handed people also tend to be right-footed. What about a correlation between left and right eye dominance?)

13. Have students conduct an experiment and measure the amount of time it takes for a hand squeeze to pass around a circle. Start with two students holding hands. When the time keeper says "now" the first person squeezes the hand of the second who then squeezes the other hand of the first person. The last person says "now" when he or she feels the hand squeeze come back to him or her. Record the data on a table with columns for number of students and number of seconds.

Squeeze Time

Number of Students	**Number of Seconds**
(x)	(y)
2	
4	
6	
8	
______	
______	
______	
______	

Add two more students to the circle and repeat the process. Continue until everyone has joined the circle. Ask students to try to pass the squeeze as quickly as they feel it. If someone messes up, it's okay to disregard that time and repeat the round.

Have students make a graph of the data by plotting the points, letting the y-axis represent students and the x-axis represent the number of seconds. Ask students the following: Should they connect the points to make a solid graph? Why or why not? Are the points scattered all around the plane or do the points tend to be a certain shape? Based on the data collected, how many seconds would it take to pass the hand squeeze around a circle of 100 people? How many minutes?

14. Have students use the Internet to record the high temperatures during a predetermined time period for selected cities. Have students construct a chart and find the mean, mode, median and range of the data.

15. Discuss the television show *Wheel of Fortune* or the game of Hangman in relation to these questions: Are there some letters that we use more than others? Are there some letters that we hardly use at all? Is there a mathematical rule that could improve chances of winning at these word games?

Have students choose a book or magazine to research the use of letters. Ask students to choose a page and a place at random and count off 300 letters. Tally the letters one at a time (without skipping around) filling out the table with columns for letter (A-Z), tally, total, and percentage. See table below.

Letter Tally

letter	tally	total	%
A			
B			
C			
D			
E			
F			
G			
H			
I			
J			
K			
L			
M			
N			
O			
P			
Q			
R			
S			
T			
U			
V			
W			
X			
Y			
Z			
	grand total		100%

Add up the totals, which should come to about 300. Calculate (to one or two decimal places) the percentage probability of finding each letter. Check accuracy by adding up percents, which should total between 99 percent and 101 percent (allowing for rounding).

Have students complete the following.

Top 10 letters

1. ______ ______%
2. ______ ______%
3. ______ ______%
4. ______ ______%
5. ______ ______%
6. ______ ______%
7. ______ ______%
8. ______ ______%
9. ______ ______%
10. ______ ______%

Bottom five letters

22. ______ ______%
23. ______ ______%
24. ______ ______%
25. ______ ______%
26. ______ ______%

- How many vowels were in the top 10?
- Which consonants would be most useful in *Wheel of Fortune* or Hangman?

- Which vowel might be the least useful?
- What percentage of letters surveyed were vowels?
- Make up 10 different words using only the top five letters.

16. Have students research to obtain data on the cost of first-class postage and the year in which each price increased (or decreased). Ask students to create a scatter plot with time on the x-axis and price on the y-axis. Have students find the line of best fit taking recent trends into effect. (Mathematical software or a graphing calculator may be used to find curve of best fit.) Ask students to extend the line to the year 2020 and determine a corresponding cost.

17. Have your students choose one of the 50 states to find the population and area in square miles for each state on the Internet. Construct two class graphs, one for population with ranges of 100,000 and the other for areas with ranges of 100 square miles. Have students record their data. Using the class graphs, have students answer the following: Which state has the largest population? Smallest population? Largest area? Smallest area? Does the smallest state have the smallest population? Why or why not? Explain. Does the largest state have the largest population? Why or why not? Explain. Choose two states and determine how many people live in the states per square mile rounded to the nearest whole number (population/area).

18. Are exactly that number of people living in each square mile of the states you chose? Why or why not? Explain. Write two questions for other students to answer using the graphs.

19. Have students compare selected statistics for their county with other Florida counties or their city with other major United States cities.

20. Have students use the Internet to find a sports Web site giving current information about baseball teams and have them gather data on individual players of a particular team (e.g., game, at bats, runs, hits, and bases on balls.) Have students calculate batting averages: hits/at bats; on base percentage: hits + walks + hits by pitch/at bats + walks; slugging percentage: hit + doubles + 2 (triples) + 3 (home runs)/at bats; winning percentage: wins/wins + losses; earned run average: 9 x earned runs allowed/innings

pitched; strikeout to walk ratio: strikeouts/walks allowed. Depending on the season, this activity can be adapted to any sport.

(Optional: Have students select another sport and research how statistics are used in that sport. Make a chart comparing and contrasting the use of statistics in baseball compared to another selected sport.)

21. Have students use information on the Internet about sports league leaders to create a scattergram or scatterplot graph to find the correlations to the following.

    - Do players who weigh more hit more home runs?
    - Do players who are taller get more rebounds?
    - Do older players catch more passes?

    (Optional: Have students collect information on students and create a scatterplot graph to find correlations to the following: hand size/height; hat size/grade point average; time on phone each night/grade point average.)

22. Have students use the Internet to find the dimensions of various sport-playing areas (e.g., football field, tennis court). Have students record the data, compute area of each field, create a scattergram or scatterplot with width on the vertical axis and length on the horizontal axis, measure the dimensions of the field at your school and compute the area, then compare your school's dimensions to regulation dimensions.

    Have students use the same data to compare perimeter and create scale models of playing fields.

23. Show connections in the study of probability and statistics in math and applications in science, social studies, or other courses.

24. To review unit using a *Jeopardy* format, divide topics into five subtopics and students into five groups. Have each group write five questions and the answers with a specific colored marker on index cards and assign point values from easiest (100) to hardest (500). Ask students to tape cards on the board under their subtopic. The first group to finish taping cards goes first. Then go clockwise from group to group. When a subtopic and point value is chosen by the group, read the question. If correct, assign points; if incorrect, subtract points and put card back on the board. (Students may not pick any questions submitted by their group.)

25. See Appendices for A, B and C for other instructional strategies, teaching suggestions, and accommodations/modifications.

Unit Assessment

Answer the following.

1. A study by the Horatio Alger Association of Distinguished Americans questioned 1,334 students ages 14 to 18. When asked if they planned to continue their education after high school, 78 percent responded yes.

   a. How many students responded yes?

   Answer: ________________________

   b. If there are 16 million students in the United States from 14 to 18 years old and a projection is made for that population, how many students plan to continue their education?

   Answer: ________________________

2. The National College Athletic Association (NCAA) reported the following.

   - 1 out of 22 high school senior football players play college football as college seniors.
   - 1 out of 50 college seniors playing football are drafted by the National Football League (NFL).

   Based on these statistics, what is the *probability* that a high school senior football player will play college football his senior year and be drafted by the NFL?

   Answer: ________________________

3. Use the data in the table below to respond to the following questions.

University of Michigan Law School, 2000						
	Caucasian	Asian	Black	Latino	Native American	Unknown/ Multi-Ethnic
Applied	1,871	424	257	181	34	442
Accepted	717	128	89	58	13	169
Enrolled	218	38	37	14	6	52

a. For which group was the percent enrolled the *greatest*?

____

b. For which group was the percent enrolled the *least*?

____

c. For which group was the percent accepted the *greatest*?

____

d. For which group was the percent accepted the *least*?

____

e. What was the *total* number of *applicants*?

____

f. What was the *total* number of *students accepted*?

____

g. What was the *total* number of *students enrolling*?

____

h. What *percent* of the *total applicants enrolled*? **Round to the nearest tenth of a percent.** ________________________

4. The five Florida counties with the greatest percentage increases in population from 1990 to 2000 were reported by the Census Bureau. Use the table below to answer the following.

1990 and 2000 Population of Five Florida Counties

County	1990 Population	2000 Population	Percent Increase
Collier	152,099	251,377	65.3
Flagler	28,701	49,832	73.6
Osceola	107,728	172,493	60.1
Sumter	31,577	53,345	68.9
Wakulla	14,202	22,863	61

Write **True** if the statement is correct. Write **False** if the statement is *not* correct.

__________ a. Of the five counties, Flagler County's population increased by the *greatest number* of people.

__________ b. Osceola County's population had the *smallest percent* of increase of the five counties.

__________ c. The *median percent* of increase was 60.1.

__________ d. The percents of increase *ranged* from 60.1 to 73.6 or 13.5.

__________ e. The county with the *greatest percent* of increase had the fourth largest increase in the actual number of people.

5. During a 10 year period, the mean number of students per computer in public schools in the United States decreased.

   a. Use the grid on the following page to make a graph to display the data shown in the chart.

(**Remember:** Be sure to title your graph, label your axes, and use an appropriate scale.)

title

Computers in Public Schools

School Year	Mean Number of Students per Computer
1989-90	22
1990-91	20
1991-92	18
1992-93	16
1993-94	14
1994-95	10.5
1995-96	10
1996-97	7.8
1997-98	6.1
1998-99	5.7

Complete the following based on the **data** and **your graph**.

b. I chose a ____________ graph because _________________________

____

____

c. The *decrease* in number of students was greatest in ____________ .

d. The *decrease* was *least* in ____________ .

e. The *mode* for the amount of *annual decrease* is ____________ .

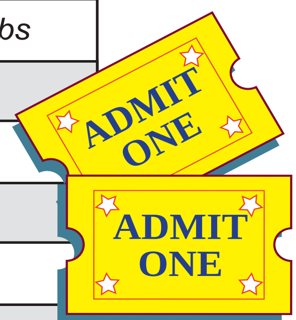
f. We know that there is no such thing as 5.7 people. The reason the *mean* number of people can be 5.7 is __________________________

____ .

6. Movies winning Oscars as the best picture of the year are shown in the table for years 1991-2000.

1991-2000 Oscar-Winning Movies

Year	Viewers (millions)	Winner
1991	42.7	*Dances with Wolves*
1992	44.4	*Silence of the Lambs*
1993	45.7	*Unforgiven*
1994	45.1	*Schindler s List*
1995	48.3	*Forrest Gump*
1996	44.9	*Braveheart*
1997	40.1	*The English Patient*
1998	55.2	*Titanic*
1999	45.6	*Shakespeare in Love*
2000	46.3	*American Beauty*



a. The *mean* number of viewers for the winning pictures was

______________________ .

b. The *median* number of viewers for the winning pictures was

______________________ .

7. During morning announcements, it was reported that 3 students out of 20 were late to homeroom each day. If there are 880 students in the school, how many students are late each day?

