

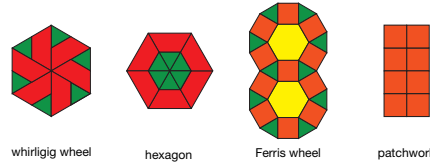
Student Guide

Angles and Lines

Questions 1–3 (SG p. 406)

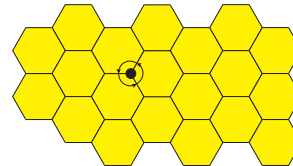
1.  $120^\circ$ ;  $360^\circ$
2. They are the same.
3.  $360^\circ$

Here are four different patterns that are used to make quilts. Work with your group. Use your Power Polygons™ to make these patterns.



These patterns are called **tessellations**—patterns made from one or more shapes that do not overlap, leave no gaps, and that can repeat over and over.

The following picture shows a tessellation made entirely of hexagons.



A large dot is placed where three hexagons come together. We call this a **vertex** of the tessellation.

1. What is the angle measure of each of the corners of the three hexagons where they come together? What is the sum of the three angles?
2. Choose another vertex. Are the angles at your new vertex the same as those at the large dot in the drawing above?
3. Find the sum of the angles at the new vertex.

Use the *Practice with Angles and Lines* pages in the *Student Activity Book* to practice the concepts in this unit.

**Student Activity Book**

**Practice with Angles and Lines**

**Questions 1–26 (SAB pp. 335–348)**

- Possible response: close to  $180^\circ$  or  $170^\circ$ ; close to  $90^\circ$  or  $85^\circ$ .
- An acute angle
  - A right angle
  - At least  $16^\circ$  larger
- Responses and estimates will vary.
  - Between  $90^\circ$  and  $180^\circ$ , or about  $120^\circ$
  - Very close to  $180^\circ$ , or about  $170^\circ$
  - Very close to  $0^\circ$ , or about  $20^\circ$
  - A little smaller than  $90^\circ$ , or about  $80^\circ$
- obtuse
  - obtuse
  - acute
  - acute
- obtuse
  - obtuse
  - right
  - acute

Possible response for C: I used the corner of a piece of paper and both edges matched. I knew the corner forms a right angle.

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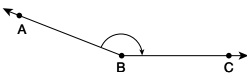
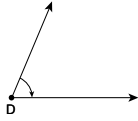
Name \_\_\_\_\_ Date \_\_\_\_\_

**Practice with Angles and Lines**

**Angles**

✓ **Self-Check: Questions 1-2**

- Estimate the size of these angles using the benchmarks  $0^\circ$ ,  $90^\circ$ , and  $180^\circ$ . Write your estimate near the angle.
 



- Grace drew an angle of  $75^\circ$ .
  - What kind of angle did Grace draw? \_\_\_\_\_
  - If she draws an angle that is exactly  $15^\circ$  larger, what kind of angle is it? \_\_\_\_\_
  - She wants to draw an obtuse angle. Her obtuse angle will have to be at least how many degrees larger than her first angle? \_\_\_\_\_

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**Use the Self-Check Questions and the menu to choose practice.**


Can I Do This?	Working On It!	Getting It!	Got It!
Estimate the size of an angle using benchmarks: $90^\circ$ , $180^\circ$ , and $360^\circ$ . Know the difference between acute, obtuse, and right angles.	I could use some extra help. *Q# 3-6	I just need more some practice. ●Q# 5-8	I'm ready for a challenge. ■Q# 7-8

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
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
- Estimate the size of the angles below using the benchmarks  $0^\circ$ ,  $90^\circ$ , and  $180^\circ$ . For example, say "a little larger than  $90^\circ$ ," or "very close to  $90^\circ$ ," or estimate in degrees, such as  $100^\circ$ .
 




$0^\circ$




$90^\circ$




$180^\circ$




A. \_\_\_\_\_



B. \_\_\_\_\_




C. \_\_\_\_\_




D. \_\_\_\_\_
- Label each angle in Question 3 as acute, right, or obtuse.

**acute** less than  $90^\circ$   
**obtuse** more than  $90^\circ$  but less than  $180^\circ$   
**right**  $90^\circ$


- Without measuring, identify these angles as acute, right, or obtuse.
 




A. \_\_\_\_\_



B. \_\_\_\_\_



C. \_\_\_\_\_



D. \_\_\_\_\_

Choose one and explain how you decided.

