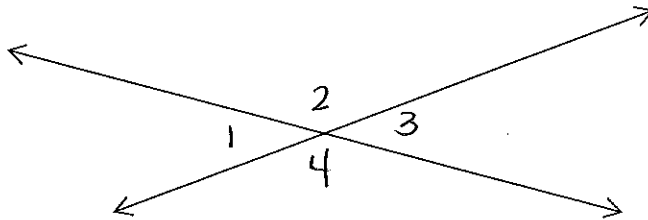


Section 2.4: Vertical Angles

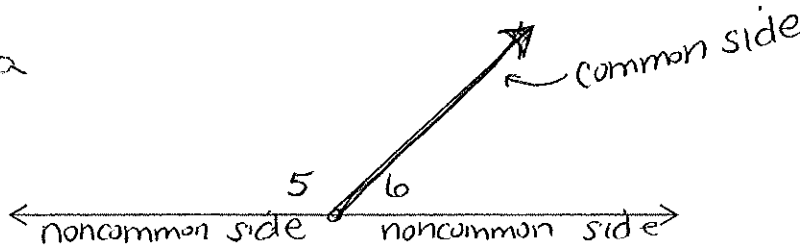
Two angles are vertical angles if they are not adjacent and their sides are formed by two intersecting lines.



$\angle 1$ & $\angle 3$ are vertical $\angle 2$ & $\angle 4$ are vertical

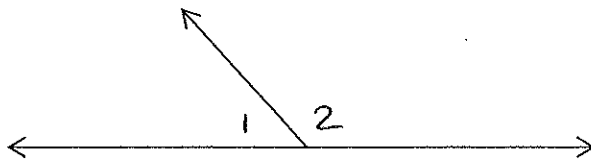
Two adjacent angles are a linear pair if their noncommon sides are on the same line.

$\angle 5$ & $\angle 6$ are a linear pair



Linear Pair Postulate

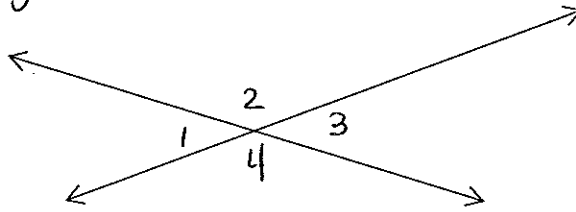
If two angles form a linear pair, then they are supplementary.



$m\angle 1 + m\angle 2 = 180^\circ$

Vertical Angles Theorem

Vertical angles are congruent.



$$\angle 1 \cong \angle 3 \quad \text{and} \quad \angle 2 \cong \angle 4$$

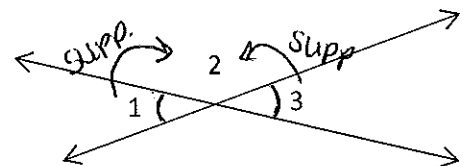
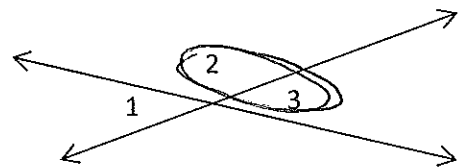
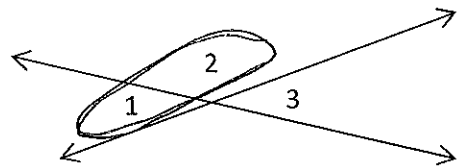
Prove It!

1. $\angle 1$ and $\angle 2$ are a linear pair,
so they are supplementary.

2. $\angle 2$ and $\angle 3$ are a linear pair,
so they are supplementary.

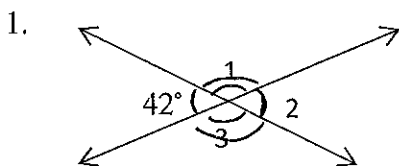
3. $\angle 1$ and $\angle 3$ are supplementary to the
same angle, so $\angle 1$ is congruent to $\angle 3$

by the congruent supplements theorem.



Examples:

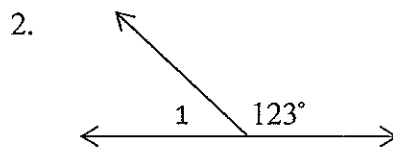
Find the measures of the numbered angles and in problem 3 find the value of x .



