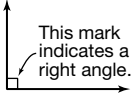
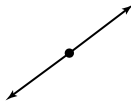
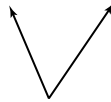



10-1

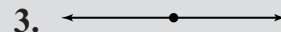
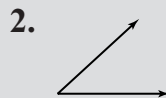
Angles (pages 413–415)

An **angle** is made up of two rays, or sides, with a common endpoint, or **vertex**. You measure angles in units called **degrees**. Angles are classified according to their measure.

Types of Angles	Right Angle  exactly 90°	Straight Angle  exactly 180°
	Acute Angle  less than 90°	Obtuse Angle  between 90° and 180°

Try These Together

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



PRACTICE

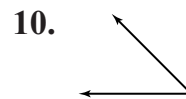
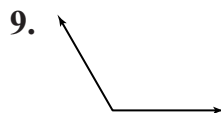
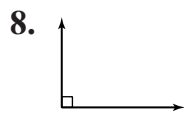
Classify each angle as acute, obtuse, right, or straight.

4. 5°

5. 135°

6. 90°

7. 28°



Draw an angle having each measurement.

11. 115°

12. 30°

13. 10°

14. 160°

15. **Standardized Test Practice** Which angle is *not* acute?

A 88°

B 92°

C 48°

D 65°

Answers: 1. obtuse 2. acute 3. straight 4. acute 5. obtuse 6. right 7. acute 8. right 9. obtuse 10. acute 11.-14. See Answer Key. 15. B

10-2

Making Circle Graphs (pages 418–421)

You can use a **circle graph** to compare parts of a whole.

EXAMPLE

Of those polled, 24% preferred Candidate A, 58% preferred Candidate B, and 18% preferred Candidate C. Express this information in a circle graph.

Step 1	Find the number of degrees for each part of the graph. Candidate A 24% of $360^\circ = 0.24 \times 360^\circ = 86.4^\circ$ Candidate B 58% of $360^\circ = 0.58 \times 360^\circ = 208.8^\circ$ Candidate C 18% of $360^\circ = 0.18 \times 360^\circ = 64.8^\circ$	<p>Preferred Candidates</p>
Step 2	Use a compass to draw a circle. Then draw a radius.	
Step 3	You can start with the least number of degrees, in this case, 64.8° . Use your protractor to draw an angle of 64.8° . Repeat this step for each part.	
Step 4	Label each section of the graph with the category and percent. Give the graph a title.	

PRACTICE

1. **Population** Refer to the table.

- Write a ratio that compares each number with the total. Write as a decimal to the nearest thousandth.
- Find the number of degrees for each section of the graph. Round to the nearest tenth.
- Make a circle graph of the world population.

Estimate of the World Population, 2001

Region	Population (millions)
North America	316
Latin America	525
South America	350
Europe	727
Asia	3,720
Africa	818
Oceania	31

Source: Population Reference Bureau



2. **Standardized Test Practice** If 85 of the 170 respondents to a survey answered “yes,” what are the number of degrees for the “yes” part in a circle graph?

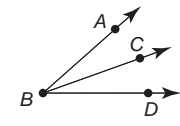
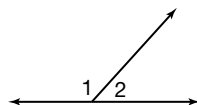
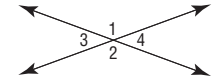
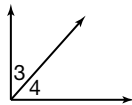
- A** 50° **B** 68° **C** 85° **D** 180°

Answers: 1a–b. North America: 0.049 , 17.6° ; Latin America: 0.081 , 29.2° ; South America: 0.054 , 19.4° ; Europe: 0.112 , 40.3° ; Asia: 0.573 , 206.3° ; Africa: 0.126 , 45.4° ; Oceania: 0.005 , 1.8° 1c. See Answer Key. 2. D

10-3

Angle Relationships (pages 422–425)

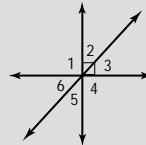
When two lines intersect, they form two pairs of opposite angles called **vertical angles**. Vertical angles have the same measure, so they are **congruent**. Two angles are **complementary** if the sum of their measures is 90° . Two angles are **supplementary** if the sum of their measures is 180° .