Answer: ______________________

8. A circular spinner is divided into five equal sectors. Two sectors are shaded. A player pays a quarter to spin the spinner. If the spinner lands on one of the two shaded sections, the player wins 50 cents. If the player spends $25 to play the game 100 times, will the winnings be likely to *exceed*, *be equal to*, **or** *be less than* the $25 spent to play the game?

   Explain your thinking. ______________________________

   ____

   ____

   ____

   ____

9. A quiz has four questions that are *true* or *false*. A student flips a coin. The student chooses *true* if the coin lands *heads* **and** *false* if the coin lands *tails*.

   a. What is the *probability* the student will answer all four questions *correctly*? __________

   b. What is the *probability* the student will answer all four questions *incorrectly*? __________

10. A student made the following 5 scores on tests during the grading period. The student is allowed to choose whether the teacher should use the *mean*, *median*, or *mode* to determine the grade. Which do you recommend? Why?

   64, 100, 88, 64, 95

   I recommend using the __________ because ______________

   ____

   ____ .

Take-Home Portion of Unit Test

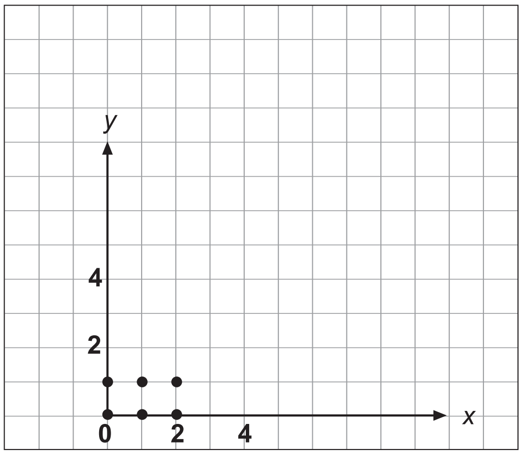
11. Find **five examples** of articles or advertisements that include *statistics* **or** *probability*. Attach each one to a sheet of paper. Explain why you think the example is an *appropriate use* **or** a *misuse* of probability and statistical analysis.

Keys

Lesson One

Practice (pp. 436-439)

1. See grid below.



2. 1, ($\sqrt{5}$)
3. 2; greater than 1
4. See table below.

Length of Segments

First Point	Second Point	Length of Segment from First Point to Second Point
(0,0)	(0,1)	1
(0,0)	(1,0)	1
(0,0)	(1,1)	$\sqrt{2}$
(0,0)	(2,0)	2
(0,0)	(2,1)	$\sqrt{5}$
(0,1)	(1,0)	$\sqrt{2}$
(0,1)	(1,1)	1
(0,1)	(2,0)	$\sqrt{5}$
(0,1)	(2,1)	2
(1,0)	(1,1)	1
(1,0)	(2,0)	1
(1,0)	(2,1)	$\sqrt{2}$
(1,1)	(2,0)	$\sqrt{2}$
(1,1)	(2,1)	1
(2,0)	(2,1)	1

5. 15
6. 8
7. $\frac{8}{15}$

Practice (pp. 440-442)

1. See table below.

Scratch Off Discounts

First Amount Scratched	Second Amount Scratched	Mean of the Two Scratched Amounts
50%	50%	50%
50%	25%	37.5%
50%	10%	30%
50%	5%	27.5%
50%	25%	37.5%
50%	10%	30%
50%	5%	27.5%
25%	10%	17.5%
25%	5%	15%
10%	5%	7.5%

2. 50; 7.5; 7.5 to 50 or 42.5
3. 28.75
4. $\frac{3}{10}$

Practice (p. 443)

1. C
2. E
3. D
4. B
5. I
6. F
7. A
8. J
9. G
10. H

Practice (p. 444)

1. random
2. hypotenuse
3. right triangle
4. leg
5. percent (%)
6. sum
7. difference
8. square root
9. table

Keys

Practice (pp. 445-446)

1. cube
2. triangular pyramid
3. See sum chart below.

Sum Game Outcomes

+	1	2	3	4	5	6
7	8	9	10	11	12	13
8	9	10	11	12	13	14
9	10	11	12	13	14	15
10	11	12	13	14	15	16

4. 8; 16; 8 to 16 or 8
5. 8; 16
6. 11; 12; 13
7. $\frac{4}{24}$ or $\frac{1}{6}$

Practice (p. 447)

1. $\frac{128}{365}$
2. $\frac{133}{261}$
3. $\frac{261}{765}$
4. $\frac{29}{85}$

Practice (pp. 448-452)

1. Students do experiments 20 times and record results.
2. See table below.

First Experiment Outcomes

First Bill	Second Bill	Sum
1 **a**	1 **b**	2
1 **a**	5	6
1 **a**	10	11
1 **a**	20	21
1 **b**	5	6
1 **b**	10	11
1 **b**	20	21
5	10	15
5	20	25
10	20	30

3. a. $\frac{2}{10}$ or $\frac{1}{10}$
   b. $\frac{2}{10}$ or $\frac{1}{5}$
   c. $\frac{2}{10}$ or $\frac{1}{5}$
   d. $\frac{2}{10}$ or $\frac{1}{5}$
   e. $\frac{1}{10}$
   f. $\frac{1}{10}$
   g. $\frac{1}{10}$
4. a. 2 to 8
   b. 2 to 8
   c. 1 to 9
   d. 2 to 8
   e. 1 to 9
   f. 0 to 10
   g. 1 to 9
   h. 5 to 5
   i. 5 to 5
5. \$130; \$13
6. \$148; \$14.80
7. Answers will vary.

Keys

Practice (pp. 453-456)

1. The results should be similar if the spinner card is correct and the spinner is spun correctly.
2. Students do experiment 20 times and record results.
3. Answers will vary.

Practice (pp. 457-460)

1. Students do experiment 20 times and record results.
2. See table below.

Third Experiment Outcomes

First Roll	Second Roll	Sum
1 **a**	1 **b**	2
1 **a**	5	6
1 **a**	10 **a**	11
1 **a**	10 **b**	11
1 **a**	20	21
1 **b**	5	6
1 **b**	10 **a**	11
1 **b**	10 **b**	11
1 **b**	20	21
5	10 **a**	15
5	10 **b**	15
5	20	25
10 **a**	10 **b**	20
10 **a**	20	30
10 **b**	20	30

3. a. $30
   b. $15.67
   c. $\frac{7}{15}$
   d. $\frac{8}{15}$
4. Answers will vary.
5. Answers will vary.

Practice (pp. 461-462)

1. triangle
2. rectangle
3. pyramid
4. fraction
5. face
6. cube
7. sector
8. congruent ($\cong$)
9. numerator
10. denominator
11. greatest common factor (GCF)
12. rounded number

Practice (pp. 463-470)

1. $4.00
2. Answers and team responses will vary.
3. Additional suggestions will vary.

Practice (p. 471)

1. See table below.

Possible Outcomes for Three Children

First Child	Second Child	Third Child
G	G	G
G	G	B
G	B	G
B	G	G
G	B	B
B	G	B
B	B	G
B	B	B

2. $\frac{1}{8}$

Keys

Practice (pp. 472-474)

1. a. 1
   b. 5
   c. 10
   d. 10
   e. 5
   f. 1
   g. 32
2. There are 32 possible outcomes or answer keys. If 30 students choose 30 of the 32, there are two not chosen. Either of the two could be the actual answer key.

Practice (p. 475)

1. $\frac{1}{32}$
2. $\frac{5}{32}$
3. $\frac{10}{32}$ or $\frac{5}{16}$
4. $\frac{10}{32}$ or $\frac{5}{16}$
5. $\frac{5}{32}$
6. $\frac{1}{32}$
7. $\frac{2}{32}$ or $\frac{1}{16}$
8. $\frac{20}{32}$ or $\frac{5}{8}$

Practice (pp. 476-481)

1. $\frac{12}{32}$ or $\frac{3}{8}$; See table below.

Team Outcomes

	First Game	Second Game	Third Game	Fourth Game	Fifth Game
	A	A	A	A	A
	A	A	A	A	B
	A	A	A	B	A
	A	A	B	A	A
	A	B	A	A	A
	B	A	A	A	A
	A	A	A	B	B
	A	A	B	A	B
	A	B	A	A	B
	B	A	A	A	B
1	***A***	***A***	***B***	***B***	***A***
2	***A***	***B***	***A***	***B***	***A***
3	***B***	***A***	***A***	***B***	***A***
4	***A***	***B***	***B***	***A***	***A***
5	***B***	***A***	***B***	***A***	***A***
6	***B***	***B***	***A***	***A***	***A***
7	***A***	***A***	***B***	***B***	***B***
8	***A***	***B***	***A***	***B***	***B***
9	***A***	***B***	***B***	***A***	***B***
	A	B	B	B	A
10	***B***	***A***	***A***	***B***	***B***
11	***B***	***A***	***B***	***A***	***B***
	B	A	B	B	A
12	***B***	***B***	***A***	***A***	***B***
	B	B	A	B	A
	B	B	B	A	A
	A	B	B	B	B
	B	A	B	B	B
	B	B	A	B	B
	B	B	B	A	B
	B	B	B	B	A
	B	B	B	B	B

* The number of 3 out of 5 wins are underlined and shaded.

