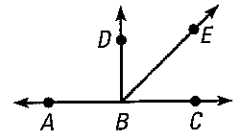


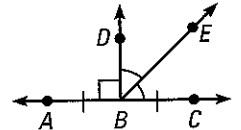
Interpreting a Diagram

There are some things you can conclude from a diagram, and some you cannot. For example, here are some things that you **can conclude** from the diagram at the right:



- All points shown are coplanar.
- Points A, B, and C are collinear, and B is between A and C.
- $\overleftrightarrow{AC}$ ,  $\overleftrightarrow{BD}$ , and  $\overleftrightarrow{BE}$  intersect at point B.
- $\angle DBE$  and  $\angle EBC$  are adjacent angles, and  $\angle ABC$  is a straight angle.
- Point E lies in the interior of  $\angle DBC$ .

In the diagram above, you **cannot conclude** that  $\overline{AB} \cong \overline{BC}$ , that  $\angle DBE \cong \angle EBC$ , or that  $\angle ABD$  is a right angle. This information must be indicated, as shown at the right.



1.5 EXERCISES

HOMWORK KEY

- = WORKED-OUT SOLUTIONS on p. WS1 for Exs. 9, 21, and 47
- ★ = STANDARDIZED TEST PRACTICE Exs. 2, 16, 30, and 53
- ◆ = MULTIPLE REPRESENTATIONS Ex. 55

SKILL PRACTICE

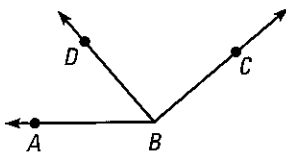
- VOCABULARY** Sketch an example of adjacent angles that are complementary. Are all complementary angles adjacent? *Explain.*
- ★ WRITING** Are all linear pairs supplementary angles? Are all supplementary angles linear pairs? *Explain.*

EXAMPLE 1

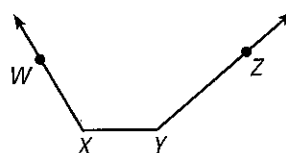
on p. 35  
for Exs. 3–7

IDENTIFYING ANGLES Tell whether the indicated angles are adjacent.

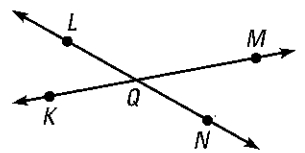
3.  $\angle ABD$  and  $\angle DBC$



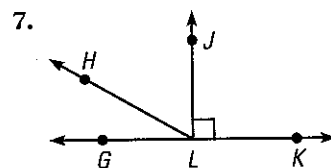
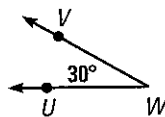
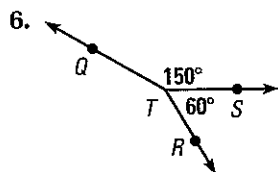
4.  $\angle WXY$  and  $\angle XYZ$



5.  $\angle LQM$  and  $\angle NQM$



IDENTIFYING ANGLES Name a pair of complementary angles and a pair of supplementary angles.



**EXAMPLE 2**  
on p. 36  
for Exs. 8–16

**COMPLEMENTARY ANGLES**  $\angle 1$  and  $\angle 2$  are complementary angles. Given the measure of  $\angle 1$ , find  $m\angle 2$ .

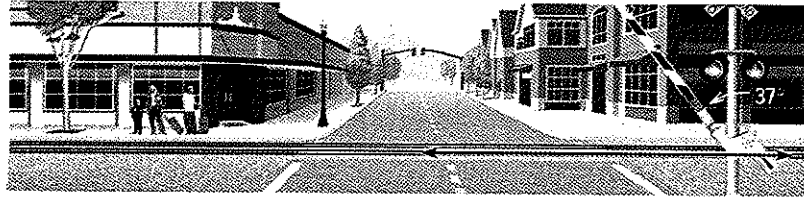
8.  $m\angle 1 = 43^\circ$     9.  $m\angle 1 = 21^\circ$     10.  $m\angle 1 = 89^\circ$     11.  $m\angle 1 = 5^\circ$

**SUPPLEMENTARY ANGLES**  $\angle 1$  and  $\angle 2$  are supplementary angles. Given the measure of  $\angle 1$ , find  $m\angle 2$ .

