



Florida Math Connects

Chapter 6 Resource Masters

Contents

Chapter Resources

- Family Letter
- Are You Ready Worksheets
- Diagnostic Test
- Pretest

Language Arts Resources

- Student Glossary

Practice and Reinforcement

- Facts Practice

Leveled Lesson Resources


- Explore
- Reteach
- Skills Practice
- Homework Practice
- Problem-Solving Practice
- Enrich

Technology Resources

- Graphing Calculator Activity
- Scientific Calculator Activity
- Spreadsheet Activity

Assessment Resources

- Reflecting on the Chapter
- Chapter Quizzes
- Vocabulary Test
- Chapter Tests
- Standardized Test Practice
- Extended-Response Test
- Student Recording Sheet
- Chapter Project Rubric

Answer Pages

**Chapter
Resource Masters**
are provided for
every chapter in both
print and digital
formats.

The McGraw-Hill Companies



Copyright © by the McGraw-Hill Companies, Inc. All rights reserved. Permission is granted to reproduce the material contained herein on the condition that such materials be reproduced only for classroom use; be provided to students, teachers, and families without charge; and be used solely in conjunction with *Math Connects, Course 3*. Any other reproduction, for use or sale, is expressly prohibited without prior written permission of the publisher.

Send all inquiries to:
Glencoe/McGraw-Hill
8787 Orion Place
Columbus, OH 43240

ISBN: 978-0-07-892305-0

MHID: 0-07-892305-0

Math Connects, Course 3

Printed in the United States of America.

2 3 4 5 6 7 8 9 10 032 18 17 16 15 14 13 12 11 10 09

CONTENTS

Teacher’s Guide v

Chapter 6 Resources

Family Letter 1

Are You Ready?

Practice Worksheet 5

AL Review Worksheet 6

BL Apply Worksheet 7

Diagnostic Test 8

Pretest 9

Language Arts Resources

Student Glossary 10

Practice and Reinforcement

Facts Practice 11

Lesson 6-1 Lesson Resources

A Explore: Angle Measure
Explore 12

B Classify Angles
AL Reteach 13
Skills Practice 14
Homework Practice 15
Problem-Solving Practice 16
BL Enrich 17
TI-84 Plus Activity 18

C Complementary and Supplementary Angles
AL Reteach 19
Skills Practice 20
Homework Practice 21
Problem-Solving Practice 22
BL Enrich 23

D PSI: Use Logical Reasoning
AL Reteach 24
Skills Practice 25
Homework Practice 26
Problem-Solving Practice 27

Lesson 6-2 Lesson Resources

A Explore: Parallel Lines
Explore 28

B Lines
AL Reteach 29
Skills Practice 30
Homework Practice 31
Problem-Solving Practice 32
BL Enrich 33

Lesson 6-3 Lesson Resources

A Explore: Triangles
Explore 34

B Triangles
AL Reteach 35
Skills Practice 36
Homework Practice 37
Problem-Solving Practice 38
BL Enrich 39
TI-84 Plus Activity 40

C Explore: Quadrilaterals
Explore 41

D Quadrilaterals
AL Reteach 42
Skills Practice 43
Homework Practice 44
Problem-Solving Practice 45
BL Enrich 46

AL = Approaching Level **BL** = Beyond Level

E	Polygons and Angles	
	AL Reteach	47
	Skills Practice	48
	Homework Practice	49
	Problem-Solving Practice	50
	BL Enrich.	51
	TI-84 Plus Activity	52

Assessment Resources

Reflecting on Chapter 6	53
Chapter Quizzes	54
Vocabulary Test	56

Chapter Tests

AL 1A	57
AL 1B	59
2A	61
2B	63
BL 3A	65
BL 3B	67

Standardized Test Practice	69
Extended-Response Test	71
Extended-Response Rubric	72
Student Recording Sheet	73
Chapter Project Rubric	74

Answers	A1
--------------------------	-----------

Teacher's Guide to Using the Chapter 6 Resource Masters

The *Chapter 6 Resource Masters* includes the core materials needed for Chapter 6. These materials include information for families, student worksheets, extensions, and assessment options. The answers for these pages appear at the back of this booklet.

All of the materials found in this booklet are included for viewing and printing from the online Teacher Edition.

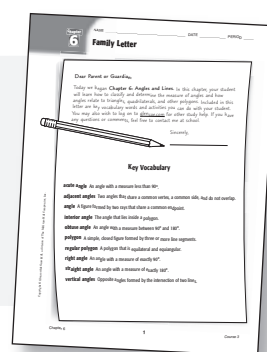
Family Resources

Family Introduction to Course 3 (Available in Chapter 0)

- Talks about the focus of the grade level.
- Gives Web site information.

Family Letter

- English and Spanish
- Overview of the chapter
- Key vocabulary
- Provides at home activities



Chapter Resources

Are You Ready Worksheets

- Use after the Are You Ready section in the Student Edition.
- **AL** Review: Approaching-level students
- Practice: On-level students
- **BL** Apply: Beyond-level students

Chapter Diagnostic Test

- Use to test skills needed for success in the upcoming chapter.
- Retest approaching-level students after the Are You Ready worksheets.

Chapter Pretest

- Quick check of the upcoming chapter's concepts to determine pacing.
- Use before the chapter to gauge students' skill level.
- Use to determine class grouping.

Language Arts Resources

Student Glossary

- Includes key vocabulary terms from the chapter.
- Students record definitions and/or examples for each term.
- Students can use the page as a bookmark as they study the chapter.

Practice and Reinforcement

Facts Practice

- Quick recall of concepts needed in the upcoming chapter.
- Use as a timed test to gauge student mastery of prior concepts.

Lesson Resources

Explore

- Provides additional practice for the activities and exercises found in the Student Edition.
- Use as homework for same-day teaching.

Reteach

- Provides vocabulary, key concepts, additional worked-out examples, and exercises.
- Use for students who have been absent.

Skills Practice

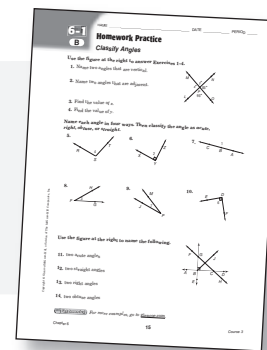
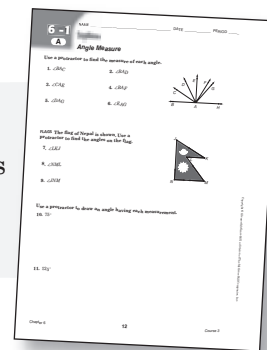
- Focuses on the computational nature of the lesson.
- Use as an additional practice.
- Use as homework for second-day teaching.

Homework Practice

- Mimics the types of problems found in the Practice and Problem Solving of the Student Edition.
- Use as an additional practice.
- Use as homework for second-day teaching.

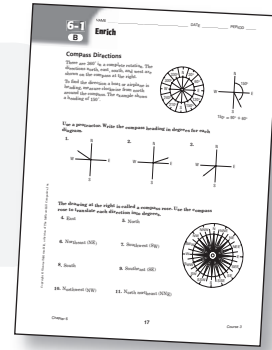
Problem-Solving Practice

- Includes word problems that apply the concepts of the lesson.
- Use as an additional practice.
- Use as homework for second-day teaching.



Enrich

- Provides an extension of the concepts, offers a historical or multicultural look at the concepts, or widens students' perspectives on the mathematics.
- For use with all levels of students.



Technology Activities

- Presents ways in which technology can be used with the concepts in some of the lessons.
- Use as an alternative approach to teaching the concept.
- Use as part of the lesson presentation.

Assessment Resources

Reflecting on Chapter 6

- Three open-ended questions
- Allows students to write about mathematics.



Chapter Quizzes

- Free-response questions
- One quiz for each multi-part lesson

Vocabulary Test

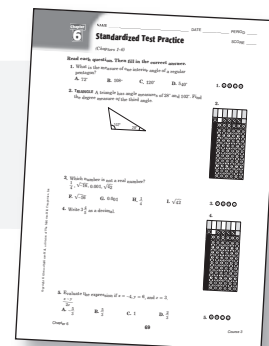
- Includes a list of vocabulary words and questions to assess students' knowledge of those words.
- Use in conjunction with one of the Chapter Tests.

Chapter Tests

- **AL** 1A-1B Approaching-level students
 - Contains multiple choice questions.
- 2A-2B On-level students
 - Contains both multiple-choice and free-response questions.
- **BL** 3A-3B Beyond-level students
 - Contains free response questions.
- Tests A and B are the same format with different numbers.
- Use when students are absent or for different rows.

Standardized Test Practice

- Test is cumulative.
- Includes multiple-choice and short-response questions.



Extended-Response Test

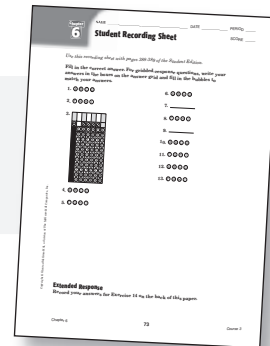
- Contains performance-assessment tasks
- Sample answers are included.

Extended-Response Rubric

- The scoring rubric for the Extended-Response Test.

Student Recording Sheet

- Corresponds with the Test Practice at the end of the Student Edition chapter.



Chapter Project Rubric

- The scoring rubric for the Chapter Project found in the Teacher Edition.

Answers

Chapter and Lesson Resources

- Chapter Resources, Facts Practice, and Lesson Resources are provided as reduced pages with answers appearing in black.

Assessments

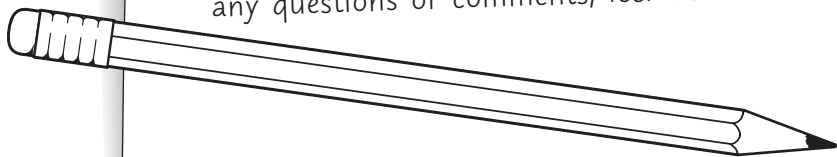
- Full-size answer keys are provided for the assessment masters.

Family Letter

Dear Parent or Guardian:

Today we began **Chapter 6: Angles and Lines**. In this chapter, your student will learn how to classify and determine the measure of angles and how angles relate to triangles, quadrilaterals, and other polygons. Included in this letter are key vocabulary words and activities you can do with your student. You may also wish to log on to glencoe.com for other study help. If you have any questions or comments, feel free to contact me at school.

Sincerely,



Key Vocabulary

acute angle An angle with a measure less than 90° .

adjacent angles Two angles that share a common vertex, a common side, and do not overlap.

angle A figure formed by two rays that share a common endpoint.

interior angle The angle that lies inside a polygon.

obtuse angle An angle with a measure between 90° and 180° .

polygon A simple, closed figure formed by three or more line segments.

regular polygon A polygon that is equilateral and equiangular.

right angle An angle with a measure of exactly 90° .

straight angle An angle with a measure of exactly 180° .

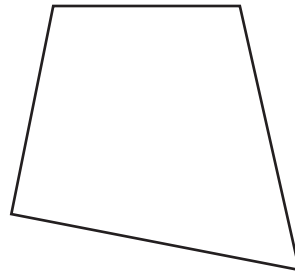
vertical angles Opposite angles formed by the intersection of two lines.

At-Home Activities

Hands-On Activity

Materials: paper, pencil, ruler, protractor

- Use the ruler to draw several different types of quadrilaterals on a piece of paper. For example, rectangles, squares, trapezoids, and parallelograms.
- Use the protractor to measure the angles of each quadrilateral.
- Record each angle measure.
- Find the sum of the angle measures of each quadrilateral. Record each sum.
- What do you notice about the sum of the angle measures of each quadrilateral?



Real-World Activity

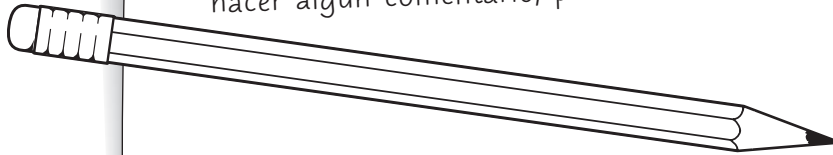
- Visit a playground or other public park that has a fence.
- Find parallel lines in the fence.
- Find another line, a *transversal*, that crosses the parallel lines.
- Estimate the measure of the angles formed by the parallel lines and the transversal.
- Discuss the relationship among the different angles.
- Find several other examples of parallel lines and transversals and repeat the previous two steps.

Carta a la familia

Estimado padre o apoderado:

Hoy comenzamos el **Capítulo 6: Ángulos y rectas**. En este capítulo, su estudiante aprenderá a clasificar y a determinar las medidas de ángulos y cómo se relacionan los ángulos con los triángulos, los cuadriláteros y otros polígonos. En esta carta se incluyen palabras del vocabulario clave y actividades que pueden realizar con su estudiante. Si desean obtener más ayuda para el estudio, visiten glencoe.com. Si tienen alguna pregunta o desean hacer algún comentario, pueden contactarme en la escuela.

Sinceramente,



Vocabulario clave

ángulo agudo Ángulo que mide menos de 90° .

ángulos adyacentes Dos ángulos que comparten un vértice común, un lado común y no se superponen.

ángulo Figura formada por dos rayos que comparten un extremo común.

ángulo interno Ángulo que yace dentro de un polígono.

ángulo obtuso Ángulo que mide entre 90° y 180° .

polígono Figura simple y cerrada formada por tres o más segmentos de recta.

polígono regular Polígono equilátero y equiangular.

ángulo recto Ángulo que mide exactamente 90° .

ángulo llano Ángulo que mide exactamente 180° .

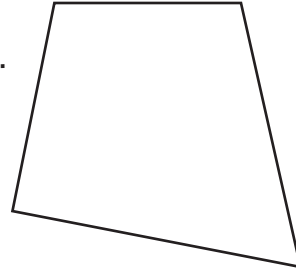
ángulos opuestos por el vértice Ángulos opuestos formados por la intersección de dos rectas.

Actividades para el hogar

Actividad manual

Materiales: papel, lápiz, regla, transportador

- Usen la regla para trazar distintos tipos de cuadriláteros en un trozo de papel. Por ejemplo, rectángulos, cuadrados, trapecios y paralelogramos.
- Usen el transportador para medir los ángulos de cada cuadrilátero.
- Anoten la medida de cada ángulo.
- Calculen la suma de las medidas de los ángulos de cada cuadrilátero. Anoten cada suma.
- ¿Qué observan acerca de la suma de las medidas de los ángulos de cada cuadrilátero?



Actividad concreta

- Visiten un patio de recreo o cualquier parque público que esté cercado.
- Hallen las rectas paralelas en el cercado.
- Hallen otra recta, una transversal, que atraviese las rectas paralelas.
- Estimen la medida de los ángulos formados por las rectas paralelas y la transversal.
- Comenten la relación entre los distintos ángulos.
- Hallen otros ejemplos de rectas paralelas y transversales y repitan los dos pasos anteriores.

Are You Ready for Chapter 6?

Practice

Solve each equation.

1. $23 + a + 140 = 180$

1. _____

2. $s + 78 + 53 = 180$

2. _____

3. $114 + 63 + j = 180$

3. _____

4. $34 + 99 + 120 + z = 360$

4. _____

5. $142 + \ell + 55 + 107 = 360$

5. _____

6. $87 + 57 + b + 139 = 360$

6. _____

7. **BABYSITTING** Dell made \$45 on Friday and \$62 on Saturday for watching his nephews. How much did he make on Sunday if his three-day total was \$180?

7. _____

8. **TICKETS** The table shows the number of tickets to the football game Anaclaudia sold at the end of the week.

Day	Tickets
Wednesday	14
Thursday	78
Friday	112

8. _____

If she sold 360 tickets altogether, how many did she sell at the beginning of the week?

Evaluate each expression.

9. $(4 - 3)180$

9. _____

10. $(9 - 3)180$

10. _____

11. $(14 - 3)180$


11. _____

12. $(25 - 3)180$

12. _____

13. **NUMBER SENSE** Find the product of the difference of 5 and 3 and 180.

13. _____

 **Get Connected** For more examples, go to glencoe.com.

Are You Ready for Chapter 6?

Review

Evaluate expressions.

Use order of operations.

1. Evaluate everything in the parentheses first.
2. Add and subtract in order from left to right.
3. Multiply and divide in order from left to right

Example 1 Evaluate $(7 - 4)180$.

$$\begin{aligned} (7 - 4)180 &= (3)180 && \text{Subtract 4 from 7.} \\ &= 540 && \text{Multiply.} \end{aligned}$$

Example 2 Evaluate $(10 - 4)180$.

$$\begin{aligned} (10 - 4)180 &= (6)180 && \text{Subtract 4 from 10.} \\ &= 1,080 && \text{Multiply.} \end{aligned}$$

Exercises

Evaluate each expression.

- | | |
|----------------------|-----------|
| 1. $(5 - 4)180$ | 1. _____ |
| 2. $(9 - 4)180$ | 2. _____ |
| 3. $(12 - 4)180$ | 3. _____ |
| 4. $(14 + 4)8$ | 4. _____ |
| 5. $6(9 - 4)$ | 5. _____ |
| 6. $(21 - 4)180$ | 6. _____ |
| 7. $(25 - 4)180$ | 7. _____ |
| 8. $(10 - 2) \div 4$ | 8. _____ |
| 9. $5(9 + 3)$ | 9. _____ |
| 10. $3(12 - 4)$ | 10. _____ |

Are You Ready for Chapter 6?

Apply

<p>1. WOODWORKING Aponi is making a wooden picture frame. The pieces of raw wood she has are 88 centimeters, 70 centimeters, and 76 centimeters. If the total length of all of the wood is 360 centimeters, how long is the fourth piece?</p>	<p>2. BAKING Ernesto is making fruit pies. He has 47 strawberries, 38 blueberries, and some number of gooseberries. If Ernesto has 180 total berries, how many gooseberries does he have?</p>
<p>3. TRACK Ruben is doing wind sprints. In the morning he ran sets of 50 feet, 60 feet, and 70 feet. If he ran a total of 360 feet, how much further did he run that day?</p>	<p>4. NUMBER SENSE Find the product of the difference of 8 and 4 and 120.</p>
<p>5. HOT DOGS Jolene is selling hot dogs at the school soccer game. Each case contains 300 hot dogs. If Jolene started with 4 cases and has emptied 2 of them, how many total hot dogs does she have left?</p>	<p>6. CHEERLEADING At the state cheerleading finals, the teams are put into groups of 180 participants. If the competition started with 7 groups, and 2 groups were eliminated after the first round, how many participants are going to the second round?</p>

Diagnostic Test

Solve each equation.

1. $34 + a + 131 = 180$

2. $s + 67 + 42 = 180$

3. $125 + 24 + j = 180$

4. $23 + 88 + 131 + z = 360$

5. $153 + \ell + 44 + 96 = 360$

6. $76 + 68 + b + 150 = 360$

7. **CLOTHES** Fen buys a new outfit for school. The jacket costs \$115, the shirt costs \$42, and the pants cost \$50. If he spent \$360 on the outfit, how much did the shoes cost?

8. **GRADES** The table shows the average grades on the first three science tests.

Test	Average
First	92
Second	88
Third	90

If the total of the averages is 360, what was the average of the fourth test?

Evaluate each expression.

9. $(6 - 4)180$

10. $(12 - 4)180$

11. $(14 - 4)180$

12. $(20 - 4)180$

13. **NUMBER SENSE** Find the product of the difference of 7 and 4 and 180.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____

11. _____

12. _____

13. _____

Pretest

Classify each angle measure below as *acute*, *right*, *obtuse*, or *straight*.

1. 84°

1. _____

2. 114°

2. _____

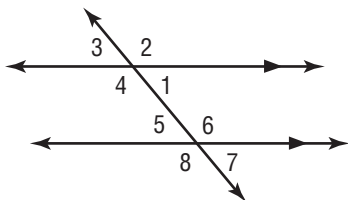
3. 90°

3. _____

4. 180°

4. _____

For Exercises 5 and 6, use the figure below.



5. If $m\angle 2 = 110^\circ$, find $m\angle 8$.

5. _____

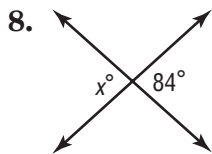
6. If $m\angle 5 = 70^\circ$, find $m\angle 7$.

6. _____

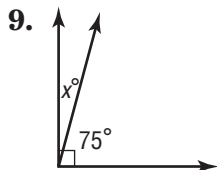
7. **RIGHT TRIANGLE** A right triangle has an acute angle that measures 42° . What are the measures of the other angles?

7. _____

Find the value of x in each figure.



8. _____



9. _____

10. **POLYGONS** Draw a figure that is not a polygon. Then explain how you know.

10. _____

Student Glossary

This is an alphabetical list of new vocabulary terms you will learn in Chapter 6. Fold the page vertically and use it as a bookmark. As you study the chapter, write each term's definition or description in as few words as possible.

Vocabulary Word	Definition/Description/Example
acute angle	
adjacent angles	
corresponding angles	
interior angle	
obtuse angle	
polygon	
regular polygon	
right angle	
straight angle	
vertical angles	

Fold over

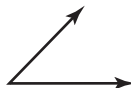
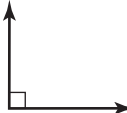
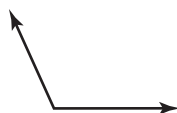
Facts Practice

Find the value of x .

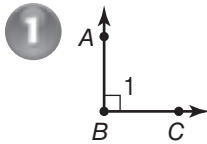
1. $x + 78 = 90$	2. $23 + x = 90$	3. $x + 88 = 90$	4. $44 + x = 90$
5. $x + 112 = 180$	6. $14 + x = 180$	7. $x + 150 = 180$	8. $36 + x = 180$
9. $x + 22 + 78 = 180$	10. $90 + x + 45 = 180$	11. $111 + 23 + x = 180$	12. $x + 2x + 30 = 180$
13. $50 + 2x + 80 = 180$	14. $72 + 4x + 2x = 180$	15. $x + 45 + 45 + 135 = 360$	16. $33 + x + 77 + 100 = 360$
17. $82 + 67 + x + 90 = 360$	18. $93 + 18 + 116 + x = 360$	19. $x + x + x + x = 360$	20. $3x + 2x + 4x + x = 360$

Reteach**Classify Angles**

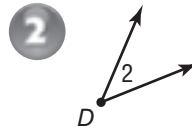
- An angle is formed by two rays that share a common endpoint called the vertex.
- An angle can be named in several ways. The symbol for angle is \angle .
- Angles are classified according to their measure. Two angles that have the same measure are said to be **congruent**.
- Two angles are **vertical** if they are opposite angles formed by the intersection of two lines. Vertical angles are congruent.
- Two angles are **adjacent** if they share a common vertex, a common side, and do not overlap.

Acute Angleless than 90° **Right Angle**exactly 90° **Obtuse Angle**between 90° and 180° **Straight Angle**exactly 180° **Examples**

Name each angle below. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.



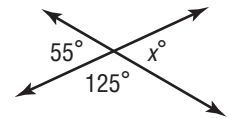
Use the vertex as the middle letter and a point from each side, $\angle ABC$, $\angle CBA$, or use the vertex or the number only, $\angle B$ or $\angle 1$. The angle is 90° , so it is a right angle.



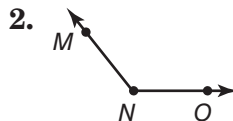
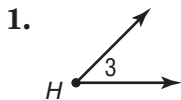
Use the vertex or the number only, $\angle D$ or $\angle 2$. The angle is less than 90° , so it is an acute angle.

3 **What is the value of x in the figure at the right?**

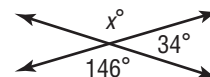
The angle labeled x° and the angle labeled 55° are vertical angles. Since vertical angles are congruent, the value of x is 55.

**Exercises**

Name each angle. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.



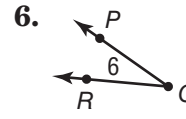
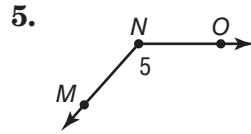
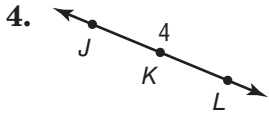
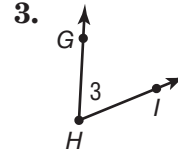
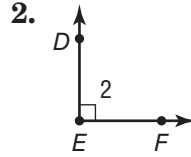
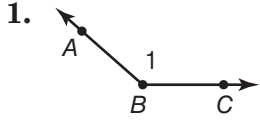
4. Find the value of x in the figure at the right.



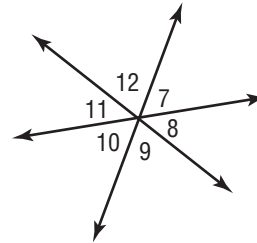
Skills Practice

Classify Angles

Name each angle in four ways. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.

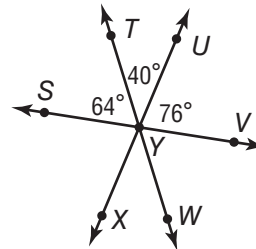


Refer to the diagram at the right. Identify each angle pair as *adjacent*, *vertical*, or *neither*.



- | | |
|-------------------------------|---------------------------------|
| 7. $\angle 7$ and $\angle 12$ | 8. $\angle 8$ and $\angle 11$ |
| 9. $\angle 7$ and $\angle 10$ | 10. $\angle 9$ and $\angle 11$ |
| 11. $\angle 8$ and $\angle 9$ | 12. $\angle 10$ and $\angle 12$ |

Refer to the figure at the right to determine the measure of each given angle.