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
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6. Responses will vary; make sure that students' estimates are in the correct quadrant.
- A. Around  $95^\circ$
  - B. Around  $135^\circ$
  - C. Around  $30^\circ$
  - D. Around  $330^\circ$
  - E. Around  $70^\circ$
  - F. Around  $45^\circ$
7. A. Acute angles include  $\angle NPR$ ,  $\angle MPQ$ ,  $\angle PQS$
- B. Obtuse angles include  $\angle MPN$ ,  $\angle QPR$ ,  $\angle LQP$
- C. Right angles include  $\angle VRP$ ,  $\angle RTU$ ,  $\angle RTS$
8.  $\angle MPQ$  is about  $45^\circ$   
 $\angle RPQ$  is about  $135^\circ$   
 $\angle RTU$  is about  $90^\circ$
9. A.  $\angle A = 66^\circ$   
 B.  $\angle DEG = 144^\circ$   
 C.  $\angle STV = 15^\circ$   
 $\angle STW = 15^\circ$

Name \_\_\_\_\_ Date \_\_\_\_\_


★●6. Estimate the sizes of the angles below. Give your answers in degrees, for example,  $30^\circ$  or  $90^\circ$ . You may use a square corner to help you, but not a protractor.

A. 

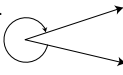
\_\_\_\_\_

B. 

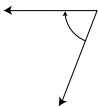
\_\_\_\_\_

C. 

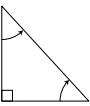
\_\_\_\_\_

D. 

\_\_\_\_\_

E. 

\_\_\_\_\_

F. 

\_\_\_\_\_

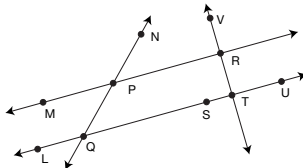
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Use the figure below for Questions 7 and 8.



●●7. A. Identify two acute angles. Write the angle names using three letters, such as  $\angle ABC$ . \_\_\_\_\_

B. Name two obtuse angles. \_\_\_\_\_

C. Name a right angle. \_\_\_\_\_

●●8. Use the benchmarks  $0^\circ$ ,  $90^\circ$ , and  $180^\circ$  to estimate the size of the following angles.

$\angle MPQ$  is \_\_\_\_\_

$\angle RPQ$  is \_\_\_\_\_

$\angle RTU$  is \_\_\_\_\_

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Workshop: Angles and Lines

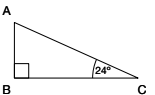
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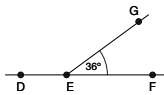
**Add and Subtract Angles**

✓ Self-Check: Question 9

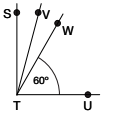
9. Without using a protractor, find the missing angle measures.

A. 

$\angle A =$  \_\_\_\_\_

B. 

$\angle DEG =$  \_\_\_\_\_

C. 

$\angle STV = 90^\circ$

$\angle STV = \angle VTW$

$\angle STV =$  \_\_\_\_\_

$\angle STW =$  \_\_\_\_\_

Use the Self-Check Question and menu to choose practice.

<b>Can I Do This?</b>	<b>Working On It!</b>	<b>Getting It!</b>	<b>Got It!</b>
I could use some extra help.	I just need some more practice.	I'm ready for a challenge.	
Add and subtract angle measures.	★Q# 10-11, 13, 15	●Q# 11-14, 16	■Q# 12-14, 17

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# Answer Key • Lesson 6: Workshop: Angles and Lines

Name \_\_\_\_\_ Date \_\_\_\_\_

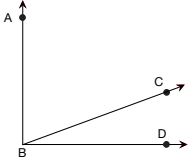
★10. Use a protractor to measure the angles.

A.  $\angle ABC =$  \_\_\_\_\_

B.  $\angle CBD =$  \_\_\_\_\_

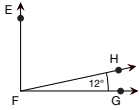
C.  $\angle ABD =$  \_\_\_\_\_

D. Is this statement true? Explain.  
 $\angle ABC + \angle CBD = \angle ABD$

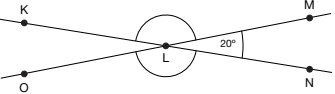


★11.  $\angle EFG$  is a right angle. Without using a protractor, find the measure of  $\angle EFH$ .

\_\_\_\_\_



●12.  $\angle MLK = \angle NLO$ . Without using a protractor, find the angle measure of  $\angle KLO$ .