12.  $m\angle 1 = 60^\circ$     13.  $m\angle 1 = 155^\circ$     14.  $m\angle 1 = 130^\circ$     15.  $m\angle 1 = 27^\circ$

16. **★ MULTIPLE CHOICE** The arm of a crossing gate moves  $37^\circ$  from vertical. How many more degrees does the arm have to move so that it is horizontal?

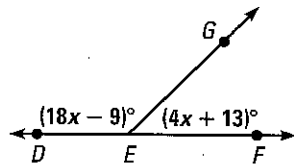
- (A)  $37^\circ$   
(B)  $53^\circ$   
(C)  $90^\circ$   
(D)  $143^\circ$



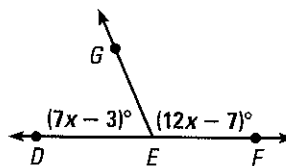
**EXAMPLE 3**  
on p. 36  
for Exs. 17–19

**ALGEBRA** Find  $m\angle DEG$  and  $m\angle GEF$ .

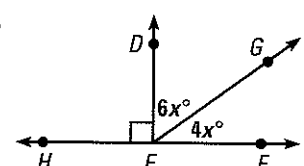
17.



18.



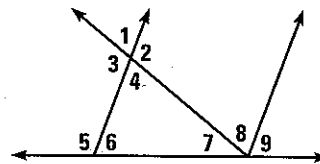
19.



**EXAMPLE 4**  
on p. 37  
for Exs. 20–27

**IDENTIFYING ANGLE PAIRS** Use the diagram below. Tell whether the angles are *vertical angles*, a *linear pair*, or *neither*.

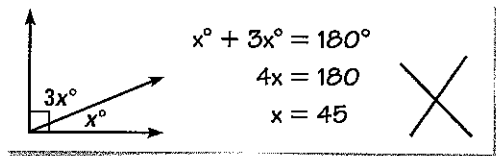
20.  $\angle 1$  and  $\angle 4$     21.  $\angle 1$  and  $\angle 2$   
22.  $\angle 3$  and  $\angle 5$     23.  $\angle 2$  and  $\angle 3$   
24.  $\angle 7, \angle 8,$  and  $\angle 9$     25.  $\angle 5$  and  $\angle 6$   
26.  $\angle 6$  and  $\angle 7$     27.  $\angle 5$  and  $\angle 9$



**EXAMPLE 5**  
on p. 37  
for Exs. 28–30

28. **ALGEBRA** Two angles form a linear pair. The measure of one angle is 4 times the measure of the other angle. Find the measure of each angle.

29. **ERROR ANALYSIS** Describe and correct the error made in finding the value of  $x$ .

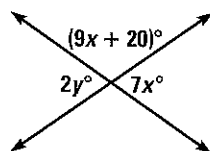


30. **★ MULTIPLE CHOICE** The measure of one angle is  $24^\circ$  greater than the measure of its complement. What are the measures of the angles?

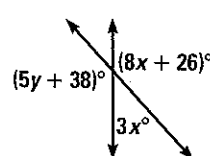
- (A)  $24^\circ$  and  $66^\circ$     (B)  $24^\circ$  and  $156^\circ$     (C)  $33^\circ$  and  $57^\circ$     (D)  $78^\circ$  and  $102^\circ$

**ALGEBRA** Find the values of  $x$  and  $y$ .

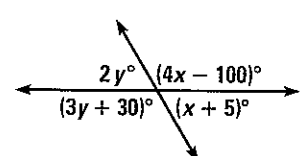
31.



32.



33.



**REASONING** Tell whether the statement is *always*, *sometimes*, or *never* true. Explain your reasoning.

34. An obtuse angle has a complement.
35. A straight angle has a complement.
36. An angle has a supplement.
37. The complement of an acute angle is an acute angle.
38. The supplement of an acute angle is an obtuse angle.

