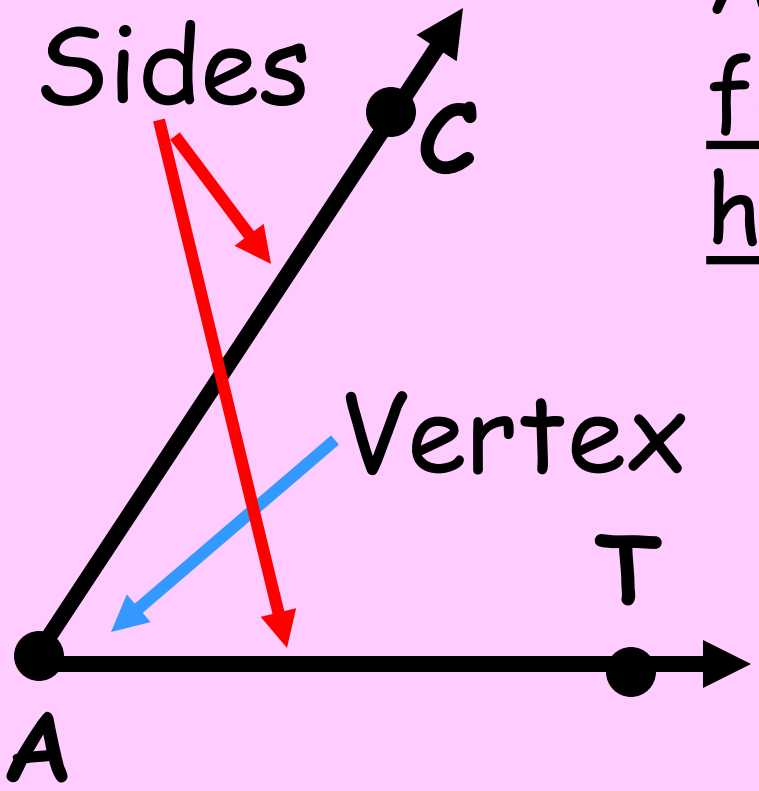
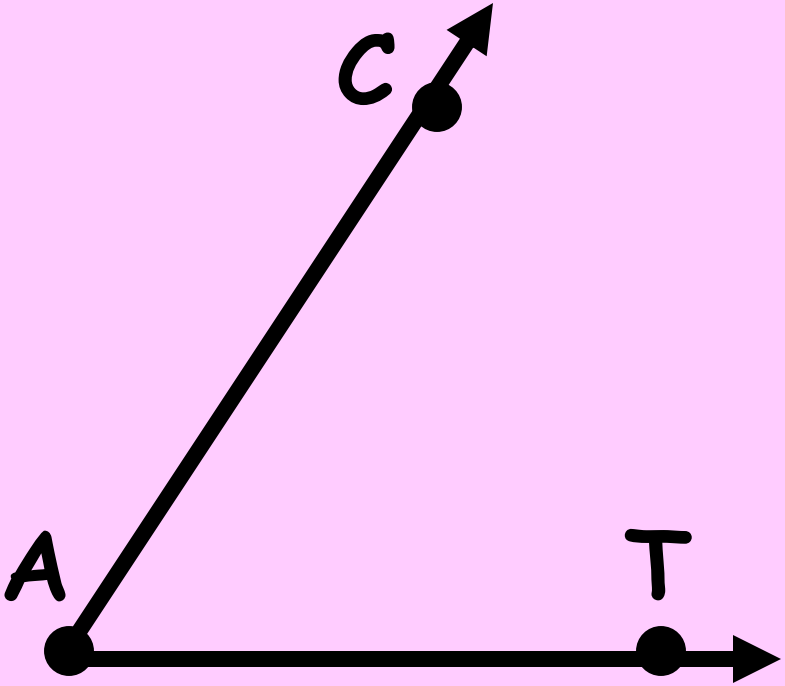
Angles



Angle – the figure formed by two rays that have the same endpoint.

The two rays are called the **sides**; the shared endpoint is called the **vertex**.

We name an angle using three letters and the ∠ symbol.



Acceptable:

∠CAT

∠TAC

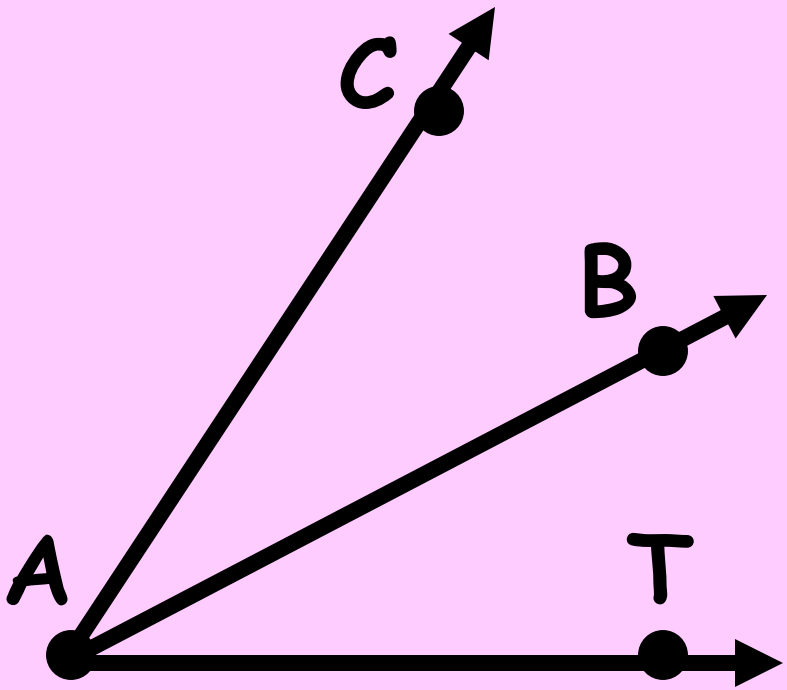
Unacceptable:

∠ACT

∠TCA

Order Matters!! The vertex must be the letter in the middle!

Alternative Notation



∠CAB

∠CAT

∠BAT

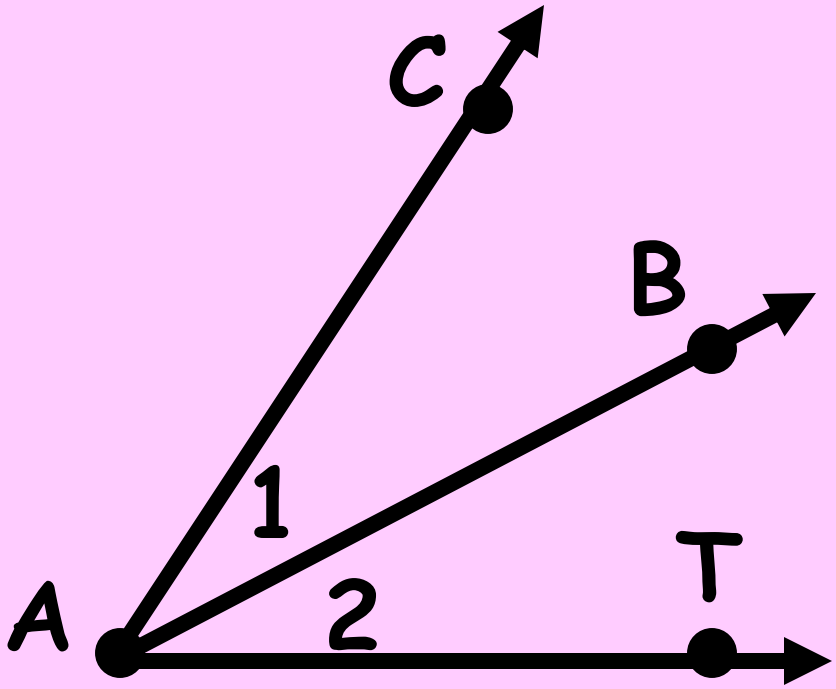
You can name an angle just with the vertex. This angle could be ∠A.

