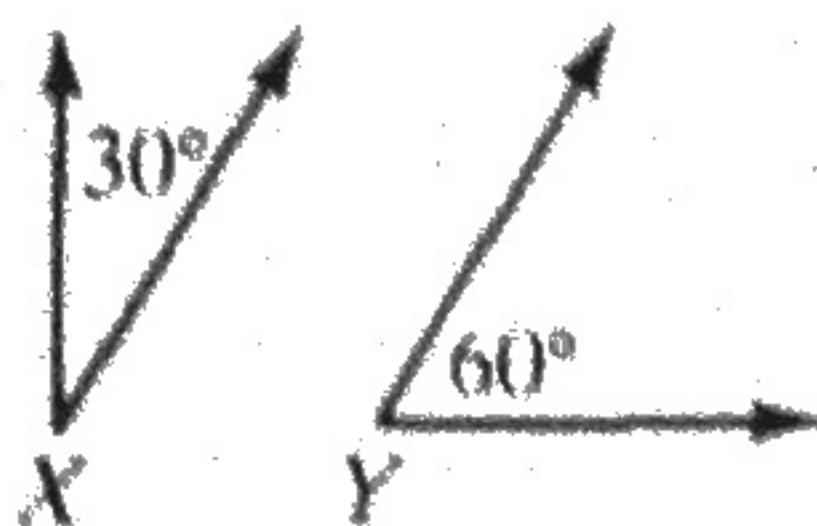


1-4b Special Pairs of Angles

Objectives: Apply the definitions of complementary and supplementary angles.
State and use the theorem about vertical angles.

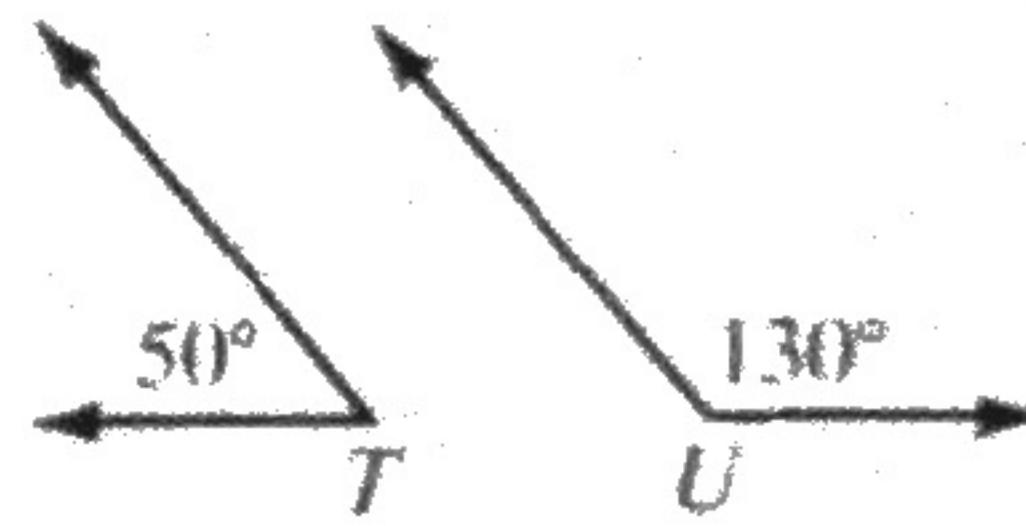
complementary angles Two angles whose measures have the sum 90 are complementary.

supplementary angles Two angles whose measures have the sum 180 are supplementary.



$$m\angle X + m\angle Y = 90$$

$\angle X$ and $\angle Y$ are complementary.
 $\angle X$ is a complement of $\angle Y$.