2. Answers and team responses will vary.
3. Additional suggestions will vary.
4. Answers will vary.

Keys

Practice (p. 482)

1. equally likely
2. Pascal's triangle
3. odd number
4. even number
5. minimum
6. pattern
7. maximum

Lesson Two

Practice (pp. 485-486)

1. 2,800
2. a. $3.41 billion
   b. $3.22 billion
   c. 1 to 101 or 100
   d. does not
   e. may
   f. 8 (0, 6, **8**, 22, 22) **or** 15 (6, **8**, **22**, 22)

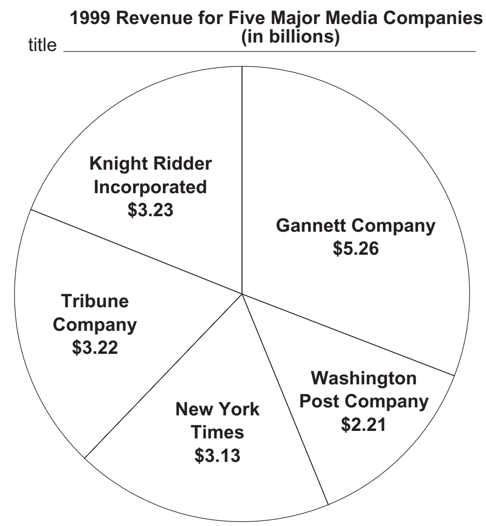
Practice (pp. 490-493)

1. See table below.

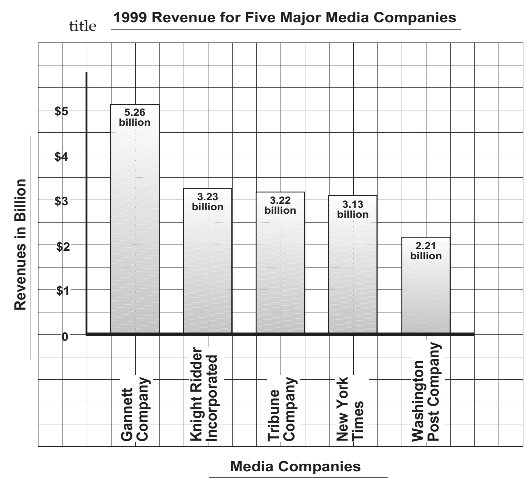
1999 Revenue for Five Major Media Companies (in billions)

Media Company	Fractional Part of Total Revenue	Calculation	Number of Degrees (i) Determining Sector
Gannett Company	$\frac{5.26 \text{ billion}}{17.05 \text{ billion}}$	$\frac{5.26}{17.05} \times 360$	111
Knight Ridder Incorporated	$\frac{3.23 \text{ billion}}{17.05 \text{ billion}}$	$\frac{3.23}{17.05} \times 360$	68
Tribune Company	$\frac{3.23 \text{ billion}}{17.05 \text{ billion}}$	$\frac{3.22}{17.05} \times 360$	68
New York Times	$\frac{3.13 \text{ billion}}{17.05 \text{ billion}}$	$\frac{3.13}{17.05} \times 360$	66
Washington Post Company	$\frac{2.21 \text{ billion}}{17.05 \text{ billion}}$	$\frac{2.21}{17.05} \times 360$	47

2. See circle graph below.



3. See bar graph below.



4. Answers will vary but may include circle graphs which are often preferred to show parts of a whole.

Practice (p. 494)

31% of $10.7 million is less than 31% of $36.5 million. The bars represent dollar amounts. One shows an increase of a little more than a million, the other shows a decrease of a little more than 11 million.

Keys

Practice (p. 495)

1. 10,810,810; 11,000,000

Practice (pp. 496-497)

1. 0.078; 3; 10.92; 18; 21.5; 26; 140; 460
2. 19.75
3. 84.93725
4. 19.75
5. 36.57
6. The minimum and maximum values for this data set have the impact of more than doubling the mean when included in the calculation for mean. They have no effect on the median.
7. median
8. mean

Practice (pp. 498-505)

1. If there are 5 tests and an average of 85 is needed, Melinda needs 5 x 85 points or 425 points. The sum of her current tests grades of 75, 75, 95, and 80 is 325. Melinda must make 100 on her final test if her average is to be 85.
2. Answers and team responses will vary.
3. Additional suggestions will vary.

Practice (p. 506)

1. pictograph
2. data
3. protractor
4. central angle (of a circle)
5. center of a circle
6. degree (°)
7. circle
8. circle graph
9. graph
10. data display

Practice (p. 507)

1. A
2. C
3. B
4. F
5. D
6. E

Practice (p. 508)

1. E
2. C
3. B
4. A
5. D

Keys

Lesson Three

Practice (pp. 514-515)

See the chart below.

Survey Plans

Type of Sample	Plan	Advantage	Disadvantage
convenience	A.	convenient	Students entering this door may not be a representative sample.
convenience	B.	convenient	Students riding a bus are likely to live in one area and may not be a representative sample.
systematic	C.	systematic and convenient	Students in band may not be a representative sample.
voluntary-response	D.	representative sample	May be less convenient and require more time.
random	E.	representative sample	May be less convenient and require more time.

3. Answers will vary.
4. Answers will vary.

Practice (pp. 516-517)

Correct answers will be determined by the teacher.

Practice (p. 519)

1. rounded number
2. mean
3. mode
4. range
5. median
6. probability
7. sample

Practice (p. 520)

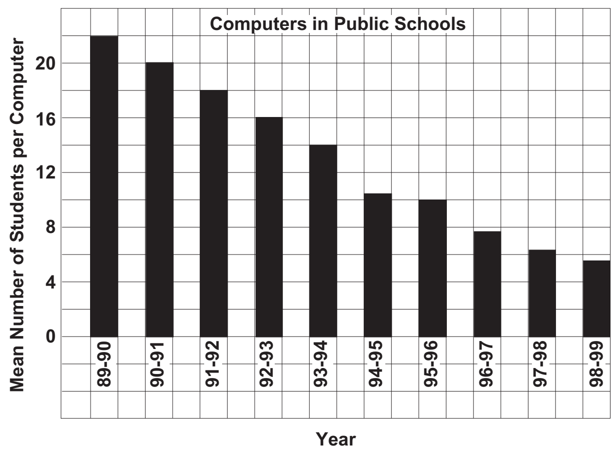
1. G
2. B
3. F
4. A
5. E
6. D
7. C

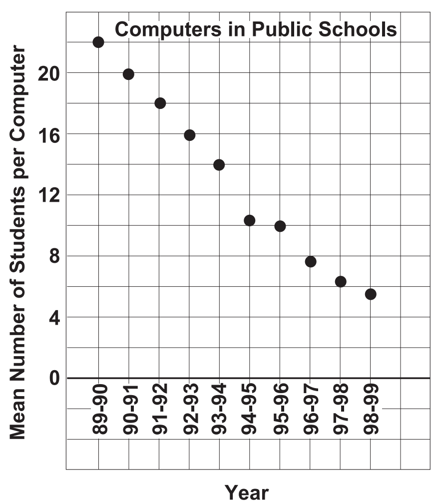
Unit Assessment (pp. 135-142TG)

1. a. 1,040.52 or 1041
   b. 12,480,000
2. $\frac{1}{1100}$ or .0909%
3. a. Native American
   b. Latino
   c. Caucasian
   d. Asian
   e. 3,209
   f. 1,174
   g. 365
   h. 11.4%
4. a. False
   b. True
   c. False
   d. True
   e. True

Keys

5. a. Graph type will vary. See graphs below. Students may have created either one.





b. Answers will vary.
c. 1994-95
d. 1998-99
e. 2
f. Answers will vary but should include the following: An understanding that in a set of 10 computers, there would be 6 students for each of 7 and 5 students for each of the remaining 3 is sought. The student might also explain that when the number of computers was divided into the number of students, it did not come out even.

6. a. 45.83 million or 45,830,000
b. 45.35 million or 43,350,000

7. 132

Keys

8. Answer will vary but may include the following: The winnings will be \$20 which is less than the \$25 spent playing the game. The probability of winning is $\frac{2}{5}$ or $\frac{40}{100}$. If the player wins 50 cents 40 times, total winnings are \$20. The student might also reason that the probability of winning is $\frac{2}{5}$ which is less than $\frac{1}{2}$. The game must be won $\frac{1}{2}$ of the time to win at least the amount spent to play because the winning amount is twice the amount it cost to play.
9. a. $\frac{1}{16}$

   b. $\frac{1}{16}$
10. The median score will be the highest of the 3 measures of central tendency since the median is 88, the mean is 82.2 and the mode is 64.

Take-Home Portion:

Answers will vary but should represent knowledge from this unit.

Scoring Recommendations for Unit Assessment

Students will answer all 10 questions and each will count 7.5 points. The take home portion will count 25 points.

or

Allow students to choose 7 of the 10 questions and each of the 7 will count 10 points. The take home portion will count 30 points.

Benchmark Correlations for Unit Assessment

Benchmark	Addressed in Items
E.1.3.1	5
E.1.3.2	4, 5, 6, 10
E.1.3.3	5, 6, 10
E.2.3.2	2, 8, 9
E.3.3.1	1, 3, 6
E.3.3.2	11
A.3.3.3	1-11

Appendices

Instructional Strategies

Classrooms draw from a diverse pool of talent and potential. The educator's challenge is to structure the learning environment and instructional material so that each student can benefit from his or her unique strengths. Instructional strategies adapted from the Curriculum Frameworks are provided on the following pages as examples that you might use, adapt, and refine to best meet the needs of your students and instructional plans.

Cooperative Learning Strategies—to promote individual responsibility and positive group interdependence for a given task.

Jigsawing: each student becomes an "expert" and shares his or her knowledge so eventually all group members know the content.

Divide students into groups and assign each group member a numbered section or a part of the material being studied. Have each student meet with the students from the other groups who have the same number. Next, have these new groups study the material and plan how to teach the material to members of their original groups. Then have students return to their original groups and teach their area of expertise to the other group members.

Corners: each student learns about a topic and shares that learning with the class (similar to jigsawing).

Assign small groups of students to different corners of the room to examine and discuss particular topics from various points of view. Have corner teams discuss various points of view concerning the topic. Have corner teams discuss conclusions, determine the best way to present their findings to the class, and practice their presentation.

Think, Pair, and Share: students develop their own ideas and build on the ideas of other learners.

Have students reflect on a topic and then pair up to discuss, review, and revise their ideas. Then have the students share their ideas with the class.

Debate: students participate in organized presentations of various viewpoints.

Have students form teams to research and develop their viewpoints on a particular topic or issue. Provide structure in which students will articulate their viewpoints.

Sequence of Activities—to develop understanding by progressing from new ideas through use of concrete manipulatives to an application of the concept using pictures, graphs, diagrams, or numerical representations, and ending with using symbols.

Have students explore concepts with concrete objects followed by pictorial representations of the concept, and then progress to symbolic lessons that include independent problem solving.

Use of Manipulatives—to introduce or reinforce a concept through observation of mathematical concepts in action.

Have students explore the meaning of the concept in a visual style and observe mathematical patterns, procedures, and relationships.

Drill and Practice Activities—to prompt quick recall. Some examples of "drill and practice" activities are skip counting, the number line, triangle flash cards, chalkboard drills, and basic fact games.

Have students practice algorithms and number facts a few at a time at frequent intervals. Timed tests are not recommended because they can put too much pressure on students and can cause them to become fearful and develop negative attitudes toward mathematics learning.

Projects—to prepare and deliver a presentation or produce a product over a period of time.

Have students choose a topic for a project that can be linked with a mathematical concept. The project can be in the form of a term paper, a physical model, a video, a debate or mathematically relevant art, music, or athletic performance.

Brainstorming—to elicit ideas from a group.

Have students contribute ideas related to a topic. Accept all contributions without initial comment. After the list of ideas is finalized, have students categorize, prioritize, and defend their contributions.