CAUTION

Sometimes using only one letter may not be specific enough, because it may refer to more than one angle.

IF THERE IS ANY DOUBT, USE THREE LETTERS!

Alternative Notation



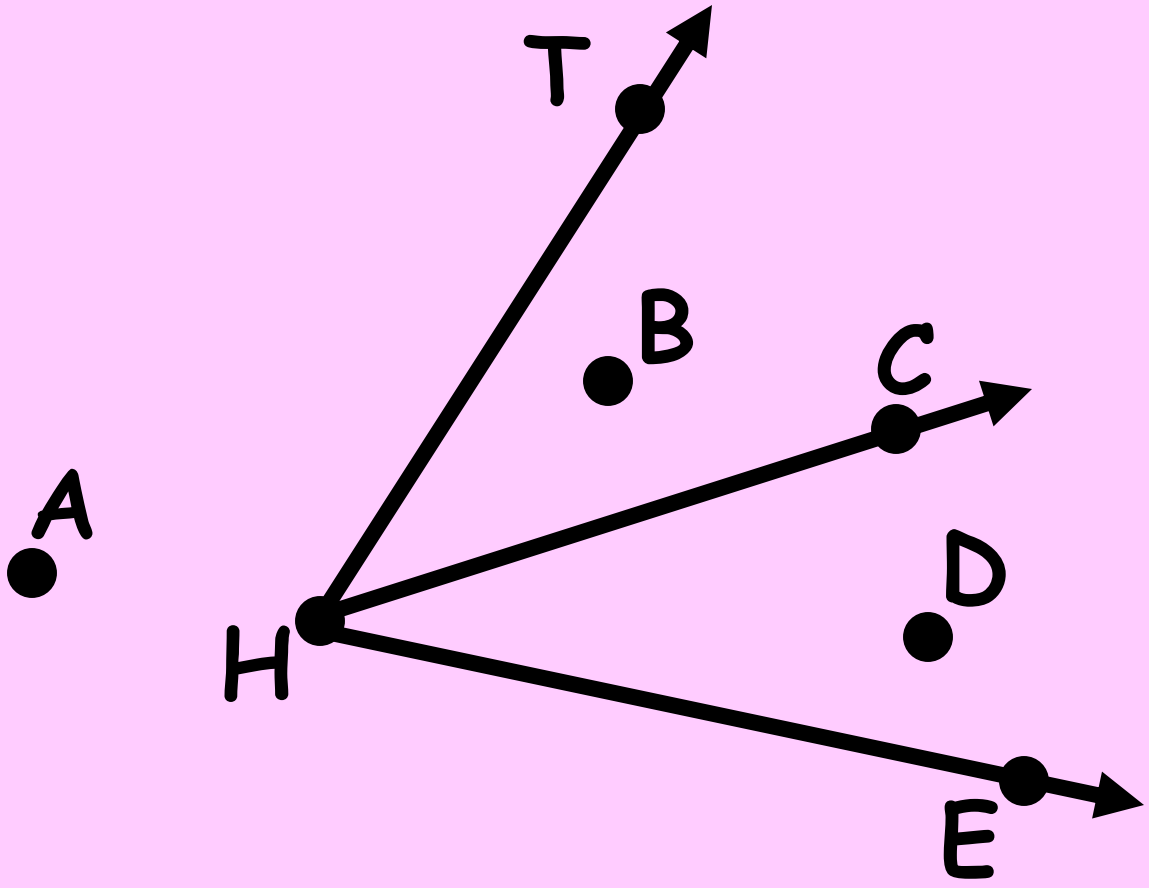
$\angle CAB$ is $\angle 1$

$\angle BAT$ is $\angle 2$

We also may name angles with numbers.

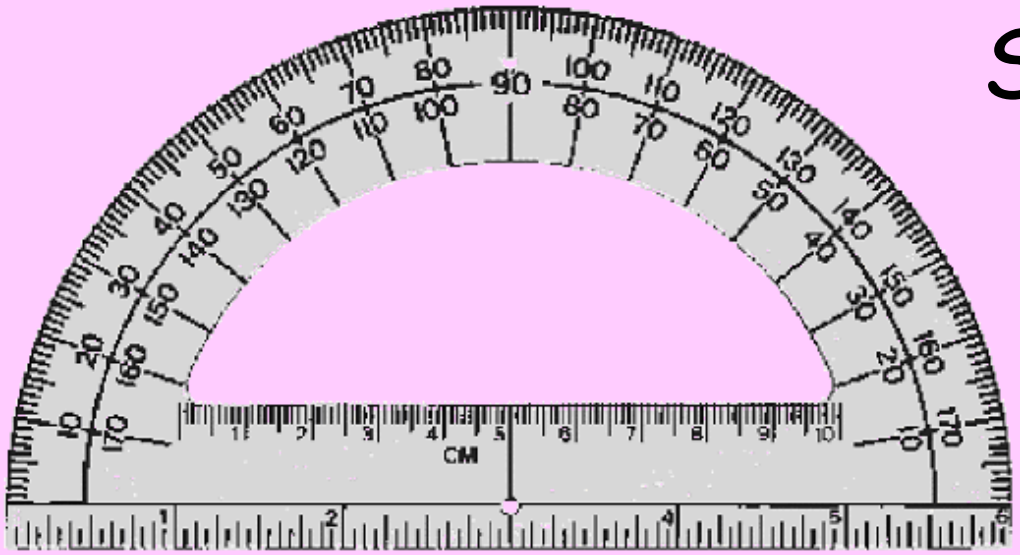
Angle Interior

Any points that lie inside the angle.



Measuring Angles

We measure angles using a protractor. The units for angle measurement is either degrees or radians. In this class we will use degrees.



Symbol for Degree:

45°

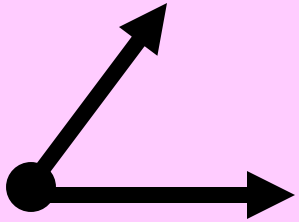
Measure of Angle:

$m\angle ABC$

Classifying Angles

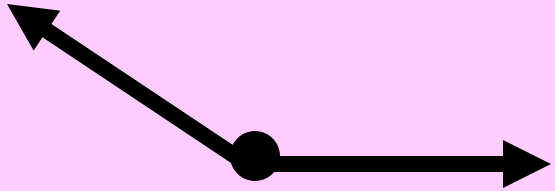
Acute Angle

An angle measuring between 0° and 90°.