Angle Relationships	Adjacent Angles  $m\angle ABC + m\angle CBD = m\angle ABD$	Supplementary Angles  $m\angle 1 + m\angle 2 = 180^\circ$
	Vertical Angles  $\angle 1 \cong \angle 2$ $\angle 3 \cong \angle 4$	Complementary Angles  $m\angle 3 + m\angle 4 = 90^\circ$

Try These Together

Use the diagram at the right to name a pair of angles for each relationship.

- adjacent angles
- vertical angles
- complementary angles

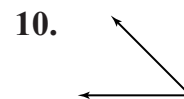
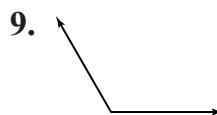
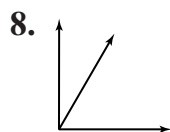


PRACTICE

Identify the measure of the angle supplementary and the angle complementary to the given angle.

4. 82° 5. 30° 6. 15° 7. 68°

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



11. **Decorating** Darma is using angles to create a border for a poster. She has made several 35° angles and now wants to draw supplementary angles. Will the supplementary angles be acute, right, obtuse, or straight?



12. **Standardized Test Practice** Angles r and s are supplementary. Find $m\angle r$ if $m\angle s = 138^\circ$.

- A** 38° **B** 42° **C** 48° **D** 35°

Answers: 1. Sample answer: 71° and 76° ; 2. Sample answer: 72° and 73° ; 3. Sample answer: 72° and 73° ; 4. 98° , 8° ; 5. 150° , 60° ; 6. 165° , 75° ; 7. 112° , 22° ; 8. complementary; 9. neither; 10. supplementary; 11. obtuse; 12. B

10-4


Triangles (pages 428–431)

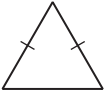
You can classify triangles by their angles and sides. The sum of the angles of a triangle is always 180° .

Types of Triangles	acute	all angles acute	right	1 right angle
	obtuse	1 obtuse angle	scalene	no congruent sides
	isosceles	exactly two congruent sides	equilateral	3 congruent sides

EXAMPLES

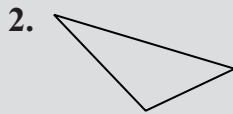
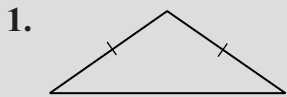
Classify each triangle by its angles and by its sides.

A  This is a triangle with one right angle, so it is a right triangle. No two sides are congruent, so the triangle is scalene.

B  This is a triangle with all angles acute, so it is an acute triangle. There are two congruent sides, so the triangle is isosceles.

Try These Together

Classify each triangle by its angles and by its sides.



HINT: Refer to the above table to help you classify the triangles.

PRACTICE

Find the missing angle measure for each triangle. Then classify the triangle by its angles.

4. $15^\circ, 28^\circ$

5. $60^\circ, 30^\circ$

6. $120^\circ, 36^\circ$

7. $72^\circ, 54^\circ$

8. $60^\circ, 60^\circ$

9. $90^\circ, 25^\circ$

10. **Algebra** Find $m\angle E$ in $\triangle CDE$ if $m\angle C = 65^\circ$ and $m\angle D = 58^\circ$.



11. **Standardized Test Practice** A triangle has sides that measure 5 cm, 5 cm, and 8 cm. Classify the triangle by its sides.

A isosceles

B acute

C scalene

D equilateral

Answers: 1. obtuse, isosceles 2. obtuse, scalene 3. acute, equilateral 4. 137° , obtuse 5. 90° , right 6. 24° , obtuse 7. 54° , acute 8. 60° , acute 9. 65° , right 10. 57° 11. A

10-5

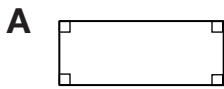
Quadrilaterals (pages 434–437)

You can classify quadrilaterals by their angles and sides.

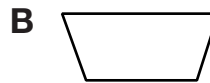
Types of Quadrilaterals	parallelogram opposite sides parallel and opposite sides congruent rectangle parallelogram with 4 right angles rhombus parallelogram with 4 congruent sides square parallelogram with 4 right angles and 4 congruent sides trapezoid exactly one pair of sides parallel
--------------------------------	--

EXAMPLES

Classify each quadrilateral by its angles and by its sides.