Free Writing—to express ideas in writing.

Have students reflect on a topic, then have them respond in writing to a prompt, a quotation, or a question. It is important that they keep writing whatever comes to mind. They should not self-edit as they write.

K–W–L (Know–Want to Know–Learned)—to provide structure for students to recall what they know about a topic, deciding what they want to know, and then after an activity, list what they have learned and what they still want or need to learn.

Before engaging in an activity, list on the board under the heading "What We Know" all the information students know or think they know about a topic. Then list all the information the students want to know about a topic under, "What We Want to Know." As students work, ask them to keep in mind the information under the last list. After completing the activity, have students confirm the accuracy of what was listed and identify what they learned, contrasting it with what they wanted to know.

Learning Log—to follow-up K–W–L with structured writing.

During different stages of a learning process, have students respond in written form under three columns:

"What I Think"
"What I Learned"
"How My Thinking Has Changed"

Interviews—to gather information and report.

Have students prepare a set of questions in interview format. After conducting the interview, have students present their findings to the class.

Dialogue Journals—to hold private conversations with the teacher or share ideas and receive feedback through writing (this activity can be conducted by e-mail).

Have students write on topics on a regular basis, responding to their writings with advice, comments, and observations in written conversation.

Continuums—to indicate the relationships among words or phases.

Using a selected topic, have students place words or phases on the continuum to indicate a relationship or degree.

Mini-Museums—to create a focal point.

Have students work in groups to create exhibits that represent areas of mathematics.

Models—to represent a concept in simplified form.

Have students create a product, like a model of Platonic solids, or a representation of an abstract idea, like an algebraic equation or a geometric relationship.

Reflective Thinking—to reflect on what was learned after a lesson.

Have students write in a journal the concept or skill they have learned, comment on the learning process, note questions they still have, and describe their interest in further exploration of the concept or skill. Or have students fill out a questionnaire addressing such questions as: Why did you study this? Can you relate it to real life?

Problem Solving—to apply knowledge to solve problems.

Have students determine a problem, define it, ask a question about it, and then identify possible solutions to research. Have them choose a solution and test it. Finally, have students determine if the problem has been solved.

Predict, Observe, Explain—to predict what will happen in a given situation when a change is made.

Ask students to predict what will happen in a given situation when some change is made. Have students observe what happens when the change is made and discuss the differences between their predictions and the results.

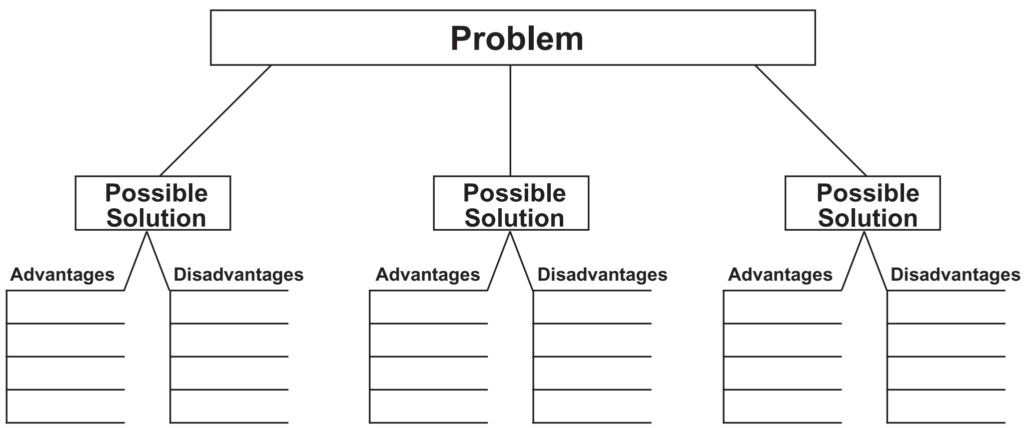
Literature, History, and Storytelling—to bring history to life through the eyes of a historian, storyteller, or author, revealing the social context of a particular period in history.

Have students locate books, brochures, and tapes relevant to a specific period in history. Assign students to prepare reports on the life and times of mathematicians during specific periods of history. Ask students to write their own observations and insights afterwards.

Graphic Organizers—to transfer abstract concepts and processes into visual representations.

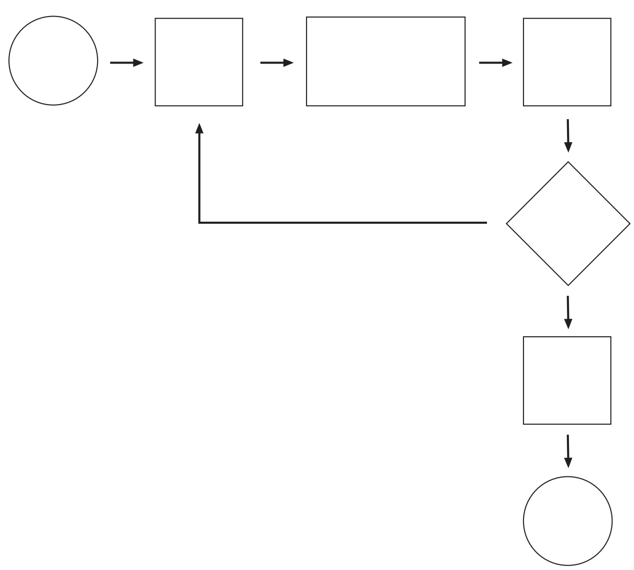
Consequence Diagram/Decision Trees: illustrates real or possible outcomes of different actions.

Have students visually depict outcomes for a given problem by charting various decisions and their possible consequences.



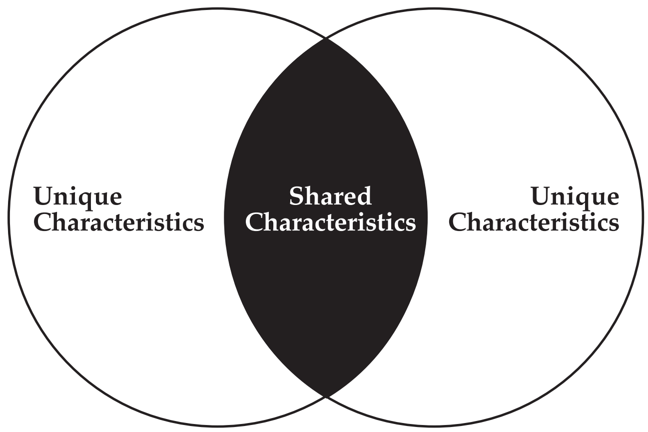
Flowchart: depicts a sequence of events, actions, roles, or decisions.

Have students structure a sequential flow of events, actions, roles, or decisions graphically on paper.



Venn Diagram: analyzes information representing the similarities and differences among, for example, concepts, objects, events, and people.

Have students use two overlapping circles to list unique characteristics of two items or concepts (one in the left part of the circle and one in the right); in the middle have them list shared characteristics.



Portfolio—to capture students' learning within the context of the instruction.

Elements of a portfolio can be stored in a variety of ways; for example, they can be photographed, scanned into a computer, or videotaped. Possible elements of a portfolio could include the following selected student products:

- solution to an open-ended question that demonstrates originality and unusual procedures
- mathematical autobiography
- teacher-completed checklists
- student-or teacher-written notes from an interview
- papers that show the student's correction of errors or misconceptions
- photo or sketch of student's work with manipulatives or mathematical models of multi-dimensional figures

- letter from student to the reader of the portfolio, explaining each item
- description by the teacher of a student activity that displayed understanding of a mathematical concept or relation
- draft, revision, and final version of student's work on a complex mathematical problem, including writing, diagrams, graphs, charts, or whatever is most appropriate
- excerpts from a student's daily journal
- artwork done by student, such as a string design, coordinate picture, scaled drawing, or map
- problem made up by the student, with or without a solution
- work from another subject area that relates to mathematics, such as an analysis of data collected and presented in a graph
- report of a group project, with comments about the individual's contribution, such as a survey of the use of mathematics in the world of work or a review of the uses of mathematics in the media

Learning Cycle—to engage in exploratory investigations, construct meanings from findings, propose tentative explanations and solutions, and relate concepts to our lives.

Have students explore the concept, behavior, or skill with hands-on experience and then explain their exploration. Through discussion, have students expand the concept or behavior by applying it to other situations.

Field Experience—to use the community as a laboratory for observation, study, and participation.

Before the visit, plan and structure the field experience with the students. Engage in follow-up activities after the trip.

Teaching Suggestions

The standards and benchmarks of the Sunshine State Standards are the heart of the curriculum frameworks and reflect Florida's efforts to reform and enhance education. The following pages provide samples of ways in which students could demonstrate achievements of benchmarks through the study of Mathematics.

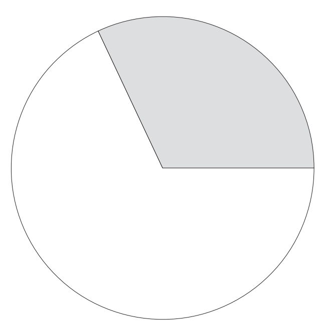
Number Sense, Concepts, and Operations

1. Have students draw a picture and describe how an elevator could be used to explain integers to a friend. (MAA.1.3.1)

2. Have students use data displays to demonstrate an understanding of the relative size of fractions and percents and answer questions about a given problem. (MAA.1.3.2.a)

   Example:

   In the pictograph below, the shaded sector represents the portion of time that an average teenager of Max Lewis Middle School spends on the phone on the weekends. About what fraction of the weekend do these teenagers spend on the phone? About what percent of the weekend do they spend talking on the phone?