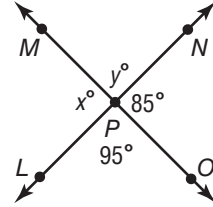
- | | |
|------------------|------------------|
| 13. $\angle SYX$ | 14. $\angle XYW$ |
| 15. $\angle WYV$ | 16. $\angle SYW$ |
| 17. $\angle TYX$ | 18. $\angle VYX$ |

Homework Practice

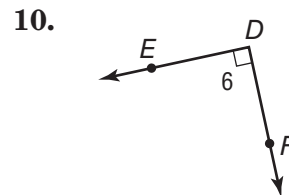
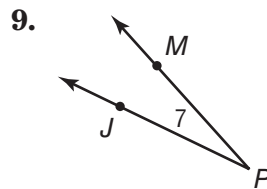
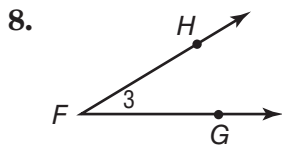
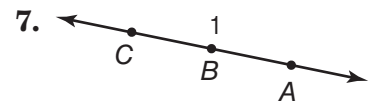
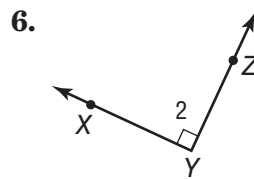
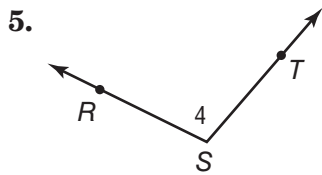
Classify Angles

Use the figure at the right to answer Exercises 1–4.

1. Name two angles that are vertical.
2. Name two angles that are adjacent.
3. Find the value of x .
4. Find the value of y .

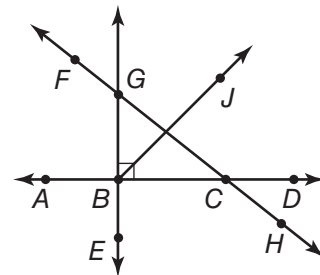


Name each angle in four ways. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.



Use the figure at the right to name the following.

11. two acute angles
12. two straight angles
13. two right angles
14. two obtuse angles



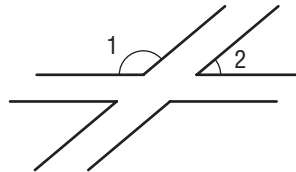
Get Connected For more examples, go to glencoe.com.

Problem-Solving Practice**Classify Angles**

- 1. CLOCKS** The time shown on the clock is 11:05. Starting at this time, approximately what time will it be when the hands form an obtuse angle?



- 2. AIRPORT** The runways at a local airport are sketched in the figure. Classify $\angle 1$ and $\angle 2$ as *acute*, *obtuse*, *right*, or *straight*.



- 3. ALPHABET** Which of the following letters contain at least one acute angle? Which contain vertical angles? Which contain adjacent angles?

A E L X

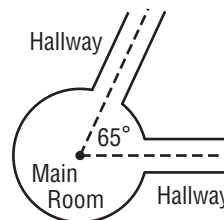
- 4. CLOCKS** The time shown on the clock is 12:07. After 20 minutes have gone by, will the angle formed by the hour and minute hands be *acute*, *obtuse*, *right*, or *straight*?



- 5. BALLET** When a ballet dancer's feet are in first position, the heels are touching, and the feet are turned out. A dancer with excellent technique can position his or her feet so that they are nearly in a straight line. Isabella is practicing her technique. Classify the angle her feet form as *acute*, *obtuse*, or *right*.



- 6. ARCHITECTURE** The plans for a new aquarium call for several hallways of exhibits leading out of a circular main room. Because of the size of the tanks that will be used, the angle formed between two adjacent hallways can be no smaller than 65° . What is the maximum number of hallways that can be built leading out of the main room?



TI-84 Plus Activity**Draw Angles**

You can use the Cabri Jr. application to draw and measure angles.

Example Draw and measure a 28° angle.

Step 1: Press **APPS** and choose **Cabri Jr.**

Step 2: Press **WINDOW** to get the Object Tools menu. Arrow down to **Segment** and press **ENTER**. Move the cursor to one point and press **ENTER**. Move to another point and press **ENTER**. Draw a second segment to intersect with the first to create an angle. Press **CLEAR** to disable the Segment tool.

Step 3: Press **GRAPH** to get the Display and Measurement Tools. Arrow down to **Measure** and arrow over to **Angle** and press **ENTER**. Select one point on one line, the vertex, and then a point on the other line. Points will blink when selected.

Step 4: Select an endpoint and press **ALPHA**. Drag the point until the angle measure is 28° . Press **CLEAR** to disable the Measurement tool.

Exercises

Draw each angle by following the steps above. Sketch the angle below. Then classify each angle as *acute*, *right*, *obtuse*, or *straight*.

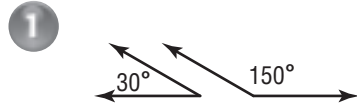
1. 10° 2. 15° 3. 45° 4. 90° 5. 114° 6. 180°

Reteach

Complementary and Supplementary Angles

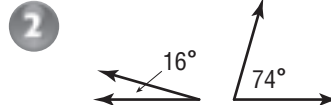
- Two angles are **complementary** if the sum of their measures is 90° .
- Two angles are **supplementary** if the sum of their measures is 180° .

Examples Identify each pair of angles as *complementary*, *supplementary*, or *neither*.



$$30^\circ + 150^\circ = 180^\circ$$

The angles are supplementary.

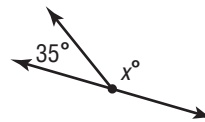


$$16^\circ + 74^\circ = 90^\circ$$

The angles are complementary.

Example 3 ALGEBRA Find the value of x .

Since the two angles are supplementary, the sum of their measures is 180° .



$$x + 35 = 180$$

Write the equation.

$$\begin{array}{r} x + 35 = 180 \\ - 35 \quad -35 \\ \hline x \quad = 145 \end{array}$$

Subtract 35 from each side.

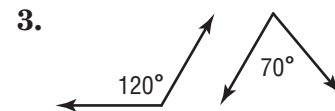
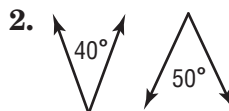
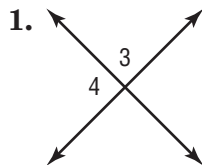
$$x = 145$$

Simplify.

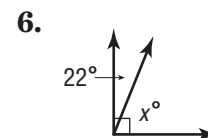
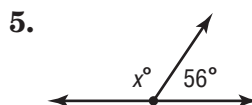
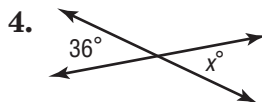
So, the value of x is 145.

Exercises

Identify each pair of angles as *complementary*, *supplementary*, or *neither*.



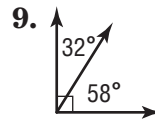
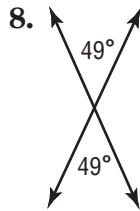
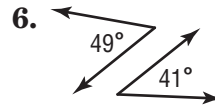
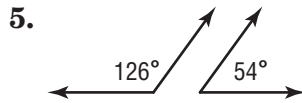
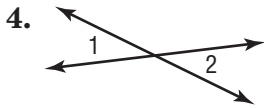
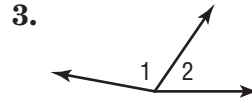
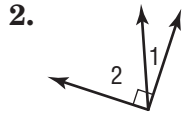
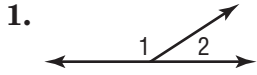
ALGEBRA Find the value of x in each figure.



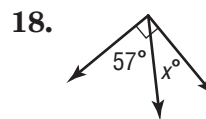
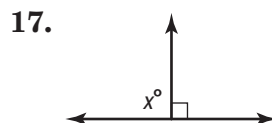
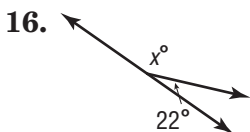
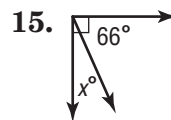
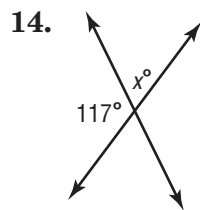
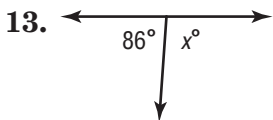
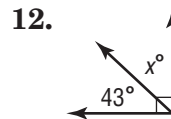
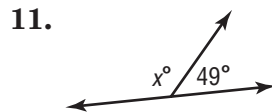
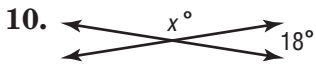
Skills Practice

Complementary and Supplementary Angles

Identify each pair of angles as *complementary*, *supplementary*, or *neither*.



ALGEBRA Find the value of x in each figure.

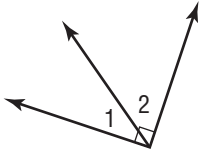


Homework Practice

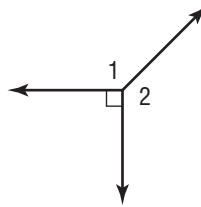
Complementary and Supplementary Angles

Classify each pair of angles as *complementary*, *supplementary*, or *neither*.

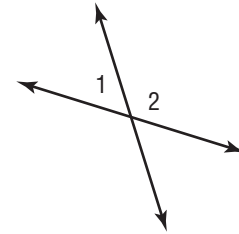
1.



2.

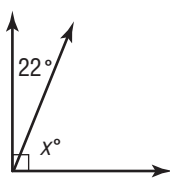


3.

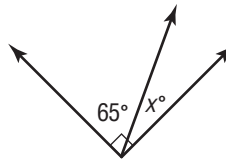


ALGEBRA Find the value of x in each figure.

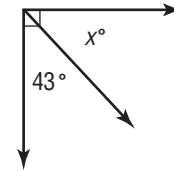
4.



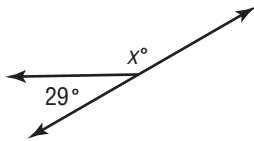
5.



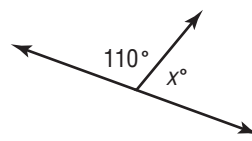
6.



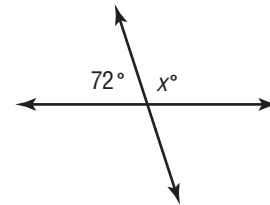
7.



8.

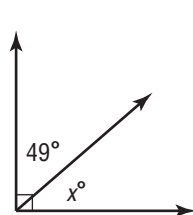


9.

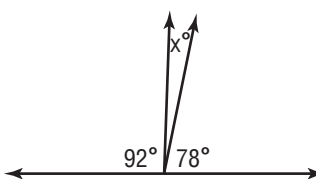


ALGEBRA Find the value of x in each figure.

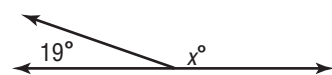
10.



11.



12.



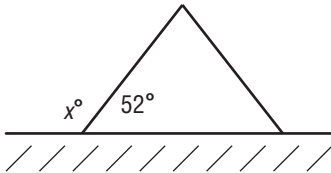
13. **ALGEBRA** If $\angle C$ and $\angle D$ are supplementary, and the measure of $\angle D$ is 45° , what is the measure of $\angle C$?

Get Connected For more examples, go to glencoe.com.

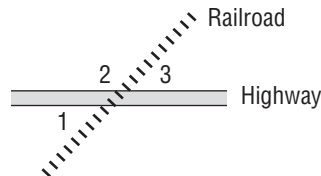
Problem-Solving Practice

Complementary and Supplementary Angles

- 1. PYRAMIDS** A side view of the Great Pyramid at Giza is shown below. The sides of the pyramid make an angle of 52° with respect to the ground. What is the value of x ?

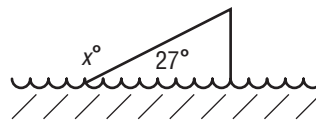


- 2. RAILROAD** A map shows a railroad crossing a highway, as shown below. Which of the numbered angles are supplementary angles?

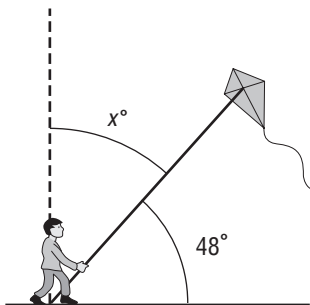


- 3. RAILROAD** Refer to the map shown in Exercise 2. If $m\angle 1$ is 64° , what is the measure of $\angle 2$?

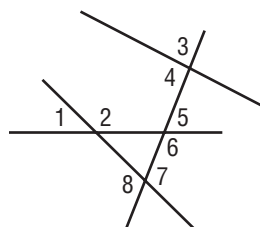
- 4. SKIING** A ski jump makes an angle of 27° with respect to the water as shown below. How are the 27° angle and the unknown angle related? What is the value of x ?



- 5. KITES** A kite string makes an angle of 48° with respect to the ground as shown below. The dashed line is vertical and the ground is horizontal. How are the 48° angle and the unknown angle related? What is the value of x ?



- 6. GAMES** In a game of pick-up-sticks, the last 4 sticks are shown below. Which of the numbered angles are supplementary angles?



Enrich**Classify or Give the Angle!**

You already know that the complement of an angle and the original angle add up to 90° and that the supplement of an angle and the original angle add up to 180° . You can use or combine these ideas to learn more about complements and supplements.

For Exercise 1–5, answer *acute, right, obtuse, or straight*. (Hint: There may be more than one answer.)

1. I am an angle that has no complement. What type of angle am I?
2. I am an angle that is congruent to my complement. What type of angle am I?
3. I am an angle that is congruent to my supplement. What type of angle am I?
4. I am an angle that has so supplement. What type of angle am I?
5. I have a complement and I have a supplement. What type of angle am I?

For Exercises 6–9, use the *guess, check, and revise* strategy to find the angle measure.

6. My complement is 40° more than I am. What is my measure?
7. The measure of my complement plus the measure of my supplement gives me a straight angle. What is my measure?
8. My measure is four times the measure of my complement. What is my measure?
9. Five times my measure is the same as my supplement. What is my measure?

Reteach**Problem-Solving Investigation: Use Logical Reasoning**

You may need to use logical reasoning to solve some problems.

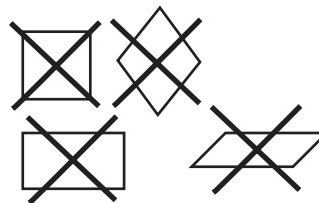
Understand	• Determine what information is given in the problem and what you need to find.
Plan	• Select a strategy including a possible estimate.
Solve	• Solve the problem by carrying out your plan.
Check	• Examine your answer to see if it seems reasonable.

Example

A plane figure has four sides. The figure has only two congruent sides and two pairs of congruent angles. Is the figure a square, rectangle, parallelogram, rhombus, or trapezoid? Did you use deductive or inductive reasoning?

Understand You know that a plane figure has four sides and the figure has only two congruent sides and two pairs of congruent angles. We need to see if the figure is a square, rectangle, parallelogram, rhombus, or trapezoid.

Plan Look at the characteristics of these different figures. A square or rhombus has *four* congruent sides. The figure is not a square or a rhombus. A rectangle or parallelogram has *two* pairs of congruent sides. The figure is not a rectangle or a parallelogram.



Solve An isosceles trapezoid can have two congruent sides and two pairs of congruent angles. The figure could be a trapezoid.

Check Since all choices but the trapezoid were eliminated, the figure is a trapezoid. Because you used existing rules about four-sided figures to make a decision, you used deductive reasoning.

Exercises

For Exercises 1 and 2, solve each problem using logical reasoning.

- GEOMETRY** Jennifer draws a square on a piece of paper and uses a ruler to draw one line through the square to create two shapes. What is the maximum number of sides that either of these shapes can have, and how would the line have to be drawn to create it?
- MODELS** You have 30 toothpicks. You can add two adjacent squares horizontally using 7 toothpicks if the adjacent square shares a toothpick for the side between them. How many total squares could be created this way with 30 toothpicks, if the squares are formed in a row?

Skills Practice**Problem-Solving Investigation: Use Logical Reasoning**

For Exercises 1–6, state whether the example uses *deductive* reasoning or *inductive* reasoning.

1. After checking the house numbers on several streets in your neighborhood, you discover that houses that face north always have an odd house number.
2. You determine the type of shape that a sticker is by examining its sides and angles.
3. You place students in order from lowest grade on a math test to highest grade to compare their scores.
4. You roll a number cube 1,000 times and discover that it lands on the number 4 twice as many times as the number 1.
5. You find a way to use 2 larger containers to measure out the exact amount for a smaller container.
6. You determine what types of shapes will be created by connecting the corners of a regular hexagon.

For Exercises 7–10, solve each problem using logical reasoning.

7. Use a 5-liter container and a 3-liter container to measure out 4 liters of water into a third container.
8. How can you create two right triangles and an isosceles trapezoid by drawing two straight lines through a square?
9. How can you arrange four squares with 6-inch sides to create a figure with a perimeter of 48 inches?
10. Use a 7-inch-long craft stick and a 4-inch-long eraser to draw a 10-inch line.

Homework Practice**Problem-Solving Investigation: Use Logical Reasoning****Mixed Problem Solving**

Use logical reasoning to solve Exercises 1 and 2.

1. **NUMBER SENSE** Simplify each product of powers. Then use logical reasoning to simplify $10^4 \times 0.1^4$, $10^5 \times 0.1^5$, and $10^{12} \times 0.1^{12}$.

Product of Powers	Simplified Form
$10^2 \times 0.1^2$	
$10^3 \times 0.1^3$	
$10^7 \times 0.1^7$	

2. **MEASUREMENT** You have a pen that is 6 inches long and a pencil that is 7 inches long. Explain how you can use the pen and pencil to draw a line segment that is 3 inches long.

Use any strategy to solve Exercises 3–6. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES

- Use logical reasoning.
- Look for a pattern.
- Guess, check, and revise.
- Choose an operation.

3. **SPORTS** At the end of a baseball game, the winning team had three more runs than their opponents. If they had scored 1 more run, they would have had twice as many as their opponents. How many runs did each team have?
4. **SHOPPING** Brittany bought five items at the grocery store for her mother. From the given clues, list the items from least expensive to most expensive.
- The peanut butter cost less than the sliced turkey.
 - The sliced turkey cost half as much as the birthday cake.
 - The peanut butter cost \$0.20 more than the milk.
 - The price of the lettuce was 40% of the price of the milk.
5. **SOLAR SYSTEM** Jupiter is the largest planet in the solar system with a diameter of 88,736 miles. Saturn is the second largest planet with a diameter of 74,978 miles. How much greater is the diameter of Jupiter than the diameter of Saturn?
6. **TRAVEL** Mr. Bradley often flies from Chicago to San Francisco and back again, a total distance of 3,716 miles. If he made this trip 25 times last year, find the total distance Mr. Bradley traveled on these trips.

Problem-Solving Practice**Problem-Solving Investigation: Use Logical Reasoning**

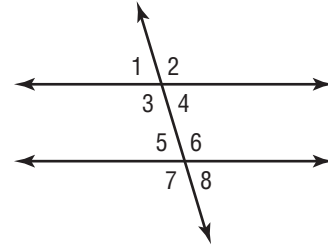
Solve each problem using logical reasoning.

<p>1. GEOMETRY A solid figure has two triangular faces and three square faces. Is the figure a pyramid, a triangular prism, or a cube? Explain.</p>	<p>2. MEASUREMENT Can you use a 4-pint container and a 9-pint container to fill a 10-pint container? Explain.</p>
<p>3. MONEY After a visit to the mall, Ray and Mary counted their money to see how much they had left. Ray said, "If I had \$8 more, I would have as much as you." Mary replied, "If I had \$8 more, I would have twice as much as you." How much money does each person have? Explain.</p>	<p>4. SPORTS Wade, Rich, Sue, Destin, and Tracey were the first five finishers of a race. From the given clues, state the order in which they finished: Rich finished behind Destin, Sue was fifth, Tracey finished ahead of Wade, and Destin finished behind Wade.</p>
<p>5. NUMBER SENSE The sum of two numbers is equal to 15. The product of the numbers is 44. What are the two numbers?</p>	<p>6. GEOMETRY A regular hexagon has 6 hexagons surrounding it. Each of the 6 hexagons shares a side with the middle hexagon and with the hexagon next to it. If each of the hexagons has 2-inch sides, what is the perimeter of the figure?</p>

Explore

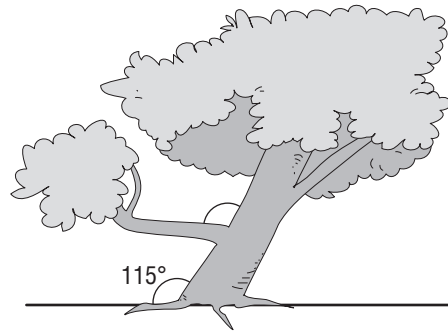
Parallel Lines

If the measure of $\angle 4$ in the figure at the right is 80° , determine the measure of each given angle without using a protractor. Then check your conjecture by measuring with a protractor.

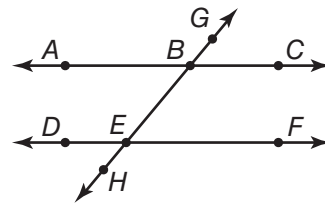


- 1. $\angle 1$
- 2. $\angle 2$
- 3. $\angle 3$
- 4. $\angle 5$
- 5. $\angle 6$
- 6. $\angle 7$
- 7. $\angle 8$

8. **TREES** A tree in the park is growing at an angle of 115° from the ground. The tree has one branch parallel to the ground. What angle does the branch make with the tree? How do you know?



Draw a diagram to match the following characteristics: lines AC and DF are parallel lines, line GH intersects both lines, point B is where lines AC and GH intersect, point E is where lines DF and GH intersect. If $m\angle GBC$ is 50° , find the measure of each angle.



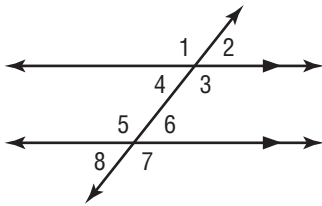
- 9. $\angle CBE$
- 10. $\angle BEF$
- 11. $\angle FEH$
- 12. $\angle GBA$
- 13. $\angle ABE$
- 14. $\angle BED$
- 15. $\angle DEH$

Reteach

Lines

- **Perpendicular lines** are lines that intersect at right angles.
- **Parallel lines** are two lines in a plane that never intersect or cross.
- A line that intersects two or more other lines is called a **transversal**.
- If the two lines cut by a transversal are parallel, then these are special pairs of angles are congruent: **alternate interior angles, alternate exterior angles, and corresponding angles.**

Example 1 Classify $\angle 4$ and $\angle 8$ as *alternate interior*, *alternate exterior*, or *corresponding*.



$\angle 4$ and $\angle 8$ are in the same position in relation to the transversal on the two lines. They are corresponding angles.

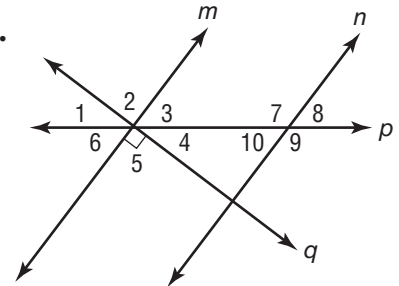
Example 2 Refer to the figure in Example 1. Find $m\angle 2$ if $m\angle 8 = 58^\circ$.

Since $\angle 2$ and $\angle 8$ are alternate exterior angles, $m\angle 2 = 58^\circ$

Exercises

In the figure at the right, lines m and line n are parallel. If $m\angle 3 = 64^\circ$, find each given angle measure. Justify each answer.

1. $m\angle 8$
2. $m\angle 10$
3. $m\angle 4$
4. $m\angle 6$

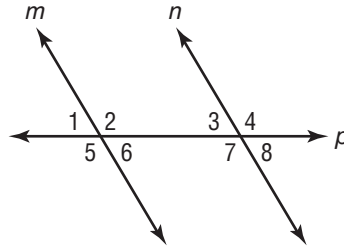


Skills Practice

Lines

For Exercises 1–12, use the figure at the right. In the figure, line m is parallel to line n .

Classify each pair of angles as *alternate interior*, *alternate exterior*, or *corresponding*.



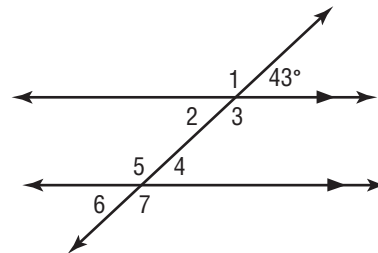
1. $\angle 1$ and $\angle 8$
2. $\angle 5$ and $\angle 7$
3. $\angle 3$ and $\angle 6$
4. $\angle 2$ and $\angle 4$
5. $\angle 2$ and $\angle 7$
6. $\angle 4$ and $\angle 5$

If $m\angle 4 = 122^\circ$, find each given angle measure. Justify your answer.

7. $m\angle 8$
8. $m\angle 5$
9. $m\angle 2$
10. $m\angle 1$
11. $m\angle 6$
12. $m\angle 7$

For Exercises 13 and 14, use the figure at the right.

13. List all the angles congruent to the given angle. Explain your reasoning.



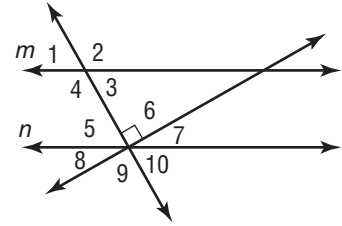
14. List all the angles congruent to $\angle 5$. Explain your reasoning.

Homework Practice**Lines**

For Exercises 1–6, use the figure at the right. In the figure, line m is parallel to line n .

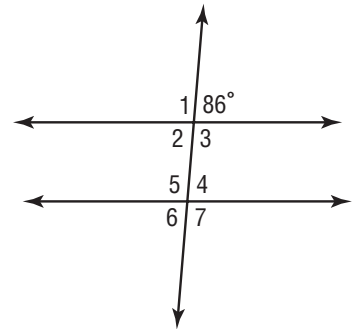
List all pairs of each type of angle.