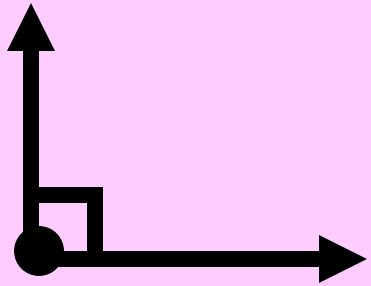
Obtuse Angle

An angle measuring between 90° and 180°.



Right Angle

An angle measuring exactly 90°.



Straight Angle

An angle measuring exactly 180°.

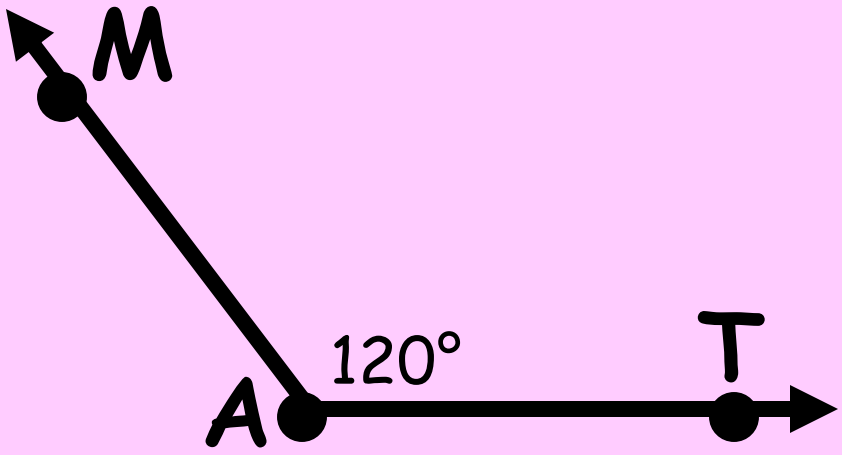
A pair of opposite rays creates a straight angle.

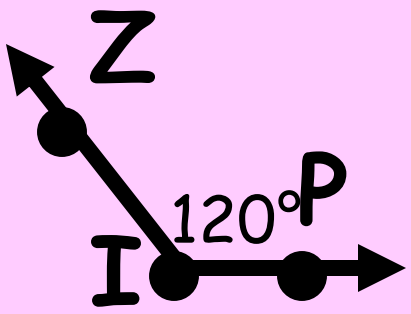
Note: "between" means we do not include the endpoints.

Congruent Angles

Recall the Definition of Congruent:
Figures that are the same shape and size.

Congruent Angles – angles that have equal measures.





Remember:
Figures can be congruent;
measures can be equal.

$\angle MAT \cong \angle ZIP$ $\quad m\angle MAT = m\angle ZIP$

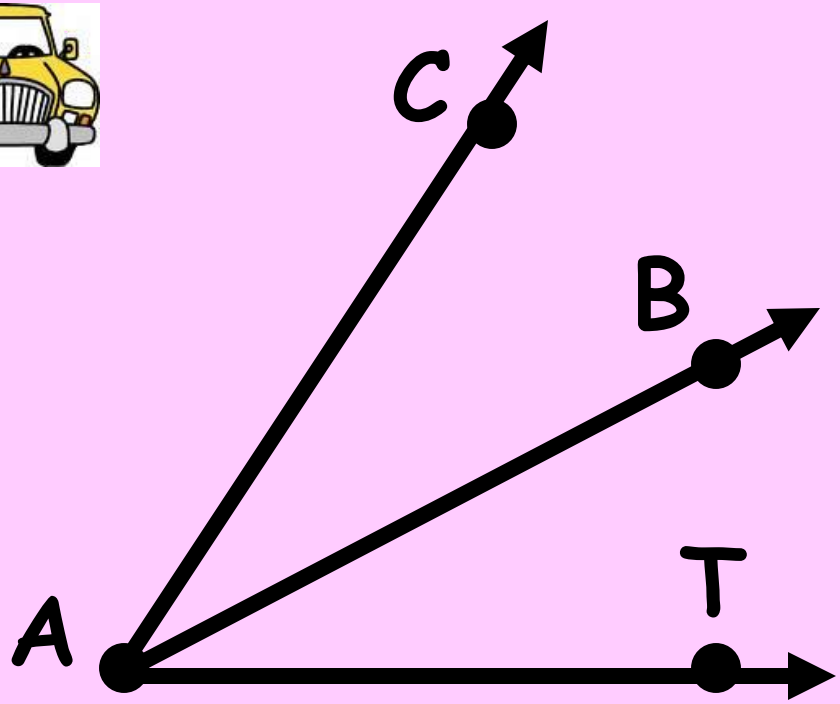
Remember: rays go off in one direction forever!

Adjacent Angles

Definition: <u>two angles that have a common vertex and a common side but no common interior points.</u>

∠CAB and ∠BAT are adjacent angles.

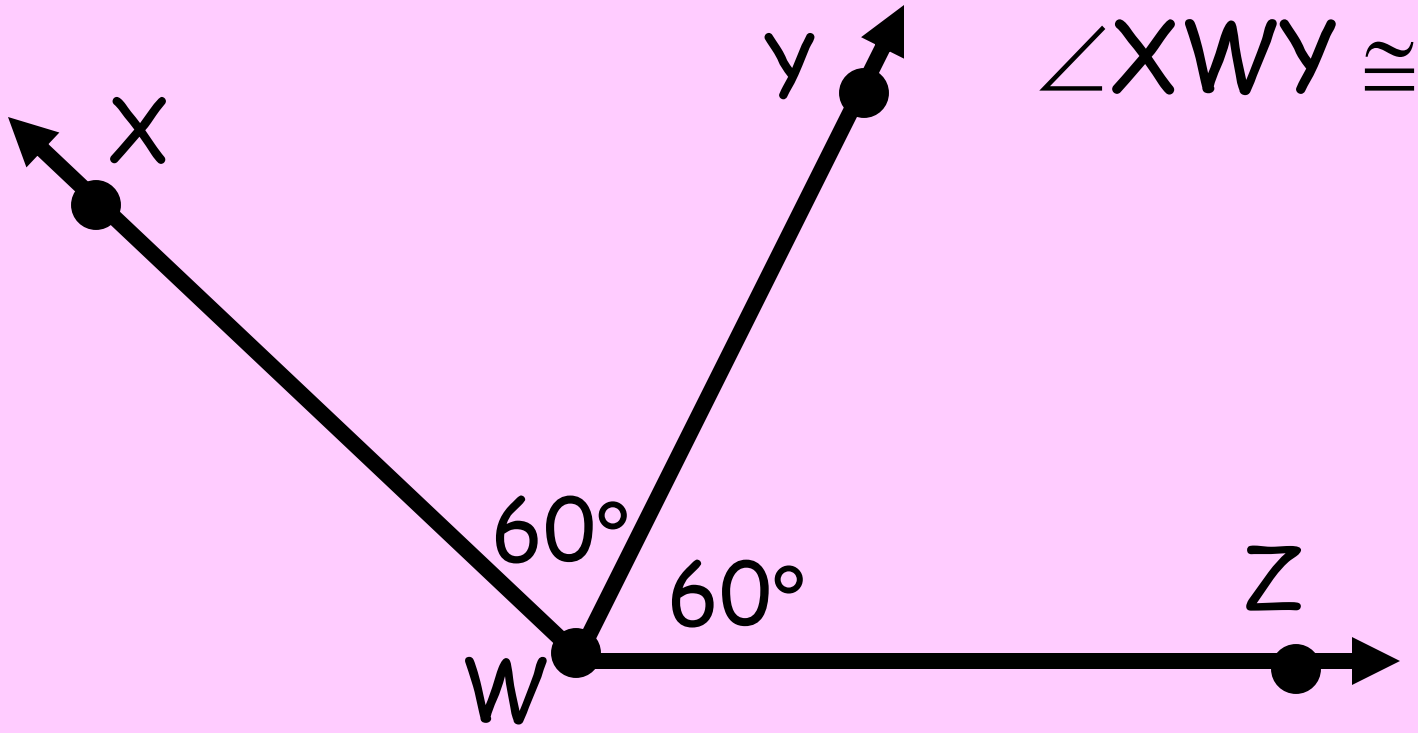
∠CAT and ∠BAT are NOT adjacent because they share interior points.