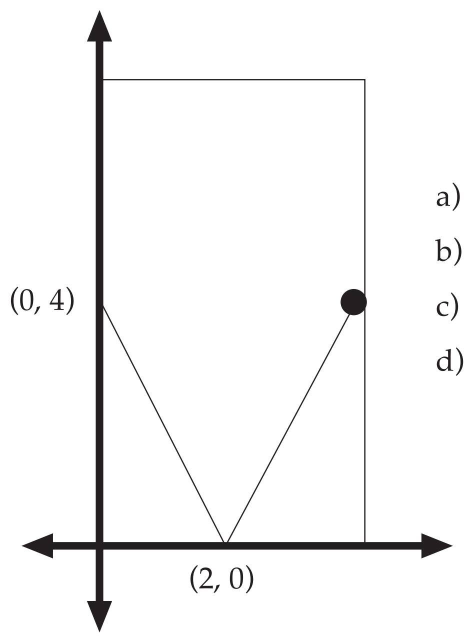


3. Have students determine the greatest distance from the sun that each planet in the solar system reaches. Ask students to express the ratio of each distance to that of Earth using scientific notation. (MA.A.1.3.4.b)

4. Have students explain the need for absolute value in the contextual situation. (MA.A.1.3.3.a)

   Example:

   Below is the graph of the path of a pool ball when hit against the side of the table. Which equation accurately represents the line? Explain your choice.



a) $y = -2x + 4$

b) $y = 2x + 4$

c) $y = 2x - 4$

d) $y = |2x + 4|$

5. Have students represent numbers in a variety of ways and answer questions about a given problem. (MA.A.1.3.4.a)

   Example:

   Batting averages for baseball and softball players are reported as a three-digit decimal that is found by dividing the number of hits by the number of times at bat. If Chip has a batting average of .280 and has been at bat 25 times, how many hits does he have? What will his average be if he gets a hit on his next time at bat? What would a batting average of 1.000 mean? How many consecutive hits would he need to have a batting average of .500?

6. Have students use and explain exponential and scientific notation. (MA.A.2.3.1.a)

   Example:

   Write two examples of large numbers containing more than 2 non-zero digits correctly represented in scientific notation (such as distance to planets).

   Write two examples of very small numbers containing more than 2 non-zero digits correctly represented in scientific notation (such as atomic units).

   Explain why these numbers are best represented in scientific notation. Explain what the exponent represents in each.

   Sample Solution:

   4.56×10^{19}

   This number, not represented in scientific notation, would require 20 digits which would make it cumbersome to work with and to write. The exponent 19 means 4.56 multiplied by 10,000,000,000,000,000,000, which gives the equivalent whole number representation.

7. Have students determine and draw the five-bar code for the missing digit. (MA.A.2.3.2.a)

   Example:

   In 1963 the United States Postal Service began using five-digit zip codes in order to expedite its handling of the mail. In order for the codes to be read by scanners, each digit of our decimal system is represented by five bars. When a five-digit zip code is written, it begins and ends with a single long bar, called a framing bar. Use the following zip codes to match the bar codes with the digits 0-9:

66045

02138

35487

Which digit is missing above? Draw the code for the missing digit and explain the strategy you used to find it.

8. Have students use the formula

$$P = 1.2\,\frac{W}{H^2} \quad \text{where} \quad \begin{array}{l} P = \text{pounds per square inch} \\ W = \text{your weight in pounds} \\ H = \text{width of heel in inches,} \end{array}$$

to describe the effect on the pounds of pressure exerted when H increases or decreases. (MA.A.3.3.1.a)

9. Have students perform mathematical operations on the numbers 2, 4, 6, 8, and 10 to form today's date. Ask students to find either the day, the month and day, or the month, day, and year. (MA.A.3.3.2.a)

Example:

To find the date each number (2, 4, 6, 8, and 10) must be used, but can only be used once. For example, March 23, 1995, might be solved by finding 23, 323, or 32395, using the correct order of operations.

Sample Solution:

$$\begin{aligned} 23 &= 10 \times 8 \div 4 + 6 \div 2 \\ &\quad 80 \div 4 + 3 \\ &\quad\quad 20 + 3 \\ &\quad\quad\quad 23 \end{aligned}$$

10. Have student defend the correct application of the algebraic order of operations in a contextual situation. (MA.A.3.3.2.b)

    Example:

    Joel and Rachel want to put a fence around their yard. They know the formula for the perimeter of a rectangle is "two times the length plus the width." The yard is 180 feet long and 200 feet wide. Joel says they need 560 feet of fencing, saying "2 times 180 is 360 and 360 plus 200 is 560." Rachel disagrees, saying they need 760 feet of fencing. Pretend to be in Rachel's place and defend her answer.

11. Have students use the advertisement sections of a newspaper as a resource to write a descriptive plan to complete a shopping trip in a contextual situation. (MA.A.3.3.3.a)

    Example:

    James has a holiday budget of $150 and 6 family members for whom to buy gifts. James' mother will leave him at the mall at 12:00 noon and pick him up at 5:30 p.m. Given this situation, develop a schedule showing the maximum time that should be allotted for finding each gift and a purchase plan with costs that include a 6% sales tax.

12. Have students use rounding and concepts of common percents to estimate real quantities. Estimate and explain the answer given the following information: The average cost of housing in the Florida panhandle is 54.5% of the cost of housing in central Florida, and the average cost of housing in central Florida is $127,500. What is the average dollar cost of a house in the panhandle? Explain your process of estimation and answer. (MA.A.4.3.1.a)

    Solution:

    Because 54.5% is close to 50%, housing in the panhandle area would be close to half the cost in central Florida (rounded to $128,000), or approximately $64,000.

13. Have students use a model to justify common multiples. (MA.A.5.3.1.a)

    Example:

    A double strand of blinking holiday lights has a strand of red lights blinking every 9 seconds and a strand of green lights blinking every 15 seconds. Determine after how many seconds both strands will be on at the same time and justify the answer.

    Sample Solution:

    red-on at 9, 18, 27, 36, 45, 54 seconds
    green-on at 15, 30, 45, 60, 75, 90 seconds

    They will both be on at 45 seconds, the least common multiple of 9 and 15.

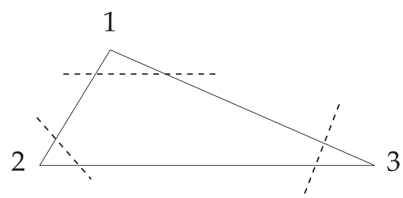
Measurement

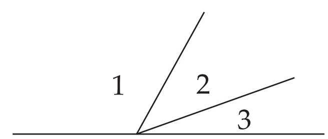
1. Have students use a graphic model to derive a formula for finding the volume of a three-dimensional model. Fold and cut graph paper to build two-dimensional shapes. Compare the area and perimeter of triangles, squares, and trapezoids that have the same base length and height and document these findings on a table with a written interpretation of the finding. With tape build three-dimensional solids using the two-dimensional models as faces. Predict the surface area, and then test predictions. Using graph paper as a guide, estimate the volume of each model. Work with a group to test estimations and reach a group consensus on a working formula for finding the volume of the three-dimensional models. (MA.B.1.3.1.a)

2. Have students use a cut out triangle to write the formula for the sum of the interior angles of a triangle. (MA.B.1.3.2.a)

   Example:

   Cut a triangle from a sheet of paper. Cut each of the three angles from the triangle and lay them so that they form adjacent angles. (See diagram below.)



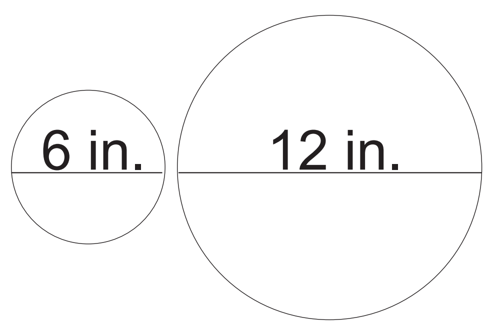


   Compare results with results from other class members and determine a rule that applies to all triangles.

3. Have students determine and justify comparable pricing for different sizes of pizza. (MA.B.1.3.3.a)

   Example:

   The eighth grade is having a pizza sale. They have 2 sizes: 6-inch diameter and 12-inch diameter. A 6-inch pizza sells for $2.75. Determine the fair price for a 12-inch pizza and justify the answer.



4. Have students construct and use scale drawings. Scale a picture from a coloring book or greeting card by drawing a 2-cm by 2-cm grid on the picture. Create a 1-cm by 1-cm grid on plain paper and a 3-cm by 3-cm grid on a legal size manila folder. Duplicate the original picture one square at a time with a "key" showing the scale used. (MA.B.1.3.4.a)

5. Have students select appropriateness of direct or indirect measurement for given situation. (MA.B.2.3.1.a)

   Example:

   Determine whether placing an order for a living room carpet would require a direct or indirect measurement and explain why. Calculate the number of square yards of carpet needed if the room is 12 feet by 15 feet.

6. Have students compute reaction time in seconds, given the speed of a ball in miles per hour. (MA.B.2.3.2.a)

   Example:

   The pitcher of the high school baseball team has been clocked throwing the ball at 70 miles per hour. The distance from the pitcher's mound to home plate is 60 feet 6 inches. Determine, for that speed and that distance, how many seconds the batter has to react?

7. Have students create a line graph to represent a real-world problem. Construct a line graph depicting the energy output of a typical middle school student over a 24-hour period, which includes a school day and an afternoon soccer practice. Label the y-axis energy output in estimated calories and the x-axis time in hours. With the graph provide a written description of the activities. (MA.B.3.3.1.a)

8. Given a list of measurements, have students identify the appropriate measurement for each defined example. (MA.B.4.3.1.a)

Example:

Determine which of the following measures would be most appropriate for each of the described situations.

500 yd   461.6 cm   462 ft   460 m

a) The length of a photo to be framed.

b) The feet of fencing needed for the back yard.

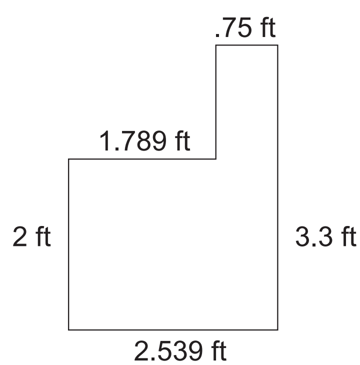
c) The distance to grandma's house.

d) The cloth needed to make costumes for the play.

9. Have students determine perimeter. (MA.B.4.3.1.b)

Example:

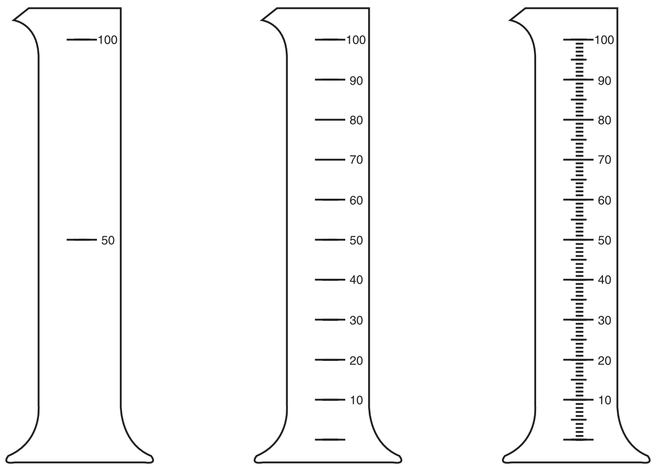
Find the perimeter of the following figure. Discuss how precise the perimeter is and why.