**FINDING ANGLES**  $\angle A$  and  $\angle B$  are complementary. Find  $m\angle A$  and  $m\angle B$ .

- |   |  |  |
|---|--|--|
| 39. $m\angle A = (3x + 2)^\circ$<br>$m\angle B = (x - 4)^\circ$ | 40. $m\angle A = (15x + 3)^\circ$<br>$m\angle B = (5x - 13)^\circ$ | 41. $m\angle A = (11x + 24)^\circ$<br>$m\angle B = (x + 18)^\circ$ |
|---|--|--|

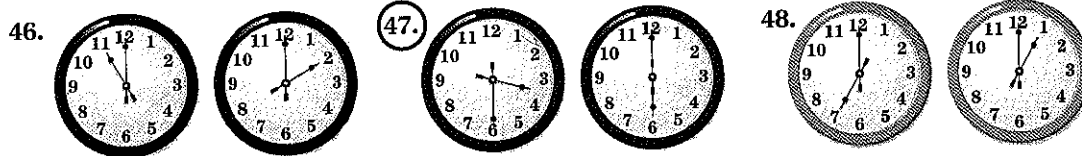
**FINDING ANGLES**  $\angle A$  and  $\angle B$  are supplementary. Find  $m\angle A$  and  $m\angle B$ .

- |   |   |  |
|---|---|--|
| 42. $m\angle A = (8x + 100)^\circ$<br>$m\angle B = (2x + 50)^\circ$ | 43. $m\angle A = (2x - 20)^\circ$<br>$m\angle B = (3x + 5)^\circ$ | 44. $m\angle A = (6x + 72)^\circ$<br>$m\angle B = (2x + 28)^\circ$ |
|---|---|--|

45. **CHALLENGE** You are given that  $\angle GHJ$  is a complement of  $\angle RST$  and  $\angle RST$  is a supplement of  $\angle ABC$ . Let  $m\angle GHJ$  be  $x^\circ$ . What is the measure of  $\angle ABC$ ? Explain your reasoning.

## PROBLEM SOLVING

**IDENTIFYING ANGLES** Tell whether the two angles shown are *complementary*, *supplementary*, or *neither*.



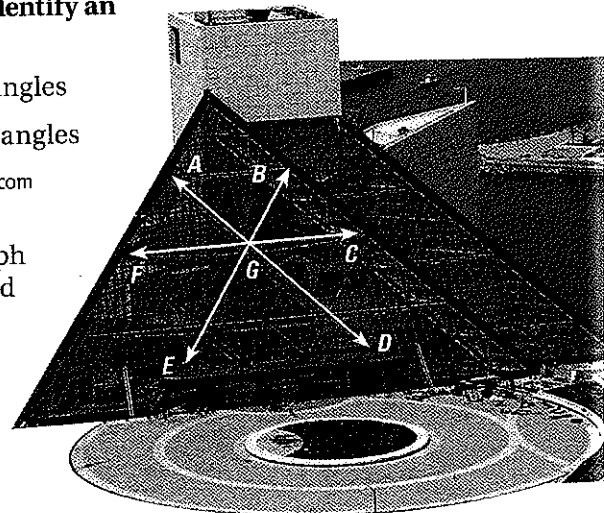
**@HomeTutor** for problem solving help at classzone.com

**ARCHITECTURE** The photograph shows the Rock and Roll Hall of Fame in Cleveland, Ohio. Use the photograph to identify an example of the indicated type of angle pair.

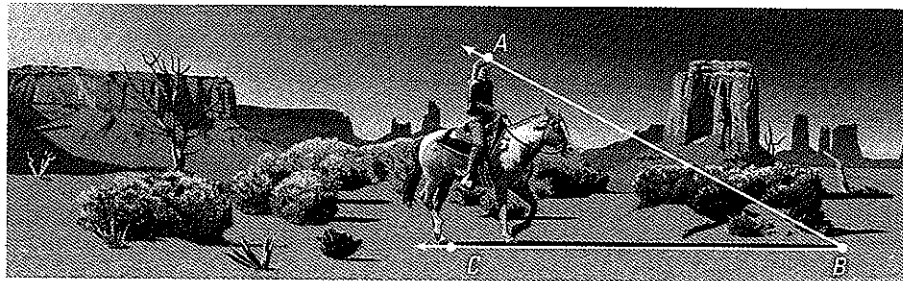
- |                          |                     |
|--------------------------|---------------------|
| 49. Supplementary angles | 50. Vertical angles |
| 51. Linear pair          | 52. Adjacent angles |

**@HomeTutor** for problem solving help at classzone.com

53. **★ SHORT RESPONSE** Use the photograph shown at the right. Given that  $\angle FGB$  and  $\angle BGC$  are supplementary angles, and  $m\angle FGB = 120^\circ$ , explain how to find the measure of the complement of  $\angle BGC$ .