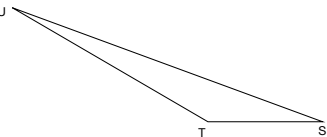
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10. A.  $\angle ABC = 70^\circ$   
 B.  $\angle CBD = 20^\circ$   
 C.  $\angle ABD = 90^\circ$   
 D. Yes; The sum of the smaller angles is equal to the measure of the larger angle.
11.  $\angle EFH = 78^\circ$
12.  $\angle KLO = 20^\circ$
13. A.  $\angle S = 20^\circ$   
 $\angle T = 150^\circ$   
 $\angle U = 10^\circ$   
 B. The sum is  $180^\circ$
14. A.  $70^\circ$   
 B.  $70^\circ$   
 C.  $70^\circ$   
 D.  $70^\circ$
15. A. See shape on SAB page.  
 B. 4 pieces  
 C. Right angles  
 D.  $90^\circ$  each  
 E.  $360^\circ$

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Name \_\_\_\_\_ Date \_\_\_\_\_

★13. A. Measure the angles in Triangle STU.



B. What is the sum of  $\angle S$ ,  $\angle T$  and  $\angle U$ ? \_\_\_\_\_

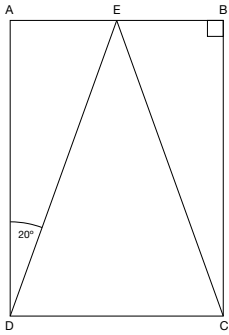
●14. Rectangle ABCD is built from three triangles.  $\angle ACE = \angle BDE$ . Without using a protractor, find the measures of the angles below. Write the measures near the angle.

A.  $\angle EDC =$  \_\_\_\_\_

B.  $\angle ECD =$  \_\_\_\_\_

C.  $\angle AED =$  \_\_\_\_\_

D.  $\angle BEC =$  \_\_\_\_\_



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Name \_\_\_\_\_ Date \_\_\_\_\_

★15. A. Make the shape with solid lines using your power polygons. Use the yellow square (A) and large green triangle (E). If you have enough pieces, you can make the whole shape in the dotted lines.

B. Find the dot on your shape. How many pieces come together at the dot?

\_\_\_\_\_

C. Are the angles at the dot acute, obtuse, or right?

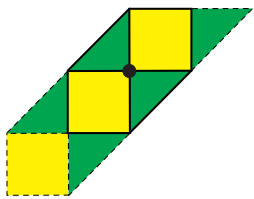
\_\_\_\_\_

D. Estimate and then measure the size of the angle of each piece at the dot.

\_\_\_\_\_

E. Add all the angle measures at the dot. What is the sum of all the angle measures?

\_\_\_\_\_



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16. A. See shape on SAB page.  
 B. 4 pieces  
 C. One angle is acute, two are right, and one is obtuse.  
 D. The angle of the small green triangle is  $60^\circ$ , the angles of the squares are  $90^\circ$ , and the angle of the hexagon is  $120^\circ$ .  
 E.  $360^\circ$
17. A. See shape on SAB page.  
 B. 4 pieces  
 C. Two are obtuse, two are acute.  
 D. The angles of the green triangles are  $60^\circ$ , the angles of the red trapezoids are  $120^\circ$ .  
 E.  $360^\circ$   
 F. 3 pieces  
 G. One angle is acute, one is obtuse, and one is straight.  
 H. The straight angle from the red trapezoid is  $180^\circ$ , the obtuse angle from the other red trapezoid is  $120^\circ$ , the acute angle from the green triangle is  $60^\circ$ .  
 I.  $360^\circ$

Name \_\_\_\_\_ Date \_\_\_\_\_

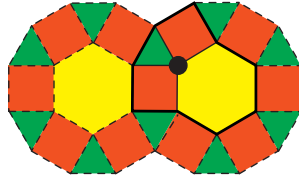
16. A. Make the part of the shape with solid lines using your power polygons. Use orange squares (B), yellow hexagons (H), and small green triangles (N). If you have enough pieces, you can extend the shape as shown with dotted lines.

B. Find the dot on your shape. How many pieces come together at the dot?  
 \_\_\_\_\_

C. Are the angles at the dot acute, obtuse, or right?  
 \_\_\_\_\_

D. Estimate and then measure the size of the angle of each piece at the dot.  
 \_\_\_\_\_

E. Add all the angle measures at the dot. What is the sum of all the angle measures?  
 \_\_\_\_\_



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Name \_\_\_\_\_ Date \_\_\_\_\_

17. A. Make the shape with the solid lines using your power polygons. Use small green triangles (N) and red trapezoids (K). If you have enough pieces, you can extend the shape as shown with dotted lines.