10. Have students choose the appropriate graduated cylinder for precision of measurement required. (MA.B.4.3.1.c)

    Example:

    Determine which of the graduated cylinders below would be best to accurately measure 4.23 ml and explain why.



a. b. c.

11. Have students in small groups estimate the cost of a construction job, given the job's blueprints, specifications, material costs, and labor. (Teachers can request samples of this information from construction contractors. Students could be required to research the material and labor costs. The groups could participate in a bid process and discuss why group estimates vary.) (MA.B.4.3.2.a)

Geometry and Spatial Sense

1. Given a variety of regular polygons (triangle, square, pentagon, hexagon, etc.), have students investigate the relationship between the number of sides, and the number of diagonals of any regular polygon. Ask students to justify the relationship and support the conclusions. (MA.C.1.3.1.a)

2. Have students visually explore the geometric concepts of symmetry, reflections, congruency, similarity, perpendicularity, parallelism and transformations, including flips, slides, and turns. (MA.C.2.3.1.a)

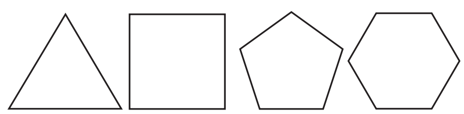
   Example:

   Make squares from self-stick notes and draw the same three-color design. Explore the many designs that can be created by flipping, sliding, and turning one or more of the self-stick notes. Display a favorite design and use geometric terms to describe how it was created and what is being shown by combining the 4 pieces.

3. Have students decide which figures can be tessellated. (M.A.C.2.3.2)

   Example:

   Of an equilateral triangle, a square, a regular pentagon, and a regular hexagon, determine and explain which can be fundamental regions for a tessellation and which cannot.

4. Have students research tessellations, including those of Escher and Islamic artists. In a group, ask students to design a unique carpet for the classroom that uses tessellations. (M.A.C.2.3.2.b)

5. Have students define a common real-world two-dimensional shape (this could be a picture of an object) that has characteristics that allow it to be tessellated. Ask students to draw an example of a tessellation using this shape. (M.A.C.2.3.2.c)

6. Have students solve a real-world problem given a context.

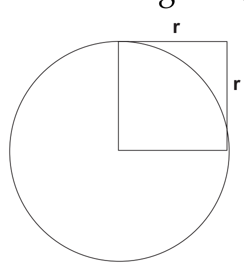
   Example:

   The local convenience store sells an average of 275 soft drinks each day. Over the course of one year, the manager noticed an imbalance in the income from soft drinks. Based on the information below, determine which drink is priced incorrectly (A, B, C, or D) and justify the answer. (MA.C.3.3.1.a)

   Volume $= \pi r^2 h$; use 3.14 for π

	radius (cm)	height (cm)	Price
A)	5	10	$ .24
B)	7	12	$ .72
C)	8	15	$ .92
D)	9	18	$1.39

7. Have students apply formulas for the area of one figure to approximate the area of another figure. (MA.C.3.3.1.b)



   What is the best approximation for the area of a circle?

   r^2 $2r^2$ $3r^2$ $4r^2$

   Justify your answer.

8. As students enter the room, give each one an index card with an ordered pair on it. Ask students to choose seats as though the desks were a rectangular coordinate system. Have students then generate a list of the names of all students who represent different lines. (MA.C.3.3.2.a)

   For example: a vertical line,

   $y = 5$; $x + y = 4$; $x - y < 6$; and so on.

9. Have students explain to another student how to get from the classroom she or he is in to another location on the school grounds using symbols and Cartesian maps. (MA.C.3.3.2.b)

Algebraic Thinking

1. Have students determine and use patterns. (MA.D.1.3.1.a)

   Example:

   Answer the following questions:

X	*Y*
1	5
3	9
7	17
8	a
16	b
c	63
d	23
e	35

   1) What is being done to the numbers in the *X* column to get the numbers in the Y column?

   2) Describe the pattern you would use to find the numbers for "*a*" and "*b*."

   3) Use the pattern described in number 2 to find the numbers for "*c*," "*d*," and "*e*."

   4) Describe how you found *X* when you used your pattern in question number 3.

2. Have students graph and explain the growth of a population over time of a colony of organisms that doubles once a day. (MA.D.1.3.2.a)

3. Have students represent and solve a real-world problem with algebraic expressions. (MA.D.2.3.1.a)

   Example:

   Write an expression that would describe a book that is overdue by 10 days; by 15 days; by "*d*" days.

   The school library overdue book fine is as follows:

   First week..................$1.00
   After first week.........$1.00 + $.25 a day

4. Have students use algebraic problem-solving strategies to solve real-world problems. (MA.D.2.3.2.a)

   Example:

   Describe the strategy or strategies used to answer the following question. Suppose there are 45 animals on the beach, some turtles and some pelicans. There are 104 legs on the beach. How many turtles and how many pelicans are on the beach?

Data Analysis and Probability

1. Have students participate in a class census. Ask students to pick from a list of topics such as favorite type of music, favorite fast food eatery, favorite professional sports team, etc. (Ideally there are as many topics as students in class.) Have students ask fellow students in class about the topic of his or her census. Record responses in an organized table. Ask students to represent the data in graph form and present it to the class with a written interpretation of what the graph shows about the class. (MA.E.1.3.1.a)

2. Have students collect temperatures every 30 minutes throughout a 12-hour period beginning at 8:00 a.m. and ending at 8:00 p.m. Ask students to find the measures of central tendency and write an argument that defends which measure best describes what the day was like or that states that none of the measures of central tendency alone fairly describe the temperature for the day. (MA.E.1.3.2.a)

3. Have students analyze and make predictions from collected data using calculators to apply formulas for measures of central tendency, and organize data in the form of charts, tables, or graphs. Have student use computer graphing software to organize collected data in a quality display. (MA.E.1.3.3.a)

   Example:

   Make a quality display of data on salaries from a company (from president to custodian). First find the mean, median, and mode. Then prepare a discussion of why these numbers accurately or inaccurately present the measure of central tendency. Show how eliminating the "extremes" affects the measures of central tendency.

4. Have students compare experimental results with mathematical expectations of probabilities in a context. (MA.E.2.3.1.a)

   Example:

   Have students compute the mathematical probability of two coins tossed in the air at the same time both landing with heads up. Next toss the two coins 20 times and record the results each time. Determine whether the experimental result matches the mathematical expectation and explain why it does or does not. If it does not, explain whether the experiment could be changed to get a better match.

Example:

Have students in small groups estimate the percentage of Earth's surface covered by each of the continents and by each of the major oceans, with other land and other water as additional categories. Have students toss and catch an inflatable globe 100 times, with the position of the index finger on the dominant hand recorded. Using statistical data for surface area of Earth and area of each land and water body listed, compute the percentage of Earth covered by each land or water body. Compare experimental probability to both estimation and mathematical expectations.

5. Have students determine all possible outcomes when tossing two differently colored number cubes numbered 1-6, and then determine the odds for and against tossing the cubes and having the sum of the two numbers shown equal 6. (MA.E.2.3.2.a)

6. Have student design, implement, and monitor a water conservation plan. Ask students to collect data on daily water usage, before and after the plan has been implemented, and write a paper justifying the plan. (M.A.E.3.3.1.a)

7. Have students stage a debate to confirm or disprove the claims of nationally advertised products. (M.A.E.3.3.2.a)

Accommodations/Modifications for Students

The following accommodations/modifications may be necessary for students with disabilities and other students with diverse learning needs to be successful in school and any other setting. Specific strategies may be incorporated into each student's individual educational plan (IEP) or 504 plan, or academic improvement plan (AIP) as deemed appropriate.

Environmental Strategies

Provide preferential seating. Seat student near someone who will be helpful and understanding.
Assign a peer tutor to review information or explain again.
Build rapport with student; schedule regular times to talk.
Reduce classroom distractions.
Increase distance between desks.
Allow student to take frequent breaks for relaxation and small talk, if needed.
Accept and treat the student as a regular member of the class. Do not point out that the student is an ESE student.
Remember that student may need to leave class to attend the ESE support lab.
Additional accommodations may be needed.

Organizational Strategies

Help student use an assignment sheet, notebook, or monthly calendar.
Allow student additional time to complete tasks and take tests.
Help student organize notebook or folder.
Help student set timelines for completion of long assignments.
Help student set time limits for assignment completion.
Ask questions that will help student focus on important information.
Highlight the main concepts in the book.
Ask student to repeat directions given.
Ask parents to structure study time. Give parents information about long-term assignments.
Provide information to ESE teachers and parents concerning assignments, due dates, and test dates.
Allow student to have an extra set of books at home and in the ESE classroom.
Additional accommodations may be needed.

Motivational Strategies

Encourage student to ask for assistance when needed.
Be aware of possibly frustrating situations.
Reinforce appropriate participation in your class.
Use nonverbal communication to reinforce appropriate behavior.
Ignore nondisruptive inappropriate behavior as much as possible.
Allow physical movement (distributing materials, running errands, etc.).
Develop and maintain a regular school-to-home communication system.
Encourage development and sharing of special interests.
Capitalize on student's strengths.
Provide opportunities for success in a supportive atmosphere.
Assign student to leadership roles in class or assignments.
Assign student a peer tutor or support person.
Assign student an adult volunteer or mentor.
Additional accommodations may be needed.

Presentation Strategies

Tell student the purpose of the lesson and what will be expected during the lesson (e.g., provide advance organizers).
Communicate orally and visually, and repeat as needed.
Provide copies of teacher's notes or student's notes (preferably before class starts).
Accept concrete answers; provide abstractions that student can handle.
Stress auditory, visual, and kinesthetic modes of presentation.
Recap or summarize the main points of the lecture.
Use verbal cues for important ideas that will help student focus on main ideas. ("The next important idea is….")
Stand near the student when presenting information.
Cue student regularly by asking questions, giving time to think, then calling student's name.
Minimize requiring the student to read aloud in class.
Use memory devices (mnemonic aids) to help student remember facts and concepts.
Allow student to tape the class.
Additional accommodations may be needed.