Angle Bisector

Definition: a ray that divides an angle into two congruent adjacent angles.

$\overrightarrow{WY}$ is an angle bisector.

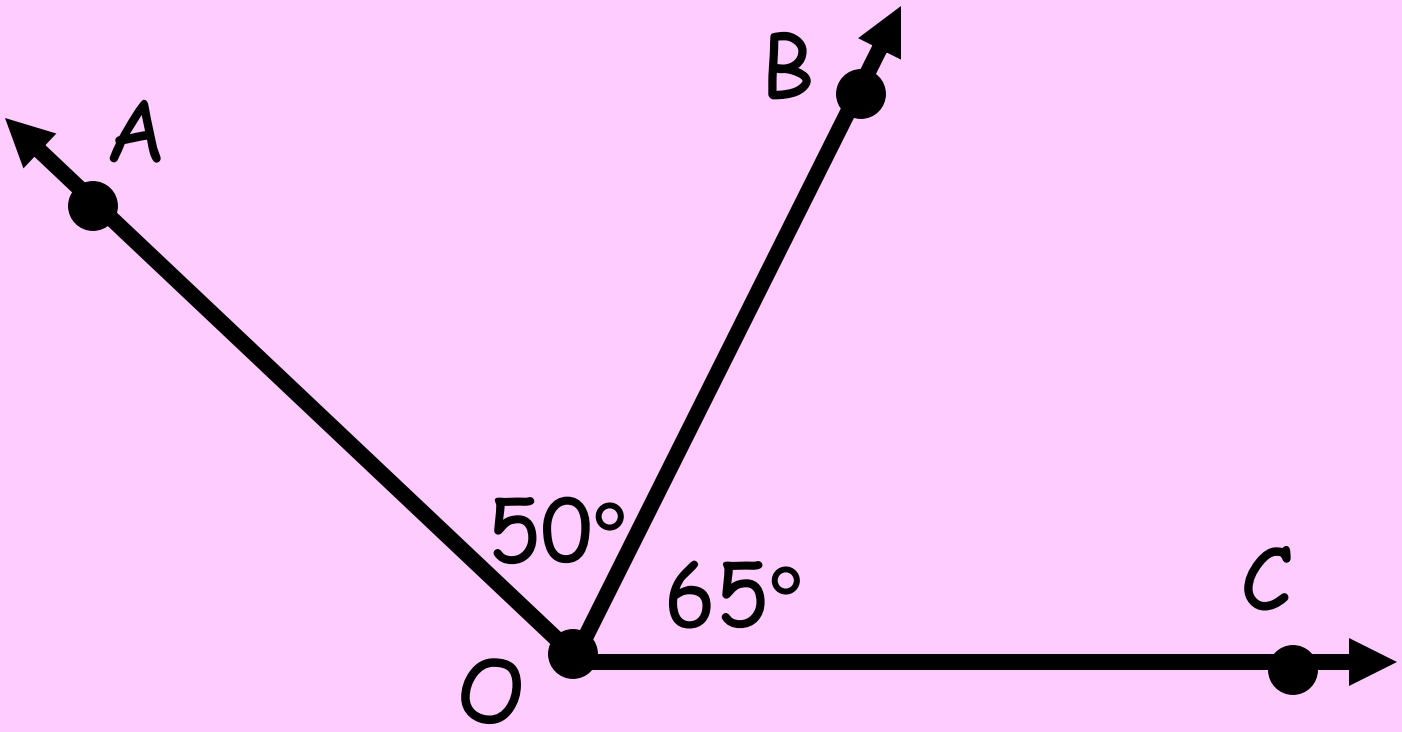


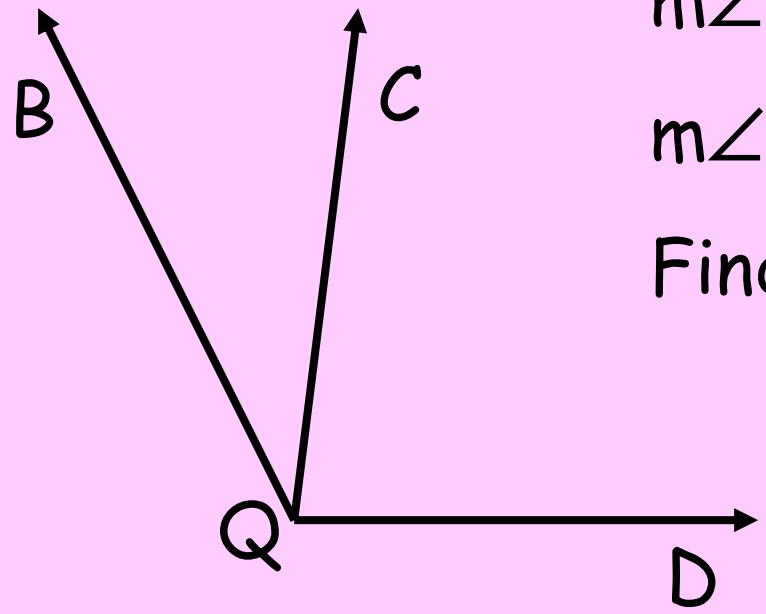
$\angle XWY \cong \angle YWZ$

Angle Addition Postulate

If B lies on the interior of $\angle AOC$, then $m\angle AOB + m\angle BOC = m\angle AOC$.

$m\angle AOC = 115°$





$m\angle BQC = x - 7$ $m\angle CQD = 2x - 1$

$m\angle BQD = 2x + 34$

Find x, $m\angle BQC$, $m\angle CQD$, $m\angle BQD$.

