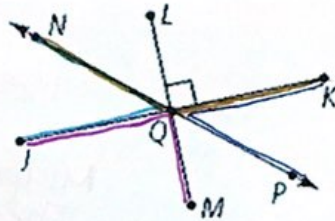


The Vertical Angle Theorem

Problem Sets:

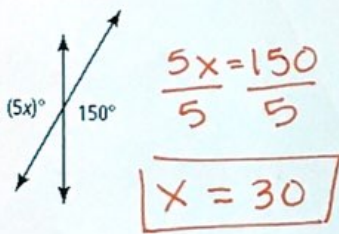
1. Name an angle in the diagram described by each of the following:

- a) Supplementary to $\angle NQK$
 $\angle NQJ$ OR $\angle KQP$
- b) Congruent to $\angle NQJ$
 $\angle PQR$
- c) Adjacent and congruent to $\angle JQM$
 $\angle MQK$ OR $\angle JQL$
- d) Complementary to $\angle KQP$
 $\angle PQM$
- e) Name two angles that form a linear pair.
 $\angle LQJ$ and $\angle LQK$

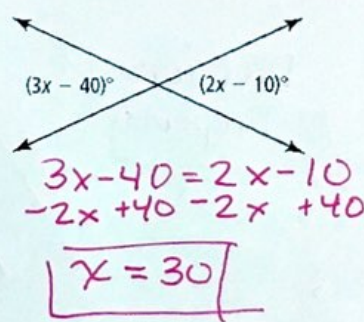


2. Solve for x:

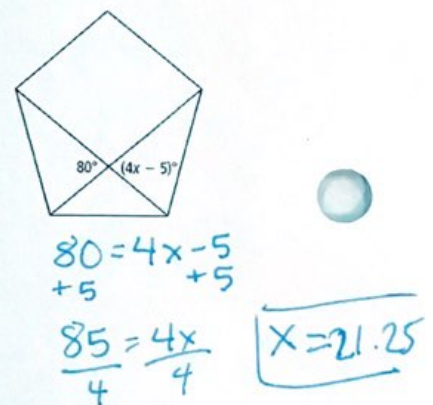
a)



b)



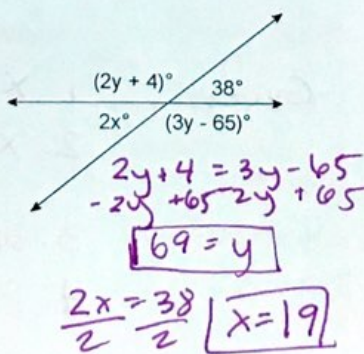
c)



3. Find the variables and angle measures:

- a) $\angle C$ and $\angle D$ are supplementary. 180°
 Find x and $m\angle C$ and $m\angle D$ if
 $m\angle C = 12x + 3$
 $m\angle D = 13x + 2$

$12x + 3 + 13x + 2 = 180$
 $25x + 5 = 180$
 -5
 $25x = 175$
 $\frac{25x}{25} = \frac{175}{25}$
 $x = 7$



- c) $\angle A$ and $\angle B$ are complementary 90°
 Find x and $m\angle A$ and $m\angle B$ if
 $m\angle A = 2x$
 $m\angle B = 3x + 10$

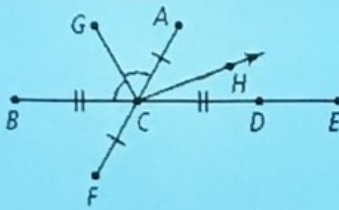
$2x + 3x + 10 = 90$
 $5x + 10 = 90$
 -10
 $5x = 80$
 $\frac{5x}{5} = \frac{80}{5}$
 $x = 16$

4. Make a diagram that matches the following description:

- $\angle 2$ and $\angle 4$ are vertical angles.
 $\angle 1$ is adjacent to $\angle 2$.
 $\angle 2$ and $\angle 3$ are a linear pair.
 $\angle 4$ and $\angle 5$ are complementary.



5. Use the figure below to answer the following questions. Problems a) and b) are independent of each other.



a) If $m\angle BCG = 60$, find $m\angle GCA$, $m\angle BCA$, and $m\angle BCD$
 $m\angle GCA = 60$ $m\angle BCA = 120$ $m\angle BCD = 180$

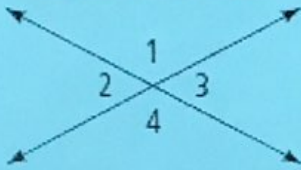
b) $m\angle ACD = 60$ and $m\angle DCH = 20$. Find $m\angle HCA$.

$$60 - 20 = 40 = m\angle HCA$$

c) Name two angles that form a linear pair.

$\angle BCF$ and $\angle FCD$

6. Using the figure below, solve for x. Problems a), b), and c) are independent of each other.



a) $m\angle 1 = 8x - 120$, $m\angle 4 = 4x + 16$

$$8x - 120 = 4x + 16$$

$$-4x + 120 = -4x + 120$$

b) $m\angle 2 = 65^\circ$, $m\angle 4 = 3x + 2$

$$65 + 3x + 2 = 180$$

$$67 + 3x = 180$$

$$\frac{3x}{3} = \frac{113}{3}$$

$$\frac{4x}{4} = \frac{136}{4}$$

$$x = 34$$

c) $m\angle 1 = 2x$, $m\angle 3 = x$

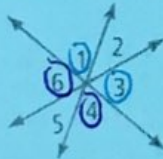
$$2x + x = 180$$

$$\frac{3x}{3} = \frac{180}{3}$$

$$x = 60$$

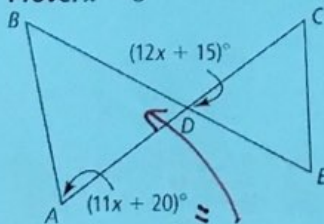
Construct a proof for each problem:

7. Given: $\angle 1 \cong \angle 3$
 Prove: $\angle 6 \cong \angle 4$



Statement	Reason
1. $\angle 1 \cong \angle 3$	1. Given
2. $\angle 1 \cong \angle 4$	2. Vertical Angles
3. $\angle 3 \cong \angle 6$	3. Vertical Angles
4. $\angle 6 \cong \angle 4$	4. Substitution

8. Given: $\angle A \cong \angle BDA$
 Prove: $x = 5$



Statement	Reason
1. $\angle A \cong \angle BDA$	1. Given
2. $\angle BDA \cong \angle CDE$	2. Vertical Angles
3. $11x + 20 = 12x + 15$	3. Substitution
4. $5 = x$	4. Subtraction