This is a parallelogram with 4 right angles, so it is a rectangle.

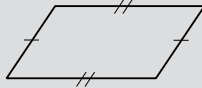


This is a quadrilateral with exactly one pair of sides parallel, so it is a trapezoid.

Try These Together

Classify each quadrilateral by its angles and by its sides.

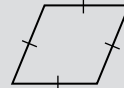
1.



2.



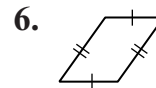
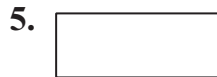
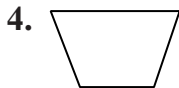
3.



HINT: Refer to the above table to help you classify the quadrilaterals.

PRACTICE

Name every quadrilateral that describes each figure. Then underline the name that best describes the figure.



7. **Advertising** Molly is working on a new advertisement for a shoe company. The shoes come in an odd-shaped box. It is a quadrilateral with exactly one pair of opposite sides that are parallel. What name can she use to best describe the box.



8. **Standardized Test Practice** Which of the following names *cannot* be used to describe a square?

A trapezoid

B parallelogram

C rhombus

D rectangle

Answers: 1. parallelogram, rectangle, square, rhombus, square 2. square, rhombus, square 3. rhombus, square, rhombus, square 4. quadrilateral, trapezoid, parallelogram, rectangle, square 5. quadrilateral, parallelogram, rectangle, square 6. quadrilateral, parallelogram, rectangle, square 7. trapezoid 8. A

10-6

Similar Figures (pages 440–443)

Two figures are **similar** if their corresponding angles are congruent and their corresponding sides are in proportion.

EXAMPLE

$\triangle ABC$ is similar to $\triangle DEF$. What is the missing segment length?

Since the triangles are similar, use a proportion to find the missing segment length.

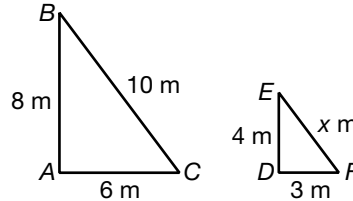
$$\frac{AC}{DF} = \frac{BC}{EF} \rightarrow \frac{6}{3} = \frac{10}{x} \quad \text{Substitute lengths.}$$

$$6x = 3(10) \quad \text{Find the cross products.}$$

$$\frac{6x}{6} = \frac{30}{6} \quad \text{Divide each side by 6.}$$

$$x = 5$$

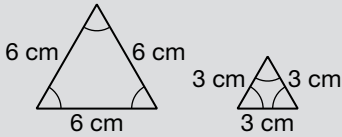
$$EF = 5 \text{ m}$$



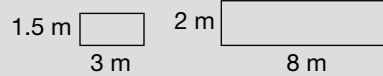
Try These Together

Determine whether each pair of figures is similar. Justify your answer.

1.



2.

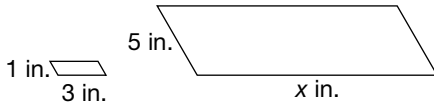


HINT: Are the angles congruent and the corresponding sides in proportion?

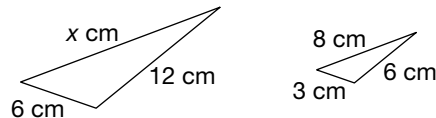
PRACTICE

Find the value of x in each pair of similar figures.

3.

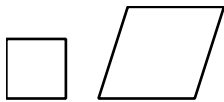


4.



5. **Standardized Test Practice** Which best represents a pair of similar figures?

A



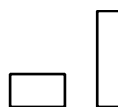
B



C



D



Answers: 1. Yes; their angles are congruent and their sides are proportional. 2. No; their sides are not proportional. 3. 15 in. 4. 16 cm 5. C

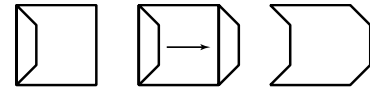
10-8

Translations (pages 451–454)

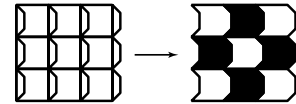
A **translation** is sliding part of a drawing to another place without turning it.