- vertical
- complementary
- supplementary
- corresponding
- alternate interior
- alternate exterior



Use the figure at the right for Exercises 7–10.

- Find the measure of $\angle 2$. Explain your reasoning.
- Find the measure of $\angle 3$. Explain your reasoning.
- Find the measure of $\angle 4$. Explain your reasoning.
- Find the measure of $\angle 6$. Explain your reasoning.
- ALGEBRA** Angles A and B are corresponding angles. If $m\angle A = 4x$ and $m\angle B = 3x + 7$, find the value of x . Explain
- ALGEBRA** Angles G and H are supplementary and congruent. If $\angle G$ and $\angle H$ are alternate interior angles, what is the measure of each angle?



Get Connected For more examples, go to glencoe.com.

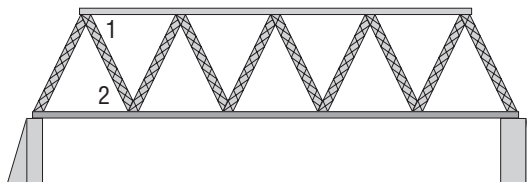
Problem-Solving Practice

Lines

- 1. SYMBOLS** The symbol below is an equal sign with a slash through it. It is used to represent *not equal to* in math, as in $1 \neq 2$. If $m\angle 1 = 108^\circ$, classify the relationship between $\angle 1$ and $\angle 2$. Then find $m\angle 2$. Assume the equal sign consists of parallel lines.

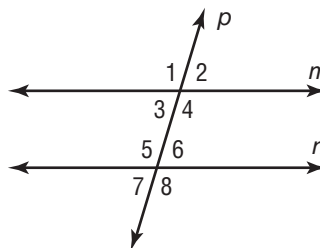


- 2. BRIDGE** Arturo is designing a bridge for science class using parallel supports for the top and bottom beam. Find $m\angle 2$ if $m\angle 1 = 60^\circ$.



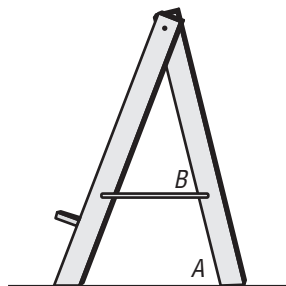
- 3. LEG LIFTS** For cheerleading practice, Kiara must be able to lift her legs so that they are parallel to her outstretched arms. For each side of her body, what relationship between the angle formed by her arms and the floor and the angle formed by her legs and the floor?

- 4. ALGEBRA** In the figure, line m is parallel to line n . If $m\angle 3 = 7x - 10$ and $m\angle 6 = 5x + 10$, What is the measure of $\angle 3$ and $\angle 6$?



- 5. ALGEBRA** Refer to the figure in Exercise 4. If $m\angle 1 = 4x + 40$, and $m\angle 5 = 120^\circ$, what is the value of x ?

- 6. ART** The drawing below shows the side view of a drawing easel. The brace is parallel to the ground. If $m\angle A$ is 82° , what is the measure of $\angle B$?

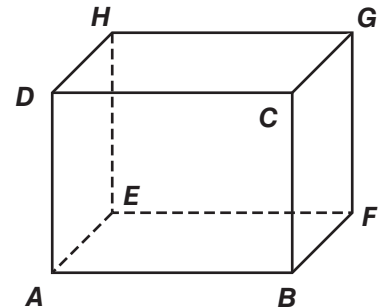


Enrich

Lines and Angles in Space

In a plane, two lines are either parallel or intersecting. In *space*, there are three possibilities: parallel, **intersecting**, or **skew**. Imagine holding two yardsticks in the air and that the lines created by the sticks extend forever in both directions. You could hold the sticks so that the lines meet or do not meet. If the lines ever meet, they are intersecting. If they do not intersect, they are either parallel or skew. If they are oriented in the same direction, they are parallel. If lines do not intersect and are not parallel, they are skew.

Imagine that the figure to the right is a cubic room with a floor, ceiling, and four walls. Each corner is labeled with a letter for reference. The line segments that form the edges of the room are each contained in a line.



\overleftrightarrow{AB} and \overleftrightarrow{HG} are parallel.

Lines AB and HG can be written as \overleftrightarrow{AB} and \overleftrightarrow{HG} .

\overleftrightarrow{BC} and \overleftrightarrow{HG} are skew.

Lines BC and HG can be written as \overleftrightarrow{BC} and \overleftrightarrow{HG} .

\overleftrightarrow{AB} and \overleftrightarrow{BC} are intersecting.

Lines AB and BC can be written as \overleftrightarrow{AB} and \overleftrightarrow{BC} .

Refer to the figure above for Exercises 1–14. Determine if the lines are *parallel*, *intersecting*, or *skew*.

1. \overleftrightarrow{CD} and \overleftrightarrow{AB}

2. \overleftrightarrow{CD} and \overleftrightarrow{DH}

3. \overleftrightarrow{FG} and \overleftrightarrow{AB}

4. \overleftrightarrow{EH} and \overleftrightarrow{FG}

5. \overleftrightarrow{CD} and \overleftrightarrow{EH}

6. \overleftrightarrow{GH} and \overleftrightarrow{AD}

7. \overleftrightarrow{EH} and \overleftrightarrow{AE}

8. \overleftrightarrow{CD} and \overleftrightarrow{EF}

Find the measure of each angle.

9. $\angle DAB$

10. $\angle AFB$

11. $\angle CHE$

CHALLENGE Determine if the given lines would be *parallel*, *intersecting*, or *skew*.

12. \overleftrightarrow{CE} and \overleftrightarrow{GA}

13. \overleftrightarrow{GB} and \overleftrightarrow{DE}

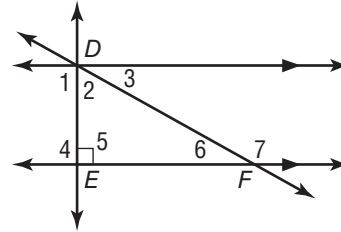
14. \overleftrightarrow{FH} and \overleftrightarrow{BD}

Explore

Triangles

For Exercises 1–5, use the figure at the right.

1. Classify the relationship between $\angle 1$ and $\angle 5$. What is true about this pair of angles?



2. Classify the relationship between $\angle 3$ and $\angle 6$. What is true about this pair of angles?

3. Is there a relationship between $\angle 2$ and $\angle 4$? Justify your answer.

4. What type of angle is formed by $\angle 1$, $\angle 2$, and $\angle 3$? What is the sum of the $m\angle 1$, $m\angle 2$, and $m\angle 3$?

5. What can you conclude about the sum of $m\angle 2$, $m\angle 5$, and $m\angle 6$? Explain your reasoning.

6. Use a sheet of paper for parts a and b.

- a. Draw three lines on the paper so that each line intersects the other two. What can you conclude about the sum of the measures of the three inside angles? Justify your answer.
- b. On the same sheet of paper, draw a new line that is parallel to one of the original lines, and intersects the other two lines. Does this new line help support your conclusion in Part a? Justify your answer.

Reteach

Triangles

- A **triangle** is formed by three line segments that intersect only at their endpoints.
- A point where the segments intersect is a **vertex** of the triangle.
- Every triangle also has three angles. The sum of the measure of the angles is 180° .
- All triangles have at least two acute angles. Triangles can be classified by the measure of its third angle: *acute*, *right*, or *obtuse*.
- Another way to classify triangles is by their sides: *scalene*, *isosceles*, or *equilateral*.

Example 1 Find the value of x in $\triangle ABC$.

$$x + 66 + 52 = 180$$

The sum of the measures is 180.

$$x + 118 = 180$$

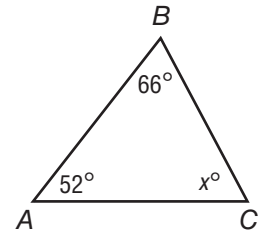
Simplify.

$$\underline{\quad - 118 \quad - 118}$$

Subtract 118 from each side.

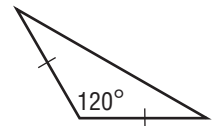
$$x = 62$$

The value of x is 62.



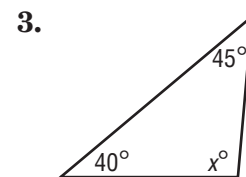
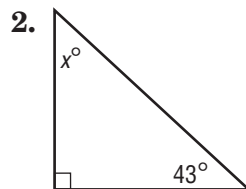
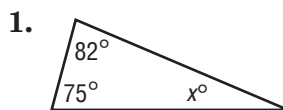
Example 2 Classify the triangle by its angles and by its sides.

The triangle has one obtuse angle and two sides the same length. So, it is an obtuse, isosceles triangle.

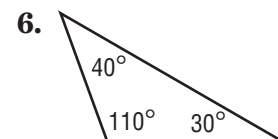
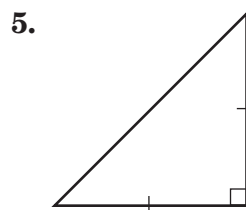
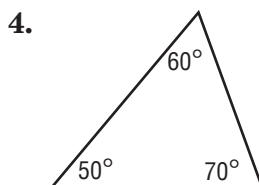


Exercises

Find the the value of x in each triangle. Then classify the triangle as *acute*, *right*, or *obtuse*.



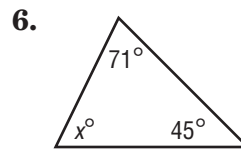
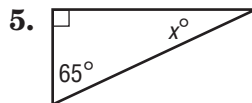
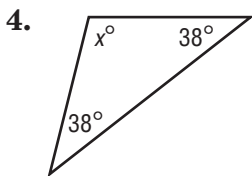
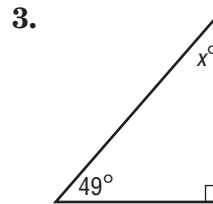
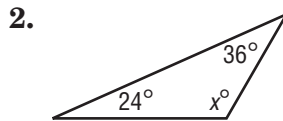
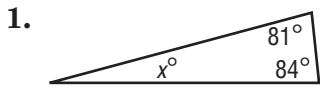
Classify each triangle by its angles and by its sides.



Skills Practice

Triangles

Find the value of x in each triangle with the given angle measures.
Then classify the triangle as *acute*, *right*, or *obtuse*.

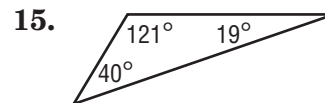
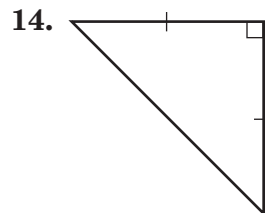
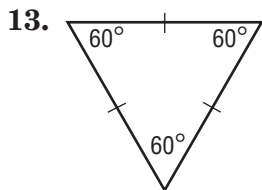
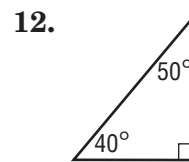
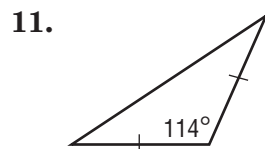
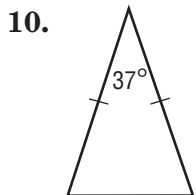


7. $57^\circ, 51^\circ, x^\circ$

8. $x^\circ, 126^\circ, 22^\circ$

9. $90^\circ, x^\circ, 50^\circ$

Classify each triangle the given angle and side with measures.



16. angles: $40^\circ, 100^\circ, 40^\circ$
sides: 19 ft, 19 ft, 29 ft

17. angles: $46^\circ, 52^\circ, 82^\circ$
sides: 17 m, 19 m, 24 m

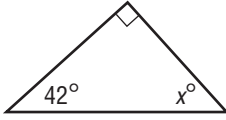
18. angles: $28^\circ, 76^\circ, 76^\circ$
sides: 2 km, 1 km, 2 km

Homework Practice

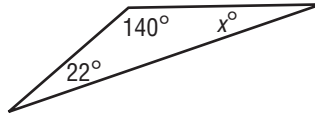
Triangles

Find the value of x in each triangle.

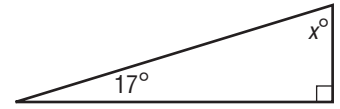
1.



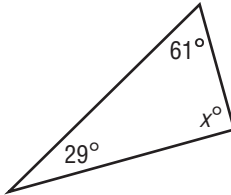
2.



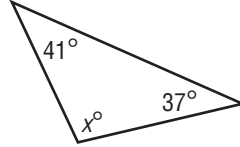
3.



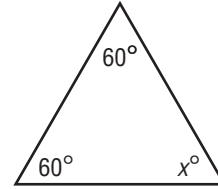
4.



5.



6.



Find the missing measure in each triangle with the given angle measures.

7. $45^\circ, 35^\circ, x^\circ$

8. $100^\circ, x^\circ, 40^\circ$

9. $x^\circ, 90^\circ, 16^\circ$

10. Find the third angle of a right triangle if one of the angles measures 24° .

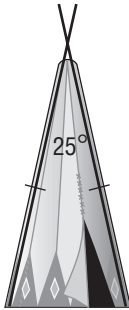
11. What is the third angle of a right triangle if one of the angles measures 51° ?

12. **ALGEBRA** Find $m\angle A$ in $\triangle ABC$ if $m\angle B = 38^\circ$ and $m\angle C = 38^\circ$.

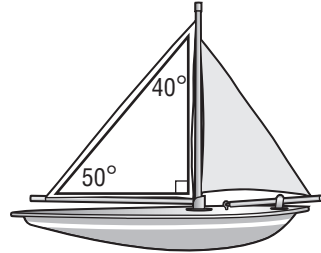
13. **ALGEBRA** In $\triangle XYZ$, $m\angle Z = 113^\circ$ and $m\angle X = 28^\circ$. What is $m\angle Y$?

Classify the marked triangle in each object by its angles and by its sides.

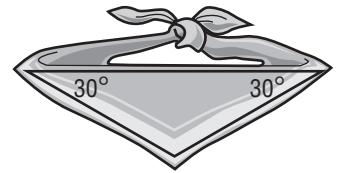
14.



15.

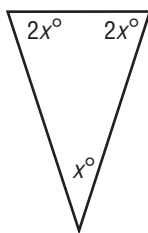


16.

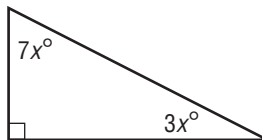


ALGEBRA Find the value of x in each triangle.

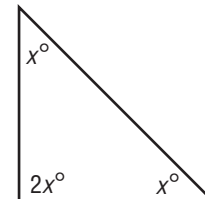
17.



18.



19.



Get Connected For more examples, go to glencoe.com.

Problem-Solving Practice

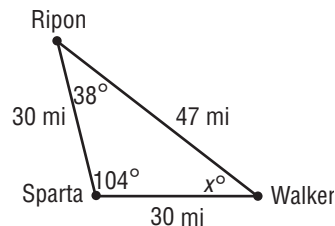
Triangles

1. TAILORING Each lapel on a suit jacket is in the shape of a triangle. The three angles of each triangle measure 47° , 68° , and 65° . Classify the triangle by its angles.

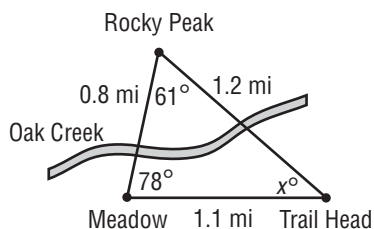
2. FLAGS A naval distress signal flag is in the shape of a triangle. The three sides of the triangle measure 5 feet, 9 feet, and 9 feet. Classify the triangle by its sides.

3. CARPENTRY The supports of a wooden table are in the shape of a triangle. Find the angles of the triangle if the measures of the angles are in the ratio $4x : 4x : 10x$.

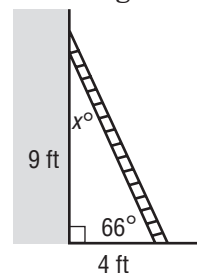
4. MAPS The three towns of Ripon, Sparta, and Walker form a triangle as shown below. Classify the triangle by its angles and by its sides. What is the value of x in the triangle?



5. HIKING The figure shows the Oak Creek trail, which is shaped like a triangle. Classify the triangle by its angles and by its sides. What is the value of x in the figure?



5. LADDER The figure shows a ladder leaning against a wall, forming a triangle. Classify the triangle by its angles and by its sides. What is the value of x in the figure?

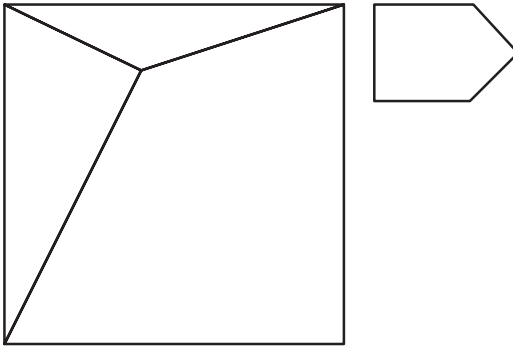


Enrich

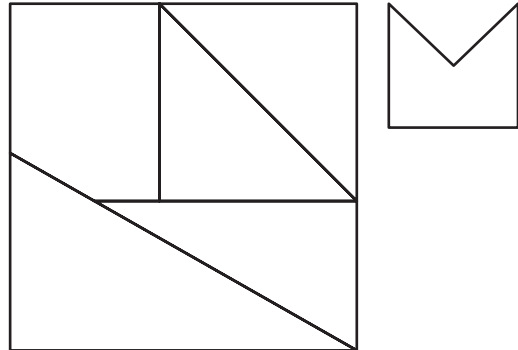
Dissecting Squares

In a *dissection puzzle*, the pieces of one shape are rearranged to make a different shape. Draw a square and then make a set of pieces to solve each dissection puzzle. Record your answers.

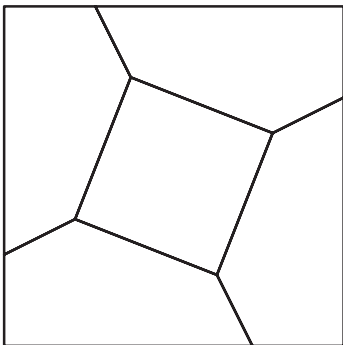
1. Rearrange the pieces to make a figure shaped like the one at the right.



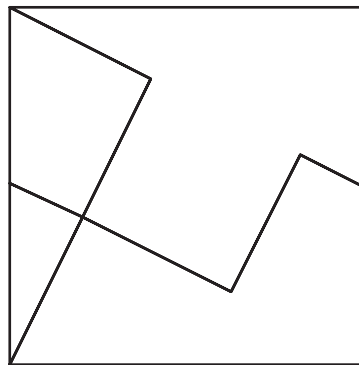
2. Rearrange the pieces to make a figure shaped like the one at the right.



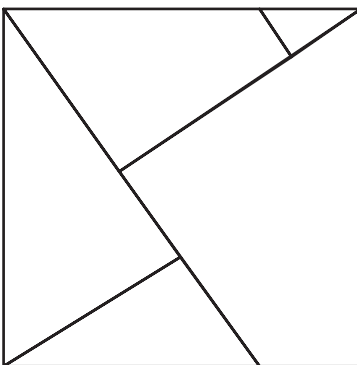
3. Rearrange the pieces to make an octagon with sides of equal length.



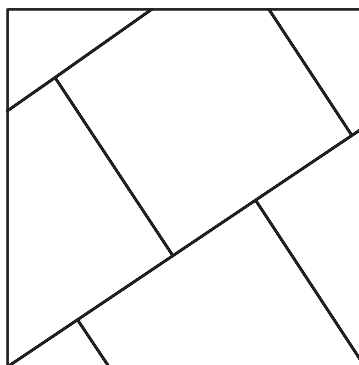
4. Rearrange the pieces to make a figure shaped like a plus sign.



5. Rearrange the pieces to make two new squares.



6. Rearrange the pieces to make three squares of equal size.



TI-84 Plus Activity**Use Cabri Jr. To Draw Triangles**

You can use the Cabri Jr. application to draw triangles.

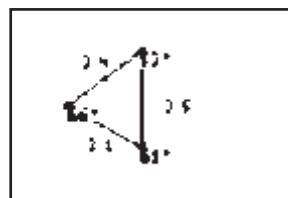
Example Draw an acute triangle and measure each angle and side.

Step 1: Press **APPS** and choose **Cabri Jr.**

Step 2: Press **WINDOW** to get the Object Tools menu. Arrow down to **Triangle** and press **ENTER**. Move the cursor to the desired location of each vertex and press **ENTER**.

Step 3: Press **GRAPH** to get the Display and Measurement Tools. Arrow down to **Measure**, over to **Angle**, and press **ENTER**. Measure each angle by selecting a point on one side, the vertex, and a point on the other side.

Step 4: Press **GRAPH** to get the Display and Measurement Tools. Arrow down to **Measure**, over to **D. & Length**, and press **ENTER**. Select the endpoints of the side you wish to measure. Use the arrows to place the length where you want it. Press **ENTER**.

**Exercises**

Draw each triangle in Cabri Jr. Find the measures of the sides and angles. Record them in the tables below.

1. First Triangle: Acute

	Angle	Side
1		
2		
3		

2. Second Triangle: Right

	Angle	Side
1		
2		
3		

3. Third Triangle: Obtuse

	Angle	Side
1		
2		
3		

4. Fourth Triangle: Scalene

	Angle	Side
1		
2		
3		

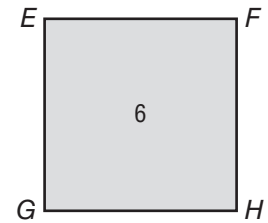
Explore

Quadrilaterals

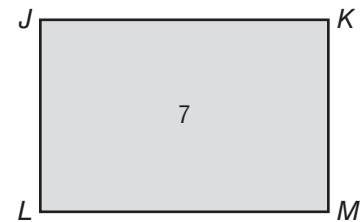
Use a ruler and a protractor to measure the sides and angles of the figures below. Record the measurements in the table. Use the table for Exercises 1–6.

Quadrilateral	6	7	8	9
Sides				
Angles				

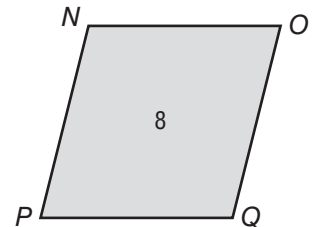
1. Which two quadrilaterals have four congruent sides? Are these quadrilaterals the same? Why or why not?



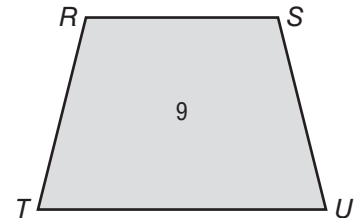
2. Which two quadrilaterals have four congruent angles? Are these quadrilaterals the same? Why or why not?



3. Which quadrilaterals have at least two congruent sides?



4. Which quadrilaterals have at least two parallel sides?



5. Which quadrilaterals have two pairs of parallel sides?

6. Which quadrilaterals have two different pairs of congruent angles that do not have four congruent angles?

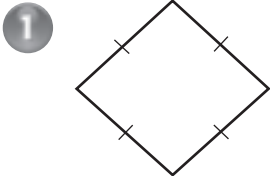
Reteach

Quadrilaterals

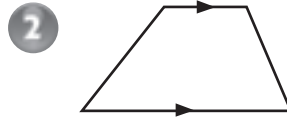
- A **quadrilateral** is a closed figure with four sides and four angles.
- Quadrilaterals are named based on their sides and angles.

<p>Trapezoid</p>	<p>Parallelogram</p>	<p>Rectangle</p>	<p>Rhombus</p>	<p>Square</p>
<p>quadrilateral with exactly one pair of parallel sides</p>	<p>quadrilateral with opposite sides parallel and opposite sides congruent</p>	<p>parallelogram with 4 right angles</p>	<p>parallelogram with 4 congruent sides</p>	<p>parallelogram with 4 right angles and 4 congruent sides</p>

Examples



The quadrilateral is a parallelogram with 4 congruent sides. It is a rhombus.

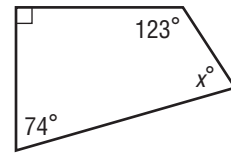


The quadrilateral has one pair of parallel sides. It is a trapezoid.

Example 3 Find the value of x in the quadrilateral shown.

$$\begin{array}{r}
 123 + 90 + 74 + x = 360 \\
 287 + x = 360 \\
 - 287 \quad = -287 \\
 \hline
 x = 73
 \end{array}$$

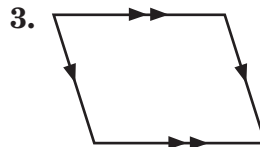
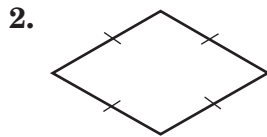
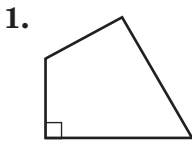
Write the equation.
Simplify.
Subtract.



So, the value of x is 73.

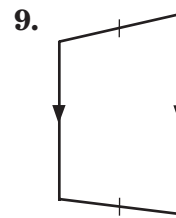
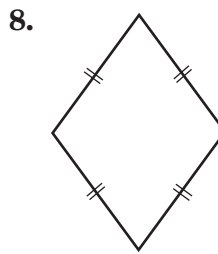
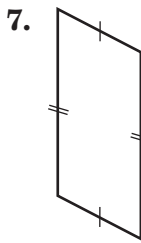
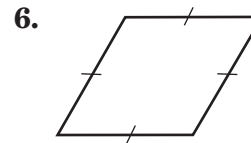
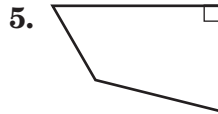
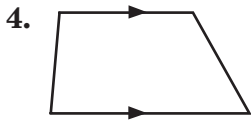
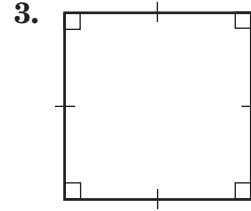
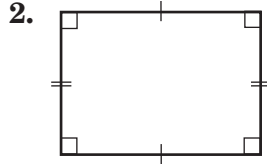
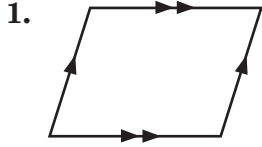
Exercises

Classify the quadrilateral using the name that best describes it.