B. Find the dot on your shape. How many pieces come together at the dot?  
 \_\_\_\_\_

C. Are the angles acute, obtuse, or right?  
 \_\_\_\_\_

D. Estimate and then measure the size of the angle of each piece at the dot.  
 \_\_\_\_\_

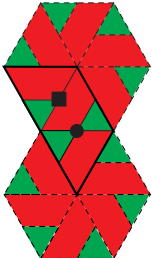
E. Add all the angle measures at the dot. What is the sum of all the angle measures?  
 \_\_\_\_\_

F. Now find the square on your shape. How many pieces touch at the square?  
 \_\_\_\_\_

G. Are the angles acute, obtuse, or right? Or is there another kind of angle? What is it?  
 \_\_\_\_\_

H. Estimate and then measure the size of the angle of each piece at the square.  
 \_\_\_\_\_

I. Add all the angle measures. What is the sum of all the angle measures at the square?  
 \_\_\_\_\_



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**Lines**  
 ✓ **Self-Check: Questions 18-21**

18. A. Name one set of parallel lines. \_\_\_\_\_  
 B. Name two lines that are perpendicular to each other.  
 \_\_\_\_\_

19. A. Name a ray on the figure. \_\_\_\_\_  
 B. Name a line segment on the figure. \_\_\_\_\_  
 C. Find and name a quadrilateral on the figure. \_\_\_\_\_

20. Use a protractor to draw a line perpendicular to  $\overleftrightarrow{VT}$ .  
 21. Use a protractor to draw a line parallel to  $\overleftrightarrow{VT}$ .

**Use the Self-Check Questions and menu to choose practice.**

<b>Can I Do This?</b>	<b>Working On It!</b> I could use some extra help.	<b>Getting It!</b> I just need some more practice.	<b>Got It!</b> I'm ready for a challenge.
<b>Draw and identify lines that intersect, are perpendicular, or are parallel.</b>	★ Q# 22-24	● Q# 23-25	■ Q# 25-26

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\*22. The figure below is an octagon because it has 8 sides. Each side is a part of a line which means each side is a line segment.

A. What are two different ways you can name this octagon?  
 \_\_\_\_\_

B. Name 4 pairs of parallel lines that make up the octagon.  
 \_\_\_\_\_

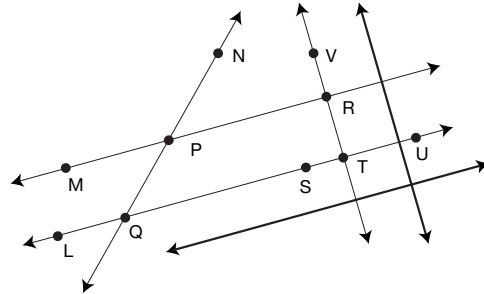
C. Use your ruler to draw a line segment from Point D to Point H. Draw another line segment from Point B to Point F. Do  $\overline{DH}$  and  $\overline{BF}$  intersect? What kind of angle is formed at the intersection? What can you say about  $\overline{DH}$  and  $\overline{BF}$ ?  
 \_\_\_\_\_  
 \_\_\_\_\_

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18. A. Possible responses include  $\overleftrightarrow{MR}$  and  $\overleftrightarrow{LT}$ ,  $\overleftrightarrow{PR}$  and  $\overleftrightarrow{QS}$   
 B. Possible responses include  $\overleftrightarrow{VR}$  and  $\overleftrightarrow{PR}$ ,  $\overleftrightarrow{RT}$  and  $\overleftrightarrow{SU}$
19. A. Possible responses include  $\overleftrightarrow{RV}$ ,  $\overleftrightarrow{TV}$ ,  $\overleftrightarrow{MR}$ ,  $\overleftrightarrow{TU}$   
 B. Possible responses include  $\overline{MP}$ ,  $\overline{MR}$ ,  $\overline{QN}$ ,  $\overline{SU}$   
 C. PRTQ

20–21.