$m\angle BQC + m\angle CQD = m\angle BQD$

$x - 7 + 2x - 1 = 2x + 34$

$3x - 8 = 2x + 34$

$x - 8 = 34$

$x = 42$

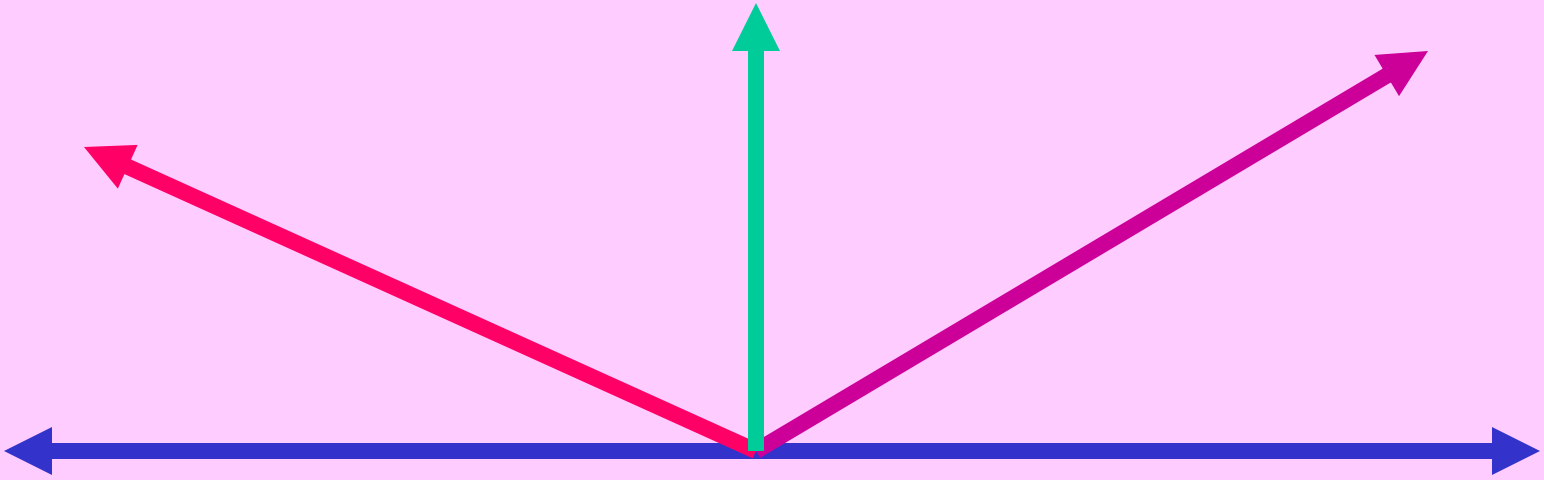
$m\angle BQC = 35$

$m\angle CQD = 83$

$m\angle BQD = 118$

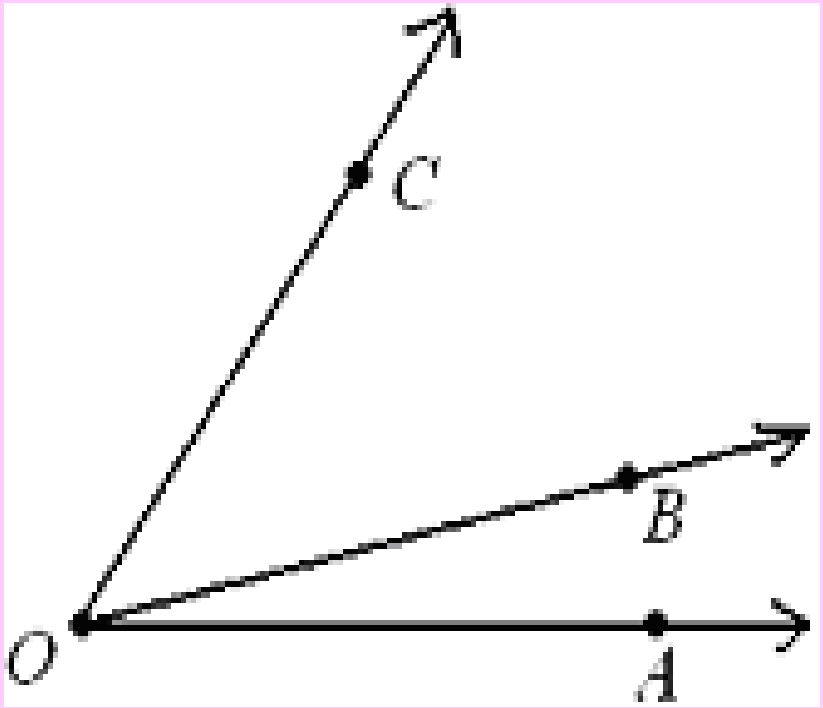
Algebra Connection

Special Pairs of Angles



Angle Addition Postulate

If B lies on the interior of $\angle COA$,
then $m\angle COB + m\angle BOA = m\angle COA$.

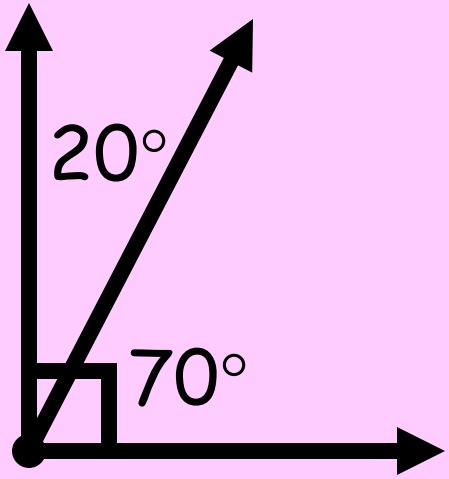


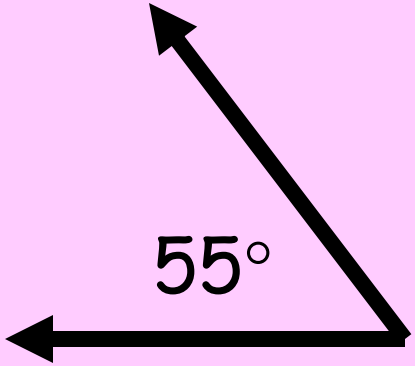
If $\angle AOC$ is a right angle, then
$m\angle AOB + m\angle BOC =$ _____

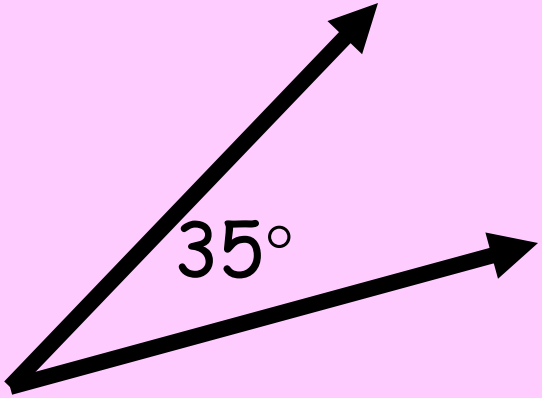
If $\angle AOC$ is a straight angle, then
$m\angle AOB + m\angle BOC =$ _____

Complementary Angles

Definition: two angles whose measures have the sum of 90°.