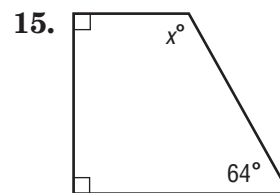
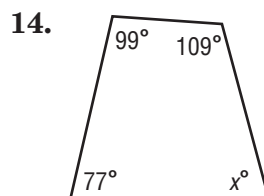
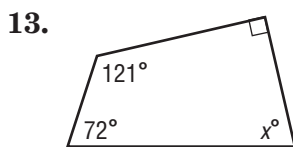
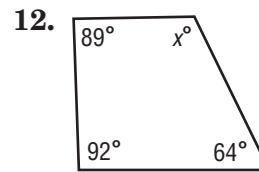
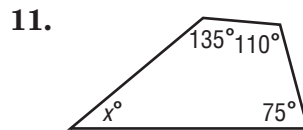
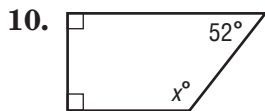


Skills Practice
Quadrilaterals

Classify the quadrilateral using the name that best describes it.

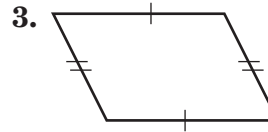
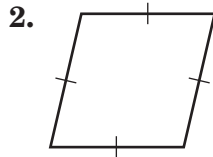
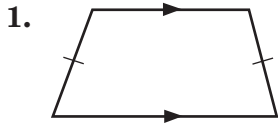


Find the missing angle measure in each quadrilateral.

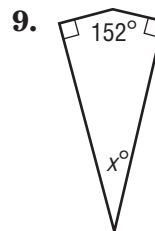
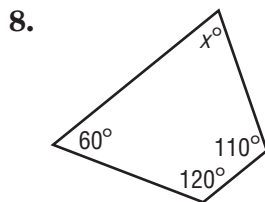
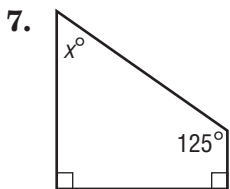
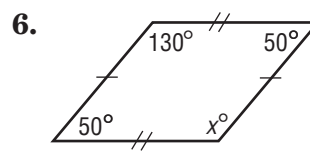
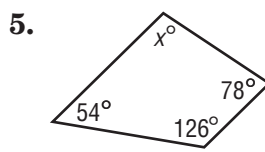
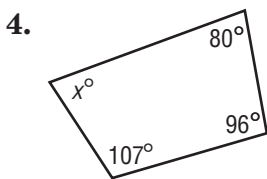


Homework Practice**Quadrilaterals**

Classify each quadrilateral using the name that best describes it.



ALGEBRA Find the missing angle measure in each quadrilateral.



Find the missing angle measure in each quadrilateral with the given angle measures.

10. $63^\circ, 56^\circ, 111^\circ, x^\circ$

11. $31^\circ, x^\circ, 161^\circ, 51^\circ$

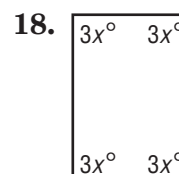
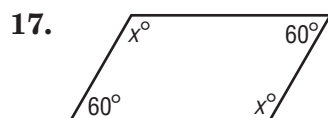
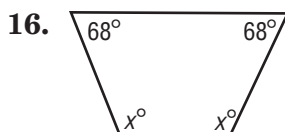
12. $x^\circ, 122^\circ, 53^\circ, 90^\circ$

13. $83^\circ, 137^\circ, x^\circ, 28^\circ$

14. **ALGEBRA** Find $m\angle C$ in quadrilateral $ABCD$ if $m\angle A = 110^\circ$, $m\angle B = 88^\circ$, and $m\angle D = 55^\circ$.

15. **ALGEBRA** What is $m\angle Z$ in quadrilateral $WXYZ$ if $m\angle W = 86^\circ$, $m\angle X = 88^\circ$, and $m\angle Y = 92^\circ$?

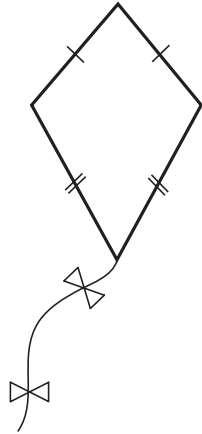
ALGEBRA Find the value of x in each quadrilateral.



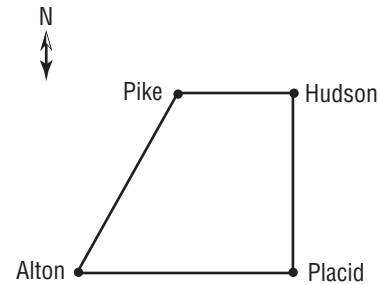
Problem-Solving Practice

Quadrilaterals

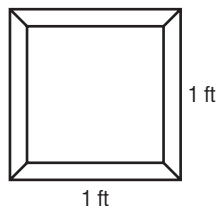
- 1. KITES** A kite is shown below. What is the best name to classify the shape of the kite? Explain.



- 2. MAPS** A map showing the road connecting the towns of Pike, Hudson, Placid, and Alton is shown. The road connecting Pike and Hudson is parallel to the road connecting Alton and Placid. What is the best name to classify the shape of the roads connecting the four towns? Explain.



- 3. ART** A picture frame is shown below. What is the *best* name to classify the shape of the frame?



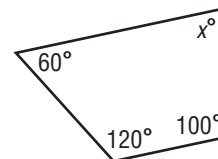
- 4. SCHOOL SUPPLIES** The side view of an eraser is shown below. What is the best name to classify the shape of the eraser?



- 5. PARTY** The front of a birthday party invitation is shown below. Find the measure of the missing angle.



- 6. TABLE** The top of Mr. Bautista's new coffee table is shown below. Find the measure of the missing angle.

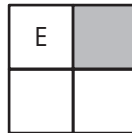
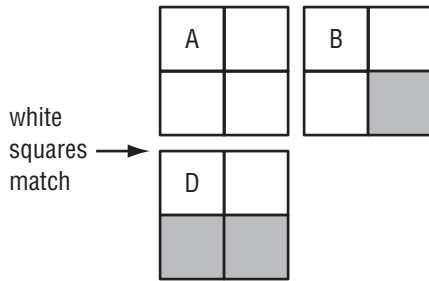


Enrich

The Colormatch Square

To work this puzzle, cut out the 16 tiles at the bottom of this page. The goal of the puzzle is to create a square so that the sides of any pair of adjacent tiles match. You are not allowed to rotate any of the tiles.

- Complete the solution to the colormatch square puzzle below.



- Find at least one other solution in which the A tile is in the upper left corner.

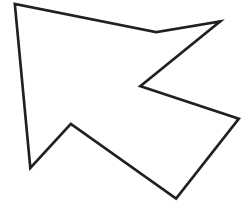
A		B		C		D		E		F		G		H	
I		J		K		L		M		N		O		P	

Reteach**Polygons and Angles**

- A **polygon** is a simple, closed figure formed by three or more line segments. The segments intersect only at their endpoints.
- Polygons can be classified by the number of sides they have.
- The sum of the measures of the **interior angles** of a polygon is $(n - 2)180$, where n represents the number of sides.

Example 1 Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.

The figure has 8 sides that only intersect at their endpoints. It is an octagon.



Example 2 The defense department of the United States has its headquarters in a building called the Pentagon because it is shaped like a regular pentagon. Find the measure of an interior angle of a regular pentagon.

$$S = (n - 2)180$$

Write an equation.

$$S = (5 - 2)180$$

Replace n with 5. Subtract.

$$S = (3)180$$

Multiply.

$$S = 540$$

The sum of the interior angles is 540° .

$$540 \div 5 = 108$$

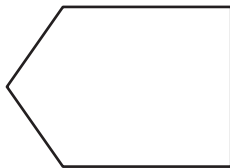
Divide by the number of interior angles to find the measure of one angle.

The measure of one interior angle of a regular pentagon is 108° .

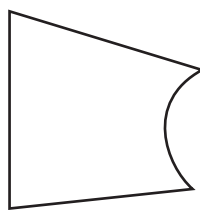
Exercises

Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.

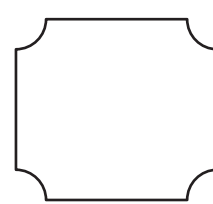
1.



2.



3.



Find the sum of the interior angle measures of each polygon.

4. nonagon (9-sided)

5. 14-gon

Find the measure of one interior angle in each regular polygon.

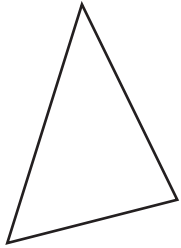
6. hexagon

7. 15-gon

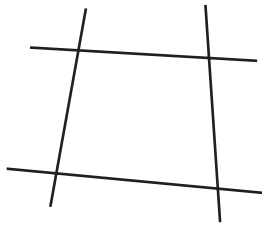
Skills Practice***Polygons and Angles***

Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.

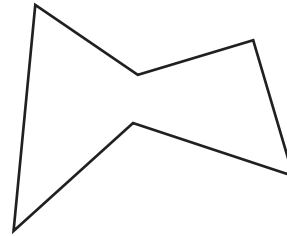
1.



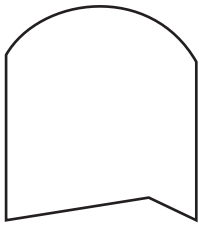
2.



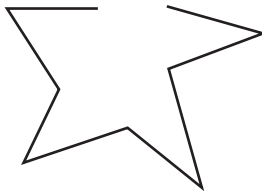
3.



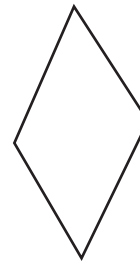
4.



5.



6.



Find the sum of the interior angle measures of each polygon.

7. 13-gon

8. 18-gon

9. 32-gon

10. 35-gon

Find the measure of one interior angle in each regular polygon.

Round to the nearest tenth if necessary.

11. heptagon (7-sided)

12. 26-gon

13. decagon (10-sided)

14. 23-gon

Homework Practice

Polygons and Angles

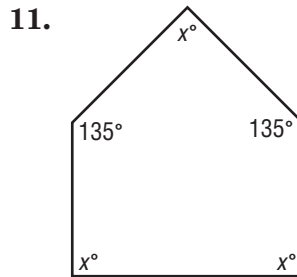
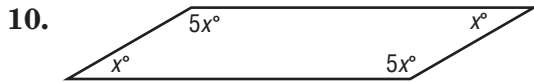
Find the sum of the interior angle measures of each polygon.

- | | | |
|-------------|------------|-----------|
| 1. pentagon | 2. decagon | 3. 16-gon |
| 4. 18-gon | 5. 30-gon | 6. 34-gon |

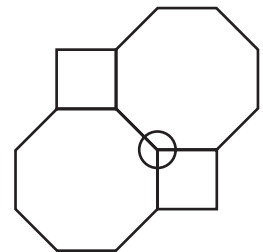
Find the measure of one interior angle in each regular polygon. Round to the nearest tenth if necessary.

- | | | |
|-------------|------------|-----------|
| 7. pentagon | 8. octagon | 9. 24-gon |
|-------------|------------|-----------|

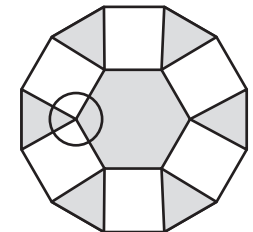
ALGEBRA For Exercises 10 and 11, determine the angle measures in each polygon.



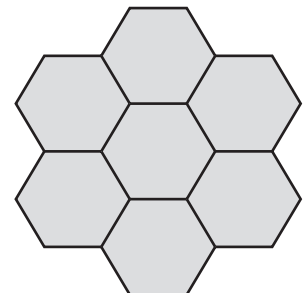
12. **FLOORING** A floor is tiled with a pattern consisting of regular octagons and squares as shown. Find the measure of each angle at the circled vertex. Then find the sum of the angles.



13. **ART** Rachaunn is laying out a pattern for a stained glass window. So far he has placed the 13 regular polygons shown. Find the measure of each angle at the circled vertex. Then find the sum of the angles.



14. **REASONING** Vanessa's mother made a quilt using a pattern of repeating regular hexagons as shown. Will Vanessa be able to make a similar quilt with a pattern of repeating regular pentagons? Explain your reasoning.

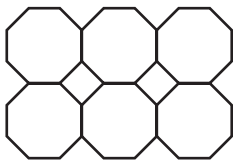


Get Connected For more examples, go to glencoe.com.

Problem-Solving Practice**Polygons and Angles**

For Exercises 1–6, use the formula $S = (n - 2)180^\circ$ to solve.

- 1. FLOORING** Ashley's kitchen floor is made from a tessellation of rows of regular octagons. The space between them is filled with square tiles as shown below. Find the measure of one interior angle in both the octagon and the square tiles.

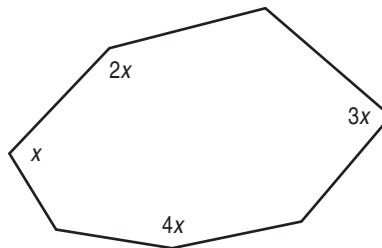


- 2. CIRCLES** As the number of sides of a regular polygon increase, the polygon gets closer and closer to a true circle. The interior angles of any regular polygon can never actually reach 180° . How many sides would a polygon have if its interior angles are exactly 179° ?

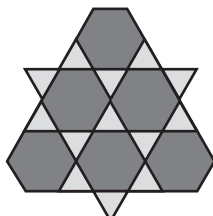
- 3. GEOMETRY** A trapezoid has angles that measure $3x^\circ$, $3x^\circ$, x° , and x° . What is the measure of x ?



- 4. GEOMETRY** An irregular heptagon has angles that measure x° , x° , $2x^\circ$, $2x^\circ$, $3x^\circ$, $3x^\circ$, and $4x^\circ$. What is the measure of x ?



- 5. TILES** A bathroom tile consists of regular hexagons surrounded by regular triangles as shown below. Find the measure of one interior angle in both the hexagon and the triangle tiles.



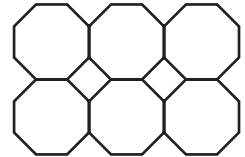
- 6. CHALLENGE** How many sides does a regular polygon have if the measure of an interior angle is 171° ?

Enrich

M.C. Escher

Maurits Cornelis Escher (1898–1972) was a Dutch graphic and mathematical artist. Some of his most famous pieces used **tessellations**, or repeated tiling of one or more shapes. His designs range from artfully simple to extremely intricate.

A regular polygon will tessellate a plane if the measure of one of its interior angles is a factor of 360° . Other combinations of polygons tessellate if the sum of the measures of the adjoining angles equals 360° . The tessellation at the right is made of regular octagons and squares. At any vertex the sum of the measures of the angles is $90^\circ + 135^\circ + 135^\circ$ or 360° .



1. Make a list of all regular polygons that will tessellate.
2. Explain why you know there are no other regular polygons that will tessellate.

For Steps A–E, you will create your own tessellation on a separate piece of paper.

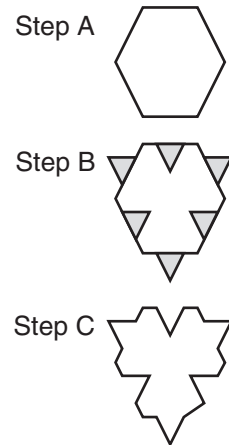
Step A Start with a polygon that will tessellate. Trace it, and cut it out. Grid paper or isometric dot paper may help you accurately draw your shape.

Step B Cut a portion of the figure on one side, slide it to the *opposite* side, and tape it on. (This was done three times in the example at right.)

Step C Use the modified shape as a tracing template. Trace the template on another sheet of paper.

Step D Slide, reflect, and/or rotate the shape so that it fits with your first tracing. Trace the template where it fits with the previous tracing. Repeat the process to cover the page.

Step E Color each polygon in the tessellation. Escher often decorated the shapes so that they resembled objects or animals.



TI-84 Plus Activity**Draw Polygons**

You can use the **Cabri Jr.** application to draw and measure polygons.

Example Draw a quadrilateral and measure the angles.

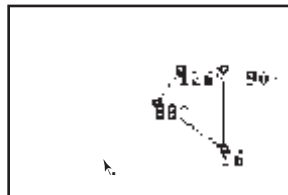
Step 1: Press **APPS** and choose **Cabri Jr.**

Step 2: Press **WINDOW** to get the Object Tools menu.

Arrow down to **Segment** and press **ENTER**.

Draw a quadrilateral by pressing **ENTER** at the desired locations of the vertices.

Press **CLEAR** to disable this tool.



Step 3: Press **GRAPH** to get the Display and Measurement Tools. Arrow down to **Measure**, over to **Angle**, and press **ENTER**. Measure each angle by selecting a point on one side, the vertex, and a point on the other side.

Exercises

Draw each polygon on your calculator. Find the sum of the angles of each polygon.

1. pentagon

2. hexagon

3. octagon

4. 9-gon

5. dodecagon (12-gon)

6. 15-gon

Reflecting on Chapter **6**

1. Why do you think using angle properties like *vertical angles* and *alternate exterior angles* to measure unknown angles is more accurate than using a protractor?

2. Can you make a triangle with one angle measure being equal to 180° ? Why or why not?

3. Is a circle a polygon? Explain.

Quiz 1

(Lesson 6-1)

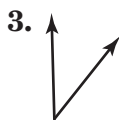
1. Is an angle measuring 90° *acute*, *obtuse*, *right*, or *straight*?

1. _____

Classify each angle as *acute*, *obtuse*, *right*, or *straight*.

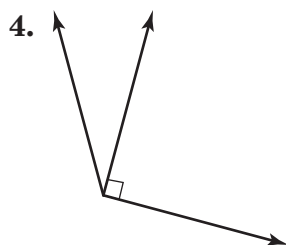


2. _____

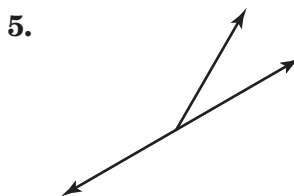


3. _____

Identify each pair of angles as *complementary*, *supplementary*, or *neither*.

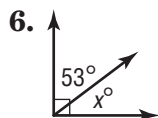


4. _____

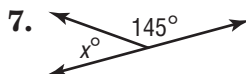


5. _____

Find the value of x in each figure.



6. _____



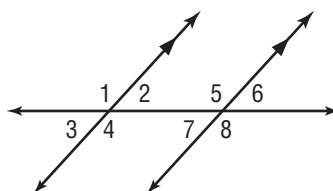
7. _____

Quiz 2

(Lesson 6-2)

For Exercises 1-3, use the figure at the right.

- Look at $\angle 1$ and $\angle 2$. Classify the angle pair using all names that apply.
- Find $m\angle 4$ if $m\angle 1 = 100^\circ$.
- Find $m\angle 5$ if $m\angle 1 = 100^\circ$.



1. _____

2. _____

3. _____

- $\angle A$ and $\angle B$ are alternate exterior angles. Find $m\angle B$ if $m\angle A = 38^\circ$.
- $\angle 9$ and $\angle 10$ are corresponding and complementary angles. Find $m\angle 9$.

4. _____

5. _____

Quiz 3

(Lesson 6-3)

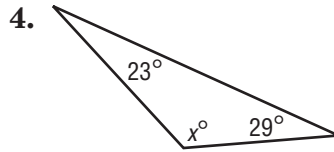
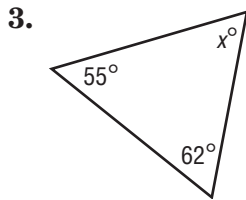
1. Draw several triangles and measure the three angles. What can you conclude about the sum of the angles in a triangle?

1. _____

2. Find the third angle of a right triangle if the measure of one of the angles is 25° .

2. _____

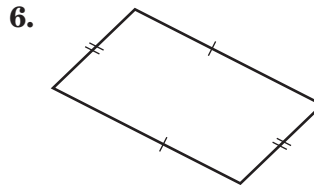
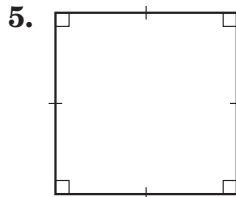
Find the missing measure in each triangle. Then classify the triangle as *acute*, *right*, or *obtuse*.



3. _____

4. _____

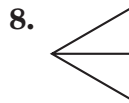
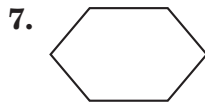
Classify each quadrilateral using the name that *best* describes it.



5. _____

6. _____

Determine whether each figure is a polygon. If it is, classify the polygon and state whether it is regular. If it is *not* a polygon, explain why.



7. _____

8. _____

9. Find the sum of the measures of the interior angles of a 15-gon.

9. _____

10. Find the measure of one interior angle in a regular octagon. Round to the nearest tenth if necessary.

10. _____

Vocabulary Test

acute angle
adjacent angles
angle
interior angles

obtuse angle
polygon
regular polygon

right angle
straight angle
vertical angles

Choose from the terms above to complete each sentence.

1. A(n) _____ is a simple, closed figure formed by three or more line segments. 1. _____
2. A(n) _____ is formed by two rays that share a common endpoint. 2. _____
3. Two angles are _____ if they share a common vertex, a common side, and do not overlap. 3. _____
4. A(n) _____ is less than 90° . 4. _____
5. A(n) _____ is exactly 180° . 5. _____
6. Two angles are (vertical, adjacent) if they are opposite angles formed by the intersection of two lines. 6. _____
7. A(n) (right, acute) angle is exactly 90° . 7. _____
8. A(n) (straight, obtuse) angle is greater than 90° and less than 180° . 8. _____

Define each term in your own words.

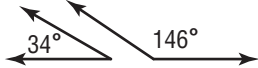
9. regular polygon 9. _____
10. interior angles 10. _____

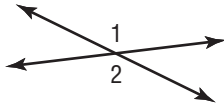
Test, Form 1A

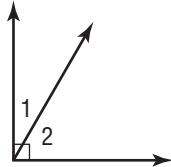
Write the letter for the correct answer in the blank at the right of each question.

1. The measure of an angle is 45° . Classify the angle.
 A. acute B. straight C. obtuse D. right 1. _____
2. The measure of an angle is 180° . Classify the angle.
 F. acute G. straight H. obtuse I. right 2. _____

For Exercises 3 and 4, classify each pair of angles.

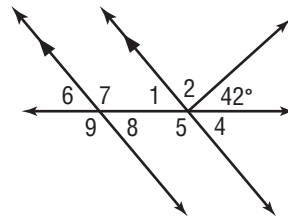
3. 
- | | | |
|------------------|--------------------|----------|
| A. complementary | C. supplementary | |
| B. vertical | D. no relationship | 3. _____ |

4. 
- | | | |
|------------------|--------------------|----------|
| F. complementary | H. supplementary | |
| G. vertical | I. no relationship | 4. _____ |

5. Which name applies to the angle pair at the right?
 A. supplementary C. complementary
 B. straight D. vertical
- 
5. _____

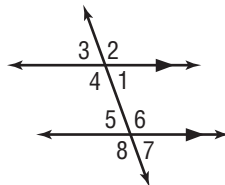
For Exercises 6 and 7, use the figure at the right.

6. If $m\angle 5 = 130^\circ$, find $m\angle 1$.
 F. 40° H. 50°
 G. 130° I. 180° 6. _____



7. Find $m\angle 8$ if $m\angle 2 = 88^\circ$.
 A. 50° B. 180° C. 70° D. 40° 7. _____

8. In the figure at the right, find $m\angle 1$ if $m\angle 7 = 60^\circ$.
 F. 60° G. 90° H. 120° I. 150° 8. _____



Test, Form 1A *(continued)*

9. Classify the triangle by its angles and by its sides.

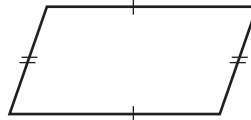
- A. acute, equilateral C. obtuse, isosceles
 B. right, equilateral D. obtuse, equilateral



9. _____

10. Classify the quadrilateral using the name that *best* describes it.

- F. square H. trapezoid
 G. parallelogram I. rhombus



10. _____

11. Classify the quadrilateral using the name that *best* describes it.

- A. rhombus C. square
 B. rectangle D. trapezoid



11. _____

12. Which figure is a regular polygon?

- F. G. H. I.

12. _____

13. Which figure is a polygon?

- A. B. C. D.

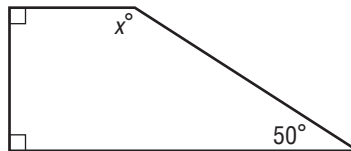
13. _____

14. Which regular polygon can be used by itself to make a tessellation?

- F. pentagon G. octagon H. square I. decagon

14. _____

15. Find the missing angle measure in the quadrilateral.



- A. 130° B. 90° C. 50° D. 40°

15. _____

16. Draw several pentagons and measure the interior angles. What can you conclude about the sum of the angles in a pentagon?

- F. The sum is 180° . H. The sum is 540° .
 G. The sum is 90° . I. No conclusion can be reached.

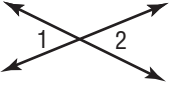
16. _____

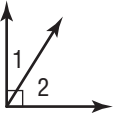
Test, Form 1B

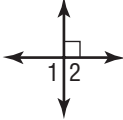
Write the letter for the correct answer in the blank at the right of each question.