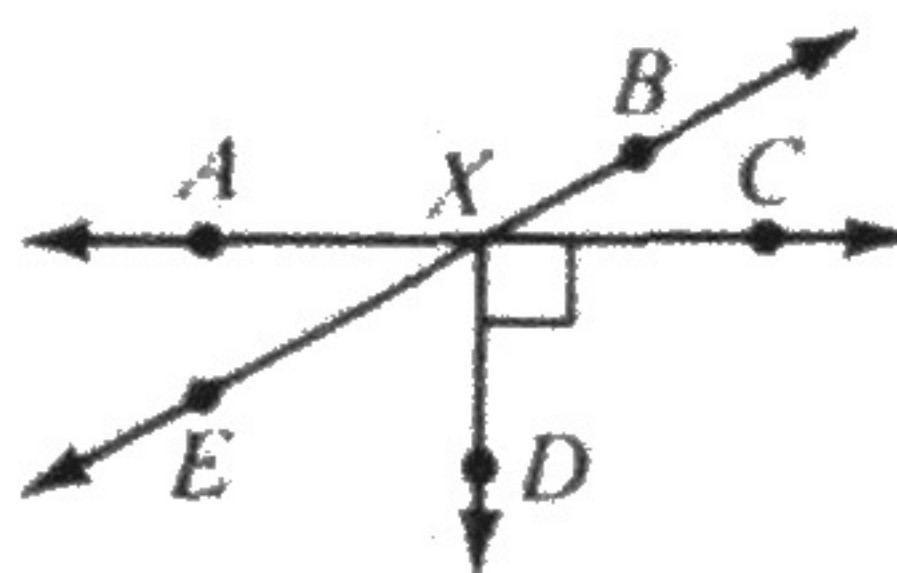


$$m\angle T + m\angle U = 180$$

$\angle T$ and $\angle U$ are supplementary.
 $\angle T$ is a supplement of $\angle U$.

In the diagram, $\angle CXD$ is a right angle. Name:

1. another right angle.
2. two congruent supplementary angles.
3. two noncongruent supplementary angles.
4. two complementary angles.



Example 1

$\angle C$ and $\angle D$ are complementary, $m\angle C = 3y - 5$, and $m\angle D = y + 15$. Find the value of y , $m\angle C$, and $m\angle D$.

Solution

$$\begin{aligned} m\angle C + m\angle D &= 90 \\ (3y - 5) + (y + 15) &= 90 \\ 4y + 10 &= 90 \\ 4y &= 80 \\ y &= 20 \end{aligned}$$

$$\begin{aligned} m\angle C &= 3y - 5 \\ &= 3(20) - 5 \\ &= 60 - 5 \\ &= 55 \end{aligned}$$

$$\begin{aligned} m\angle D &= y + 15 \\ &= 20 + 15 \\ &= 35 \end{aligned}$$

Example 2

A supplement of an angle is seven times a complement of the angle. Find the measures of the angle, its complement, and its supplement.

Solution

Let x be the measure of the angle. Then $90 - x$ is the measure of its complement, and $180 - x$ is the measure of its supplement.

$$\begin{aligned} 180 - x &= 7(90 - x) \\ 180 - x &= 630 - 7x \\ 6x &= 450 \\ x &= 75 \end{aligned}$$

$$\begin{aligned} \text{measure of angle} &= 75 \\ \text{measure of complement} &= 90 - x = 90 - 75 = 15 \\ \text{measure of supplement} &= 180 - x = 180 - 75 = 105 \end{aligned}$$

Special Pairs of Angles (continued)

$\angle A$ and $\angle B$ are supplementary. Find the value of x , $m\angle A$, and $m\angle B$.

5. $m\angle A = 3x, m\angle B = x + 20$

6. $m\angle A = x + 11, m\angle B = 2x - 5$

$\angle C$ and $\angle D$ are complementary. Find the value of y , $m\angle C$, and $m\angle D$.

7. $m\angle C = y + 11, m\angle D = 2y - 5$

8. $m\angle C = 3y + 5, m\angle D = 2y + 10$

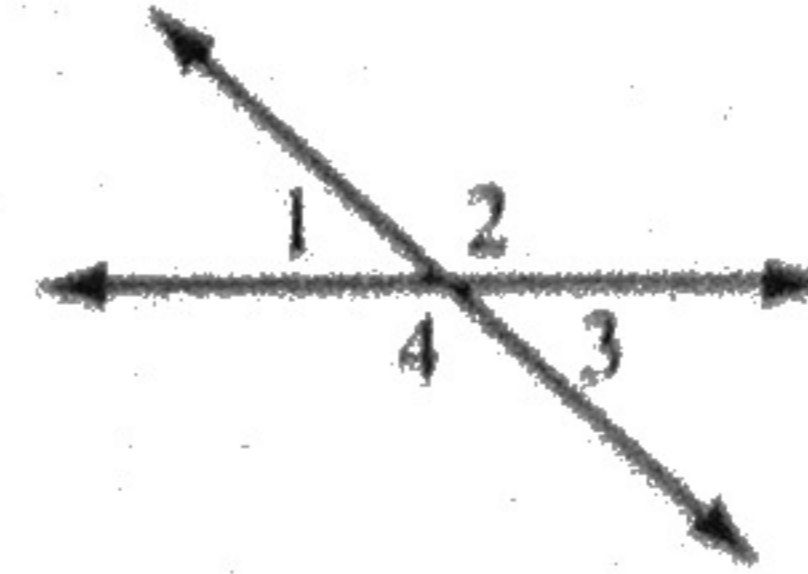
Use the given information to write an equation and solve the problem.