Curriculum Strategies

Help provide supplementary materials that student can read.
Provide *Parallel Alternative Strategies for Students* (*PASS*) materials.
Provide partial outlines of chapters, study guides, and testing outlines.
Provide opportunities for extra drill before tests.
Reduce quantity of material (reduce spelling and vocabulary lists, reduce number of math problems, etc.).
Provide alternative assignments that do not always require writing.
Supply student with samples of work expected.
Emphasize high-quality work (which involves proofreading and rewriting), not speed.
Use visually clear and adequately spaced work sheets. Student may not be able to copy accurately or fast enough from the board or book; make arrangements for student to get information.
Encourage the use of graph paper to align numbers.
Specifically acknowledge correct responses on written and verbal class work.
Allow student to have sample or practice test.
Provide all possible test items to study and then student or teacher selects specific test items.
Provide extra assignment and test time.
Accept some homework papers dictated by the student and recorded by someone else.
Modify length of outside reading.
Provide study skills training and learning strategies.
Offer extra study time with student on specific days and times.
Allow study buddies to check spelling.
Allow use of technology to correct spelling.
Allow access to computers for in-class writing assignments.
Allow student to have someone edit papers.
Allow student to use fact sheets, tables, or charts.
Tell student in advance what questions will be asked.
Color code steps in a problem.
Provide list of steps that will help organize information and facilitate recall.
Assist in accessing taped texts.
Reduce the reading level of assignments.
Provide opportunity for student to repeat assignment directions and due dates.
Additional accommodations may be needed.

Testing Strategies

Allow extended time for tests in the classroom and/or in the ESE support lab.
Provide adaptive tests in the classroom and/or in the ESE support lab (reduce amount to read, cut and paste a modified test, shorten, revise format, etc.).
Allow open book and open note tests in the classroom and/or ESE support lab.
Allow student to take tests in the ESE support lab for help with reading and directions.
Allow student to take tests in the ESE support lab with time provided to study.
Allow student to take tests in the ESE support lab using a word bank of answers or other aid as mutually agreed upon.
Allow student to take tests orally in the ESE support lab.
Allow the use of calculators, dictionaries, or spell checkers on tests in the ESE support lab.
Provide alternative to testing (oral report, making bulletin board, poster, audiotape, demonstration, etc.).
Provide enlarged copies of the answer sheets.
Allow copy of tests to be written upon and later have someone transcribe the answers.
Allow and encourage the use of a blank piece of paper to keep pace and eliminate visual distractions on the page.
Allow use of technology to check spelling.
Provide alternate test formats for spelling and vocabulary tests.
Highlight operation signs, directions, etc.
Allow students to tape-record answers to essay questions.
Use more objective items (fewer essay responses).
Give frequent short quizzes, not long exams.
Additional accommodations may be needed.

Evaluation Criteria Strategies

Student is on an individualized grading system.
Student is on a pass or fail system.
Student should be graded more on daily work and notebook than on tests (e.g., 60 percent daily, 25 percent notebook, 15 percent tests).
Student will have flexible time limits to extend completion of assignments or testing into next period.
Additional accommodations may be needed.

Correlation to Sunshine State Standards

Course Requirements for Mathematics 3
Course Number 1205070

These requirements include the benchmarks from the Sunshine State Standards that are most relevant to this course. The benchmarks printed in regular type are required for this course. The portions printed in *italic type* are **not** required for this course.

1. Demonstrate understanding and application of concepts about number systems.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.A.2.3.1	Understand and use exponential and scientific notation.	1, 4	
MA.A.2.3.2	Understand the structure of number systems other than the decimal system.	2	
MA.A.5.3.1	Use concepts about numbers, including primes, factors, and multiples, to build number sequences.	1, 4	

2. Demonstrate understanding and application of a variety of strategies to solve problems.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.A.3.3.1	Understand and explain the effect of addition, subtraction, multiplication, and division on whole numbers, fractions, including mixed numbers, and decimals, including the inverse relationship of positive and negative numbers.	1	
MA.A.3.3.2	Select the appropriate operation to solve problems involving addition, subtraction, multiplication, and division of rational numbers, ratios, proportions, and percents, including the appropriate application of the algebraic order of operations.	1, 2, 3	
MA.A.3.3.3	Add, subtract, multiply, and divide whole numbers, decimals, and fractions, including mixed numbers, to solve real-world problems, using appropriate methods of computing, such as mental mathematics, paper and pencil, and calculator.	1, 2, 3, 4, 5	
MA.A.4.3.1	Use estimation strategies to predict results and to check the reasonableness of results.	1, 3	
MA.B.2.3.1	Use direct (measured) and indirect (not measured) measures to compare a given characteristic in either metric or customary units.	2, 3	
MA.B.2.3.2	Solve problems involving units of measure and convert answers to a larger or smaller unit within either metric or customary units.	2	
MA.D.2.3.1	Represent and solve real-world problems graphically, with algebraic expressions, equations, and inequalities.	3, 4	
MA.D.2.3.2	Use algebraic problem-solving strategies to solve real-world problems involving linear equations and inequalities.	4	

Correlation to Sunshine State Standards

Course Requirements for Mathematics 3
Course Number 1205070

3. Estimate and measure quantities and use measures to solve problems.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.A.4.3.1	Use estimation strategies to predict results and to check the reasonableness of results.	1, 3	
MA.B.1.3.1	Use concrete and graphic models to derive formulas for finding perimeter, area, surface area, circumference, and volume of two- and three-dimensional shapes, including rectangular solids and cylinders.	2, 3	
MA.B.1.3.2	Use concrete and graphic models to derive formulas for finding rates, distance, time, and angle measures.	2, 3	
MA.B.1.3.3	Understand and describe how the change of a figure in such dimensions as length, width, height, or radius affects its other measurements such as perimeter, area, surface area, and volume.	2, 3, 5	
MA.B.1.3.4	Construct, interpret, and use scale drawings such as those based on number lines and maps to solve real-world problems.	2, 3	
MA.B.3.3.1	Solve real-world and mathematical problems involving estimates of measurements including length, time, weight/mass, temperature, money, perimeter, area, and volume in either customary or metric units.	2, 3	
MA.B.4.3.1	Select appropriate units of measurement and determine and apply significant digits in a real-world context. (Significant digits should relate to both instrument precision and to the least precise unit of measurement.)	2	
MA.B.4.3.2	Select and use appropriate instruments, technology, and techniques to measure quantities in order to achieve specified degrees of accuracy in a problem situation.	2	

Correlation to Sunshine State Standards

Course Requirements for Mathematics 3
Course Number 1205070

4. Describe situations either verbally or by using graphical, numerical, physical, or algebraic mathematical models.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.A.1.3.1	Associate verbal names, written word names, and standard numerals with integers, fractions, and decimals; numbers expressed as percents; numbers with exponents; numbers in scientific notation; radicals; absolute values; and ratios.	1, 3	
MA.A.1.3.2	Understand the relative size of integers, fractions, and decimals; numbers expressed as percents; numbers with exponents; numbers in scientific notation; radicals; absolute value; and ratios.	1, 2, 5	
MA.A.1.3.3	Understand concrete and symbolic representations of rational numbers and irrational numbers in real-world situations.	1, 3	
MA.E.1.3.1	Collect, organize, and display data in a variety of forms, including tables, line graphs, charts, and bar graphs, to determine how different ways of presenting data can lead to different interpretations.	4, 5	

5. Demonstrate understanding, representation, and use of numbers in a variety of equivalent forms.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.A.1.3.4	Understand that numbers can be represented in a variety of equivalent forms, including integers, fractions, decimals, percents, scientific notation, exponents, *radicals*, and absolute value.	1, 3	

Correlation to Sunshine State Standards

Course Requirements for Mathematics 3
Course Number 1205070

6. Apply statistical methods and probability concepts in real-world situations.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.A.4.3.1	Use estimation strategies to predict results and to check the reasonableness of results.	1, 3	
MA.E.1.3.2	Understand and apply the concepts of range and central tendency (mean, median, and mode).	1, 5	
MA.E.1.3.3	Analyze real-world data by applying appropriate formulas for measure of central tendency and organizing data in a quality display, using appropriate technology, including calculators and computers.	5	
MA.E.2.3.2	Determine the odds for and against a given situation.	5	
MA.E.3.3.1	Formulate hypotheses, design experiments, collect and interpret data, and evaluate hypotheses by making inferences and drawing conclusions based on statistics (range, mean, median, and mode) and tables, graphs, and charts.	5	
MA.E.3.3.2	Identify the common uses and misuses of probability and statistical analysis in the everyday world.	5	

Correlation to Sunshine State Standards

Course Requirements for Mathematics 3
Course Number 1205070

7. Use geometric properties and relationships.

Benchmarks		Addressed in Unit(s)	Addressed in Class on Date(s)
MA.C.1.3.1	Understand the basic properties of, and relationships pertaining to, regular and irregular geometric shapes in two and three dimensions.	2, 3	
MA.C.2.3.1	Understand the geometric concepts of symmetry, reflections, congruency, similarity, perpendicularity, parallelism, and transformations, including flips, slides, turns, and enlargements.	3	
MA.C.2.3.2	Predict and verify patterns involving tessellations (covering of a plane with congruent copies of the same pattern with no holes or overlaps, like floor tiles).	3	
MA.C.3.3.1	Represent and apply geometric properties and relationships to solve real-world and mathematical problems.	3, 5	
MA.C.3.3.2	Identify and plot ordered pairs in all four quadrants of a rectangular coordinate system (graph) and apply simple properties of lines.	3, 5	
MA.D.1.3.1	Describe a wide variety of patterns, relationships, and functions through models, such as manipulatives, tables, graphs, expressions, equations, *and* inequalities.	1, 2, 3, 4	
MA.D.1.3.2	Create and interpret tables, graphs, equations, and verbal descriptions to explain cause-and-effect relationships.	3, 4, 5	

Glossary

The glossary adapted from the *Florida Curriculum Framework: Mathematics* is provided on the following pages for your use with the Sunshine State Standards and instructional practices.

absolute value .... the number of units a number is from 0 on a number line.
Example: The absolute value of both 4 and -4, written $|4|$ and $|^{-}4|$, is 4.

additive identity .... the number zero

additive inverse .... the opposite of a number
Example: 19 and -19 are additive inverses of each other.

algebraic expression .... a combination of variables, numbers, and at least one operation
Example: $5x + 7$, $3t$, or $\frac{1}{2}(x - yz)$

algebraic order of operations ...... the order in which operations are done when performing computations on expressions

- do all operations within parentheses or the computations above or below a division bar
- find the value of numbers in exponent form; multiply and divide from left to right
- add and subtract from left to right

Example: 5 + 10 ÷ 2 - 3 x 2 is 5 + 5 - 6, or 10 - 6 which is 4.

