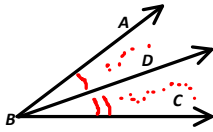


Angle Relationships

Adjacent Angles - Two angles in the same plane that have a common vertex and a common side, but no common interior points.



$\angle ABD, \angle DBC$
Share \overrightarrow{BD} and have their
common vertex at B

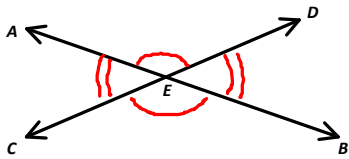
non adjacent \angle 's
 $\angle ABD, \angle ABC$

Complementary Angles - Two angles that add up to 90° .

Supplementary Angles - Two angles that add up to 180° .

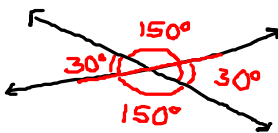
Angle	Complement	Supplement
$\rightarrow 40^\circ$	$90 - 40 = 50^\circ$	$180 - 40 = 140^\circ$
$\rightarrow 25^\circ$	$90 - 25 = 65^\circ$	$180 - 25 = 155^\circ$
$\rightarrow 100^\circ$	No comp.	$180 - 100 = 80^\circ$
$\rightarrow 200^\circ$	No comp.	No supp.
$\rightarrow x^\circ$	$(90 - x)^\circ$	$(180 - x)^\circ$
$\rightarrow (2x)^\circ$	$(90 - 2x)^\circ$	$(180 - 2x)^\circ$
$\rightarrow \left(\frac{1}{2}x\right)^\circ$	$(90 - \frac{1}{2}x)^\circ$	$(180 - \frac{1}{2}x)^\circ$

Vertical Angles - Two nonadjacent angles formed by intersecting lines.



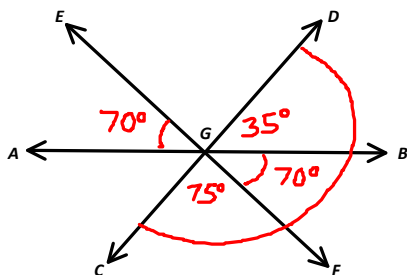
$\angle AED, \angle CEB$

$\angle AEC, \angle DEB$



* all vertical \angle 's are
equal

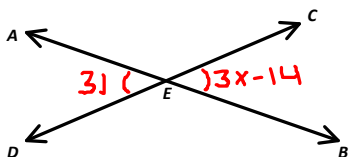
1. In the accompanying diagram, \overline{AB} , \overline{CD} and \overline{EF} intersect at G . If $m\angle DGB = 35^\circ$ and $m\angle CGF = 75^\circ$, find $m\angle AGE$.



$$\begin{array}{r} 180 \\ - 75 \\ - 75 \\ \hline 30 \end{array}$$

$$m\angle AGE = 70^\circ$$

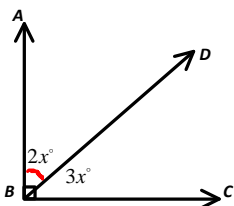
2. In the accompanying diagram, \overline{AB} and \overline{CD} intersect at point E . If $m\angle CEB = (3x - 14)^\circ$ and $m\angle AED = 31^\circ$, find the value of x .



$$\begin{array}{r} 3x - 14 = 31 \\ + 14 \quad + 14 \\ \hline 3x = 45 \\ \frac{3x}{3} = \frac{45}{3} \end{array}$$

$$x = 15$$

3. In the accompanying diagram, $m\angle ABC = 90^\circ$. Find $m\angle ABD$.



$$\begin{array}{r} 2x + 3x = 90 \\ 5x = 90 \\ \frac{5x}{5} = \frac{90}{5} \\ x = 18 \end{array}$$

$$\begin{array}{r} m\angle ABD = 2x \\ = 2(18) \\ = 36 \end{array}$$

$$m\angle ABD = 36^\circ$$

4. If two supplementary angles are in the ratio of 4:5, find the measure of the larger angle.

$$\begin{aligned} 1^{\text{st}}: & 4x = 4(20) = 80 \\ 2^{\text{nd}}: & 5x = 5(20) = 100 \end{aligned}$$

$$\begin{aligned} 4x + 5x &= 180 \\ \frac{9x}{9} &= \frac{180}{9} \\ x &= 20 \end{aligned}$$

Larger \angle : 100°

5. Two angles are supplementary. The measure of one angle is twice as large as the measure of the other angle. What is the total number of degrees in the measure of the smaller angle?