9. Find the measure of an angle that is twice as large as its complement.

10. A supplement of an angle is four times as large as the angle. Find the measure of the angle.

11. The measure of a complement of an angle is three more than twice the measure of the angle. Find the measures of the angle and its complement.

When two lines intersect, **vertical angles** are formed. In the figure, $\angle 1$ and $\angle 3$ are vertical angles. $\angle 2$ and $\angle 4$ are vertical angles.

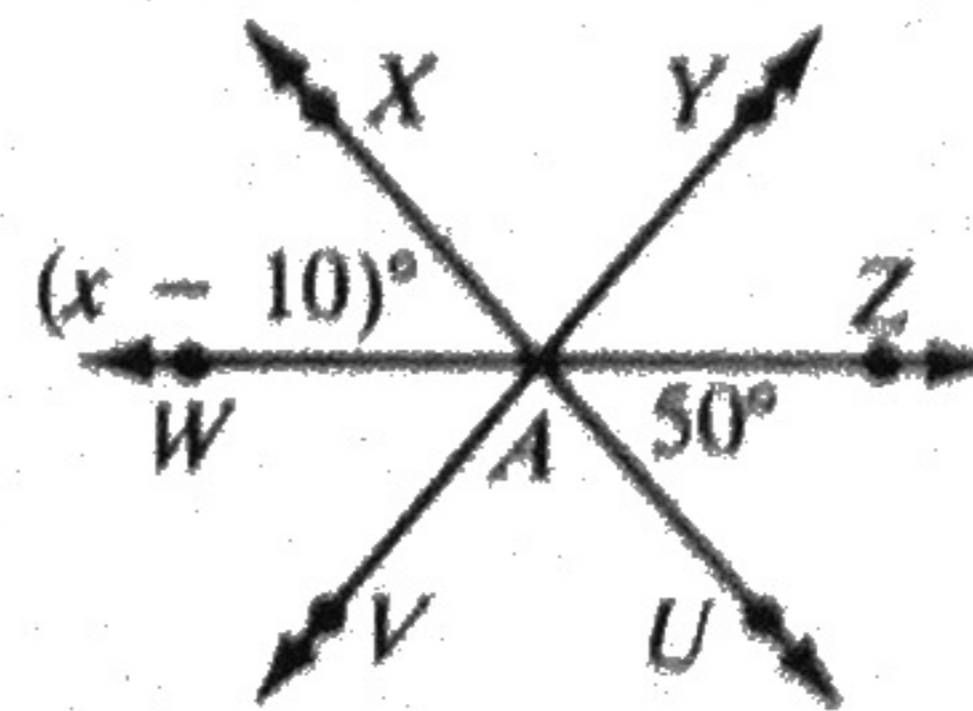


Vertical angles are congruent.

Example 3 In the diagram, \vec{AZ} bisects $\angle YAU$.

a. Name three angles congruent to $\angle YAZ$.

b. Find the value of x .