analog time .... time displayed on a timepiece having hour and minute hands.

associative property of addition .... for all real numbers a, b, and c, their sum is always the same, regardless of how they are grouped
Example: In algebraic terms:
$(a + b) + c = a + (b + c)$;
in numeric terms:
$(5 + 6) + 9 = 5 + (6 + 9)$.

associative property of multiplication .... for all real numbers a, b, and c, their product is always the same, regardless of how they are grouped
Example: In algebraic terms:
$(a \bullet b) \bullet c = a \bullet (b \bullet c)$;
in numeric terms:
$(5 \bullet 6) \bullet 9 = 5 \bullet (6 \bullet 9)$.

central tendency .... a measure used to describe data
Example: mean, mode, median

chance .... the possibility of a particular outcome in an uncertain situation

commutative property of addition .... two or more factors can be added in any order without changing the sum
Example: In algebraic terms:
$a + b + c = c + a + b = b + a + c$;
in numeric terms:
$9 + 6 + 3 = 6 + 3 + 9 = 3 + 9 + 6$.

commutative property of multiplication .... two or more factors can be multiplied in any order without changing the product
Example: In algebraic terms:
$a \bullet b \bullet c = b \bullet c \bullet \mathrm{a} = c \bullet b \bullet a$.

complex numbers .... numbers that can be written in the form $a + bi$, where a and b are real numbers and $i = \sqrt{-1}$

composite number .... a whole number that has more than two whole-number factors
Example: 10 is a composite number whose factors are 1, 10, 2, 5.

concrete representation .... a physical representation
Example: graph, model

congruent .... two things are said to be congruent if they have the same size and shape

customary system .... a system of weights and measures frequently used in the United States
Example: The basic unit of weight is the pound, and the basic unit of capacity is the quart.

digit .... a symbol used to name a number
Example: There are ten digits: 0, 1, 2, 3, 4, 5, 6, 7, 8, 9. In the number 49, 4 and 9 are digits.

digital time .... a time displayed in digits on a timepiece

dilation .... the process of reducing and/or enlarging a figure

distributive property of multiplication over addition ...... multiplying a sum by a number gives the same results as multiplying each number in the sum by the number and then adding the products
Example: In algebraic terms:
$ax + bx = (a + b)\ x$ and
$x\ (a + b) = ax + bx$;
in numeric terms:
$3 \bullet (4 + 5) = 3 \bullet 4 + 3 \bullet 5$.

equation .... a mathematical sentence that uses an equals sign to show that two quantities are equal
Example: In algebraic terms: $a + b = c$;
in numeric terms: $3 + 6 = 9$.

equivalent forms .... different forms of numbers, for instance, a fraction, decimal, and percent, that name the same number
Example: $\frac{1}{2} = .5 = 50\%$

estimate .... an answer that is close to the exact answer
Example: An estimate in computation may be found by rounding, by using front-end digits, by clustering, or by using compatible numbers to compute.

exponents (exponential form) .... the number that indicates how many times the base occurs as a factor.
Example: 2^3 is the exponential form of $2 \times 2 \times 2$, with 2 being the base and 3 being the exponent.

expression .... a mathematical phrase that can include operations, numerals, and variables
Example: In algebraic terms: $2l + 3x$;
in numeric terms: 13.4 - 4.7.

factor .... a number that is multiplied by another number to get a product; number that divides another number exactly
Example: The factors of 12 are 1, 2, 3, 4, 6, 12.

fractal .... a geometric shape that is self-similar and has fractional dimensions
Example: Natural phenomena such as the formation of snowflakes, clouds, mountain ranges, and landscapes involve patterns. The pictorial representations of these patterns are fractals and are usually generated by computers.

function .... a relationship in which the output value depends upon the input according to a specified rule
Example: With the function $f(x) = 3x$, if the input is 7, the output is 21.

histogram .... a bar graph that shows the frequency of data within intervals

identity property of addition ...... adding zero to a number does not change the number's value
Example: $x + 0 = x$; $7 + 0 = 7$; $\frac{1}{2} + 0 = \frac{1}{2}$

identity property of multiplication .... multiplying a number by 1 does not change the number's value
Example: $y \bullet 1 = y$; $2 \bullet 1 = 2$

inequality .... a mathematical sentence that shows quantities that are not equal, using $<$, $>$, $\leq$, $\geq$, or $\neq$

infinite .... has no end or goes on forever

integers .... the numbers in the set {... -4, -3, -2, -1, 0, 1, 2, 3, 4 ...}

inverse operations .... operations that undo each other
Example: Addition and subtraction are inverse operations. Multiplication and division are inverse operations. For instance, $20 - 5 = 15$ and $15 + 5 = 20$; $20 \div 5 = 4$ and $4 \times 5 = 20$.

inverse property of addition .... the sum of a number and its additive inverse is 0
Example: $3 + -3 = 0$

inverse property of multiplication .... the product of a number and its multiplicative inverse is 1
Example: In algebraic terms: For all fractions, a/b where $a, b \neq 0$,
$a/b \times b/a = 1$;
in numeric terms: $3 \bullet \frac{1}{3} = 1$;
the multiplicative inverse is also called reciprocal.

irrational numbers .... a real number that cannot be expressed as a repeating or terminating decimal
Example: The square roots of numbers that are not perfect squares, for instance, $\sqrt{13}$; 0.121121112 … .

limit .... a number to which the terms of a sequence get closer so that beyond a certain term all terms are as close as desired to that number

linear equation .... an equation that can be graphed as a line on the coordinate plane

matrices .... a rectangular array of mathematical elements (as the coefficients of simultaneous linear equations) that can be combined to form sums and products with similar arrays having an appropriate number of rows and columns

mean .... the sum of the numbers in a set of data divided by the number of pieces of data; the arithmetic average

median .... the number in the middle (or the averages of the two middle numbers) when the data are arranged in order

midpoint .... the point that divides a line segment into two congruent line segments

mode .... the number or item that appears most frequently in a set of data

multiples .... the numbers that result from multiplying a number by positive whole numbers
Example: The multiples of 15 are 30, 45, 60, ...

natural (counting) numbers .... the numbers in the set {1, 2, 3, 4, …}

number theory .... the study of the properties of integers
Example: primes, divisibility, factors, multiples

numeration .... the act or process of counting and numbering

ordered pair .... a pair of numbers that can be used to locate a point on the coordinate plane.
Example: An ordered pair that is graphed on a coordinate plane is written in the form: (x-coordinate, y-coordinate), for instance, (8, 2).

operations .... any process, such as addition, subtraction, multiplication, division, or exponentiation, involving a change or transformation in a quantity

patterns .... a recognizable list of numbers or items

parallel lines .... lines that are in the same plane but do not intersect

permutation .... an arrangement, or listing, of objects or events in which order is important

perpendicular lines...................... two lines or line segments that intersect to form right angles

planar cross-section .... the area that is intersected when a two-dimensional plane intersects a three-dimensional object

plot.. to locate a point by means of coordinates, or a curve by plotted points, and to represent an equation by means of a curve so constructed

power.. a number expressed using an exponent
Example: The power 5^3 is read *five to the third power*, or *five cubed*.

prime .... a number that can only be divided evenly by two different numbers, itself and 1
Example: The first five primes are 2, 3, 5, 7, 11.

probability .... the number used to describe the chance of an event happening; how likely it is that an event will occur

proof .... the logical argument that establishes the truth of a statement; the process of showing by logical argument that what is to be proved follows from certain previously proved or accepted propositions

proportion .... an equation that shows that two fractions (ratios) are equal
Example: In algebraic terms:
$a/b = c/d,\ b \neq 0,\ d \neq 0$;
in numeric terms: $\frac{3}{6} = \frac{1}{2}$, 3:6 = 1:2.

radical .... an expression of the form $\sqrt[b]{a}$
Example: $\sqrt{68}$, $\sqrt[3]{27}$

range .... the difference between the greatest number and the least number in a set of data; the set of output values for a function

ratio .... a comparison of two numbers by division
Example: The ratio comparing 3 to 7 can be stated as 3 out of 7, 3 to 7, 3 : 7, or $\frac{3}{7}$.

rational number .... a number that can be expressed as a ratio in the form a/b where a and b are integers and $b \neq 0$
Example: $\frac{1}{2}$, $\frac{3}{5}$, -7, 4.2, $\sqrt{49}$

real numbers .... the set of numbers that includes all rational and irrational numbers

rectangular coordinate system ... a system formed by the perpendicular intersection of two number lines at their zero points, called the origin, and the horizontal number line is called the x-axis, the vertical number line is called the y-axis, and the axes separate the coordinate plane into four quadrants

recursive definition .... a definition of sequence that includes the values of one or more initial terms and a formula that tells how to find each term of a sequence from previous terms

reflection.. the figure formed by flipping a geometric figure about a line to obtain a mirror image

reflexive property .... a number or expression is equal to itself
Example: $a = a$, $cd = cd$

right triangle trigonometry .... finding the measures of missing sides or angles of a triangle given the measures of the other sides or angles

rotation... a transformation that results when a figure is turned about a fixed point a given number of degrees

scale .... the ratio of the size of an object or the distance in a drawing to the actual size of the object or the actual distance

scientific notation .... a short-hand way of writing very large or very small numbers
Example: The number is expressed as a decimal number between 1 and 10 multiplied by a power of 10, for instance, $7.59 \times 10^5 = 759{,}000$.

sequences .... an ordered list of numbers with either a constant ratio (geometric) or a constant difference (arithmetic)

series .... an indicated sum of successive terms of an arithmetic or geometric sequence

similar .... objects or figures are similar if their corresponding angles are congruent and their corresponding sides are in proportion, and they are the same shape, but not necessarily the same size

surface area .... the sum of the areas of all the faces of a three-dimensional figure

symmetry .... the correspondence in size, form, and arrangement of parts on opposite sides of a plane, line, or point

tessellation .... a repetitive pattern of polygons that covers an area with no holes and no overlaps
Example: floor tiles

transformation .... an operation on a geometric figure by which each point gives rise to a unique image
Example: Common geometric transformations include translations, rotations, and reflections.

translation (also called a *slide*) ... a transformation that results when a geometric figure is moved by sliding it without turning or flipping it, and each of the points of the figure move the same distance in the same direction

variable .... a symbol, usually a letter, used to represent one or more numbers in an expression, equation, or inequality
Example: In $5a$; $2x = 8$; $3y + 4 \neq 10$, a, x, and y are variables.

whole numbers .... the numbers in the set $\{0, 1, 2, 3, 4, \ldots\}$

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