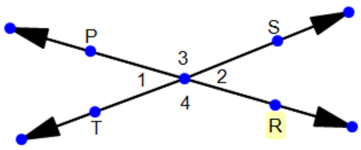
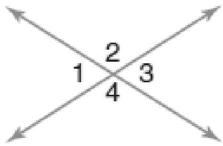
Vertical Angles

As shown at the right, two intersecting lines form two pairs of ***nonadjacent angles***, ∠1 and ∠2 are nonadjacent, ∠3 and ∠4 are nonadjacent.



Definition 1: Vertically Opposite Angles

Two angles are vertical if and only if they are two nonadjacent angles formed by a pair of intersecting lines

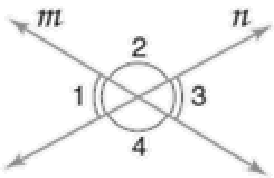


Vertical Angles: $\angle 1$ *and* $\angle 3$
$\angle 2$ *and* $\angle 4$

You may have noticed that vertical angles always appear to have the same measure. The following theorem state this

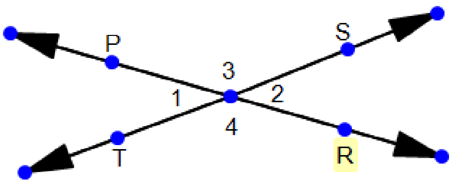
Theorem 1: Vertical Angle Theorem

Vertical Angles are congruent



$\angle 1 \cong \angle 3$
$\angle 2 \cong \angle 4$

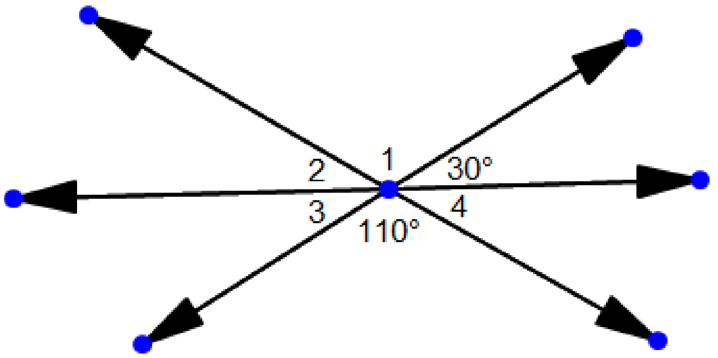
Example 1:
Given: A pair of vertical angles ($\angle 1$ and $\angle 2$).



Prove: $\angle 1 \cong \angle 2$

Statements	Reasons
1) $\angle 1$ and $\angle 2$ **are vertical angles**	1) given
2) $\angle 3$ is a supplement of $\angle 1$ $\angle 3$ is a supplement of $\angle 2$	2) linear pair
3) $\angle 1 \cong \angle 2$	3) Supp. Of the same angle are congruent

Example 2: Find the measure of each of the numbered angles.



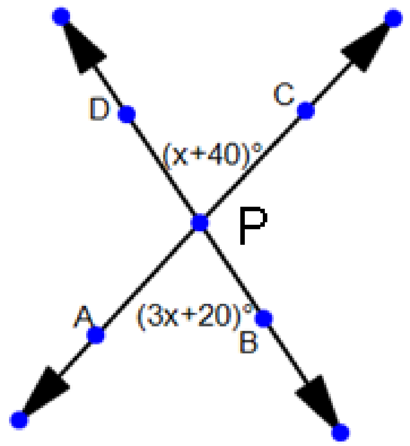
$a) m\angle 4 = 180° - (110° + 30°) = 40°$ Supplementary angles

$b) m\angle 1 = 110°$ Vertical angles theorem

$c) m\angle 3 = 30°$ Vertical angles theorem

$d) m\angle 2 = 40°$ Vertical angles theorem

Example 3: Find $m\angle APB$



$m\angle APB = m\angle DPC$, by Vertical Angles Theorem
$3x + 20 = x + 40$
$2x = 20$
$x = 10$.

Thus, $m\angle APB = 3x + 20 = 3 \bullet 10 + 20 =$ **50**.