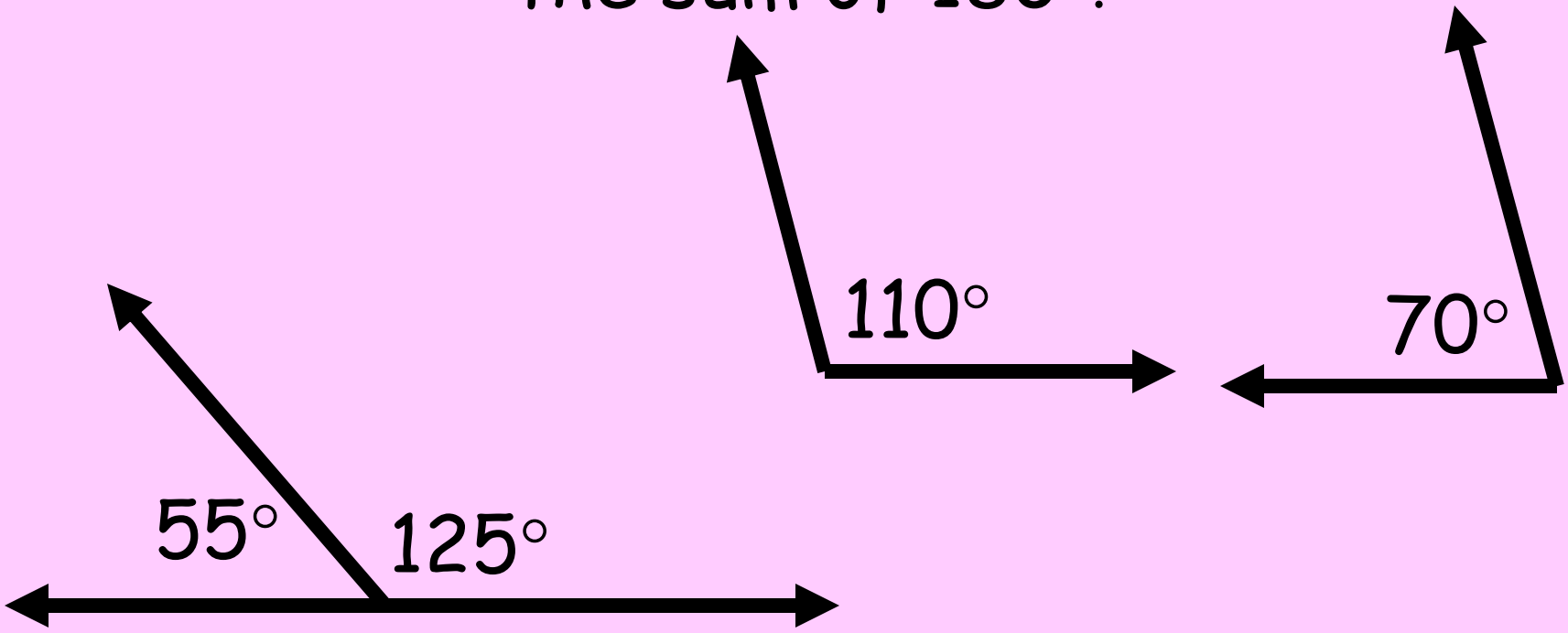




Complementary Angles may or may not be Adjacent Angles.

Supplementary Angles

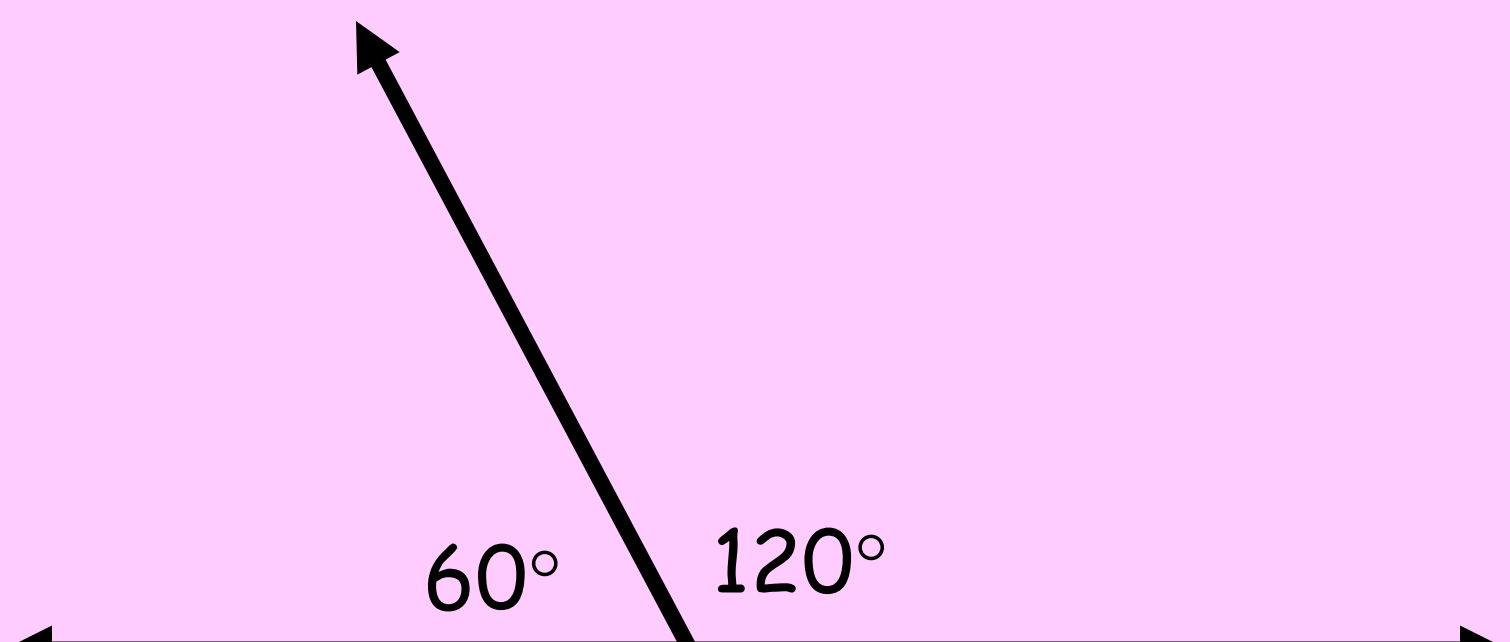
Definition: two angles whose measures have the sum of 180°.



Supplementary Angles may or may not be Adjacent Angles.