54. **SHADOWS** The length of a shadow changes as the sun rises. In the diagram below, the length of  $\overline{CB}$  is the length of a shadow. The end of the shadow is the vertex of  $\angle ABC$ , which is formed by the ground and the sun's rays. Describe how the shadow and angle change as the sun rises.



55. **MULTIPLE REPRESENTATIONS** Let  $x^\circ$  be an angle measure. Let  $y_1^\circ$  be the measure of a complement of the angle and let  $y_2^\circ$  be the measure of a supplement of the angle.
- Writing an Equation** Write equations for  $y_1$  as a function of  $x$ , and for  $y_2$  as a function of  $x$ . What is the domain of each function? Explain.
  - Drawing a Graph** Graph each function and describe its range.
56. **CHALLENGE** The sum of the measures of two complementary angles exceeds the difference of their measures by  $86^\circ$ . Find the measure of each angle. Explain how you found the angle measures.

## MIXED REVIEW

Make a table of values and graph the function. (p. 884)

57.  $y = 5 - x$

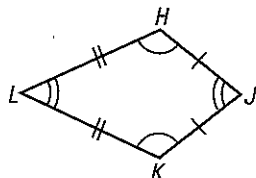
58.  $y = 3x$

59.  $y = x^2 - 1$

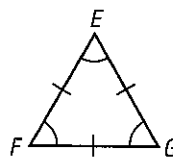
60.  $y = -2x^2$

In each figure, name the congruent sides and congruent angles. (pp. 9, 24)

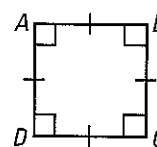
61.



62.



63.



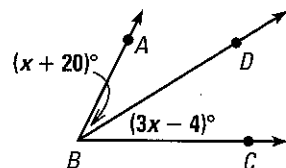
### PREVIEW

Prepare for  
Lesson 1.6 in  
Exs. 61–63.

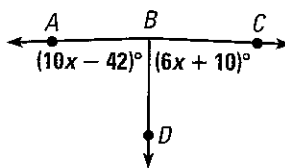
## QUIZ for Lessons 1.4–1.5

In each diagram,  $\overrightarrow{BD}$  bisects  $\angle ABC$ . Find  $m\angle ABD$  and  $m\angle DBC$ . (p. 24)

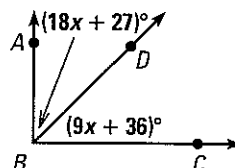
1.



2.



3.



Find the measure of (a) the complement and (b) the supplement of  $\angle 1$ . (p. 35)

4.  $m\angle 1 = 47^\circ$

5.  $m\angle 1 = 19^\circ$

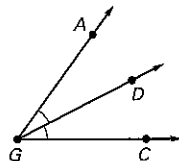
6.  $m\angle 1 = 75^\circ$

7.  $m\angle 1 = 2^\circ$

31.  $m\angle XWZ = 35.5^\circ$ ,  $m\angle YWZ = 35.5^\circ$  33.  $38^\circ$

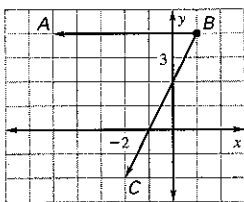
35.  $142^\circ$  37.  $53^\circ$

39. If a ray bisects  $\angle AGC$ , then its endpoint must be point G. *Sample:*

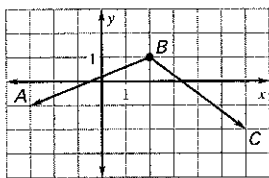


41.  $80^\circ$  43.  $75^\circ$ ; both angle measures are  $5^\circ$  less.

45. Acute. *Sample answer:*  $(-2, 0)$



47. Obtuse. *Sample answer:*  $(2, 0)$



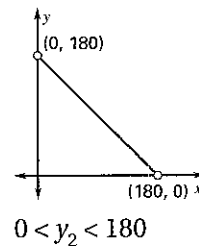
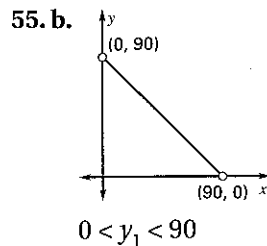
**1.4 Problem Solving** (pp. 31–32) 51.  $32^\circ$  53. a.  $112^\circ$   
b.  $56^\circ$  c.  $56^\circ$  d.  $56^\circ$  55. *Sample answer:* acute:  $\angle ABG$ ,  
obtuse:  $\angle ABC$ , right:  $\angle DGE$ , straight:  $\angle DGF$   
57. about  $140^\circ$  59. about  $62^\circ$  61. about  $107^\circ$

**1.5 Skill Practice** (pp. 38–40)

1. No. *Sample answer:* Any two angles whose angle measures add up to  $90^\circ$  are complementary, but they do not have to have a common vertex and side.