1. The measure of an angle is 95° . Classify the angle.
 A. acute B. right C. straight D. obtuse 1. _____
2. The measure of an angle is 60° . Classify the angle.
 F. acute G. right H. straight I. obtuse 2. _____

For Exercises 3 and 4, classify each pair of labeled angles.

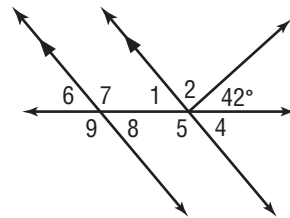
3. 
- A. complementary C. vertical
 B. supplementary D. no relationship 3. _____

4. 
- F. complementary H. vertical
 G. supplementary I. no relationship 4. _____

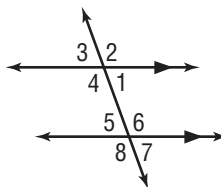
5. Which name does *not* apply to the angle pair?
 A. vertical C. supplementary
 B. adjacent D. right angles
- 
5. _____

For Exercises 6 and 7, use the figure at the right.

6. If $m\angle 9 = 130^\circ$, find $m\angle 8$.
 F. 40° H. 50°
 G. 130° J. 180° 6. _____
7. Find $m\angle 4$ if $m\angle 2 = 88^\circ$.
 A. 50° B. 180° C. 70° D. 40° 7. _____



8. In the figure at the right, find $m\angle 2$ if $m\angle 6 = 120^\circ$.
 F. 60°
 G. 90°
 H. 120°
 I. 150° 8. _____



Test, Form 1B (continued)

9. Classify the triangle by its angles and by its sides.

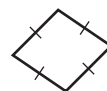
- A. right, isosceles
- B. acute, isosceles
- C. obtuse, isosceles
- D. acute, equilateral



9. _____

10. Classify the quadrilateral using the name that best describes it.

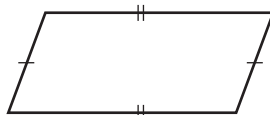
- F. rhombus
- G. square
- H. parallelogram
- I. trapezoid



10. _____

11. Classify the quadrilateral using the name that best describes it.

- A. square
- B. trapezoid
- C. parallelogram
- D. rectangle



11. _____

12. Which figure is a regular polygon?

- F.
- G.
- H.
- I.

12. _____

13. Which figure is a polygon?

- A.
- B.
- C.
- D.

13. _____

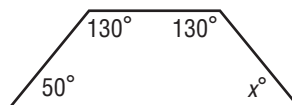
14. Which regular polygon can be used by itself to make a tessellation?

- F. octagon
- G. decagon
- H. equilateral triangle
- I. circle

14. _____

15. Find the missing angle measure in the quadrilateral.

- A. 130°
- B. 90°
- C. 50°
- D. 40°



15. _____

16. Draw several 20-gons and measure the interior angles. What can you conclude about the sum of the angles in a pentagon?

- F. The sum is 180° .
- G. The sum is 3240° .
- H. The sum is 162° .
- I. No conclusion can be reached.

16. _____

Test, Form 2A

Write the letter for the correct answer in the blank at the right of each question.

For Exercises 1 and 2, classify each angle.

1.



- A. acute B. right C. straight D. obtuse

1. _____

2.

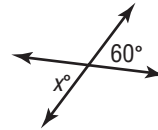


- F. acute G. right H. straight I. obtuse

2. _____

3. Find the value of x in the figure at the right.

- A. 90° C. 120°
 B. 60° D. 30°



3. _____

4. Angle 1 and angle 2 are supplementary. If $m\angle 1 = 27^\circ$, find $m\angle 2$.

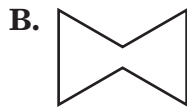
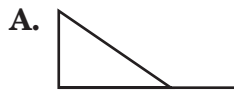
- F. 27° G. 63° H. 153° I. 163°

4. _____

5. Draw a regular polygon. Then name the polygon you drew.

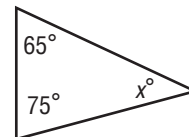
5. _____

6. Which figure is *not* a polygon.



6. _____

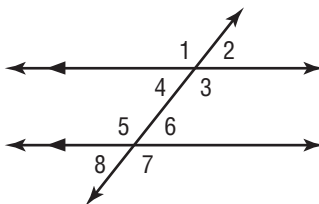
7. Find the value of x in the triangle.



7. _____

Test, Form 2A (continued)

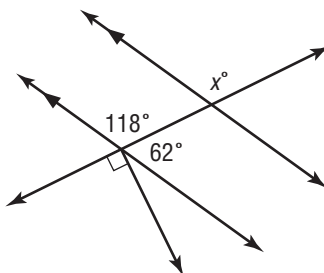
8. Which pair of angles is *not* congruent?



- F. $\angle 1$ and $\angle 7$ G. $\angle 3$ and $\angle 5$ H. $\angle 4$ and $\angle 6$ I. $\angle 2$ and $\angle 5$

8. _____

9. Find the value of x .



- A. 28° B. 62° C. 90° D. 118°

9. _____

10. Draw several octagons and measure the interior angles. What can you conclude about the sum of the angles in an octagon?

- F. The sum is 1080° . H. The sum is 180° .
G. The sum is 1440° . I. No conclusion can be reached.

10. _____

11. Classify the triangle by its angles and by its sides.

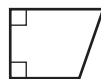
- A. obtuse, scalene C. right, isosceles
B. right, scalene D. acute, scalene



11. _____

12. Classify the quadrilateral using the name that *best* describes it.

- F. quadrilateral H. trapezoid
G. rhombus I. parallelogram



12. _____

13. $\angle 1$ and $\angle 3$ are alternate exterior angles for a pair of parallel lines cut by a transversal. If $m\angle 1 = 36^\circ$, find $m\angle 3$.

- A. 36° B. 54° C. 136° D. 144°

13. _____

14. **PENTAGON** The Pentagon building in Washington, D.C., is named because it is in the shape of a pentagon. What is the measure of each interior angle?

14. _____

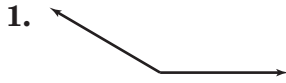
15. Find the sum of the measures of the interior angles of a 21-gon.

15. _____

Test, Form 2B

Write the letter for the correct answer in the blank at the right of each question.

For Exercises 1 and 2, classify each angle.



- A. acute B. right C. straight D. obtuse

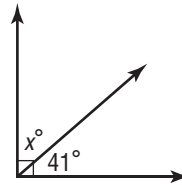
1. _____



- F. acute G. right H. straight I. obtuse

2. _____

3. Find the value of x in the figure at the right.



- A. 41° B. 49° C. 139° D. 141°

3. _____

4. Angle 1 and angle 2 are supplementary. If $m\angle 1 = 63^\circ$, find $m\angle 2$.

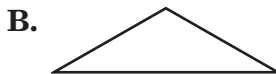
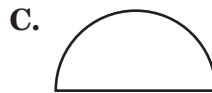
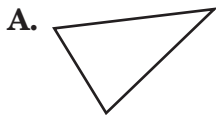
- F. 27° G. 63° H. 117° I. 153°

4. _____

5. Draw a regular polygon. Then name the polygon you drew.

5. _____

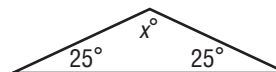
6. Which figure is *not* a polygon?



6. _____

7. Find the value of x in the triangle.

- F. 40° H. 130°
G. 90° I. 150°



7. _____

Test, Form 2B (continued)

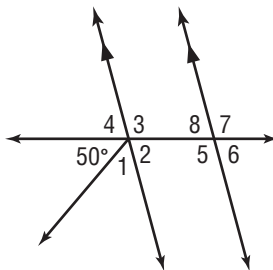
For Exercises 8 and 9 use the figure at the right.

8. Find $m\angle 4$ if $m\angle 2 = 75^\circ$.

- A. 50°
- B. 55°
- C. 75°
- D. 105°

9. Find $m\angle 8$ if $m\angle 2 = 55^\circ$.

- F. 50°
- G. 55°
- H. 75°
- I. 105°



8. _____

9. _____

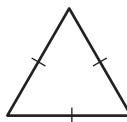
10. Draw several hexagons and measure the interior angles. What can you conclude about the sum of the angles in a hexagon?

- A. The sum is 60° .
- B. The sum is 720° .
- C. The sum is 180° .
- D. no conclusion can be reached.

10. _____

11. Classify the triangle by its angles and by its sides.

- F. obtuse, scalene
- G. right, scalene
- H. right, isosceles
- I. acute, equilateral



11. _____

12. Classify the quadrilateral using the name that *best* describes it.

- A. trapezoid
- B. rhombus
- C. parallelogram
- D. square



12. _____

13. $\angle 1$ and $\angle 3$ are alternate interior angles for a pair of parallel lines cut by a transversal. If $m\angle 1 = 144^\circ$, find $m\angle 3$.

- F. 36°
- G. 54°
- H. 136°
- I. 144°

13. _____

14. **PENTAGON** The Pentagon building in Washington, D.C., is named because it is in the shape of a pentagon. What is the sum of the measures of its interior angles?

14. _____

15. Find the sum of the measures of the interior angles of an 18-gon.

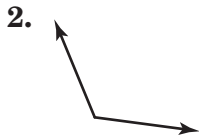
15. _____

Test, Form 3A

1. Draw an angle having a measurement of 90° . Then classify the angle as *acute*, *obtuse*, *right*, or *straight*.

1. _____

For Exercises 2 and 3, classify each angle as *acute*, *obtuse*, *right*, or *straight*.

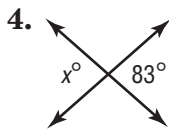


2. _____

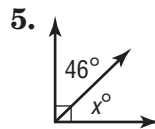


3. _____

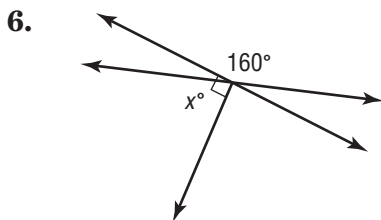
Find the value of x in each figure.



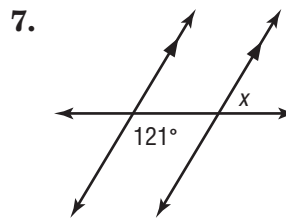
4. _____



5. _____



6. _____

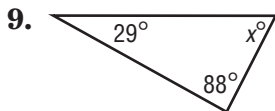


7. _____

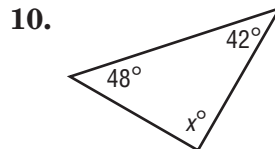
8. Draw a figure that is *not* a polygon.

8. _____

Find the missing measure in each triangle. Then classify the triangle as *acute*, *right*, or *obtuse*.



9. _____



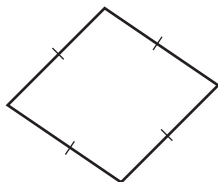
10. _____

11. Draw several right triangles and measure the two angles that are not the right angle. What can you conclude about the sum of any two non-right angles in a right triangle?

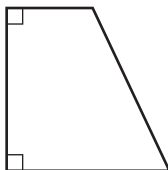
11. _____

Classify each quadrilateral using the name that *best* describes it.

12.

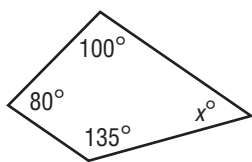


13.



12. _____

14. Find the missing measure.



13. _____

14. _____

15. Draw several parallelograms and measure the interior angles. What can you conclude about opposite angles in a parallelogram?

15. _____

For Exercises 16 and 17, find the measure of an angle in each polygon.

16. regular octagon

17. regular nonagon

16. _____

17. _____

18. Find the sum of the measures of the interior angles of a 30-gon.

18. _____

19. **ELEVATION** The front view of a house (the “front elevation”) is often in the shape of a pentagon. If two of the angles measure 90° , what is the sum of the measures of the other 3 angles?

19. _____

20. Find the measure of one interior angle in a regular 20-gon. Round to the nearest tenth if necessary.

20. _____

21. **HONEYCOMBS** Honeycombs that bees make are a tessellation of regular hexagons. Find the measure of one interior angle.

21. _____

22. Can a regular polygon with an angle measure of 135° be used by itself to make a tessellation? Explain.

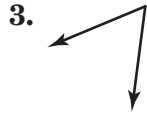
22. _____

Test, Form 3B

1. Draw an angle having a measurement of 157° .
Then classify the angle as *acute*, *obtuse*, *right*, or *straight*.

1. _____

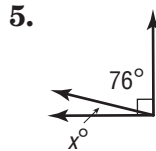
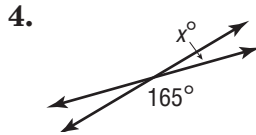
For Exercises 2 and 3, classify each angle as *acute*, *obtuse*, *right*, or *straight*.



2. _____

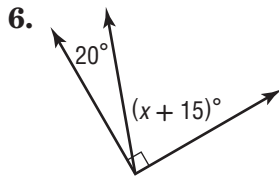
3. _____

Find the value of x in each figure.



4. _____

5. _____



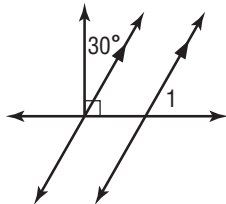
6. _____

7. Find $m\angle 1$.

8. Draw a figure that is *not* a polygon.

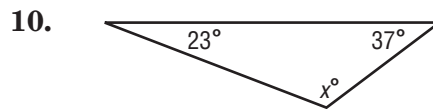
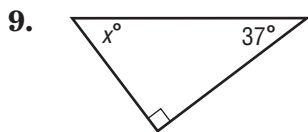
7. _____

8. _____



8. _____

Find the missing angle measure in each triangle. Then classify the triangle as *acute*, *right*, or *obtuse*.



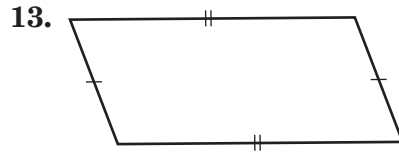
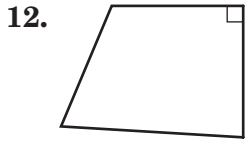
9. _____

10. _____

11. Draw several equilateral triangles and measure the angles. What can you conclude about angles in an equilateral triangle.

11. _____

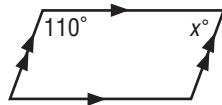
Classify each quadrilateral using the name that *best* describes it.



12. _____

13. _____

14. Find the missing measure.



14. _____

15. Draw several parallelograms and measure the sides. What can you conclude about opposite sides of a parallelogram?

15. _____

For Exercises 16 and 17, find the measure of an angle in each polygon.

16. regular decagon

17. regular 18-gon

16. _____

17. _____

18. Find the sum of the measures of the interior angles of a 50-gon.

18. _____

19. **ELEVATION** The side view of a house (the “side elevation”) is often in the shape of a pentagon. If the angle at the roof is 150° and there are two other angles of 90° , what is the sum of the measures of the other 2 angles?

19. _____

20. Find the measure of one interior angle in a regular 35-gon. Round to the nearest tenth if necessary.

20. _____

21. **HONEYCOMBS** Honeycombs that bees make are a tessellation of regular hexagons. Find the sum of the measure of the interior angles.

21. _____

22. Can a regular polygon with an angle measure of 120° be used by itself to make a tessellation? Explain.

22. _____

Standardized Test Practice

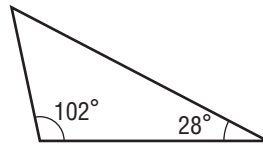
(Chapters 1–6)

Read each question. Then fill in the correct answer.

1. What is the measure of one interior angle of a regular pentagon?
 A. 72° B. 108° C. 120° D. 540°

1. (A) (B) (C) (D)

2. **TRIANGLE** A triangle has angle measures of 28° and 102° . Find the degree measure of the third angle.



2.

⊖	⊘	⊘	⊘	⊘	⊘
●	●	●	●	●	●
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

3. Which number is not a real number?
 $\frac{1}{4}$, $\sqrt{-16}$, 0.001, $\sqrt{42}$
 F. $\sqrt{-16}$ G. 0.001 H. $\frac{1}{4}$ I. $\sqrt{42}$
4. Write $3\frac{4}{5}$ as a decimal.

3. (F) (G) (H) (I)

4.

⊖	⊘	⊘	⊘	⊘	⊘
●	●	●	●	●	●
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

5. Evaluate the expression if $x = -4$, $y = 6$, and $z = 3$.
 $\frac{x - y}{2z}$
 A. $-\frac{5}{3}$ B. $\frac{5}{3}$ C. 1 D. $\frac{2}{3}$

5. (A) (B) (C) (D)

6. Find the total interest earned if \$8,200 is invested at 4% simple interest for 2 years.

F. \$32.80 G. \$328 H. \$656 I. \$8,856 6. F G H I

7. **TEMPERATURE** Scott is baking a turkey and a casserole. The cookbook suggests baking the turkey at 325° and the casserole at 375° . What is the difference between the low and high temperatures?

A. 700° B. 350° C. -40° D. -50° 7. A B C D

8. **MARKUP** Find the selling price in dollars for the given percent for a basketball: \$32; 25% markup.

8.

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
0	0	0	0	0	0
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	4	4	4	4
5	5	5	5	5	5
6	6	6	6	6	6
7	7	7	7	7	7
8	8	8	8	8	8
9	9	9	9	9	9

9. **QUADRILATERAL** Andrea's dollhouse is in the shape of a quadrilateral with angles of 70° , 82° , and 103° . What is the measure of the fourth angle?

F. 28° G. 77° H. 105° I. 285° 9. F G H I

10. Write $\frac{3}{4} \div 9$ in simplest form.

A. $\frac{27}{4}$ B. $6\frac{3}{4}$ C. $\frac{1}{12}$ D. $\frac{3}{36}$ 10. A B C D

11. Solve by substitution.

$$y = 2x - 1$$

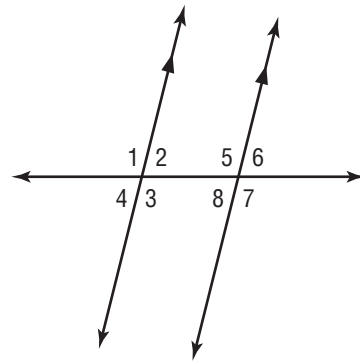
$$y = 3x$$

F. $x = -1, y = 1$ H. $x = 1, y = -3$
 G. $x = 1, y = 3$ I. $x = -1, y = -3$ 11. F G H I

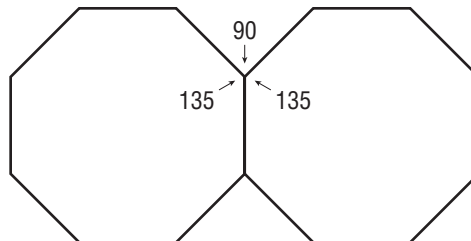
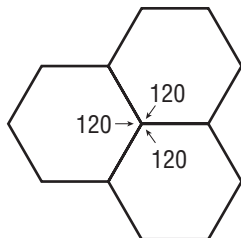
Extended-Response Test

Demonstrate your knowledge by giving a clear, concise solution to each problem. Be sure to include all relevant drawings and justify your answers. You may show your solutions in more than one way or investigate beyond the requirements of the problem. If necessary, record your answer on another piece of paper.

1. a. Explain what it means for two angles to be congruent.
- b. In the figure, which angles are congruent? Find the measure of all the angles if $m\angle 2 = 76^\circ$.



2. a. Draw a figure that is a polygon and another figure that is not a polygon. Explain how the figures are different.
- b. Explain how to classify triangles by the measure of their angles. Draw an example of each classification.
- c. Describe at least four classifications of quadrilaterals. Draw an example of each.
- d. Is a trapezoid ever a rhombus? Explain your reasoning.
- e. Explain what is meant by *regular polygon*.
- f. Draw a right angle, obtuse angle, straight angle, and acute angle. Explain how the figures are different.
- g. Draw an example of supplementary angles. Explain how supplementary angles are different from complementary angles.
3. a. Explain why you think honeycombs are tessellated with hexagons instead of octagons.



- b. Tile a rectangular area with squares. Then use at least two translations to create an Escher-like drawing. Explain each step.

Extended-Response Rubric

Score	Description
4	<p>A score of four is a response in which the student demonstrates a thorough understanding of the mathematics concepts and/or procedures embodied in the task. The student has responded correctly to the task, used mathematically sound procedures, and provided clear and complete explanations and interpretations.</p> <p>The response may contain minor flaws that do not detract from the demonstration of a thorough understanding.</p>
3	<p>A score of three is a response in which the student demonstrates an understanding of the mathematics concepts and/or procedures embodied in the task. The student's response to the task is essentially correct with the mathematical procedures used and the explanations and interpretations provided demonstrating an essential but less than thorough understanding.</p> <p>The response may contain minor flaws that reflect inattentive execution of mathematical procedures or indications of some misunderstanding of the underlying mathematics concepts and/or procedures.</p>
2	<p>A score of two indicates that the student has demonstrated only a partial understanding of the mathematics concepts and/or procedures embodied in the task. Although the student may have used the correct approach to obtaining a solution or may have provided a correct solution, the student's work lacks an essential understanding of the underlying mathematical concepts.</p> <p>The response contains errors related to misunderstanding important aspects of the task, misuse of mathematical procedures, or faulty interpretations of results.</p>
1	<p>A score of one indicates that the student has demonstrated a very limited understanding of the mathematics concepts and/or procedures embodied in the task. The student's response is incomplete and exhibits many flaws. Although the student's response has addressed some of the conditions of the task, the student reached an inadequate conclusion and/or provided reasoning that was faulty or incomplete.</p> <p>The response exhibits many flaws or may be incomplete.</p>
0	<p>A score of zero indicates that the student has provided no response at all, or a completely incorrect or uninterpretable response, or demonstrated insufficient understanding of the mathematics concepts and/or procedures embodied in the task. For example, a student may provide some work that is mathematically correct, but the work does not demonstrate even a rudimentary understanding of the primary focus of the task.</p>

Student Recording Sheet

Use this recording sheet with pages 388-389 of the Student Edition.

Fill in the correct answer. For gridded-response questions, write your answers in the boxes on the answer grid and fill in the bubbles to match your answers.

1. (A) (B) (C) (D)

2. (F) (G) (H) (I)

3.

⊖	⊘	⊘	⊘	⊘	⊘	
0	0	0	0	0	0	0
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

4. (A) (B) (C) (D)

5. (F) (G) (H) (I)

6. (A) (B) (C) (D)

7. _____

8. (F) (G) (H) (I)

9. _____

10. (A) (B) (C) (D)

11. (F) (G) (H) (I)

12. (A) (B) (C) (D)

13. (F) (G) (H) (I)

Extended Response

Record your answers for Exercise 14 on the back of this paper.

Project Rubric

Score	Explanation
3	<p>Student successfully completed the chapter project.</p> <p>Graphic novels included the required number of topics. Drawings of angles were accurate and related to the real world.</p>
2	<p>Student completed the chapter project with partial success.</p> <p>Graphic novels included the required number of topics. A few mathematical errors were present in the topic dialogues. Drawings of angles were accurate, but not all related to the real world.</p>
1	<p>Student completed the chapter project with little success. Graphic novels included only a few of the required topics. Mathematical errors were present in the topic dialogues. Drawings of angles were accurate, but not all related to the real world.</p>
0	<p>Student did not complete the chapter project.</p> <p>Graphic novels did not have dialogue regarding the topics. No drawings of angles were present.</p>

NAME _____ DATE _____ PERIOD _____

Are You Ready for Chapter 6?

Apply

<p>1. WOODWORKING Aponi is making a wooden picture frame. The pieces of raw wood she has are 88 centimeters, 70 centimeters, and 76 centimeters. If the total length of all of the wood is 360 centimeters, how long is the fourth piece? 126 cm</p>	<p>2. BAKING Ernesto is making fruit pies. He has 47 strawberries, 38 blueberries, and some number of gooseberries. If Ernesto has 180 total berries, how many gooseberries does he have? 95 gooseberries</p>
<p>3. TRACK Ruben is doing wind sprints. In the morning he ran sets of 50 feet, 60 feet, and 70 feet. If he ran a total of 360 feet, how much further did he run that day? 180 ft</p>	<p>4. NUMBER SENSE Find the product of the difference of 8 and 4 and 120. 480</p>
<p>5. HOT DOGS Jolene is selling hot dogs at the school soccer game. Each case contains 300 hot dogs. If Jolene started with 4 cases and has emptied 2 of them, how many total hot dogs does she have left? 600 hot dogs</p>	<p>6. CHEERLEADING At the state cheerleading finals, the teams are put into groups of 180 participants. If the competition started with 7 groups, and 2 groups were eliminated after the first round, how many participants are going to the second round? 900 cheerleaders</p>

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6

7

Course 3

NAME _____ DATE _____ PERIOD _____

Chapter

6

Facts Practice

Find the value of x .

<p>1. $x + 78 = 90$ 12</p>	<p>2. $23 + x = 90$ 67</p>	<p>3. $x + 88 = 90$ 2</p>	<p>4. $44 + x = 90$ 46</p>
<p>5. $x + 112 = 180$ 68</p>	<p>6. $14 + x = 180$ 166</p>	<p>7. $x + 150 = 180$ 30</p>	<p>8. $36 + x = 180$ 144</p>
<p>9. $x + 22 + 78 = 180$ 80</p>	<p>10. $90 + x + 45 = 180$ 45</p>	<p>11. $111 + 23 + x = 180$ 46</p>	<p>12. $x + 2x + 30 = 180$ 50</p>
<p>13. $50 + 2x + 80 = 180$ 25</p>	<p>14. $72 + 4x + 2x = 180$ 18</p>	<p>15. $x + 45 + 45 + 135 = 360$ 135</p>	<p>16. $33 + x + 77 + 100 = 360$ 150</p>
<p>17. $82 + 67 + x + 90 = 360$ 121</p>	<p>18. $93 + 18 + 116 + x = 360$ 133</p>	<p>19. $x + x + x + x = 360$ 90</p>	<p>20. $3x + 2x + 4x + x = 360$ 36</p>

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6

11

Course 3

6-1

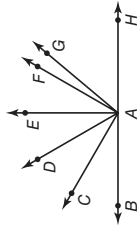
A

Explore

Angle Measure

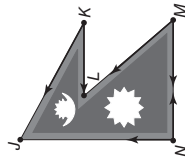
Use a protractor to find the measure of each angle.