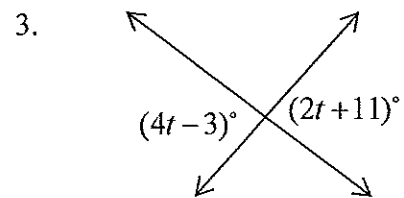
$$m\angle 1 = \underline{138^\circ}$$

$$m\angle 2 = \underline{42^\circ}$$

$$m\angle 3 = \underline{138^\circ}$$



$$m\angle 1 = \underline{57^\circ}$$



$$x = \underline{7}$$

$$\begin{aligned} 4t - 3 &= 2t + 11 \\ -2t &\quad -2t \\ \hline 2t - 3 &= 11 \\ +3 &\quad +3 \\ \hline 2t &= 14 \\ \frac{2t}{2} &= \frac{14}{2} \\ t &= 7 \end{aligned}$$

Homework:

1) $\angle A$ and $\angle B$ are a linear pair. $m\angle A = (4x+2)^\circ$ and $m\angle B = (x-7)^\circ$. Find x then find $m\angle A$ and $m\angle B$.

$$(4x+2) + (x-7) = 180$$

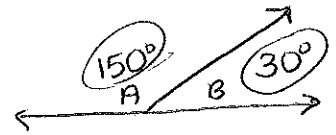
$$5x - 5 = 180$$

$$\begin{array}{r} +5 \quad +5 \\ \hline 5x = 185 \end{array}$$

$$\begin{array}{r} \frac{5x}{5} = \frac{185}{5} \\ \hline x = 37 \end{array}$$

$$m\angle A = 4(37) + 2 = 150^\circ$$

$$m\angle B = (37) - 7 = 30^\circ$$

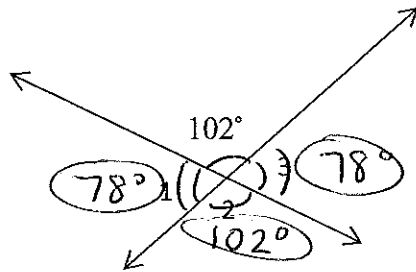


$$x = \underline{37}$$

$$m\angle A = \underline{150^\circ}$$

$$m\angle B = \underline{30^\circ}$$

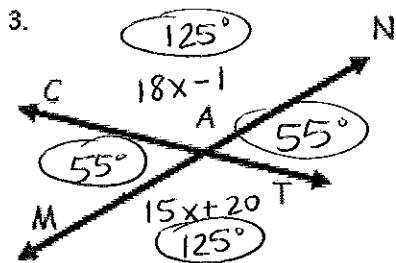
2. Find each angle.



$$m\angle 1 = \underline{78^\circ}$$

$$m\angle 2 = \underline{102^\circ}$$

$$m\angle 3 = \underline{78^\circ}$$



$$m\angle CAN = 18x - 1$$

$$m\angle MAT = 15x + 20$$

Find the following:

$$x = \underline{7} \quad m\angle CAN = \underline{125^\circ}$$

$$m\angle MAC = \underline{55^\circ} \quad m\angle TAN = \underline{55^\circ}$$

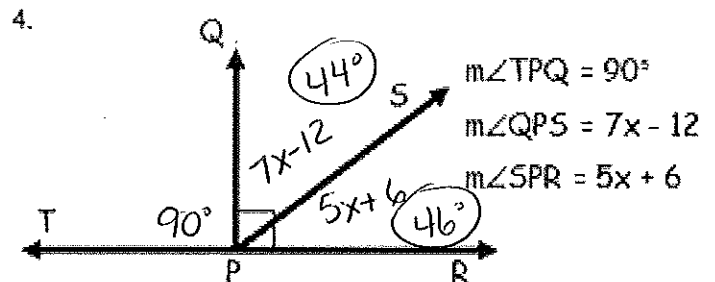
$$m\angle MAT = \underline{125^\circ} \quad m\angle MAN = \underline{180^\circ}$$

$$\begin{array}{r} 18x - 1 = 15x + 20 \\ -15x \quad -15x \\ \hline 3x - 1 = 20 \end{array}$$

$$\begin{array}{r} +1 \quad +1 \\ \hline 3x = 21 \end{array}$$

$$\begin{array}{r} \frac{3x}{3} = \frac{21}{3} \\ \hline x = 7 \end{array}$$

$$x = 7$$



$$m\angle TPQ = 90^\circ$$

$$m\angle QPS = 7x - 12$$

$$m\angle SPR = 5x + 6$$

Find the following:

$$x = \underline{8} \quad m\angle TPR = \underline{180^\circ}$$

$$m\angle QPS = \underline{44^\circ} \quad m\angle SPR = \underline{46^\circ}$$

$$m\angle QPR = \underline{90^\circ} \quad m\angle SPT = \underline{134^\circ}$$

$$7x - 12 + 5x + 6 = 90$$

$$\begin{array}{r} 12x - 6 = 90 \\ +6 \quad +6 \\ \hline 12x = 96 \end{array}$$

$$\begin{array}{r} \frac{12x}{12} = \frac{96}{12} \\ \hline x = 8 \end{array}$$

$$x = 8$$