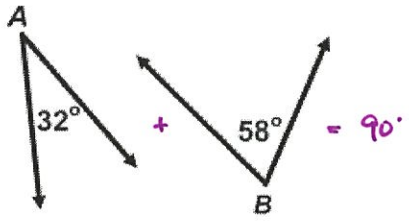
Section 3.4
Special Pairs of Angles

Complementary and Supplementary Angles

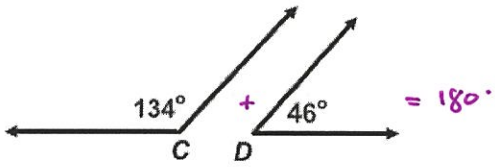
COMPLEMENTARY ANGLES: 2 angles that add up to 90^o. Each angle is the *complement* of the other.



$\angle A$ and $\angle B$ are complementary angles.

$m\angle A + m\angle B = 32^o + 58^o = 90^o$

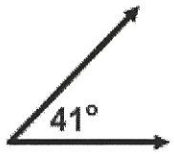
SUPPLEMENTARY ANGLES: 2 angles that add up to 180^o. Each angle is the *supplement* of the other.



$\angle C$ and $\angle D$ are supplementary angles.

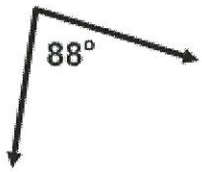
$m\angle C + m\angle D = 134^o + 46^o = 180^o$

Measures of Complements and Supplements

1. 

Complement = 49°

Supplement = 131°

2. 

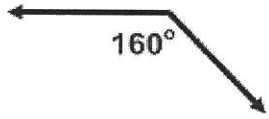
Complement = 2°

Supplement = 92°

3. 

Complement = 66°

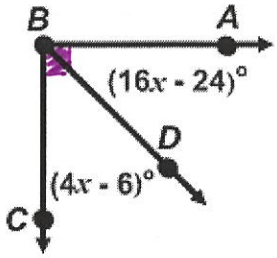
Supplement = 156°

4. 

Complement = NONE

Supplement = 20°

5. Given $\angle ABD$ and $\angle DBC$ are complementary angles, find the value of x.



$16x - 24 + 4x - 6 = 90$

$20x - 30 = 90$

$20x = 120$

$\boxed{x = 6}$

6. $\angle A$ and $\angle B$ are supplementary angles, where $m\angle A = 9x + 2$ and $m\angle B = 3x + 8$. Find the $m\angle A$ and $m\angle B$.

$m\angle A + m\angle B = 180°$

$9x + 2 + 3x + 8 = 180°$

$12x + 10 = 180$

$12x = 170$

$\boxed{x = \frac{170}{12} = \frac{85}{6}}$

$m\angle A = 9\left(\frac{85}{6}\right)$

$m\angle A = \frac{255}{2}$

$m\angle A = 129.5$

$m\angle B = 180 - 129.5$

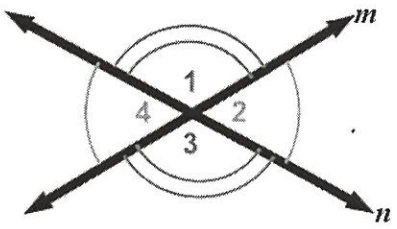
$\boxed{m\angle B = 50.5}$

VERTICAL ANGLES: two angles that are formed by the intersection of two straight lines.

Vertical angles are congruent.

When two lines intersect, four angles are formed.

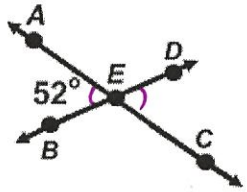
Therefore…$\angle 1 \cong \angle 3$ and are vertical angles.
$\angle 2 \cong \angle 4$ and are vertical angles.



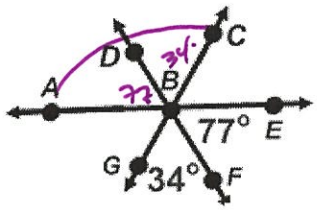
Finding Angle Measures

Find the measure of the indicated angles.

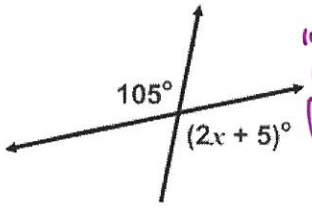
7. $m\angle DEC =$ 52°



8. $m\angle ABC =$ 111°

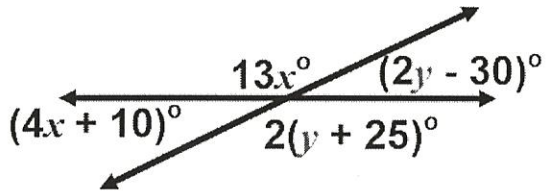


9. $x =$ 50°



105 = 2x + 5
100 = 2x
50 = x

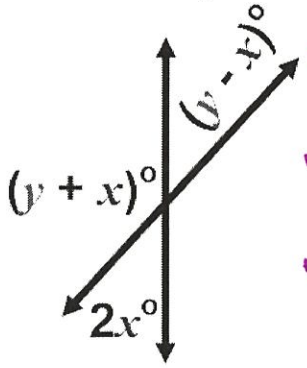
10. $x =$ 10° $y =$ 40°



$4x + 10 + 13x = 180$
$17x + 10 = 180$
$17x = 170$
$x = 10$

$2y - 30 + 2(y + 25) = 180$
$2y - 30 + 2y + 50 = 180$
$4y + 20 = 180$
$4y = 160$
$y = 40$