- $\angle BAC$ 30°
- $\angle BAD$ 60°
- $\angle CAE$ 60°
- $\angle BAF$ 120°
- $\angle DAG$ 70°
- $\angle EAG$ 40°



FLAGS The flag of Nepal is shown. Use a protractor to find the angles on the flag.

- $\angle LKJ$ 29°
- $\angle NML$ 50°
- $\angle JNM$ 90°



Use a protractor to draw an angle having each measurement.

- 75°



- 125°



6-1

B

Reteach

Classify Angles

- An angle is formed by two rays that share a common endpoint called the vertex.
- An angle can be named in several ways. The symbol for angle is \angle .
- Angles are classified according to their measure. Two angles that have the same measure are said to be **congruent**.
- Two angles are **vertical** if they are opposite angles formed by the intersection of two lines. Vertical angles are congruent.
- Two angles are **adjacent** if they share a common vertex, a common side, and do not overlap.

Acute Angle Right Angle Obtuse Angle Straight Angle



Examples Name each angle below. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.

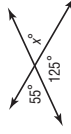


Use the vertex as the middle letter and a point from each side, $\angle ABC$, $\angle CBA$, or use the vertex or the number only, $\angle B$ or $\angle 1$. The angle is 90° , so it is a right angle.

Use the vertex or the number only, $\angle D$ or $\angle 2$. The angle is less than 90° , so it is an acute angle.

- What is the value of x in the figure at the right?

The angle labeled x° and the angle labeled 55° are vertical angles. Since vertical angles are congruent, the value of x is 55.



Exercises

Name each angle. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.



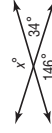
$\angle H$ or $\angle 3$; acute

$\angle MNO$, $\angle ONM$, or $\angle N$; obtuse

$\angle Q$; right

- Find the value of x in the figure at the right.

146



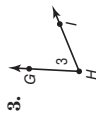
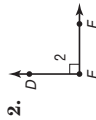
NAME _____ DATE _____ PERIOD _____

6-1

B Skills Practice

Classify Angles

Name each angle in four ways. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.



$\angle ABC$, $\angle CBA$, $\angle B$, $\angle 1$; obtuse

$\angle DEF$, $\angle FED$, $\angle E$, $\angle 2$; right

$\angle GHI$, $\angle IGH$, $\angle H$, $\angle 3$; acute



$\angle JKL$, $\angle LKJ$, $\angle K$, $\angle 4$; straight

$\angle MNO$, $\angle ONM$, $\angle N$, $\angle 5$; obtuse

$\angle PQR$, $\angle RQP$, $\angle Q$, $\angle 6$; acute

Refer to the diagram at the right. Identify each angle pair as *adjacent*, *vertical*, or *neither*.

7. $\angle 7$ and $\angle 12$
adjacent

8. $\angle 8$ and $\angle 11$
vertical

9. $\angle 7$ and $\angle 10$
vertical

10. $\angle 9$ and $\angle 11$
neither

11. $\angle 8$ and $\angle 9$
adjacent

12. $\angle 10$ and $\angle 12$
neither

Refer to the figure at the right to determine the measure of each given angle.

13. $\angle SYX$
 76°

14. $\angle XYW$
 40°

15. $\angle WYV$
 64°

16. $\angle SYW$
 116°

17. $\angle TYX$
 140°

18. $\angle VYX$
 104°

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

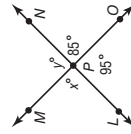
NAME _____ DATE _____ PERIOD _____

6-1

B Homework Practice

Classify Angles

Use the figure at the right to answer Exercises 1–4.



1. Name two angles that are vertical.

$\angle MPL$, $\angle NPO$ or $\angle MPN$, $\angle LPO$

2. Name two angles that are adjacent.

$\angle LPM$, $\angle MPN$ or $\angle MPN$, $\angle NPO$
 $\angle NPO$, $\angle OPL$ or $\angle OPL$, $\angle LPM$

3. Find the value of x . **85**

4. Find the value of y . **95**

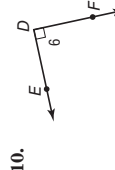
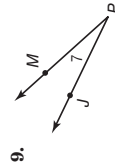
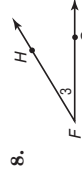
Name each angle in four ways. Then classify the angle as *acute*, *right*, *obtuse*, or *straight*.



$\angle 4$, $\angle S$, $\angle RST$, $\angle TSR$; obtuse

$\angle 2$, $\angle Y$, $\angle XYZ$, $\angle ZYX$; right

$\angle 1$, $\angle B$, $\angle CBA$, $\angle ABC$; straight



$\angle 3$, $\angle F$, $\angle HFG$, $\angle GFH$; acute

$\angle 7$, $\angle P$, $\angle JPM$, $\angle MPJ$; acute

$\angle 6$, $\angle D$, $\angle EDF$, $\angle FDE$; right

Use the figure at the right to name the following.

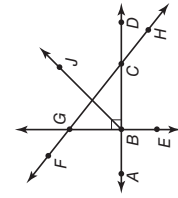
11–14 Sample answers are given.

11. two acute angles
 $\angle DCH$, $\angle JBD$

12. two straight angles
 $\angle ABD$, $\angle EBG$

13. two right angles
 $\angle ABE$, $\angle GBC$

14. two obtuse angles
 $\angle FGE$, $\angle ACH$



GET CONNECTED! For more examples, go to glencoe.com.

NAME _____


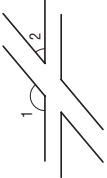


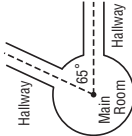
DATE _____

PERIOD _____

6-1
B

Problem-Solving Practice

Classify Angles

<p>1. CLOCKS The time shown on the clock is 11:05. Starting at this time, approximately what time will it be when the hands form an obtuse angle? Sample answer: about 11:12</p> 	<p>3. ALPHABET Which of the following letters contain at least one acute angle? Which contain vertical angles? Which contain adjacent angles? A, X; X; A, E, X A E L X</p>
<p>2. AIRPORT The runways at a local airport are sketched in the figure. Classify $\angle 1$ and $\angle 2$ as <i>acute</i>, <i>obtuse</i>, <i>right</i>, or <i>straight</i>. $\angle 1$ is obtuse; $\angle 2$ is acute.</p> 	<p>4. CLOCKS The time shown on the clock is 12:07. After 20 minutes have gone by, will the angle formed by the hour and minute hands be <i>acute</i>, <i>obtuse</i>, <i>right</i>, or <i>straight</i>? obtuse</p> 
<p>5. BALLET When a ballet dancer's feet are in first position, the heels are touching, and the feet are turned out. A dancer with excellent technique can position his or her feet so that they are nearly in a straight line. Isabella is practicing her technique. Classify the angle her feet form as <i>acute</i>, <i>obtuse</i>, or <i>right</i>. obtuse</p> 	<p>6. ARCHITECTURE The plans for a new aquarium call for several hallways of exhibits leading out of a circular main room. Because of the size of the tanks that will be used, the angle formed between two adjacent hallways can be no smaller than 65°. What is the maximum number of hallways that can be built leading out of the main room? 5</p> 

Chapter 6

16

Course 3

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

NAME _____

DATE _____

PERIOD _____

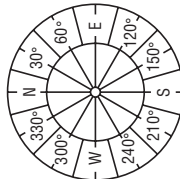
6-1
B

Enrich

Compass Directions

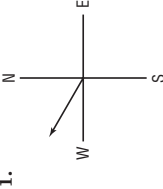
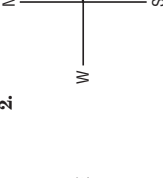
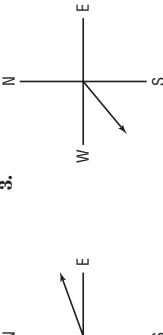
There are 360° in a complete rotation. The directions north, east, south, and west are shown on the compass at the right.

To find the direction a boat or airplane is heading, measure clockwise from north around the compass. The example shows a heading of 150° .



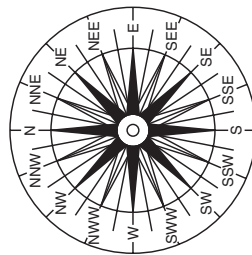
$150^\circ = 90^\circ + 60^\circ$

Use a protractor. Write the compass heading in degrees for each diagram.

-  **300°**
-  **70°**
-  **230°**

The drawing at the right is called a compass rose. Use the compass rose to translate each direction into degrees.

- East **90°**
- North **0°, or 360°**
- Northeast (NE) **45°**
- Southwest (SW) **225°**
- South **180°**
- Southeast (SE) **135°**
- Northwest (NW) **315°**
- North northeast (NNE) **22.5°**



Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

6-1

B

TI-84 Plus Activity
Draw Angles

You can use the Cabri Jr. application to draw and measure angles.

Example

Draw and measure a 28° angle.

Step 1: Press **APPS** and choose **Cabri Jr.**

Step 2: Press **WINDOW** to get the Object Tools menu. Arrow down to **Segment** and press **ENTER**. Move the cursor to one point and press **ENTER**. Move to another point and press **ENTER**. Draw a second segment to intersect with the first to create an angle. Press **CLEAR** to disable the Segment tool.

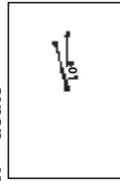
Step 3: Press **GRAPH** to get the Display and Measurement Tools. Arrow down to **Measure** and arrow over to **Angle** and press **ENTER**. Select one point on one line, the vertex, and then a point on the other line. Points will blink when selected.

Step 4: Select an endpoint and press **ALPHA**. Drag the point until the angle measure is 28°. Press **CLEAR** to disable the Measurement tool.

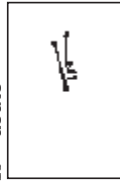
Exercises

Draw each angle by following the steps above. Sketch the angle below. Then classify each angle as *acute*, *right*, *obtuse*, or *straight*.

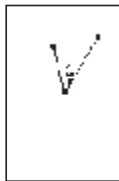
1. 10° acute



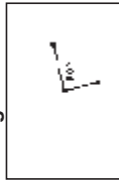
2. 15° acute



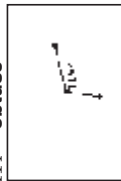
3. 45° acute



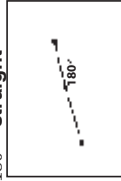
4. 90° right



5. 114° obtuse



6. 180° straight



Chapter 6

18

Course 3

NAME _____ DATE _____ PERIOD _____

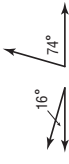
6-1

C

Reteach
Complementary and Supplementary Angles

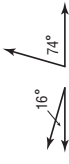
- Two angles are **complementary** if the sum of their measures is 90°.
- Two angles are **supplementary** if the sum of their measures is 180°.

Examples Identify each pair of angles as *complementary*, *supplementary*, or *neither*.



$30^\circ + 150^\circ = 180^\circ$

The angles are supplementary.



$16^\circ + 74^\circ = 90^\circ$

The angles are complementary.

Example 3 ALGEBRA Find the value of x .

Since the two angles are supplementary, the sum of their measures is 180°.

$x + 35 = 180$

Write the equation.

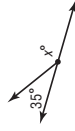
$-35 \quad -35$

Subtract 35 from each side.

$x = 145$

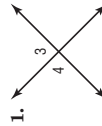
Simplify.

So, the value of x is 145.

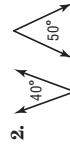


Exercises

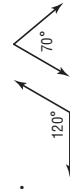
Identify each pair of angles as *complementary*, *supplementary*, or *neither*.



supplementary

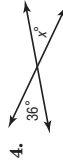


complementary

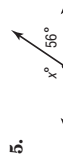


neither

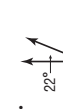
ALGEBRA Find the value of x in each figure.



36



124



68

Chapter 6

19

Course 3

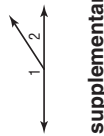
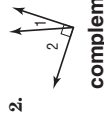
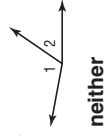
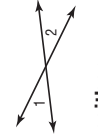
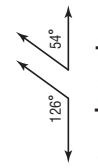
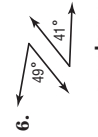
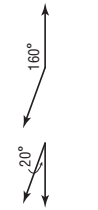
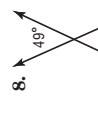
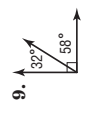
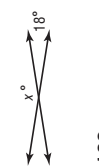
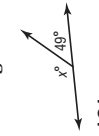
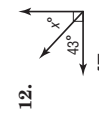
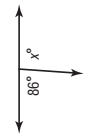
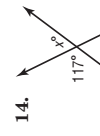
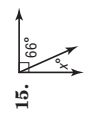
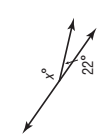
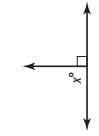
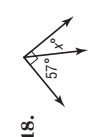
NAME _____ DATE _____ PERIOD _____

6-1
C

Skills Practice

Complementary and Supplementary Angles

Identify each pair of angles as *complementary*, *supplementary*, or *neither*.

1.  **supplementary**
2.  **complementary**
3.  **neither**
4.  **neither**
5.  **supplementary**
6.  **complementary**
7.  **supplementary**
8.  **neither**
9.  **complementary**
10.  **supplementary**
11.  **neither**
12.  **complementary**
13.  **162**
14.  **63**
15.  **24**
16.  **94**
17.  **90**
18.  **33**

Chapter 6

Course 3

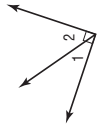
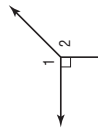

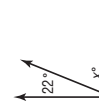
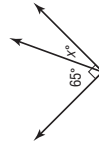
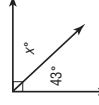
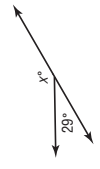
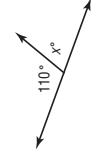
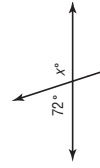
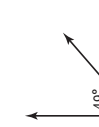
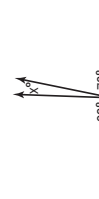
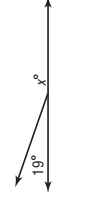
NAME _____ DATE _____ PERIOD _____

6-1
C

Homework Practice

Complementary and Supplementary Angles

Classify each pair of angles as *complementary*, *supplementary*, or *neither*.

1.  **complementary**
2.  **neither**
3.  **supplementary**
4.  **68**
5.  **25**
6.  **47**
7.  **41**
8.  **70**
9.  **108**
10.  **41**
11.  **10**
12.  **161**

ALGEBRA Find the value of x in each figure.

13. ALGEBRA If $\angle C$ and $\angle D$ are supplementary, and the measure of $\angle D$ is 45° , what is the measure of $\angle C$? **135**

Get Connected For more examples, go to glencoe.com.

Chapter 6

21

Course 3

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

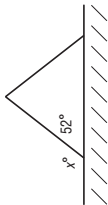
Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

6-1
C

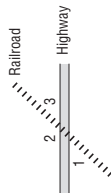
NAME _____ DATE _____ PERIOD _____

Problem-Solving Practice
Complementary and Supplementary Angles

1. PYRAMIDS A side view of the Great Pyramid at Giza is shown below. The sides of the pyramid make an angle of 52° with respect to the ground. What is the value of x ? **128**



2. RAILROAD A map shows a railroad crossing a highway, as shown below. Which of the numbered angles are supplementary angles? **$\angle 1$ and $\angle 2$; $\angle 2$ and $\angle 3$**

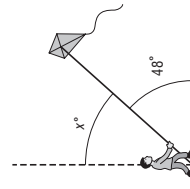


3. RAILROAD Refer to the map shown in Exercise 2. If $m\angle 1$ is 64° , what is the measure of $\angle 2$? **116**

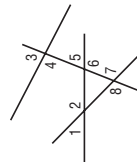
4. SKIING A ski jump makes an angle of 27° with respect to the water as shown below. How are the 27° angle and the unknown angle related? What is the value of x ? **supplementary angles; 153**



5. KITES A kite string makes an angle of 48° with respect to the ground as shown below. The dashed line is vertical and the ground is horizontal. How are the 48° angle and the unknown angle related? What is the value of x ? **complementary angles; 42**



6. GAMES In a game of pick-up-sticks, the last 4 sticks are shown below. Which of the numbered angles are supplementary angles? **$\angle 1$ and $\angle 2$, $\angle 3$ and $\angle 4$, $\angle 5$ and $\angle 6$**



Answers (Lesson 6-1)

NAME _____ DATE _____ PERIOD _____

6-1
C

Enrich

Classify or Give the Angle!

You already know that the complement of an angle and the original angle add up to 90° and that the supplement of an angle and the original angle add up to 180° . You can use or combine these ideas to learn more about complements and supplements.

For Exercise 1–5, answer acute, right, obtuse, or straight. Hint: There may be more than one answer.

- I am an angle that has no complement. What type of angle am I?
right, obtuse, straight
- I am an angle that is congruent to my complement. What type of angle am I?
acute
- I am an angle that is congruent to my supplement. What type of angle am I?
right
- I am an angle that has so supplement. What type of angle am I?
straight
- I have a complement and I have a supplement. What type of angle am I?
acute

For Exercise 6–9, use the guess, check, and revise strategy to find the angle measure.

- My complement is 40° more than I am. What is my measure?
 25°
- The measure of my complement plus the measure of my supplement gives me a straight angle. What is my measure?
 45°
- My measure is four times the measure of my complement. What is my measure?
 72°
- Five times my measure is the same as my supplement. What is my measure?
 30°

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

6-1
D

Skills Practice

Problem-Solving Investigation: Use Logical Reasoning

For Exercises 1–6, state whether the example uses *deductive* reasoning or *inductive* reasoning.

1. After checking the house numbers on several streets in your neighborhood, you discover that houses that face north always have an odd house number. **inductive reasoning**
2. You determine the type of shape that a sticker is by examining its sides and angles. **deductive reasoning**
3. You place students in order from lowest grade on a math test to highest grade to compare their scores. **deductive reasoning**
4. You roll a number cube 1,000 times and discover that it lands on the number 4 twice as many times as the number 1. **inductive reasoning**
5. You find a way to use 2 larger containers to measure out the exact amount for a smaller container. **deductive reasoning**
6. You determine what types of shapes will be created by connecting the corners of a regular hexagon. **deductive reasoning**

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

6-1
D

Reteach

Problem-Solving Investigation: Use Logical Reasoning

You may need to use logical reasoning to solve some problems.

- Understand** • Determine what information is given in the problem and what you need to find.
Plan • Select a strategy including a possible estimate.
Solve • Solve the problem by carrying out your plan.
Check • Examine your answer to see if it seems reasonable.

Example A plane figure has four sides. The figure has only two congruent sides and two pairs of congruent angles. Is the figure a square, rectangle, parallelogram, rhombus, or trapezoid? Did you use deductive or inductive reasoning?

Understand You know that a plane figure has four sides and the figure has only two congruent sides and two pairs of congruent angles. We need to see if the figure is a square, rectangle, parallelogram, rhombus, or trapezoid.

Plan Look at the characteristics of these different figures. A square or rhombus has *four* congruent sides. The figure is not a square or a rhombus. A rectangle or parallelogram has *two* pairs of congruent sides. The figure is not a rectangle or a parallelogram.



Solve An isosceles trapezoid can have two congruent sides and two pairs of congruent angles. The figure could be a trapezoid.

Check Since all choices but the trapezoid were eliminated, the figure is a trapezoid. Because you used existing rules about four-sided figures to make a decision, you used deductive reasoning.

Exercises

For Exercises 1–3, solve each problem using logical reasoning.

1. **GEOMETRY** Jennifer draws a square on a piece of paper and uses a ruler to draw one line through the square to create two shapes. What is the maximum number of sides that either of these shapes can have, and how would the line have to be drawn to create it? **5 sides. The line would have to be drawn through adjacent sides of the square, which creates a triangle and an irregular pentagon.**
2. **MODELS** You have 30 toothpicks. You can add two adjacent squares horizontally using 7 toothpicks if the adjacent square shares a toothpick for the side between them. How many total squares could be created this way with 30 toothpicks, if the squares are formed in a row?
9 squares. The first square takes 4 toothpicks. Each addition square uses 3 toothpicks and shares a side with the previous squares (4 + 3 + 3 + 3 + 3 + 3 + 3 = 28 toothpicks).

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

NAME _____

DATE _____

PERIOD _____

6-1

D

Homework Practice

Problem-Solving Investigation: Use Logical Reasoning

Mixed Problem Solving

Use logical reasoning to solve Exercises 1 and 2.

1. **NUMBER SENSE** Simplify each product of powers. Then use logical reasoning to simplify $10^4 \times 0.1^4$, $10^5 \times 0.1^5$, and $10^{12} \times 0.1^{12}$. **1; 1; 1**

Product of Powers	Simplified Form
$10^5 \times 0.1^2$	1
$10^3 \times 0.1^3$	1
$10^7 \times 0.1^7$	1

2. **MEASUREMENT** You have a pen that is 6 inches long and a pencil that is 7 inches long. Explain how you can use the pen and pencil to draw a line segment that is 3 inches long.
Sample answer: Draw a line segment the length of three pencils (21 inches). From that line segment, take away the length of three pens (18 inches). The remaining portion of the line segment is 3 inches long (21 - 18 = 3).

Use any strategy to solve Exercises 3–6. Some strategies are shown below.

PROBLEM-SOLVING STRATEGIES
<ul style="list-style-type: none"> Use logical reasoning. Look for a pattern. Guess, check, and revise. Choose an operation.

Get Connected! For more examples, go to glencoe.com.

NAME _____

DATE _____

PERIOD _____

6-1

D

Problem-Solving Practice

Problem-Solving Investigation: Use Logical Reasoning

Solve each problem using logical reasoning.

<p>1. GEOMETRY A solid figure has two triangular faces and three square faces. Is the figure a pyramid, a triangular prism, or a cube? Explain. A triangular prism. A pyramid would have one square face and four triangular faces. A cube would have six square faces. A triangular prism is the only figure with two triangular faces.</p>	<p>2. MEASUREMENT Can you use a 4-pint container and a 9-pint container to fill a 10-pint container? Explain. Yes. Sample answer: Fill the 9-pint container and then use it to fill the 4-pint container. Empty the rest of the 9-pint container into a larger container. Repeat to get 10 pints. Or, use the 9-pint container to fill the 4-pint container twice, emptying both times. Then move the remaining pint to the 4-pint container and refill the 9-pint container.</p>
<p>3. MONEY After a visit to the mall, Ray and Mary counted their money to see how much they had left. Ray said, "If I had \$8 more, I would have as much as you." Mary replied, "If I had \$8 more, I would have twice as much as you." How much money does each person have? Explain. Ray has \$16 and Mary has \$24. \$16 + \$8 = \$24, \$24 + \$8 = \$32, which is twice \$16.</p>	<p>4. SPORTS Wade, Rich, Sue, Destin, and Tracey were the first five finishers of a race. From the given clues, state the order in which they finished: Rich finished behind Destin, Sue was fifth, Tracey finished ahead of Wade, and Destin finished behind Wade. Tracey, Wade, Destin, Rich, Sue</p>
<p>5. NUMBER SENSE The sum of two numbers is equal to 15. The product of the numbers is 44. What are the two numbers? 11 and 4</p>	<p>6. GEOMETRY A regular hexagon has 6 hexagons surrounding it. Each of the 6 hexagons shares a side with the middle hexagon and with the hexagon next to it. If each of the hexagons has 2-inch sides, what is the perimeter of the figure? 36 inches</p>

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

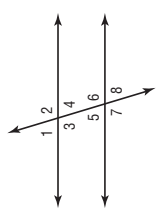
6-2

A

Explore

Parallel Lines

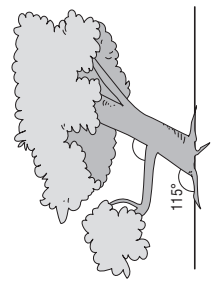
If the measure of $\angle 4$ in the figure at the right is 80° , determine the measure of each given angle without using a protractor. Then check your conjecture by measuring with a protractor.



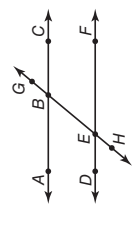
1. $\angle 1$ 80°
2. $\angle 2$ 100°
3. $\angle 3$ 100°
4. $\angle 5$ 80°
5. $\angle 6$ 100°
6. $\angle 7$ 100°
7. $\angle 8$ 80°

8. **TREES** A tree in the park is growing at an angle of 115° from the ground. The tree has one branch parallel to the ground. What angle does the branch make with the tree? How do you know? **115°** ;

Sample answer: Because the branch is parallel to the ground, the corresponding angles should be congruent.



