

INEQUALITIES IN ONE TRIANGLE Guide Notes

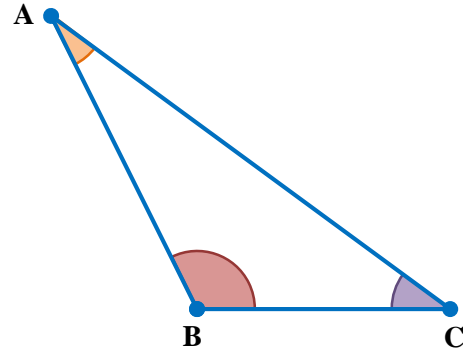
ANGLE – SIDE THEOREM

“If one side of a triangle is longer than another side, then the angle opposite the longer side is larger than the angle opposite the shorter side.”

If $\overline{AB} > \overline{BC}$ then $\angle ACB > \angle BAC$.

If $\overline{AC} > \overline{BC}$ then $\angle ABC > \angle BAC$.

If $\overline{AC} > \overline{AB}$ then $\angle ABC > \angle ACB$.



Sample Problem 1: Write the angles in order from smallest to largest.

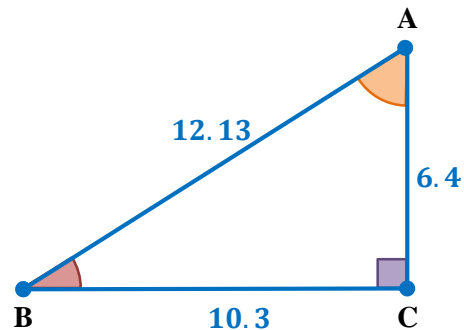
$\overline{AB} = 12.13$ is opposite $\angle C$

$\overline{BC} = 10.3$ is opposite $\angle A$

$\overline{AC} = 6.4$ is opposite $\angle B$

$$\overline{AB} < \overline{BC} < \overline{AC}$$

$$m\angle B < m\angle A < m\angle C$$



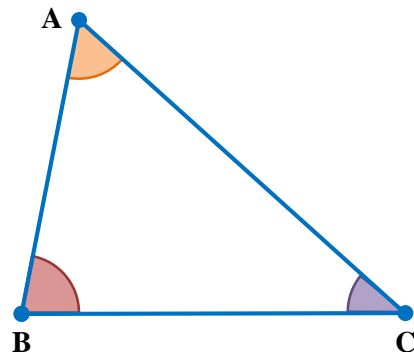
CONVERSE OF ANGLE – SIDE THEOREM

“If one angle of a triangle is larger than another angle, then the side opposite the larger angle is longer than the side opposite the smaller angle.”

If $\angle ACB > \angle BAC$ then $\overline{AB} > \overline{BC}$.

If $\angle ABC > \angle BAC$ then $\overline{AC} > \overline{BC}$.

If $\angle ABC > \angle ACB$ then $\overline{AC} > \overline{AB}$.



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Sample Problem 2: Write the sides in order from shortest to longest.

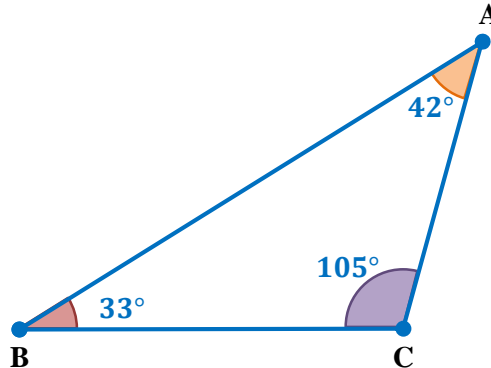
\overline{AB} is opposite $m\angle C = 105^\circ$

\overline{BC} is opposite $m\angle A = 42^\circ$

\overline{AC} is opposite $m\angle B = 33^\circ$

$$m\angle C > m\angle A > m\angle B$$

$$\overline{AC} < \overline{BC} < \overline{AB}$$



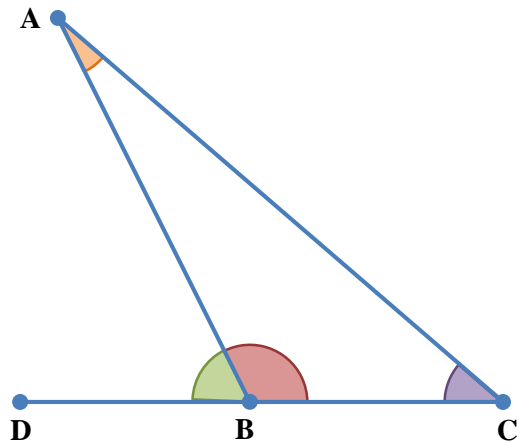
EXTERIOR ANGLE INEQUALITY THEOREM

“The measure of an exterior angle of a triangle is greater than the measure of either of its remote interior angles.”

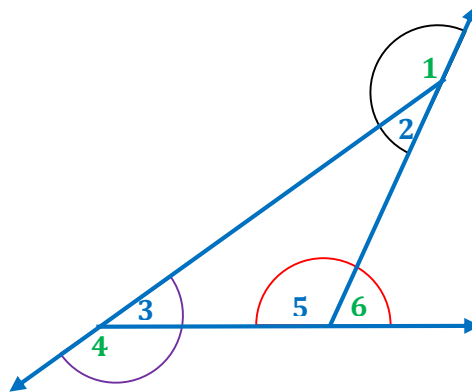
$$\angle ABD > \angle BAC$$

and

$$\angle ABD > \angle BCA$$



Sample Problem 3: Determine the smallest and the largest angles.



Interior angles: $m\angle 5 > m\angle 3 > m\angle 2$

Exterior angles: $m\angle 1 > m\angle 4 > m\angle 6$

Smallest angle: $m\angle 2$

Largest angle: $m\angle 1$

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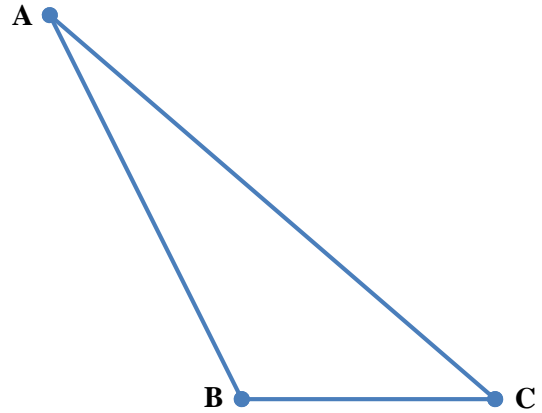
TRIANGLE INEQUALITY THEOREM

“The sum of the lengths of any two sides of a triangle is greater than the length of the third side.”

$$\overline{AB} + \overline{BC} > \overline{AC}$$

$$\overline{AC} + \overline{BC} > \overline{AB}$$

$$\overline{AB} + \overline{AC} > \overline{BC}$$



Sample Problem 4: A triangle has one side of length 12 and another of length 8. Identify the possible lengths of the third side.

$x = 12$	$y = 8$	$4 < z < 20$
$x + y > z$	$x + z > y$	$y + z > x$
$12 + 8 > z$	$12 + z > 8$	$8 + z > 12$
$20 > z$	$z > 8 - 12$	$z > 12 - 8$
	$z > -4$	$z > 4$