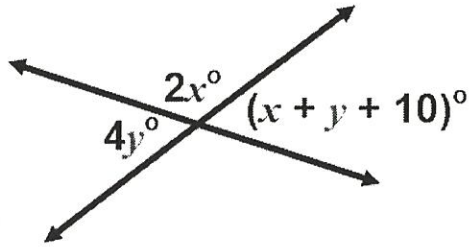
11. $x =$ 30 $y =$ 90



- $2x = y - x$
  $3x = y$ ✗
- $2x + y + x = 180$
  $3x + y = 180$ ✗
- $y + x + y - x = 180$
  $2y = 180$
  $y = 90$

$2x = y - x$
$2x = 90 - x$
$3x = 90$
$x = 30$

12. $x =$ 50° $y =$ 20°



- $4y = x + y + 10$
  $-x + 3y = 10$
- $2x + y = 180$
  $x + 2y = 90$

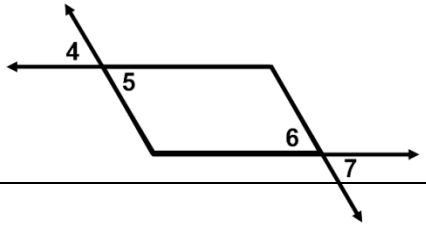
$-x + 3y = 10$
$x + 2y = 90$
$5y = 100$
$y = 20$ → $x = 50$

13. $\angle ABE$ and $\angle CBD$ are vertical angles and both are complementary with $\angle FGH$. If $m\angle ABE = (3x - 1)°$ and $m\angle FGH = 4x°$, find the $m\angle CBD$?

$3x - 1 + 4x = 90$
$7x - 1 = 90$
$7x = 91$
$x = 13$

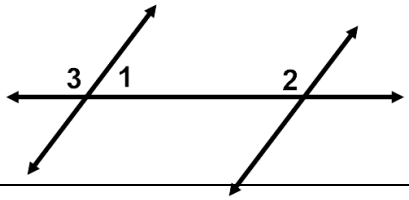
$m\angle CBD = 3(13) - 1$
$m\angle CBD = 38°$

14. Given: $\angle 5 \cong \angle 6$
Prove: $\angle 4 \cong \angle 7$



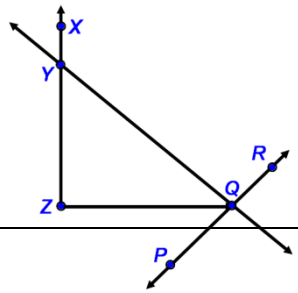
Statements	Reasons
1. $\angle 5 \cong \angle 6$	1. Given
2. $\angle 4 \cong \angle 5$	2. Vertical angles are congruent.
3. $\angle 4 \cong \angle 6$	3. Substitution Property of Congruence
4. $\angle 6 \cong \angle 7$	4. Vertical angles are congruent.
5. $\angle 4 \cong \angle 7$	5. Transitive Property of Congruence

15. Given: $\angle 1 \text{ and } \angle 2 \text{ are supplementary}$
Prove: $\angle 3 \cong \angle 2$



Statements	Reasons
1. $\angle 1 \text{ and } \angle 2 \text{ are supplementary}$	1. Given
2. $m\angle 1 + m\angle 3 = 180°$	2. Angle Addition Postulate
3. $m\angle 1 + m\angle 2 = 180°$	3. Def. of Supplementary Angles
4. $m\angle 1 + m\angle 3 = m\angle 1 + m\angle 2$	4. Substitution Property of Equality
5. $m\angle 3 = m\angle 2$	5. Subtraction Property of Equality
6. $\angle 3 \cong \angle 2$	6. Def. of Congruent Angles

16. Given: $m\angle ZYQ = 45°, m\angle ZQP = 45°$
Prove: $m\angle ZQR = m\angle XYQ$



Statements	Reasons
1. $m\angle ZYQ = 45°, m\angle ZQP = 45°$	1. Given
2. $m\angle ZYQ = m\angle ZQP$	2. Substitution Property of Equality
3. $m\angle ZYQ + m\angle XYQ = 180°$ $m\angle ZQP + m\angle ZQR = 180°$	3. Angle Addition Postulate
4. $m\angle ZQP + m\angle ZQR = m\angle ZYQ + m\angle XYQ$	4. Substitution Property of Equality
5. $m\angle ZYQ + m\angle ZQR = m\angle ZYQ + m\angle XYQ$	5. Substitution Property of Equality
6. $m\angle ZQR = m\angle XYQ$	6. Subtraction Property of Equality