Draw a diagram to match the following characteristics: lines AC and DF are parallel lines, line GH intersects both lines, point B is where lines AC and GH intersect, point E is where lines DF and GH intersect. If $m\angle GBC$ is 50° , find the measure of each angle. **Sample answers are given.**



9. $\angle CBE$ 130°
10. $\angle BEF$ 50°
11. $\angle FEH$ 130°
12. $\angle GBA$ 130°
13. $\angle ABE$ 50°
14. $\angle BED$ 130°
15. $\angle DEH$ 50°

6-2

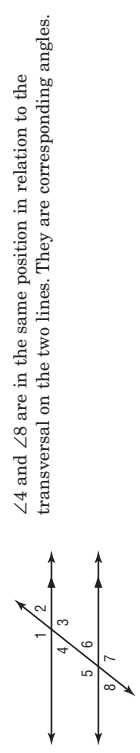
B

Reteach

Lines

- **Perpendicular lines** are lines that intersect at right angles.
- **Parallel lines** are two lines in a plane that never intersect or cross.
- A line that intersects two or more other lines is called a **transversal**.
- If the two lines cut by a transversal are parallel, then these are special pairs of angles are congruent: **alternate interior angles, alternate exterior angles, and corresponding angles.**

Example 1 Classify $\angle 4$ and $\angle 8$ as **alternate interior, alternate exterior, or corresponding**.

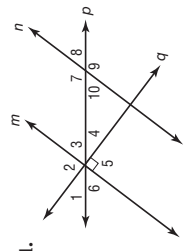


$\angle 4$ and $\angle 8$ are in the same position in relation to the transversal on the two lines. They are corresponding angles.

Example 2 Refer to the figure in Example 1. Find $m\angle 2$ if $m\angle 8 = 58^\circ$.
Since $\angle 2$ and $\angle 8$ are alternate exterior angles, $m\angle 2 = 58^\circ$

Exercises

In the figure at the right, lines m and line n are parallel. If $m\angle 3 = 64^\circ$, find each given angle measure. Justify each answer.



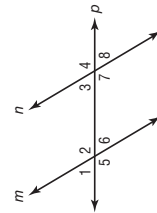
1. $m\angle 8$ 64° ; **Sample answer:** $\angle 3$ and $\angle 8$ are corresponding angles. So, $m\angle 8 = 64^\circ$.
2. $m\angle 10$ 64° ; **Sample answer:** $\angle 3$ and $\angle 10$ are alternate interior angles. So, $m\angle 10 = 64^\circ$.
3. $m\angle 4$ 26° ; **Sample answer:** $\angle 3$ is supplementary to the angle formed by adjacent angles 4 and 5. So, $m\angle 4 + m\angle 5 + m\angle 3 = 180^\circ$. So, $m\angle 4 + 90^\circ + 64^\circ = 180^\circ$. So, $m\angle 4 = 180^\circ - 90^\circ - 64^\circ = 26^\circ$.
4. $m\angle 6$ 64° ; **Sample answer:** $\angle 3$ and $\angle 6$ are vertical angles. So, $m\angle 6 = 64^\circ$.

NAME _____ DATE _____ PERIOD _____

6-2
B

Skills Practice
Lines

For Exercises 1–12, use the figure at the right. In the figure, line m is parallel to line n . Classify each pair of angles as *alternate interior*, *alternate exterior*, or *corresponding*.

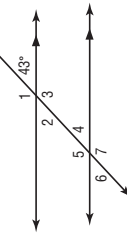


- $\angle 1$ and $\angle 8$ alternate exterior
- $\angle 5$ and $\angle 7$ corresponding
- $\angle 3$ and $\angle 6$ alternate interior
- $\angle 2$ and $\angle 4$ corresponding
- $\angle 2$ and $\angle 7$ alternate interior
- $\angle 4$ and $\angle 5$ alternate exterior

If $m\angle 4 = 122^\circ$, find each given angle measure. Justify your answer.

- $m\angle 8$ 58° ; Sample answer: $\angle 4$ and $\angle 8$ are supplementary. So, $m\angle 8 = 180^\circ - 122^\circ = 58^\circ$.
- $m\angle 5$ 122° ; Sample answer: $\angle 4$ and $\angle 5$ are alternate exterior angles. So, $m\angle 5 = 122^\circ$.
- $m\angle 2$ 122° ; Sample answer: $\angle 2$ and $\angle 4$ are corresponding angles. So, $m\angle 2 = 122^\circ$.
- $m\angle 1$ 58° ; Sample answer: $\angle 1$ and $\angle 2$ are supplementary. So, $m\angle 1 = 180^\circ - 122^\circ = 58^\circ$.
- $m\angle 6$ 58° ; Sample answer: $\angle 1$ and $\angle 6$ are vertical angles. So, $m\angle 6 = 58^\circ$.
- $m\angle 7$ 122° ; Sample answer: $\angle 4$ and $\angle 7$ are vertical angles. So, $m\angle 7 = 122^\circ$.

For Exercises 13 and 14, use the figure at the right.



- List all the angles congruent to the given angle. Explain your reasoning. $\angle 2$, $\angle 4$, $\angle 6$;
Sample answer: $\angle 2$ is vertical to the given angle; $\angle 4$ and the given angle are corresponding angles; $\angle 6$ and the given angle are alternate exterior angles.
- List all the angles congruent to $\angle 5$. Explain your reasoning. $\angle 1$, $\angle 3$, $\angle 7$; Sample answer: $\angle 1$ and $\angle 5$ are corresponding angles; $\angle 3$ and $\angle 5$ are alternate interior angles; $\angle 7$ is vertical to $\angle 5$.

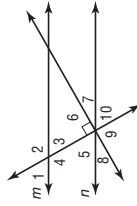
Answers (Lesson 6-2)

NAME _____ DATE _____ PERIOD _____

6-2
B

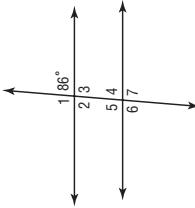
Homework Practice
Lines

For Exercises 1–6, use the figure at the right. In the figure, line m is parallel to line n . List all pairs of each type of angle.



- vertical $\angle 1$ and $\angle 3$, $\angle 2$ and $\angle 4$, $\angle 5$ and $\angle 10$, $\angle 6$ and $\angle 9$, $\angle 7$ and $\angle 8$
- complementary $\angle 7$ and $\angle 10$, $\angle 5$ and $\angle 7$, $\angle 5$ and $\angle 8$, $\angle 8$ and $\angle 10$, $\angle 8$ and $\angle 1$
- supplementary $\angle 1$ and $\angle 2$, $\angle 2$ and $\angle 3$, $\angle 3$ and $\angle 4$, $\angle 1$ and $\angle 4$, $\angle 5$ and $\angle 2$, $\angle 5$ and $\angle 4$, $\angle 10$ and $\angle 2$, $\angle 4$ and $\angle 10$
- corresponding $\angle 1$ and $\angle 5$, $\angle 3$ and $\angle 10$
- alternate interior $\angle 3$ and $\angle 5$
- alternate exterior $\angle 1$ and $\angle 10$

Use the figure at the right for Exercises 7–10.



- Find the measure of $\angle 2$. Explain your reasoning. 86° ; Sample answer: $\angle 2$ is vertical to the given angle. So, $m\angle 2 = 86^\circ$.
- Find the measure of $\angle 3$. Explain your reasoning. 94° ; Sample answer: $\angle 3$ are supplementary to the given angle. So, $m\angle 3 = 180^\circ - 86^\circ = 94^\circ$.
- Find the measure of $\angle 4$. Explain your reasoning. 86° ; Sample answer: $\angle 4$ is corresponding to the given angle. So, $m\angle 4 = 86^\circ$.
- Find the measure of $\angle 6$. Explain your reasoning. 86° ; Sample answer: $\angle 2$ and the given angle are alternate exterior angles. So, $m\angle 6 = 86^\circ$.

- ALGEBRA Angles A and B are corresponding angles. If $m\angle A = 4x$ and $m\angle B = 3x + 7$, find the value of x . Explain. $m\angle A = m\angle B$.
So $4x = 3x + 7$. So, $x = 7$.

- ALGEBRA Angles G and H are supplementary and congruent. If $\angle G$ and $\angle H$ are alternate interior angles, what is the measure of each angle? Each measures 90° ;
Sample answer: If $\angle G$ and $\angle H$ are alternate exterior angles formed by two parallel lines, they are congruent. If $\angle G$ and $\angle H$ are also supplementary, then each must be $180^\circ \div 2 = 90^\circ$.

GET CONNECTED For more examples, go to glencoe.com.

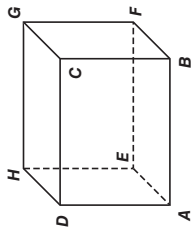
NAME _____ DATE _____ PERIOD _____

6-2
B

Enrich

Lines and Angles in Space

In a plane, two lines are either parallel or intersecting. In *space*, there are three possibilities: parallel, **intersecting**, or **skew**. Imagine holding two yardsticks in the air and that the lines created by the sticks extend forever in both directions. You could hold the sticks so that the lines meet or do not meet. If the lines ever meet, they are intersecting. If they do not intersect, they are either parallel or skew. If they are oriented in the same direction, they are parallel. If lines do not intersect and are not parallel, they are skew.



Imagine that the figure to the right is a cubic room with a floor, ceiling, and four walls. Each corner is labeled with a letter for reference. The line segments that form the edges of the room are each contained in a line.

\overleftrightarrow{AB} and \overleftrightarrow{HG} are parallel.

Lines AB and HG can be written as \overleftrightarrow{AB} and \overleftrightarrow{HG} .

\overleftrightarrow{BC} and \overleftrightarrow{HG} are skew.

Lines BC and HG can be written as \overleftrightarrow{BC} and \overleftrightarrow{HG} .

\overleftrightarrow{AB} and \overleftrightarrow{BC} are intersecting.

Lines AB and BC can be written as \overleftrightarrow{AB} and \overleftrightarrow{BC} .

Refer to the figure above for Exercises 1–14. Determine if the lines are **parallel**, **intersecting**, or **skew**.

1. \overleftrightarrow{CD} and \overleftrightarrow{AB} **parallel**
2. \overleftrightarrow{CD} and \overleftrightarrow{DH} **intersecting**
3. \overleftrightarrow{FG} and \overleftrightarrow{AB} **skew**
4. \overleftrightarrow{EH} and \overleftrightarrow{FG} **parallel**
5. \overleftrightarrow{CD} and \overleftrightarrow{EH} **skew**
6. \overleftrightarrow{GH} and \overleftrightarrow{AD} **skew**
7. \overleftrightarrow{EH} and \overleftrightarrow{AE} **intersecting**
8. \overleftrightarrow{CD} and \overleftrightarrow{EF} **parallel**

Find the measure of each angle.

9. $\angle DAB$ **90°**
10. $\angle AFB$ **45°**
11. $\angle CHE$ **90°**

CHALLENGE Determine if the given lines would be **parallel**, **intersecting**, or **skew**.

12. \overleftrightarrow{CE} and \overleftrightarrow{CA} **intersecting**
13. \overleftrightarrow{GB} and \overleftrightarrow{DE} **skew**
14. \overleftrightarrow{FH} and \overleftrightarrow{BD} **parallel**

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6

33

Course 3

NAME _____ DATE _____ PERIOD _____

6-2
B

Problem-Solving Practice

Lines

<p>1. SYMBOLS The symbol below is an equal sign with a slash through it. It is used to represent <i>not equal to</i> in math, as in $1 \neq 2$. If $m\angle 1 = 108^\circ$, classify the relationship between $\angle 1$ and $\angle 2$. Then find $m\angle 2$. Assume the equal sign consists of parallel lines. Alternate exterior angles; 108°</p>	<p>2. BRIDGE Arturo is designing a bridge for science class using parallel supports for the top and bottom beam. Find $m\angle 2$ if $m\angle 1 = 60^\circ$.</p>
<p>3. LEG LIFTS For cheerleading practice, Kiara must be able to lift her legs so that they are parallel to her outstretched arms. For each side of her body, what relationship between the angle formed by her arms and the floor and the angle formed by her legs and the floor? corresponding angles</p>	<p>4. ALGEBRA In the figure, line m is parallel to line n. If $m\angle 3 = 7x - 10$ and $m\angle 6 = 5x + 10$, what is the measure of $\angle 3$ and $\angle 6$? 60°</p>
<p>5. ALGEBRA Refer to the figure in Exercise 4. If $m\angle 1 = 4x + 40$, and $m\angle 5 = 120^\circ$, what is the value of x? 20</p>	<p>6. ART The drawing below shows the side view of a drafting easel. The brace is parallel to the ground. If $m\angle A$ is 82°, what is the measure of $\angle B$? 82°</p>

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6

32

Course 3

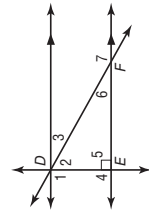
NAME _____ DATE _____ PERIOD _____

6-3

A

Explore
Triangles

For Exercises 1–5, use the figure at the right.



- Classify the relationship between $\angle 1$ and $\angle 5$. What is true about this pair of angles?
 $\angle 1$ and $\angle 5$ are alternate interior angles; They are congruent.
- Classify the relationship between $\angle 3$ and $\angle 6$. What is true about this pair of angles?
 $\angle 3$ and $\angle 6$ are alternate interior angles; They are congruent.
- Is there a relationship between $\angle 2$ and $\angle 4$? Justify your answer.
No; sample answer: Lines DE , DF , and EF are not parallel. So you cannot make any conclusions about the angles.

4. What type of angle is formed by $\angle 1$, $\angle 2$, and $\angle 3$? What is the sum of the $m\angle 1$, $m\angle 2$, and $m\angle 3$?
straight angle; 180°

5. What can you conclude about the sum of $m\angle 2$, $m\angle 5$, and $m\angle 6$? Explain your reasoning.
The sum is 180° ; Sample answer: The sum is 180° because $m\angle 1 = m\angle 5$ and $m\angle 3 = m\angle 6$, so $m\angle 2 + m\angle 5 + m\angle 6 = 180^\circ$.

6. Use a sheet of paper for parts a and b.
a. Draw three lines on the paper so that each line intersects the other two. What can you conclude about the sum of the measures of the three inside angles? Justify your answer.
Check students' work. The sum is 180° ; Sample answer: because the lines form a triangle

b. On the same sheet of paper, draw a new line that is parallel to one of the original lines, and intersects the other two lines. Does this new line help support your conclusion in Part a? Justify your answer.
Yes; sample answer: The extra line creates a straight angle and some pairs of congruent angles that can be used to find the sum of the measures of the three angles.

Answers (Lesson 6-3)

NAME _____ DATE _____ PERIOD _____

6-3

B

Reteach
Triangles

- A triangle is formed by three line segments that intersect only at their endpoints.
- A point where the segments intersect is a **vertex** of the triangle.
- Every triangle also has three angles. The sum of the measure of the angles is 180° .
- All triangles have at least two acute angles. Triangles can be classified by the measure of its third angle: *acute*, *right*, or *obtuse*.
- Another way to classify triangles is by their sides: *scalene*, *isosceles*, or *equilateral*.

Example 1 Find the value of x in $\triangle ABC$.

$$x + 66 + 52 = 180$$

The sum of the measures is 180.

$$x + 118 = 180$$

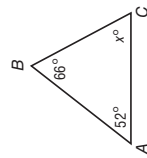
Simplify.

$$-118 \quad -118$$

Subtract 118 from each side.

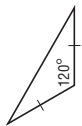
$$x = 62$$

The value of x is 62.



Example 2 Classify the triangle by its angles and by its sides.

The triangle has one obtuse angle and two sides the same length. So, it is an obtuse, isosceles triangle.



Exercises

Find the the value of x in each triangle. Then classify the triangle as *acute*, *right*, or *obtuse*.

-
-
-

23; acute **47; right** **95; obtuse**

Classify each triangle by its angles and by its sides.

-
-
-

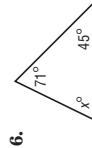
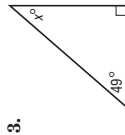
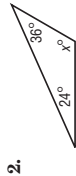
acute; scalene **right; isosceles** **obtuse; scalene**

NAME _____ DATE _____ PERIOD _____

6-3
B

Skills Practice
Triangles

Find the value of x in each triangle with the given angle measures. Then classify the triangle as *acute*, *right*, or *obtuse*.



15°; acute

120°; obtuse

41°; right

104°; obtuse

25°; right

64°; acute

7. $57^\circ, 51^\circ, x^\circ$

8. $x^\circ, 126^\circ, 22^\circ$

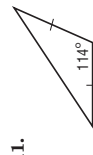
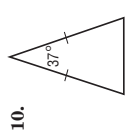
9. $90^\circ, x^\circ, 50^\circ$

72°; acute

32°; obtuse

40°; right

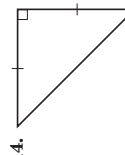
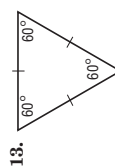
Classify each triangle the given angle and side with measures.



acute; isosceles

obtuse; isosceles

right; scalene



acute; equilateral

right; isosceles

obtuse; scalene

16. angles: $40^\circ, 100^\circ, 40^\circ$
sides: 19 ft, 19 ft, 29 ft

17. angles: $46^\circ, 52^\circ, 82^\circ$
sides: 17 m, 19 m, 24 m

18. angles: $28^\circ, 76^\circ, 76^\circ$
sides: 2 km, 1 km, 2 km

obtuse; isosceles

acute; scalene

acute; isosceles

Chapter 6

36

Course 3

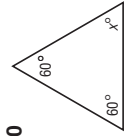
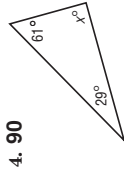
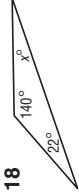
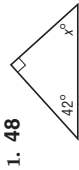
Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

NAME _____ DATE _____ PERIOD _____

6-3
B

Homework Practice
Triangles

Find the value of x in each triangle.



Find the missing measure in each triangle with the given angle measures.

7. $45^\circ, 35^\circ, x^\circ$

8. $100^\circ, x^\circ, 40^\circ$

9. $x^\circ, 90^\circ, 16^\circ$

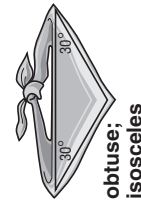
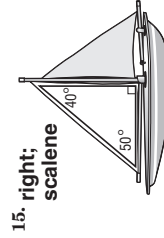
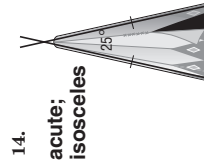
10. Find the third angle of a right triangle if one of the angles measures 24° .

11. What is the third angle of a right triangle if one of the angles measures 51° ?

12. ALGEBRA Find $m\angle A$ in $\triangle ABC$ if $m\angle B = 38^\circ$ and $m\angle C = 38^\circ$.

13. ALGEBRA In $\triangle XYZ$, $m\angle Z = 113^\circ$ and $m\angle X = 28^\circ$. What is $m\angle Y$?

Classify the marked triangle in each object by its angles and by its sides.

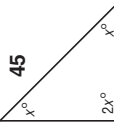
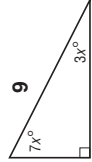
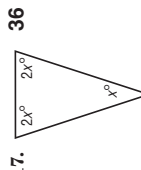


acute; isosceles

15. right; scalene

obtuse; isosceles

ALGEBRA Find the value of x in each triangle.



36

9

45

Get Connected For more examples, go to glencoe.com.

Chapter 6

37

Course 3

NAME _____

DATE _____

PERIOD _____

6-3
B

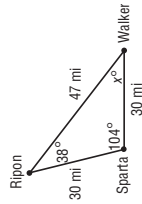
Problem-Solving Practice
Triangles

1. TAILORING Each lapel on a suit jacket is in the shape of a triangle. The three angles of each triangle measure 47° , 68° , and 65° . Classify the triangle by its angles.
acute

2. FLAGS A naval distress signal flag is in the shape of a triangle. The three sides of the triangle measure 5 feet, 9 feet, and 9 feet. Classify the triangle by its sides.
isosceles

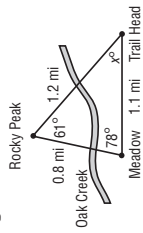
3. CARPENTRY The supports of a wooden table are in the shape of a triangle. Find the angles of the triangle if the measures of the angles are in the ratio $4x : 4x : 10x$.
 40° , 40° , 100°

4. MAPS The three towns of Ripon, Sparta, and Walker form a triangle as shown below. Classify the triangle by its angles and by its sides. What is the value of x in the triangle?



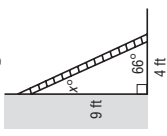
obtuse, isosceles; 38

5. HIKING The figure shows the Oak Creek trail, which is shaped like a triangle. Classify the triangle by its angles and by its sides. What is the value of x in the figure?



acute, scalene; 41

5. LADDER The figure shows a ladder leaning against a wall, forming a triangle. Classify the triangle by its angles and by its sides. What is the value of x in the figure?



right, scalene; 24

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6

38

Course 3

Answers (Lesson 6-3)

NAME _____

DATE _____

PERIOD _____

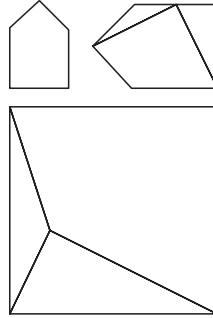
6-3
B

Enrich

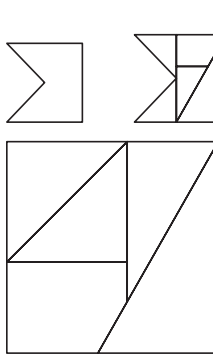
Dissecting Squares

In a *dissection puzzle*, the pieces of one shape are rearranged to make a different shape. Draw a square and then make a set of pieces to solve each dissection puzzle. Record your answers.

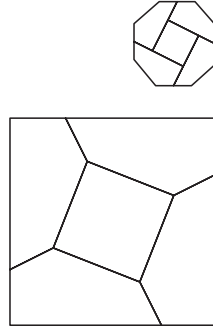
1. Rearrange the pieces to make a figure shaped like the one at the right.



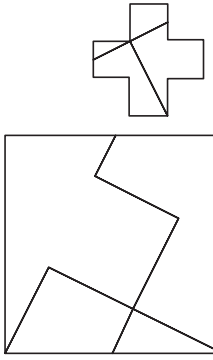
2. Rearrange the pieces to make a figure shaped like the one at the right.



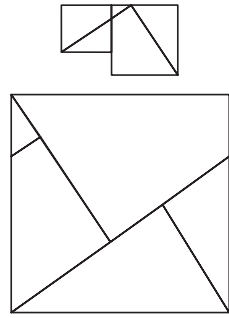
3. Rearrange the pieces to make an octagon with sides of equal length.



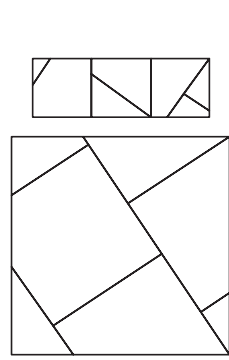
4. Rearrange the pieces to make a figure shaped like a plus sign.



5. Rearrange the pieces to make two new squares.



6. Rearrange the pieces to make three squares of equal size.



Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6

39

Course 3

6-3
C

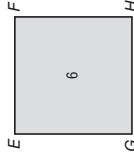
Explore

Quadrilaterals

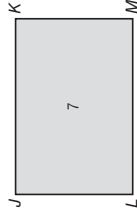
Use a ruler and a protractor to measure the sides and angles of the figures below. Record the measurements in the table. Use the table for Exercises 1–6. **Table: Sample answers are given.**

Quadrilateral	6	7	8	9
Sides	1 in.	1 in. by 1.5 in	1 in.	1 in., 1.5 in.
Angles	90°	90°	105°, 75°	105°, 75°

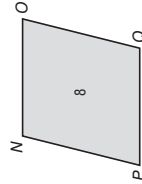
1. Which two quadrilaterals have four congruent sides? Are these quadrilaterals the same? Why or why not?
quadrilaterals 6 and 8; Sample answer: They are not the same because they have corresponding angles with different measurements.



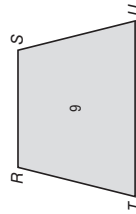
2. Which two quadrilaterals have four congruent angles? Are these quadrilaterals the same? Why or why not?
quadrilaterals 6 and 7; Sample answer: They are not the same because they have corresponding sides with different measurements.



3. Which quadrilaterals have at least two congruent sides?
quadrilaterals 6, 7, 8, and 9



4. Which quadrilaterals have at least two parallel sides?
quadrilaterals 6, 7, 8, and 9



5. Which quadrilaterals have two pairs of parallel sides?
quadrilaterals 6, 7, and 8

6. Which quadrilaterals have two different pairs of congruent angles that do not have four congruent angles?
quadrilaterals 8 and 9

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

6-3
B

TI-84 Plus Activity

Use Cabri Jr. To Draw Triangles

You can use the Cabri Jr. application to draw triangles.

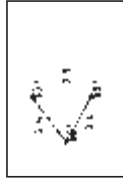
Example Draw an acute triangle and measure each angle and side.

Step 1: Press **[APPS]** and choose **Cabri Jr.**

Step 2: Press **[WINDOW]** to get the Object Tools menu. Arrow down to **Triangle** and press **[ENTER]**. Move the cursor to the desired location of each vertex and press **[ENTER]**.

Step 3: Press **[GRAPH]** to get the Display and Measurement Tools. Arrow down to **Measure**, over to **Angle**, and press **[ENTER]**. Measure each angle by selecting a point on one side, the vertex, and a point on the other side.

Step 4: Press **[GRAPH]** to get the Display and Measurement Tools. Arrow down to **D. & Length**, and press **[ENTER]**. Select the endpoints of the side you wish to measure. Use the arrows to place the length where you want it. Press **[ENTER]**.



Exercises

Draw each triangle in Cabri Jr. Find the measures of the sides and angles. Record them in the tables below. 1–4. See students' work.

1. First Triangle: Acute

Angle	Side
1	
2	
3	

2. Second Triangle: Right

Angle	Side
1	
2	
3	

3. Third Triangle: Obtuse

Angle	Side
1	
2	
3	

4. Fourth Triangle: Scalene

Angle	Side
1	
2	
3	

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.