3. adjacent 5. adjacent 7.  $\angle GLH$  and  $\angle HLJ$ ,  $\angle GLJ$  and  $\angle JLK$  9.  $69^\circ$  11.  $85^\circ$  13.  $25^\circ$  15.  $153^\circ$  17.  $135^\circ$ ,  $45^\circ$   
19.  $54^\circ$ ,  $36^\circ$  21. linear pair 23. vertical angles  
25. linear pair 27. neither 29. The angles are complementary so they should be equal to  $90^\circ$ ;  
 $x + 3x = 90^\circ$ ,  $4x = 90^\circ$ ,  $x = 22.5$ . 31. 10, 35 33. 55, 30  
35. Never; a straight angle is  $180^\circ$ , and it is not possible to have a complement of an angle that is  $180^\circ$ .  
37. Always; the sum of complementary angles is  $90^\circ$ , so each angle must be less than  $90^\circ$ , making them acute. 39.  $71^\circ$ ,  $19^\circ$  41.  $68^\circ$ ,  $22^\circ$  43.  $58^\circ$ ,  $122^\circ$

**1.5 Problem Solving** (pp. 40–41) 47. neither  
49–51. *Sample answers* are given. 49.  $\angle FGB$ ,  $\angle BGC$   
51.  $\angle AGE$ ,  $\angle EGD$  53. *Sample answer:* Subtract  $90^\circ$  from  $m\angle FGB$ . 55. a.  $y_1 = 90 - x$ ,  $0 < x < 90$ ;  
 $y_2 = 180 - x$ ,  $0 < x < 180$ ; the measure of the complement must be less than  $90^\circ$  and the measure of its supplement must be less than  $180^\circ$ .



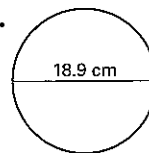
**1.6 Skill Practice** (pp. 44–46) 1. An  $n$ -gon is a polygon with  $n$  sides. 3. polygon; concave 5. polygon; convex 9. Pentagon; regular; it has 5 congruent sides and angles. 11. Triangle; none of these; the sides and/or the angles are not all congruent. 13. Quadrilateral; equiangular; it has 4 congruent angles. 15. 8 in. 17. 3 ft 19. sometimes 21. never 23. never 25. *Sample:* 27. *Sample:*



29. 1

**1.6 Problem Solving** (pp. 46–47) 33. triangle; regular 35. octagon; regular 39. 105 mm; each side of the button is 15 millimeters long, so the perimeter of the button is  $15(7) = 105$  millimeters. 41. a. 3 b. 5 c. 6 d. 8

**1.7 Skill Practice** (pp. 52–54) 1. *Sample answer:* The diameter is twice the radius. 3.  $(52)(9)$  must be divided by 2;  $\frac{52(9)}{2} = 234 \text{ ft}^2$ . 5. 22.4 m, 29.4 m<sup>2</sup>  
7. 180 yd, 1080 yd<sup>2</sup> 9. 36 cm, 36 cm<sup>2</sup> 11. 84.8 cm, 572.3 cm<sup>2</sup> 13. 76.0 cm, 459.7 cm<sup>2</sup>  
15. 59.3 cm, 280.4 cm<sup>2</sup>



17. 12.4 21. 1.44 23. 8,000,000 25. 3,456 27. 14.5 m  
29. 4.5 in. 31. 6 in., 3 in. 33. Octagon; dodecagon; the square has 4 sides, so a polygon with the same side length and twice the perimeter would have to have  $2(4) = 8$  sides, an octagon; a polygon with the same side length and three times the perimeter would have to have  $4(3) = 12$  sides, a dodecagon. 35.  $\sqrt{346}$  in.  
37.  $5\sqrt{42}$  km

**1.7 Problem Solving** (pp. 54–56) 41. 1350 yd<sup>2</sup>; 450 ft  
43. a. 15 in. b. 6 in.; the spoke is 21 inches long from the center to the tip, and it is 15 inches from the center to the outer edge, so  $21 - 15 = 6$  inches is the length of the handle.