

2.2 Complementary and Supplementary Angles

Objective: Recognize complementary and supplementary angles

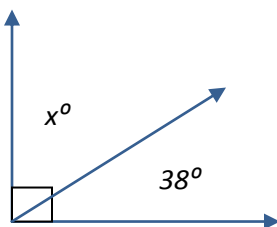
Definition

Complementary angles are:

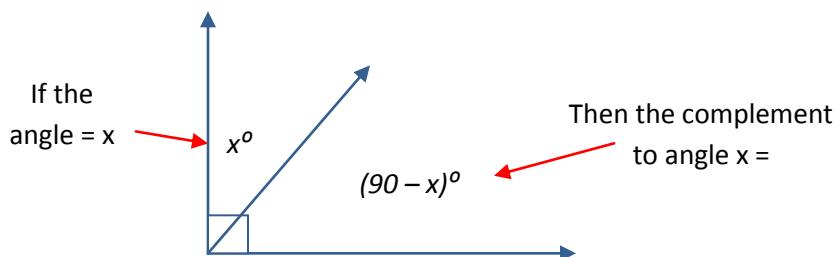
- two angles whose sum is 90 degrees (a right angle)
- each of the angles is called the complement of the other.

Example 1: If an angle measures 38 degrees, what is its complement?

$$\begin{aligned} 90 - 38 &= x \\ x &= 52 \end{aligned}$$



An illustration indicating the complement to an angle whose measure is also unknown (x):



The algebraic expression used to represent a *complementary angle* is **$90 - x$**

Remember! Complements \Rightarrow Right Angle Sum $\Rightarrow 90$

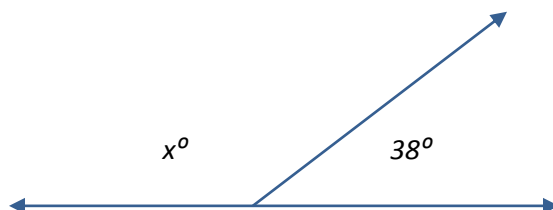
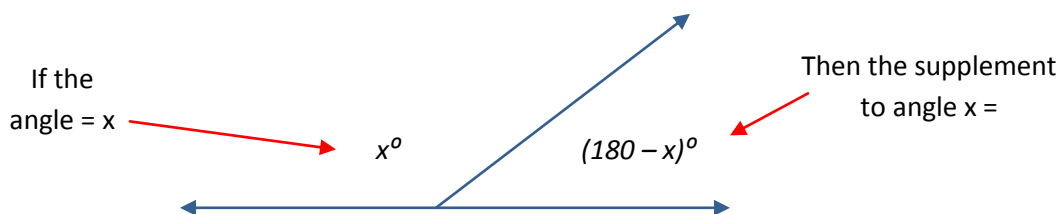
Definition**Supplementary angles** are:

- two angles whose sum is 180 degrees (a straight angle)
- each of the two angles is called the supplement of the other

Example 2: If an angle measures 38 degrees, what is the measure of its supplement?

$$180 - 38 = x$$

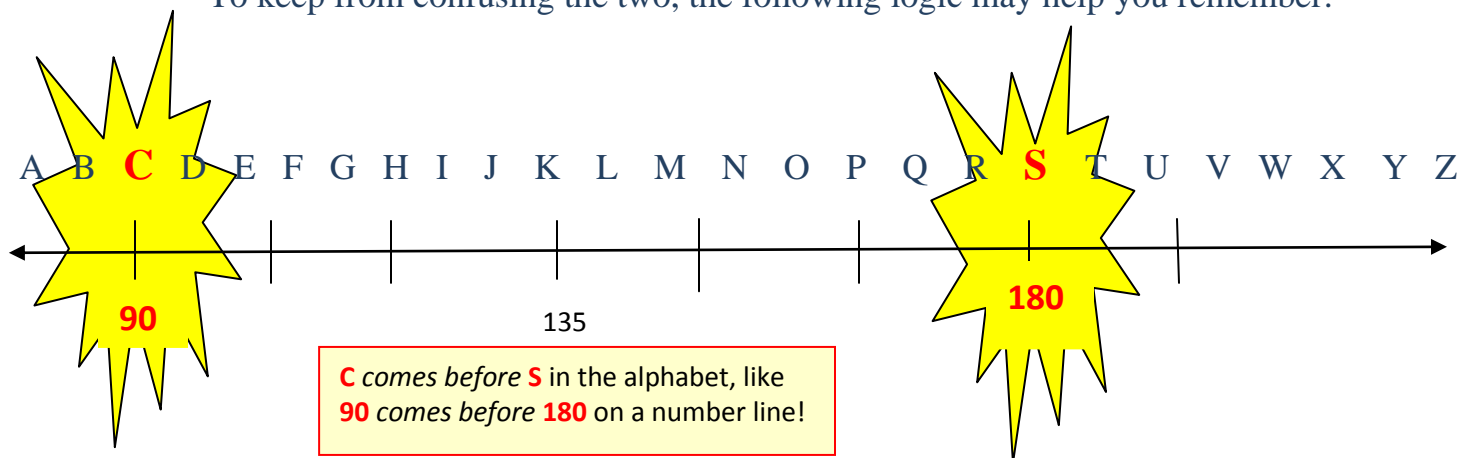
$$x = 142$$

An illustration indicating the supplement of an angle whose unknown measure = x :