EXAMPLE

The square to the right has had the left side changed. To make sure the pieces, or pattern units, will tessellate, slide or translate the change to the opposite side and copy it.

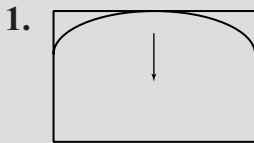


Now change all of the squares in a tessellation the same way. The tessellation takes on qualities like paintings by M. C. Escher when you add different colors or designs.



Try This Together

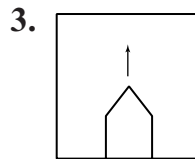
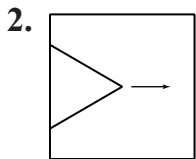
Complete the pattern unit for the translation. Then draw the tessellation.



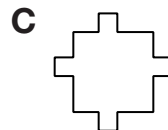
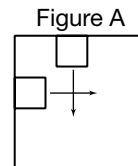
HINT: In the tessellation, all of the pieces must fit together.

PRACTICE

Complete the pattern unit for each translation. Then draw the tessellation.



4. **Standardized Test Practice** Which shows the completed pattern unit for Figure A?



Answers: 1–3. See Answer Key. 4. B

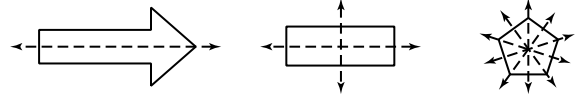
10-9

Reflections (pages 456–459)

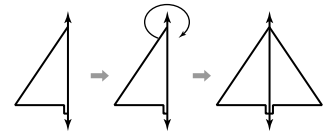
Figures that match exactly when folded in half have **line symmetry**.

EXAMPLES

A The figures to the right have line symmetry. Some figures can be folded in more than one way to show symmetry. Each fold line is called a **line of symmetry**.



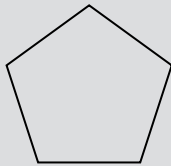
B You can create figures that have line symmetry by using a **reflection**. A reflection is a type of transformation where a figure is flipped over a line of symmetry.



Try These Together

Draw all lines of symmetry for each figure.

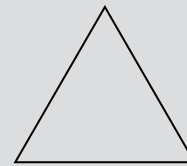
1.



2.



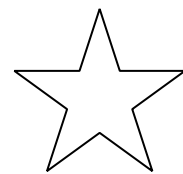
3.



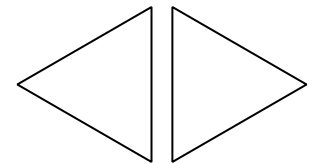
HINT: Think about all of the ways the figures can be folded in half.

PRACTICE

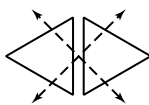
- How many lines of symmetry does a regular hexagon have?
- Life Science** Many flowers have lines of symmetry. How many lines of symmetry does a star-shaped flower have?



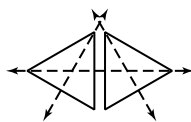
- Standardized Test Practice** Which of the following shows the lines of symmetry in the figure at the right?



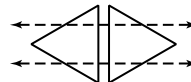
A



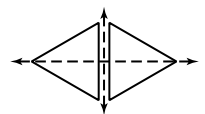
B



C



D












































Answers: 1–3. See Answer Key. 4. 6 5. 5 6. D

Chapter 10 Review

Polygon Code

The students in the math club have come up with a secret code for sending messages. The code is based on the number of sides of different polygons, along with addition and subtraction symbols. Use the table below to help you decode the message. Each box is a letter represented by the shaded polygons below it.

			
	 + 	 + 	 + 
			
 + 			
			
 + 	 - 	 + 	
			
	 + 	 +  + 	 - 

Number	Letter	Number	Letter	Number	Letter	Number	Letter
1	A	8	H	15	O	21	U
2	B	9	I	16	P	22	V
3	C	10	J	17	Q	23	W
4	D	11	K	18	R	24	X
5	E	12	L	19	S	25	Y
6	F	13	M	20	T	26	Z
7	G	14	N				

Answers are located on page 108.