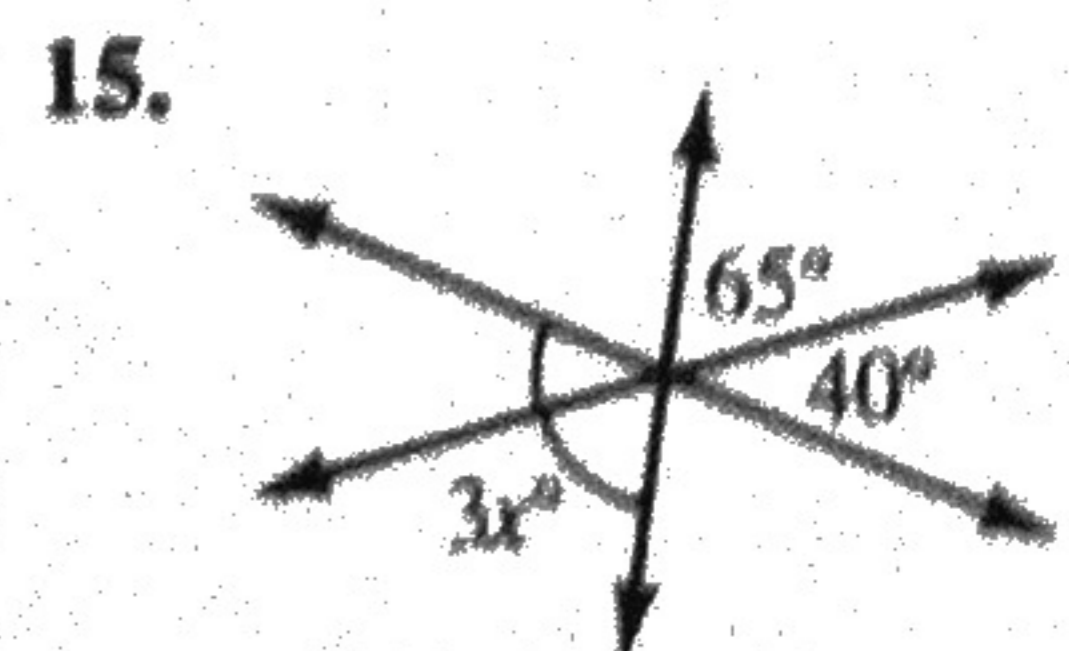
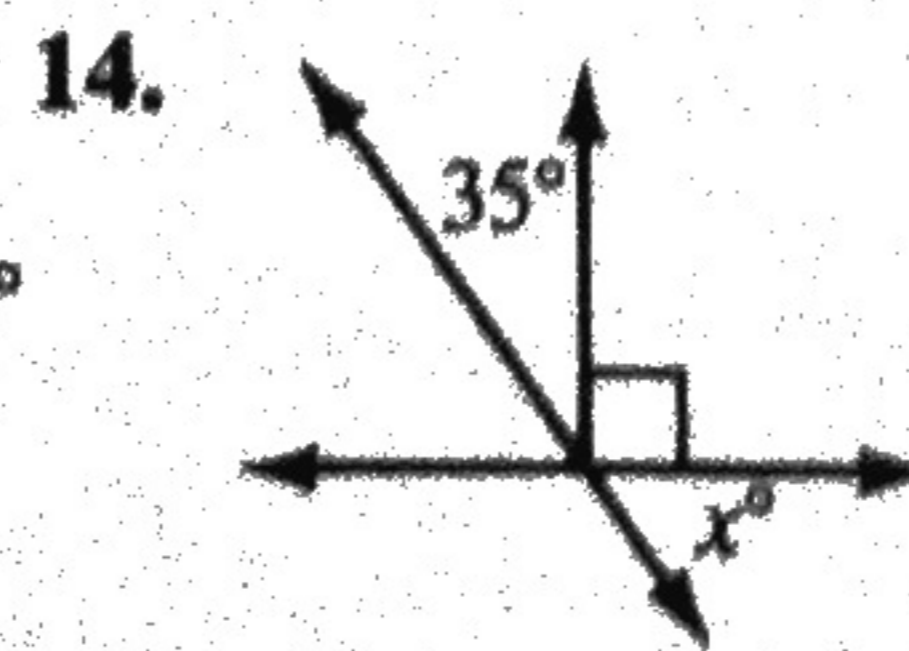
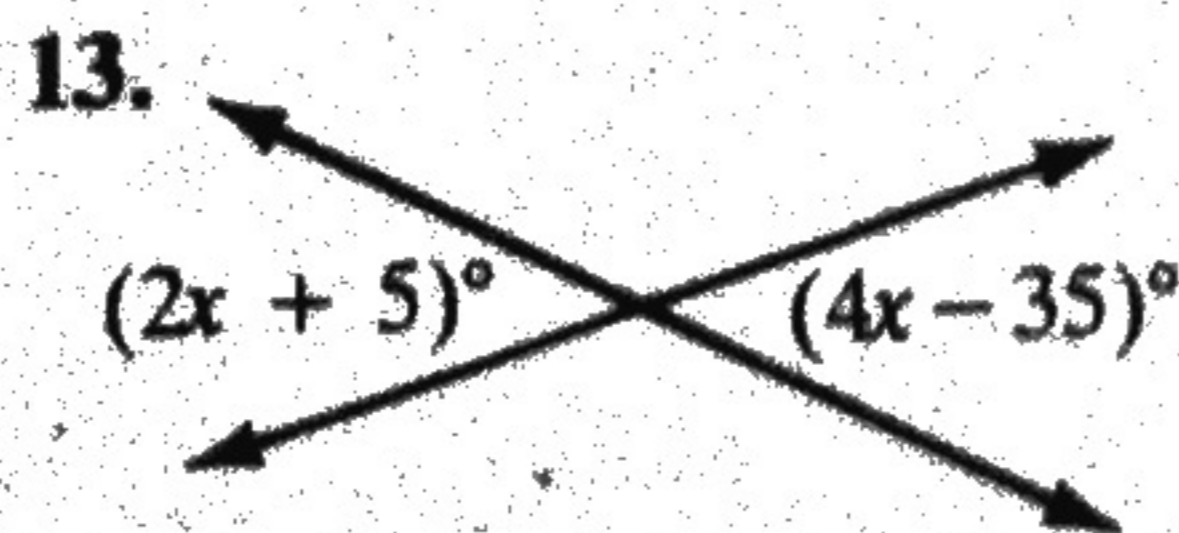
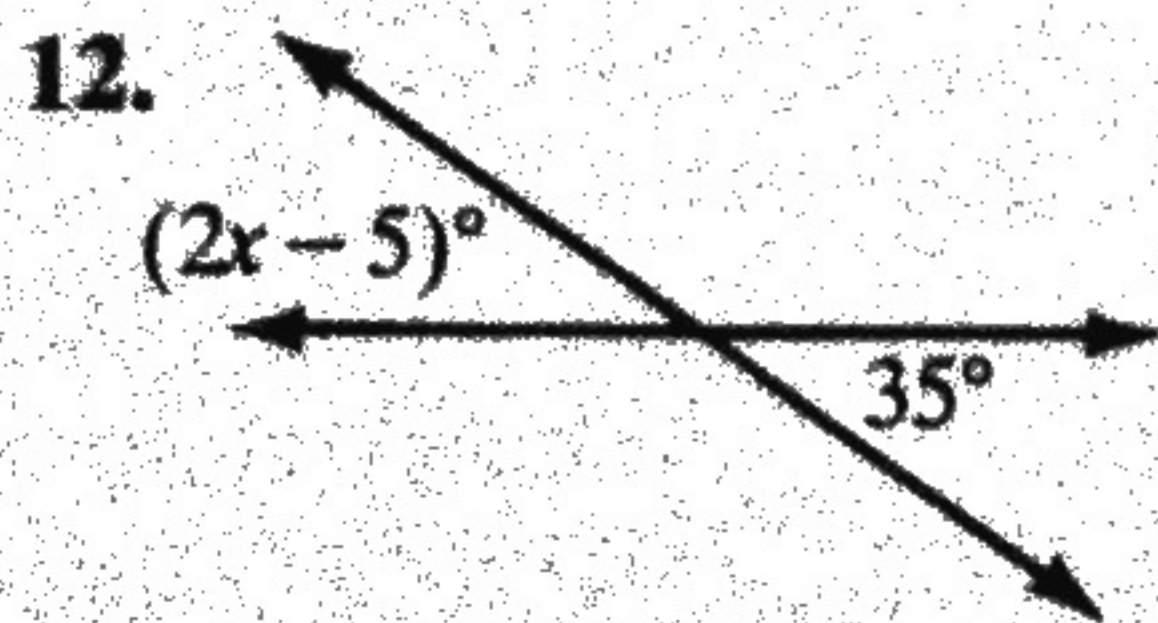


Solution

a. $\angle YAZ \cong \angle ZAU \cong \angle WAX \cong \angle WAV$

b. $x - 10 = 50$, so $x = 60$.

Find the value of x .



In the diagram, \vec{OC} bisects $\angle BOD$, $m\angle BOD = 90$, and $m\angle BOA = 40$. Find:

16. $m\angle BOC$

17. $m\angle FOG$

18. $m\angle AOH$

19. $m\angle HOE$

20. $m\angle DOE$

21. $m\angle AOE$