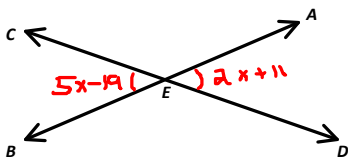
$$\begin{aligned} 1^{\text{st}}: & x = 60 \\ 2^{\text{nd}}: & 2x = 2(60) = 120 \end{aligned}$$

$$\begin{aligned} x + 2x &= 180 \\ \frac{3x}{3} &= \frac{180}{3} \end{aligned}$$

$$x = 60$$

Smaller \angle : 60°

6. In the accompanying diagram, \overline{AB} and \overline{CD} intersect at point E . If $m\angle AED = (2x + 11)^\circ$ and $m\angle CEB = (5x - 19)^\circ$, find the value of x .



$$\begin{aligned} 5x - 19 &= 2x + 11 \\ -2x & \quad -2x \\ 3x - 19 &= 11 \\ +19 & \quad +19 \\ 3x &= 30 \\ \frac{3x}{3} &= \frac{30}{3} \\ x &= 10 \end{aligned}$$

7. The larger of two complementary angles has a measure of 20° more than three times the measure of the smaller angle. Find the measure of both angles.

$$20 + 3 \cdot (x)$$

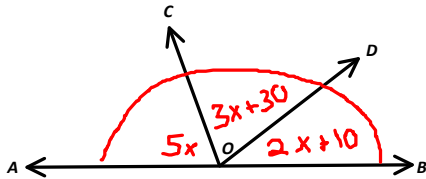
1st: $x = 17.5$

2nd: $20 + 3x$
 $20 + 3(17.5)$
 $20 + 52.5$
 72.5

$$\begin{aligned} x + 20 + 3x &= 90 \\ 4x + 20 &= 90 \\ -20 &-20 \\ \hline 4x &= 70 \\ \frac{4x}{4} &= \frac{70}{4} \\ x &= 17.5 \end{aligned}$$

smaller \angle : 17.5°
 larger \angle : 72.5°

8. In the accompanying diagram, \overline{AOB} is a straight line, $m\angle AOC = (5x)^\circ$, $m\angle COD = (3x + 30)^\circ$ and $m\angle DOB = (2x + 10)^\circ$. Find the value of x .



$$\begin{aligned} 5x + 3x + 30 + 2x + 10 &= 180 \\ 10x + 40 &= 180 \\ -40 &-40 \\ \hline 10x &= 140 \\ \frac{10x}{10} &= \frac{140}{10} \\ \hline x &= 14 \end{aligned}$$

9. The measure of an angle is 44° more than the measure of its supplement. Find the measures of the angles.

Supplementary - add the \angle 's and set equal to 180°

Supplement

Angle: $x = 112$
 Supplement: $180 - x$
 $180 - 112$
 68

Angle: 112°
 Supplement: 68°

$$\begin{aligned} x &= 44 + (180 - x) \\ x &= 44 + 180 - x \\ + x & \quad \quad + x \\ \hline 2x &= 224 \\ \frac{2x}{2} &= \frac{224}{2} \\ x &= 112 \end{aligned}$$

10. An angle measures 43° less than six times the measure of its complement. Find the measures of the angles.

Complementary - add the x 's and set = to 90°

Complement

Angle: $x = 71$
 Complement: $90 - x$
 $90 - 71$
 19

$$x = 6(90 - x) - 43$$

$$x = 540 - 6x - 43$$

$$+6x \quad +6x$$

$$\frac{7x}{7} = \frac{497}{7}$$

$$x = 71$$

Angle: 71°
 Complement: 19°

11. Using the given information, find the values of x , y , $m\angle A$, $m\angle B$, $m\angle C$ and $m\angle D$.

$$\left. \begin{array}{l} m\angle A = y - 2 \\ m\angle B = 2x + 3 \end{array} \right\} \text{add to } 90^\circ \quad y - 2 + 2x + 3 = 90 \quad *$$

$$\left. \begin{array}{l} m\angle C = 2x - y \\ m\angle D = x - 1 \end{array} \right\} \text{add to } 90^\circ \quad 2x - y + x - 1 = 90 \quad *$$

$\rightarrow \angle A$ and $\angle B$ are complementary.
 $\rightarrow \angle C$ and $\angle D$ are complementary.

$x = 36$	$m\angle A = 15^\circ$	$m\angle C = 55^\circ$
$y = 17$	$m\angle B = 75^\circ$	$m\angle D = 35^\circ$

$$y - 2 + 2x + 3 = 90 \quad 2x - y + x - 1 = 90$$

$$y + 2x + 1 = 90 \quad 3x - y - 1 = 90$$

$$\quad \quad -1 \quad -1 \quad \quad \quad +1 \quad +1$$

$$y + 2x = 89 \quad 3x - y = 91 \quad *$$

$$2x + y = 89 \quad **$$

$$\begin{array}{r} 2x + y = 89 \\ 3x + y = 91 \\ \hline 5x = 180 \\ \frac{5}{5} \quad \frac{5}{5} \\ x = 36 \end{array}$$

$$\begin{array}{r} 2x + y = 89 \\ 2(36) + y = 89 \\ 72 + y = 89 \\ -72 \quad -72 \\ \hline y = 17 \end{array}$$