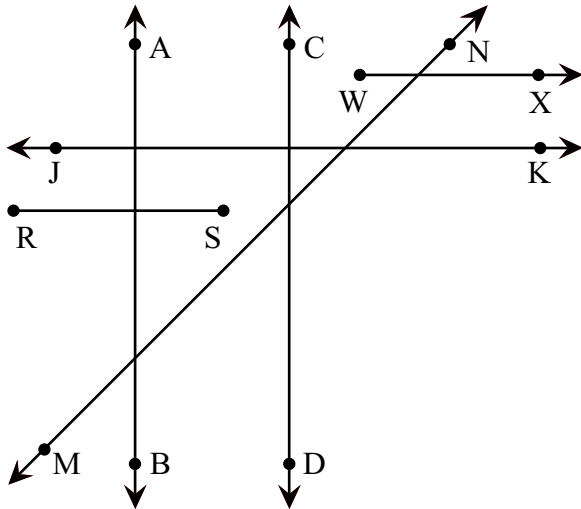


22. A. ABCDEFGH, HGFEDCBA, any sequence that is in order around the octagon is acceptable.  
 B. Possible responses include  $\overleftrightarrow{AB}$  and  $\overleftrightarrow{FE}$ ,  $\overleftrightarrow{BC}$  and  $\overleftrightarrow{GF}$ ,  $\overleftrightarrow{CD}$  and  $\overleftrightarrow{GH}$ ,  $\overleftrightarrow{DE}$  and  $\overleftrightarrow{HA}$   
 C. They intersect, and a right angle is formed at the intersection. The lines are perpendicular.

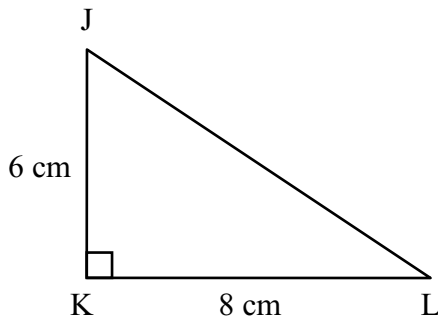
23. A–B. Responses will vary. Possible response shown below.

C. Yes,  $\overleftrightarrow{JK}$  intersects  $\overleftrightarrow{CD}$ . They make a right angle.

24. Responses will vary. Possible response:

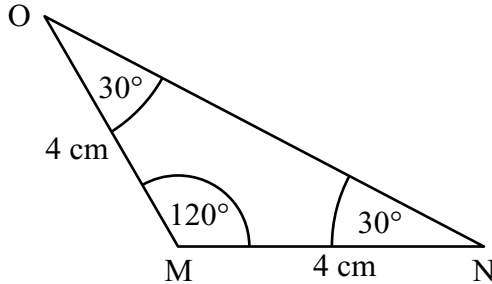


25. A.



B.  $\angle J 60^\circ$ ,  $\angle K 90^\circ$ ,  $\angle L 30^\circ$  (choice C)

26.



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★●23. A. Draw a line that is parallel to  $\overleftrightarrow{AB}$  below. Name it  $\overleftrightarrow{CD}$ .  
 B. Draw a line  $\overleftrightarrow{JK}$  that is perpendicular to  $\overleftrightarrow{AB}$ .  
 C. Does  $\overleftrightarrow{JK}$  also intersect  $\overleftrightarrow{CD}$ ? If so, tell if the intersection of  $\overleftrightarrow{JK}$  and  $\overleftrightarrow{CD}$  makes an acute angle, an obtuse angle, or a right angle.

\_\_\_\_\_

★●24. A. Draw a line segment  $\overline{RS}$  that intersects  $\overleftrightarrow{AB}$  but not  $\overleftrightarrow{CD}$ .  
 B. Draw  $\overline{MN}$  that intersects  $\overleftrightarrow{CD}$  and forms an obtuse angle.  
 C. Draw a ray  $\overrightarrow{WX}$  that intersects  $\overline{MN}$ .

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●25. A. Use these clues to draw Triangle JKL:  
 Clue 1: Side JK is 6 cm long  
 Clue 2: Angle K is a right angle  
 Clue 3: Side KL is 8 cm long

B. Look at your Triangle JKL. Which of the following is close to the correct angle measures for Triangle JKL? Fill in the circle by the correct letter.

A.  $\angle J 80^\circ$ ,  $\angle K 90^\circ$ ,  $\angle L 10^\circ$   
 B.  $\angle J 125^\circ$ ,  $\angle K 90^\circ$ ,  $\angle L 79^\circ$   
 C.  $\angle J 60^\circ$ ,  $\angle K 90^\circ$ ,  $\angle L 30^\circ$   
 D.  $\angle J 20^\circ$ ,  $\angle K 90^\circ$ ,  $\angle L 27^\circ$

■26. Use these clues to draw Triangle MNO.  
 Clue 1: Angle M is  $120^\circ$   
 Clue 2: Angle N is  $30^\circ$   
 Clue 3: Side MN is 4 cm long

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