Linear Pair

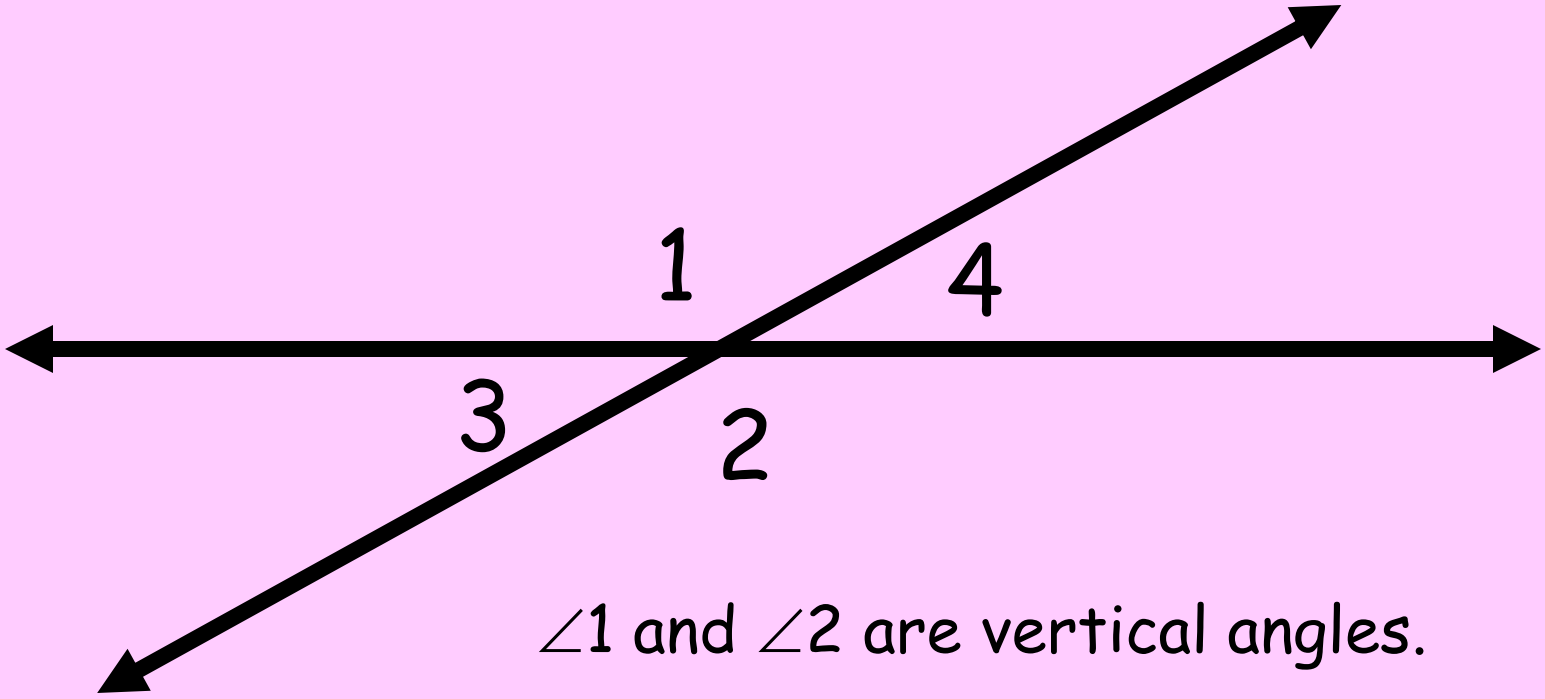
Definition: two supplementary, adjacent angles.



Linear Pair = *A Pair* of Angles that forms a *Line*.

Vertical Angles

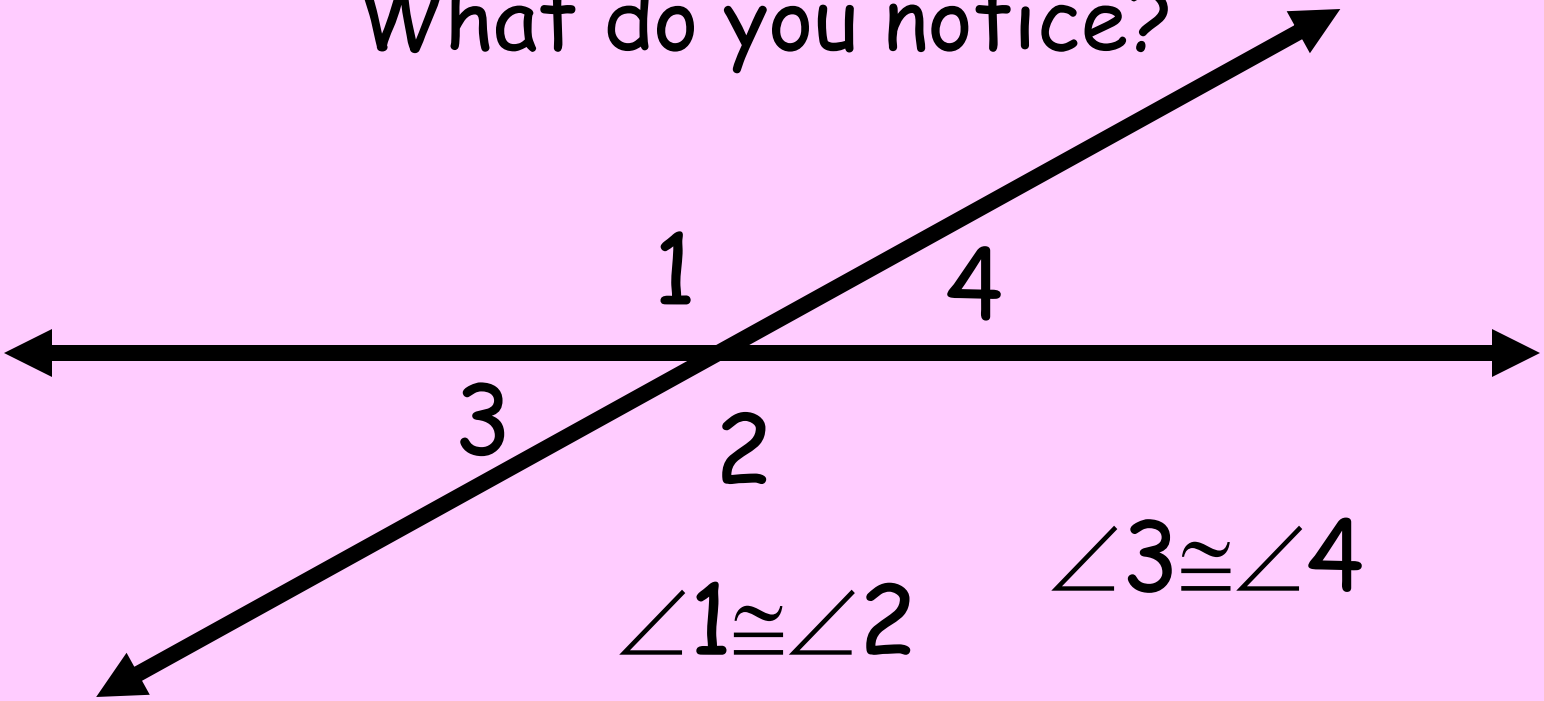
Definition: the pair of opposite angles made by intersecting lines.



$\angle 1$ and $\angle 2$ are vertical angles.

$\angle 3$ and $\angle 4$ are vertical angles.

Using your protractor…
Measure the four angles that are on your note paper.
What do you notice?

