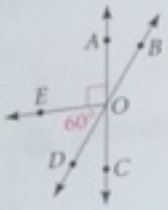
5

oblem Solving

ample

ple 1
e 97)

Name an angle or angles in the diagram described by each of the following.



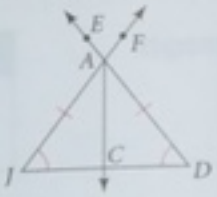
1. supplementary to $\angle AOD$
2. adjacent and congruent to $\angle AOE$
3. supplementary to $\angle EOA$
4. complementary to $\angle EOD$
5. a pair of vertical angles

In the diagram above, find the measure of each of the following angles.

6. $\angle EOC$
7. $\angle DOC$
8. $\angle BOC$
9. $\angle AOB$

e 2
97)

Can you make each conclusion from the information in the diagram? Explain.



10. $\angle J \cong \angle D$
11. $\angle JAC \cong \angle DAC$
12. $\angle JAE$ and $\angle EAF$ are adjacent and supplementary.
13. $m\angle JCA = m\angle DCA$
14. $m\angle JCA + m\angle ACD = 180$
15. $\overline{AJ} \cong \overline{AD}$
16. C is the midpoint of $\overline{JD}$.
17. $\angle EAF$ and $\angle JAD$ are vertical angles.
18. $\overrightarrow{AC}$ bisects $\angle JAD$.

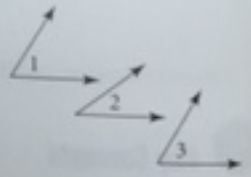
3
8)

19. **Developing Proof** Complete this proof of one form of Theorem 2-3 by filling in the blanks.

If two angles are complements of the same angle, then the two angles are congruent.

Given: $\angle 1$ and $\angle 2$ are complementary.
$\angle 3$ and $\angle 2$ are complementary.

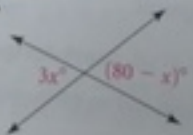
Prove: $\angle 1 \cong \angle 3$



Proof: By the definition of complementary angles, $m\angle 1 + m\angle 2 =$ **a.** ? and $m\angle 3 + m\angle 2 =$ **b.** ?. Then $m\angle 1 + m\angle 2 = m\angle 3 + m\angle 2$ by **c.** ?. Subtract $m\angle 2$ from each side. You get $m\angle 1 =$ **d.** ?.

Algebra **Find the value of each variable.**

20.



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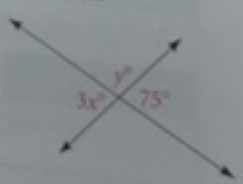

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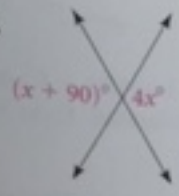


Find the measures of the labeled angles in each exercise.

23. Exercise 20
24. Exercise 21
25. Exercise 22

g and Proof

B Apply Your Skills

26. Writing How is a theorem different from a postulate?

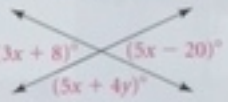
27. Open-Ended Give an example of vertical angles in your home.

28. Reasoning Explain why this statement is true:
If $m\angle 1 + m\angle 2 = 180$ and $m\angle 3 + m\angle 2 = 180$, then $\angle 1 \cong \angle 3$.

Algebra **Find the value of each variable and the measure of each labeled angle.**

29.

30.



31. Developing Proof Complete this proof of Theorem 2-4 by filling in the blanks.

All right angles are congruent.

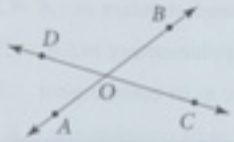
Given: $\angle X$ and $\angle Y$ are right angles.

Prove: $\angle X \cong \angle Y$

Proof: By the definition of **a.** ?, $m\angle X = 90$ and $m\angle Y = 90$.
By the Substitution Property, $m\angle X =$ **b.** ?, or $\angle X \cong \angle Y$.

Name two pairs of congruent angles in each figure. Justify your answers.

32.



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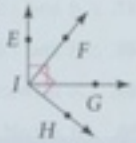

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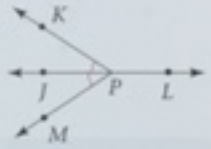


35. Developing Proof Complete this proof of Theorem 2-5 by filling in the blanks.

If two angles are congruent and supplementary, then each is a right angle.