The algebraic expression used to represent a *supplementary angle* is:
 $180 - x$

Remember! Supplements \Rightarrow Straight Angle Sum \Rightarrow 180

To keep from confusing the two, the following logic may help you remember:

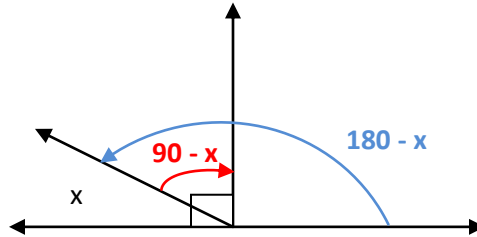


Application of Complementary and Supplementary Angles

Example 3: Problem Solving: If the supplement of an angle is 4 times the measure of its complement, what is the measure of the angle?

Step 1: Make a table and a diagram!

Name	Expression	Measure
The Angle	x	
Complement	$90 - x$	
Supplement	$180 - x$	



Step 2: Use the expressions in the table above to help you translate the problem into an equation.

the supplement of an angle	is	4 times	the measure of its complement
$180 - x$	=	4($90 - x)$

Step 3: Now we have this equation from our second table: $180 - x = 4(90 - x)$
solve algebraically

$$180 - x = 4(90 - x)$$

$$180 - x = 360 - 4x \quad (\text{distributed the 4})$$

$$3x = 180 \quad (\text{added } 4x \text{ to each side, and subtracted } 180 \text{ from each side})$$

$$x = 60 \quad (\text{divided both sides by 3})$$

This solution means “the angle” has a measure of 60 degrees.

Step 4: Fill in the last column of table and answer the question! Sometimes you are asked for the measure of the complement or supplement, so make sure you re-read the question after finding all three measures! 😊

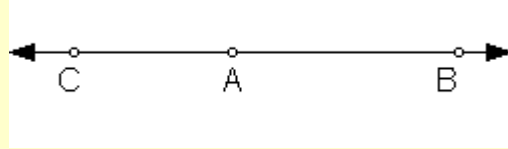
What is the measure of the angle? 60!

Name	Expression	Measure
The Angle	x	60
Complement	$90 - x$	30
Supplement	$180 - x$	120

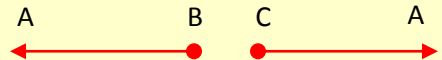
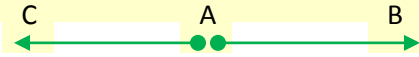
Other definitions useful for this section:

Opposite Rays-

Two rays with the same endpoint that extend in opposite directions and make up a straight line.



\overrightarrow{AC} and \overrightarrow{AB} are opposite rays
 \overrightarrow{BA} and \overrightarrow{CA} are not opposite as they do not have the same endpoint



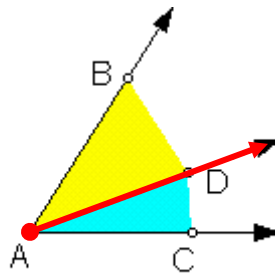
Adjacent Angles –

Two angles that share a common vertex and a side but do not have any interior points in common.

$\angle BAD$ and $\angle CAD$

share vertex A and side AD with
no common interior points . . .

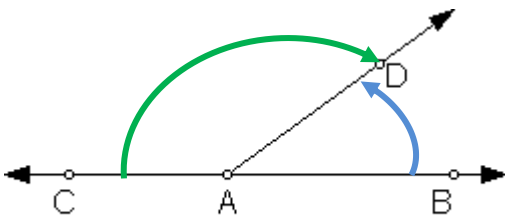
So they ARE adjacent angles



$\angle BAC$ and $\angle CAD$ are NOT adjacent
because their interiors overlap!

Linear Pair –

A linear pair of angles are two adjacent angles whose outside rays form a straight angle (line).



$\angle BAD$ and $\angle CAD$ are a linear pair!

Pssst... Side Bar!

*By the way, you know or have figured out what adjacent means, right?
If not ... it means: “next to” or as the problems state it; “sharing a side.”*

Now look at the illustrations again with that in mind! ☺