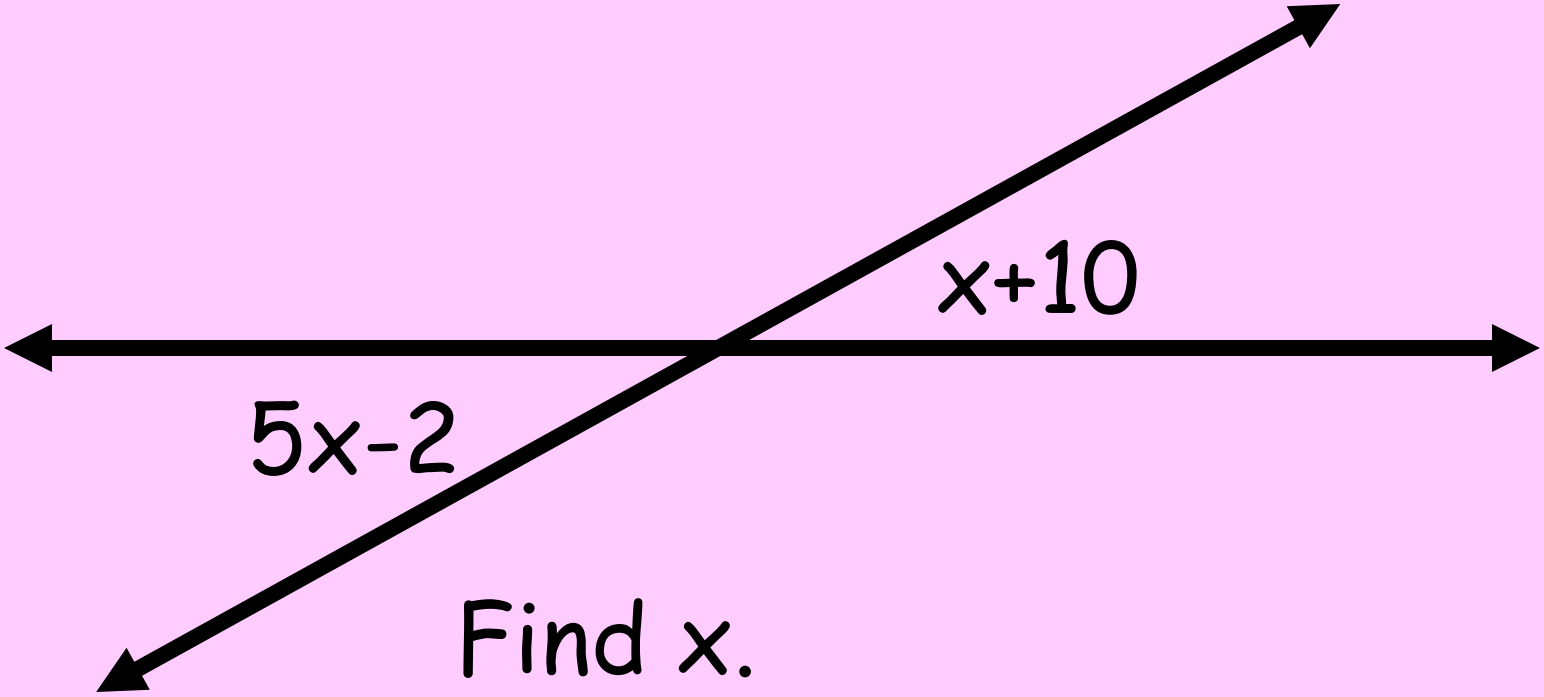


$\angle 1 \cong \angle 2$

$\angle 3 \cong \angle 4$

Theorem 2-3: Vertical Angles are Congruent.

Applying new concepts with Algebra…



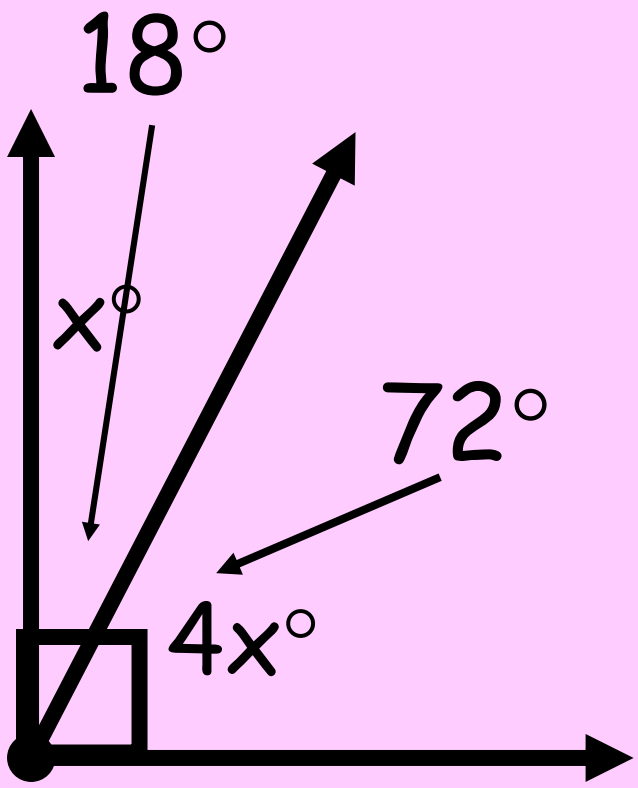
Find x.

We know vertical angles are congruent; therefore the measure of vertical angles are equal and we can set these two expressions equal to one another.

$5x-2 = x+10$

$x = 3$

What relationship do we see here?

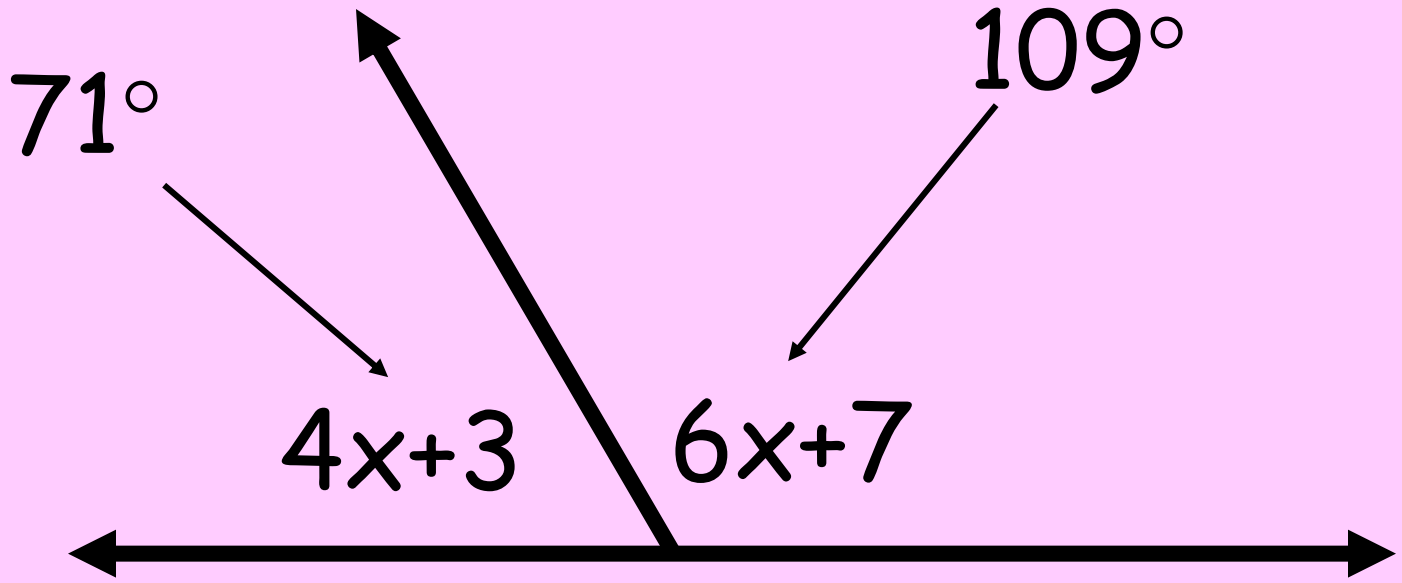


$x + 4x = 90°$

$5x = 90°$

$x = 18$

How about here?



$4x+3 + 6x+7 = 180°$ $x = 17$

$10x + 10 = 180$

$10x = 170$