Given: $\angle W$ and $\angle V$ are congruent and supplementary.

Prove: $\angle W$ and $\angle V$ are right angles.

Proof: $\angle W$ and $\angle V$ are congruent, so $m\angle W = m\angle$ **a.** ?.
$\angle W$ and $\angle V$ are supplementary so $m\angle W + m\angle V =$ **b.** ?.
Substituting $m\angle W$ for $m\angle V$, you get $m\angle W + m\angle W = 180$, or $2m\angle W = 180$.
By the **c.** ? Property of Equality, $m\angle W = 90$.
Since $\angle W \cong \angle V$, $m\angle V = 90$, too. Then both angles are **d.** ? angles.

Exercise 36

36. Design The two back legs of the director's chair pictured at the left meet in a 72° angle. Find the measure of each angle formed by the two back legs.

37. Coordinate Geometry $\angle AOX$ contains points $A(1, 3)$, $O(0, 0)$, and $X(4, 0)$.

a. Find the coordinates of a point B so that $\angle BOA$ and $\angle AOX$ are adjacent complementary angles.

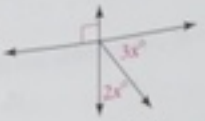
b. Find the coordinates of a point C so that $\overrightarrow{OC}$ is a side of a different angle that is adjacent and complementary to $\angle AOX$.

38. Coordinate Geometry $\angle DOE$ contains points $D(2, 3)$, $O(0, 0)$, and $E(5, 1)$. Find the coordinates of a point F so that $\overrightarrow{OF}$ is a side of an angle that is adjacent and supplementary to $\angle DOE$.

Algebra **Find the value of each variable and the mea**

39.

41.



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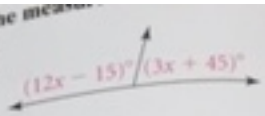

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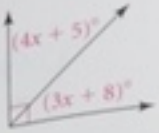


Exercise 43

43. Sports In the photograph, the wheels of the racing wheelchair are tilted so that $\angle 1 \cong \angle 2$. What theorem can you use to justify the statement $\angle 3 \cong \angle 4$?

Critical Thinking **If possible, find the measures of the angles described. If it is not possible, explain why.**

44. congruent adjacent supplementary angles

45. congruent adjacent complementary angles

46. congruent vertical angles

Algebra **Find the measure of each angle.**

47. $\angle A$ and $\angle B$ are complementary. $m\angle A = 3x + 12$ and $m\angle B = 2x - 22$.

48. $\angle A$ and $\angle B$ are supplementary. $m\angle A = 3x + 12$ and $m\angle B = 2x - 22$.

49. $\angle A$ is twice as large as its complement, $\angle B$.

50. $\angle A$ is half as large as its complement, $\angle B$.

51. $\angle A$ is twice as large as its supplement, $\angle B$.

52. $\angle A$ is half as large as twice its supplement, $\angle B$.

53. The measure of $\angle B$, the supplement of $\angle A$, is four times the measure of $\angle C$, the complement of $\angle A$.

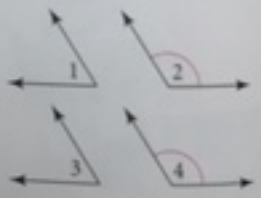
54. The measure of $\angle B$, the complement of $\angle A$, is one-sixth the measure of $\angle C$, the supplement of $\angle A$.

Challenge **Proof** **55.** Write a paragraph proof for this form of Theorem 2-2.

If two angles are supplements of congruent angles, then the two angles are congruent.

Given: $\angle 1$ and $\angle 2$ are supplementary.
$\angle 3$ and $\angle 4$ are supplementary.
$\angle 2 \cong \angle 4$

Prove: $\angle 1 \cong \angle 3$



Proof **56.** Write a paragraph proof for this form of Theorem 2-3.

If two angles are complements of congruent angles, then the two angles are congruent.

Given: $\angle 1$ and $\angle 2$ are complementary.
$\angle 3$ and $\angle 4$ are complementary.
$\angle 2 \cong \angle 4$

Prove: $\angle 1 \cong \angle 3$