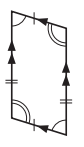

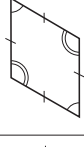
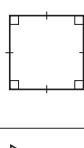
NAME _____ DATE _____ PERIOD _____

6-3

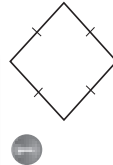
D

Reteach
Quadrilaterals

- A quadrilateral is a closed figure with four sides and four angles.
- Quadrilaterals are named based on their sides and angles.

	Trapezoid quadrilateral with exactly one pair of parallel sides
	Parallelogram quadrilateral with opposite sides parallel and opposite sides congruent
	Rectangle parallelogram with 4 right angles
	Rhombus parallelogram with 4 congruent sides
	Square parallelogram with 4 right angles and 4 congruent sides

Examples



The quadrilateral is a parallelogram with 4 congruent sides. It is a rhombus.



The quadrilateral has one pair of parallel sides. It is a trapezoid.

Example 3 Find the value of x in the quadrilateral shown.

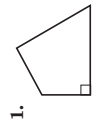
$$\begin{array}{r}
 123 + 90 + 74 + x = 360 \\
 287 + x = 360 \\
 -287 \quad -287 \\
 \hline
 x = 73
 \end{array}$$

Write the equation.
Simplify.
Subtract.

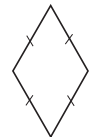
So, the value of x is 73.

Exercises

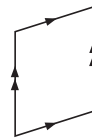
Classify the quadrilateral using the name that best describes it.



quadrilateral



rhombus



parallelogram

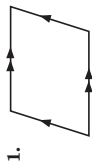
NAME _____ DATE _____ PERIOD _____

6-3

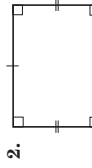
D

Skills Practice
Quadrilaterals

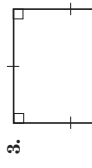
Classify the quadrilateral using the name that best describes it.



parallelogram



rectangle



square



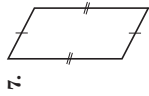
trapezoid



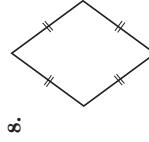
quadrilateral



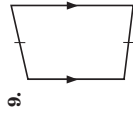
rhombus



parallelogram

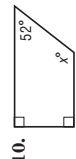


rhombus



trapezoid

Find the missing angle measure in each quadrilateral.



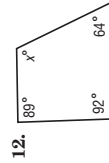
10.

128°



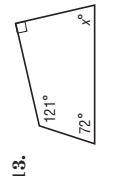
11.

40°



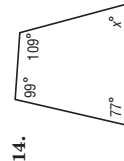
12.

115°



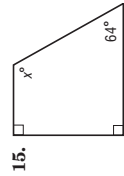
13.

77°



14.

75°




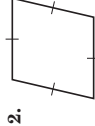
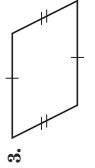
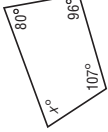
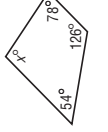
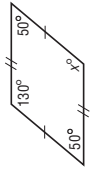
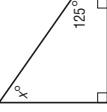

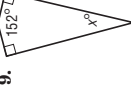
15.

116°

6-3
D

Homework Practice
Quadrilaterals

Classify each quadrilateral using the name that best describes it.


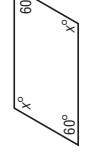
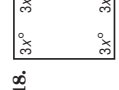
-  **trapezoid**
-  **rhombus**
-  **parallelogram**
-  **77°**
-  **102°**
-  **130°**
-  **55°**
-  **70°**
-  **28°**

ALGEBRA Find the missing angle measure in each quadrilateral.

Find the missing angle measure in each quadrilateral with the given angle measures.

- $63^\circ, 56^\circ, 111^\circ, x^\circ$ **130°**
- $x^\circ, 122^\circ, 53^\circ, 90^\circ$ **95°**
- ALGEBRA** Find $m\angle C$ in quadrilateral $ABCD$ if $m\angle A = 110^\circ, m\angle B = 88^\circ,$ and $m\angle D = 55^\circ$. **107°**
- ALGEBRA** What is $m\angle Z$ in quadrilateral $WXYZ$ if $m\angle W = 86^\circ, m\angle X = 88^\circ,$ and $m\angle Y = 92^\circ$? **94°**


ALGEBRA Find the value of x in each quadrilateral.

-  **16. 68°**
-  **17. x°**
-  **18. 3x°**

112

120

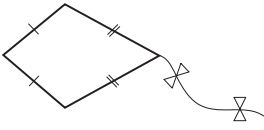
30

 **Get Connected** For more examples, go to glencoe.com.

6-3
D

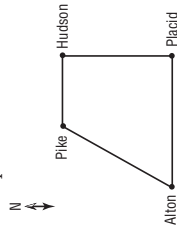
Problem-Solving Practice
Quadrilaterals

1. KITES A kite is shown below. What is the best name to classify the shape of the kite? Explain.



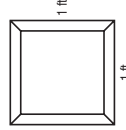
quadrilateral; Sample answer: Two does not fit the description of any other quadrilateral in the lesson.

2. MAPS A map showing the road connecting the towns of Pike, Hudson, Placid, and Alton is shown. The road connecting Pike and Hudson is parallel to the road connecting Alton and Placid. What is the best name to classify the shape of the roads connecting the four towns? Explain.



trapezoid; Sample answer: Two of the roads are going East to West, so they are parallel. So, the quadrilateral is a trapezoid.

3. ART A picture frame is shown below. What is the best name to classify the shape of the frame?



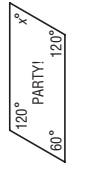
square

4. SCHOOL SUPPLIES The side view of an eraser is shown below. What is the best name to classify the shape of the eraser?



parallelogram

5. PARTY The front of a birthday party invitation is shown below. Find the measure of the missing angle.



60°

6. TABLE The top of Mr. Bautista's new coffee table is shown below. Find the measure of the missing angle.



80°

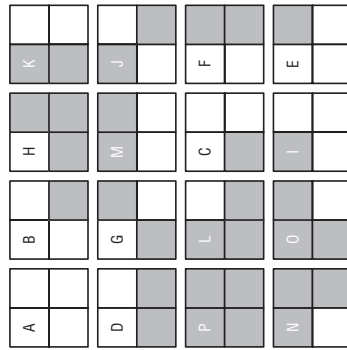
NAME _____ DATE _____ PERIOD _____

6-3
Enrich
D

The Colormatch Square

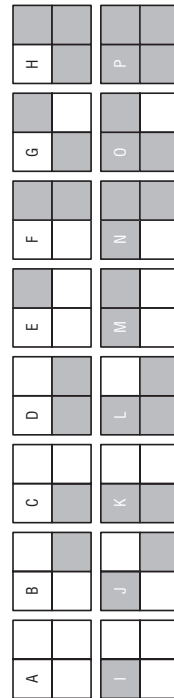
To work this puzzle, cut out the 16 tiles at the bottom of this page. The goal of the puzzle is to create a square so that the sides of any pair of adjacent tiles match. You are not allowed to rotate any of the tiles.

1. Complete the solution to the colormatch square puzzle below.



2. Find at least one other solution in which the A tile is in the upper left corner.

There are 10 other solutions with A in the upper left corner and 50 unique solutions in all.



NAME _____ DATE _____ PERIOD _____

6-3
Reteach
E

Polygons and Angles

- A **polygon** is a simple, closed figure formed by three or more line segments. The segments intersect only at their endpoints.
- Polygons can be classified by the number of sides they have.
- The sum of the measures of the **interior angles** of a polygon is $(n - 2)180$, where n represents the number of sides.

Example 1 Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.



The figure has 8 sides that only intersect at their endpoints. It is an octagon.

Example 2 The defense department of the United States has its headquarters in a building called the Pentagon because it is shaped like a regular pentagon. Find the measure of an interior angle of a regular pentagon.

$S = (n - 2)180$

$S = (5 - 2)180$

$S = (3)180$

$S = 540$

$540 \div 5 = 108$

The measure of one interior angle of a regular pentagon is 108° .

Write an equation.

Replace n with 5. Subtract.

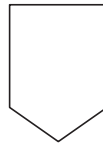
Multiply.

The sum of the interior angles is 540° .

Divide by the number of interior angles to find the measure of one angle.

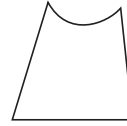
Exercises

Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.



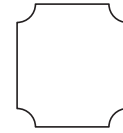
1.

Yes; sample answer: The figure has five sides that only intersect at their endpoints. It is a pentagon.



2.

No; sample answer: The figure is not a polygon because it has a curved side.



3.

No; sample answer: The figure is not a polygon because it has some curved sides.

Find the sum of the interior angle measures of each polygon.

4. nonagon (9-sided) **1,260°**

5. 14-gon **2,160°**

Find the measure of one interior angle in each regular polygon.

6. hexagon **120°**

7. 15-gon **156°**

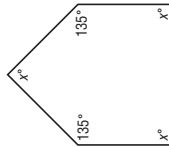
NAME _____ DATE _____ PERIOD _____

6-3
E

Homework Practice
Polygons and Angles

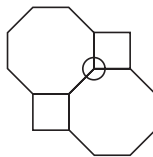
- Find the sum of the interior angle measures of each polygon.
- pentagon **540°**
 - decagon **1,440°**
 - 16-gon **2,520°**
 - 18-gon **2,880°**
 - 30-gon **5,040°**
 - 34-gon **5,760°**
- Find the measure of one interior angle in each regular polygon. Round to the nearest tenth if necessary.
- pentagon **108°**
 - octagon **135°**
 - 24-gon **165°**

ALGEBRA For Exercises 10 and 11, determine the angle measures in each polygon.

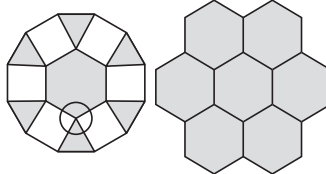


- 150°, 30°, 150°, 30°**
- 90°, 135°, 90°, 90°, 135°**

12. **FLOORING** A floor is tiled with a pattern consisting of regular octagons and squares as shown. Find the measure of each angle at the circled vertex. Then find the sum of the angles. **135°, 90°, 135°, 360°**



13. **ART** Rachaunn is laying out a pattern for a stained glass window. So far he has placed the 13 regular polygons shown. Find the measure of each angle at the circled vertex. Then find the sum of the angles. **90°, 120°, 90°, 60°, 360°**



14. **REASONING** Vanessa's mother made a quilt using a pattern of repeating regular hexagons as shown. Will Vanessa be able to make a similar quilt with a pattern of repeating regular pentagons? Explain your reasoning. **No; sample answer: Pentagons will leave spaces between them. The sum of the angles at a vertex is not 360°.**

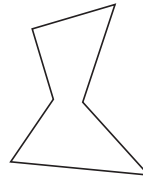
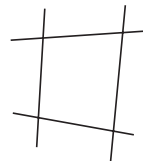
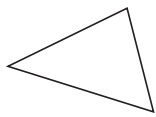
For more examples, go to glencoe.com.

NAME _____ DATE _____ PERIOD _____

6-3
E

Skills Practice
Polygons and Angles

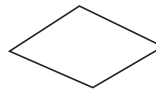
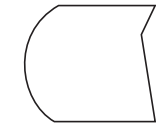
Determine whether the figure is a polygon. If it is, classify the polygon. If it is not a polygon, explain why.



1. **Yes; sample answer: The figure has 3 sides that only intersect at their endpoints. It is a triangle.**

2. **No; sample answer: The figure is not a polygon because it has 4 sides that do not intersect at their endpoints.**

3. **Yes; sample answer: The figure has 6 sides that only intersect at their endpoints. It is a hexagon.**



4. **No; sample answer: The figure is not a polygon because it has a curved side.**

5. **No; sample answer: The figure is not a polygon because it is an open figure.**

6. **Yes; sample answer: The figure has 4 sides that only intersect at their endpoints. It is a quadrilateral.**

Find the sum of the interior angle measures of each polygon.

- 13-gon **1,980°**
- 18-gon **2,880°**
- 32-gon **5,400°**
- 35-gon **5,940°**

Find the measure of one interior angle in each regular polygon. Round to the nearest tenth if necessary.

- heptagon (7-sided) **128.6°**
- 26-gon **166.2°**
- decagon (10-sided) **144°**
- 23-gon **164.3°**

6-3
E

Problem-Solving Practice
Polygons and Angles

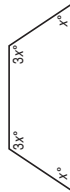
For Exercises 1–6, use the formula $S = (n - 2)180^\circ$ to solve.

1. FLOORING Ashley's kitchen floor is made from a tessellation of rows of regular octagons. The space between them is filled with square tiles as shown below. Find the measure of one interior angle in both the octagon and the square tiles. **octagon: 135° , square: 90°**

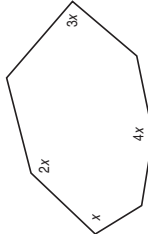


2. CIRCLES As the number of sides of a regular polygon increase, the polygon gets closer and closer to a true circle. The interior angles of any regular polygon can never actually reach 180° . How many sides would a polygon have if its interior angles are exactly 179° ? **360**

3. GEOMETRY A trapezoid has angles that measure $3x^\circ$, $3x^\circ$, x° , and x° . What is the measure of x ? **45**



4. GEOMETRY An irregular heptagon has angles that measure x° , x° , $2x^\circ$, $2x^\circ$, $3x^\circ$, $3x^\circ$, and $4x^\circ$. What is the measure of x ? **56.25**



5. TILES A bathroom tile consists of regular hexagons surrounded by regular triangles as shown below. Find the measure of one interior angle in both the hexagon and the triangle tiles. **hexagon: 120° , triangle: 60°**



6. CHALLENGE How many sides does a regular polygon have if the measure of an interior angle is 171° ? **40**

6-3
E

Enrich

M.C. Escher

Maurits Cornelis Escher (1898–1972) was a Dutch graphic and mathematical artist. Some of his most famous pieces used **tessellations**, or repeated tiling of one or more shapes. His designs range from artfully simple to extremely intricate.

A regular polygon will tessellate a plane if the measure of one of its interior angles is a factor of 360° . Other combinations of polygons tessellate if the sum of the measures of the adjoining angles equals 360° . The tessellation at the right is made of regular octagons and squares. At any vertex the sum of the measures of the angles is $90^\circ + 135^\circ + 135^\circ + 360^\circ$.

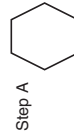


1. Make a list of all regular polygons that will tessellate. **triangle, square, hexagon**

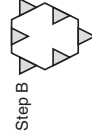
2. Explain why you know there are no other regular polygons that will tessellate. **Sample answer: These are the only regular polygons with an interior angles measure that is a factor of 360° .**

For Steps A–E, you will create your own tessellation on a separate piece of paper.

Step A Start with a polygon that will tessellate. Trace it, and cut it out. Grid paper or isometric dot paper may help you accurately draw your shape.

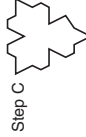


Step B Cut a portion of the figure on one side, slide it to the opposite side, and tape it on. (This was done three times in the example at right.)



Step C Use the modified shape as a tracing template. Trace the template on another sheet of paper.

Step D Slide, reflect, and/or rotate the shape so that it fits with your first tracing. Trace the template where it fits with the previous tracing. Repeat the process to cover the page.



Step E Color each polygon in the tessellation. Escher often decorated the shapes so that they resembled objects or animals. **See students' work.**

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

NAME _____ DATE _____ PERIOD _____

Reflecting on Chapter 6

- Why do you think using angle properties like *vertical angles* and *alternate exterior angles* to measure unknown angles is more accurate than using a protractor? **Sample answer: If you already know one of the angles, you can use angle properties to find the exact measure of the other angles. Using a protractor would not be as exact.**
- Can you make a triangle with one angle measure being equal to 180° ? Why or why not? **Sample answer: No, because the three angles have to add up to 180° , so if one angle was 180° by itself, the other two angles would be 0° .**
- Is a circle a polygon? Explain. **Sample answer: No, because a circle does not have any line segments, endpoints, or angles.**

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6 53 Course 3

NAME _____ DATE _____ PERIOD _____

TI-84 Plus Activity


Draw Polygons

You can use the Cabri Jr. application to draw and measure polygons.

Example Draw a quadrilateral and measure the angles.

Step 1: Press [APPS] and choose Cabri Jr.

Step 2: Press [WINDOW] to get the Object Tools menu. Arrow down to **Segment** and press [ENTER]. Draw a quadrilateral by pressing [ENTER] at the desired locations of the vertices. Press [CLEAR] to disable this tool.



Step 3: Press [GRAPH] to get the Display and Measurement Tools. Arrow down to **Measure**, over to **Angle**, and press [ENTER]. Measure each angle by selecting a point on one side, the vertex, and a point on the other side.

Exercises

Draw each polygon on your calculator. Find the sum of the angles of each polygon.

- pentagon **540°**
- hexagon **720°**
- octagon **1,080°**
- 9-gon **1,260°**
- dodecagon (12-gon) **1,800°**
- 15-gon **2,340°**

Copyright © Glencoe/McGraw-Hill, a division of The McGraw-Hill Companies, Inc.

Chapter 6 52 Course 3

Chapter 6 Assessment Answer Key

Are You Ready-Practice Page 5

1. 17

2. 49

3. 3

4. 107

5. 56

6. 77

7. \$73

8. 156 tickets

9. 180

10. 1,080

11. 1,980

12. 3,960

13. 360

Are You Ready-Review Page 6

1. 180

2. 900

3. 1,440

4. 144

5. 30

6. 3,060

7. 3,780

8. 2

9. 60

10. 24

Chapter 6 Assessment Answer Key

Chapter Diagnostic Test Page 8

1. 15
2. 71
3. 31
4. 118
5. 67
6. 66

7. \$153

8. 90

9. 360
10. 1,440
11. 1,800
12. 2,880

13. 540

Chapter Pretest Page 9

1. acute
2. obtuse
3. right
4. straight

5. 110°
6. 70°

7. 48°, 90°

8. 84

9. 15
10. Check students' drawings. Sample answer: One of the sides is curved, so the figure is not a polygon.

Chapter 6 Assessment Answer Key

Quiz 1 Page 54

1. right
2. obtuse
3. acute
4. neither
5. supplementary
6. 37
7. 35

Quiz 2 Page 54

1. adjacent,
supplementary
2. 100°
3. 100°
4. 38°
5. 45°

Quiz 3 Page 55

- Sample answer:
The sum is 180°.
1. The sum is 180°.
 2. 65°
 3. 63°; acute
 4. 128°; obtuse
 5. square
 6. parallelogram
Yes, it is a hexagon. It is not regular.
 7. Sample answer:
It is not a polygon because it is not a closed figure.
 8. _____
 9. 2,340°
 10. 135°

Chapter 6 Assessment Answer Key

Form 1A
Page 57

1. A

2. G

3. C

4. G

5. C

6. H

7. A

8. F

Page 58

9. A

10. G

11. C

12. I

13. A

14. H

15. A

16. H

Form 1B
Page 59

1. D

2. F

3. C

4. F

5. A

6. H

7. A

8. H

Page 60

9. B

10. F

11. C

12. G

13. B

14. H

15. C

16. G

Chapter 6 Assessment Answer Key

Form 2A
Page 61

Page 62

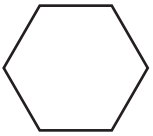
1. A

2. I

3. B

4. H

Sample
answer:



5. hexagon

6. A

7. 40°

8. I

9. D

10. F

11. B

12. H

13. A

14. 108°

15. 3,420°

Form 2B
Page 63

Page 64

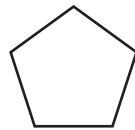
1. D

2. H

3. B

4. H

Sample
answer:



5. pentagon

6. C

7. H

8. C

9. G

10. B

11. I

12. D

13. I

14. 540°

15. 2,880°

Chapter 6 Assessment Answer Key

Form 3A

Page 65

See
students'
1. work; right

2. obtuse

3. acute

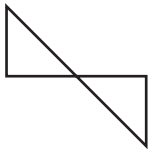
4. 83

5. 44

6. 70

7. 59

Sample
answer:



8. _____

9. 63°; acute

10. 90°; right

Sample
answer: the

11. sum is 90°

Page 66

12. rhombus

13. trapezoid

14. 45°

Sample
answer:
they are
congruent

15. _____

16. 135°

17. 140°

18. 5,040°

19. 360°

20. 162°

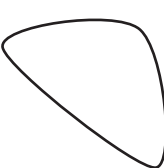
21. 120°

No;
Sample
answer:
135° is not
a factor of

22. 360°

Chapter 6 Assessment Answer Key

Form 3B
Page 67

- See students' work; obtuse
1.
 2. straight
 3. acute
 4. 15
 5. 14
 6. 55
 7. 60°
Sample answer:

 8.
 9. 53°; right
 10. 120°; obtuse
Sample answer:
they are all 60°
 11.

Page 68

12. quadrilateral
13. parallelogram
14. 70°
Sample answer:
they are parallel and congruent
15.
16. 144°
17. 160°
18. 8,640°
19. 210°
20. 169.7°
21. 720°
Yes; sample answer: 120° is a factor of 360°
22.

Chapter 6 Assessment Answer Key

Standardized Test Practice Page 69

1. (A) ● (C) (D)

2.

					5	0
⊖	⊘	⊘	⊘	⊘	⊘	⊘
●	○	○	○	○	○	○
0	0	0	0	0	0	●
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	4	4	4
5	5	5	5	5	●	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

3. ● (G) (H) (I)

4.

					3	.	8
⊖	⊘	⊘	⊘	⊘	⊘	⊘	⊘
●	○	○	○	○	○	○	○
0	0	0	0	0	0	0	0
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	●	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	●
9	9	9	9	9	9	9	9

5. ● (B) (C) (D)

Page 70

6. (F) (G) ● (I)

7. (A) (B) (C) ●

8.

					4	0
⊖	⊘	⊘	⊘	⊘	⊘	⊘
●	○	○	○	○	○	○
0	0	0	0	0	0	●
1	1	1	1	1	1	1
2	2	2	2	2	2	2
3	3	3	3	3	3	3
4	4	4	4	●	4	4
5	5	5	5	5	5	5
6	6	6	6	6	6	6
7	7	7	7	7	7	7
8	8	8	8	8	8	8
9	9	9	9	9	9	9

9. (F) (G) ● (I)

10. (A) (B) ● (D)

11. (F) (G) (H) ●

Chapter 6 Extended Response

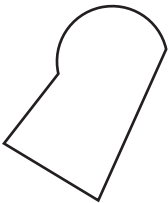
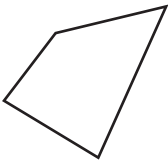
Extended-Response Test, Page 71 Sample Answers

In addition to the scoring rubric found on page A71, the following sample answers may be used as guidance in evaluating extended response assessment items.

1. a. If two angles have the same measure, they are congruent.

b. $\angle 1 \cong \angle 3$, $\angle 5 \cong \angle 7$, $\angle 1 \cong \angle 7$,
 $\angle 2 \cong \angle 4$, $\angle 6 \cong \angle 8$, $\angle 4 \cong \angle 6$,
 $\angle 8 \cong \angle 2$, $\angle 3 \cong \angle 5$, $\angle 4 \cong \angle 8$,
 $\angle 1 \cong \angle 5$, $\angle 2 \cong \angle 6$, $\angle 3 \cong \angle 7$;
 $m\angle 1 = 104^\circ$, $m\angle 3 = 104^\circ$,
 $m\angle 4 = 76^\circ$, $m\angle 5 = 104^\circ$,
 $m\angle 6 = 76^\circ$, $m\angle 7 = 104^\circ$
 $m\angle 8 = 76^\circ$

2. a.



The sides of a polygon are all line segments with no curves. A polygon is simple and closed.

b. All triangles have two acute angles. Triangles are classified by their third angle.

See students' triangles.

c. A rhombus is a quadrilateral that has 4 congruent sides.

A square is a quadrilateral that has 4 right angles and 4 congruent sides.

A rectangle is a quadrilateral that has 4 right angles.

A trapezoid is a quadrilateral that has only one pair of parallel sides.

See students' quadrilaterals.

d. No. A trapezoid has exactly one set of parallel sides, and a rhombus has two sets of parallel sides.

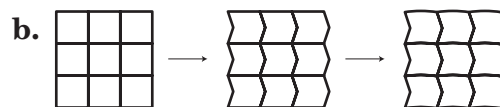
e. A regular polygon has all sides congruent and all angles congruent.

f. See students' angles. Right angles are 90° ; obtuse angles are greater than 90° and less than 180° ; straight angles are 180° , and acute angles are greater than 0° and less than 90° .

g. The sum of two angles that are supplementary is 180° . The sum of two angles that are complementary is 90° , which is half the total for supplementary angles, 180° .

See students' drawings.

3. a. Octagons cannot fit together to cover space because a third octagon cannot fit the 90° angle formed when 2 octagons are placed together.



See students' explanations.

Contents

- Chapter 0 Start Smart
- Chapter 1 Rational Numbers and Percent
- Chapter 2 Expressions and Functions
- Chapter 3 Linear Functions and Systems of Equations
- Chapter 4 Equations and Inequalities
- Chapter 5 Operations on Real Numbers
- Chapter 6 Angles and Lines
- Chapter 7 Similar Triangles and the Pythagorean Theorem
- Chapter 8 Data Analysis
- Chapter 9 Units of Measure
- Chapter 10 Measurement: Area and Volume
- Chapter 11 Properties and Multi-Step Equations and Inequalities
- Chapter 12 Nonlinear Functions and Polynomials

Also available online:



Macmillan/McGraw-Hill
Glencoe

The **McGraw-Hill** Companies

ISBN: 978-0-07-892305-0

MHID: 0-07-892305-0



www.glencoe.com