

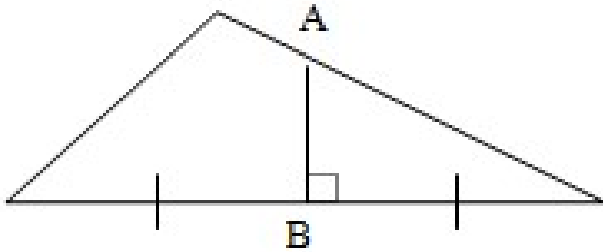
# Relations between Sides and Angles in a Triangle

## Objective:

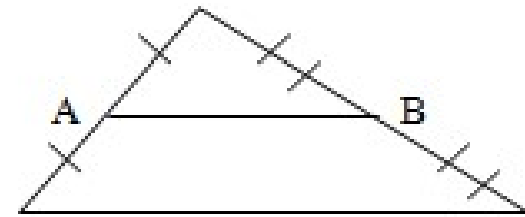
- \* Understand the large side is opposite the large angle
- \* Understand the range of possible sizes for each side.
- \* Use properties of isosceles triangles to find missing measurements
- \* Use properties of equilateral triangles to find missing measurements

# Review - What is segment AB?

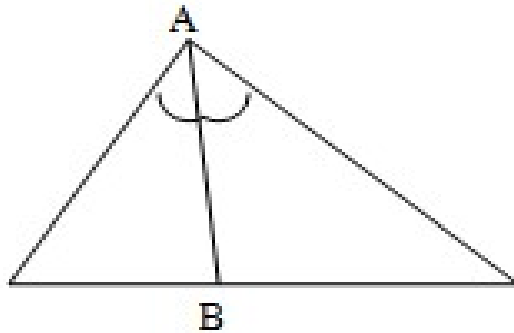
1)



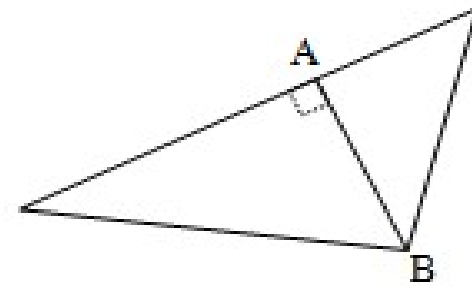
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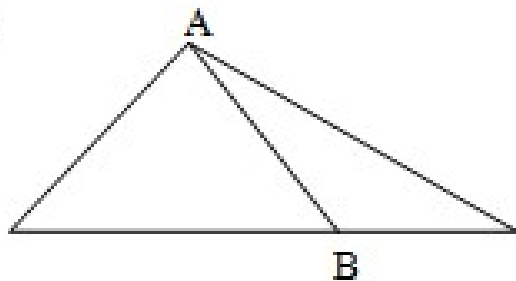
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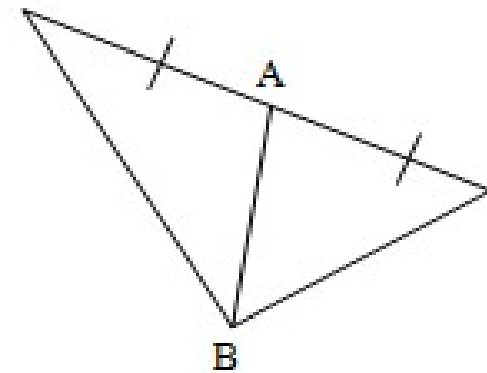
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5)

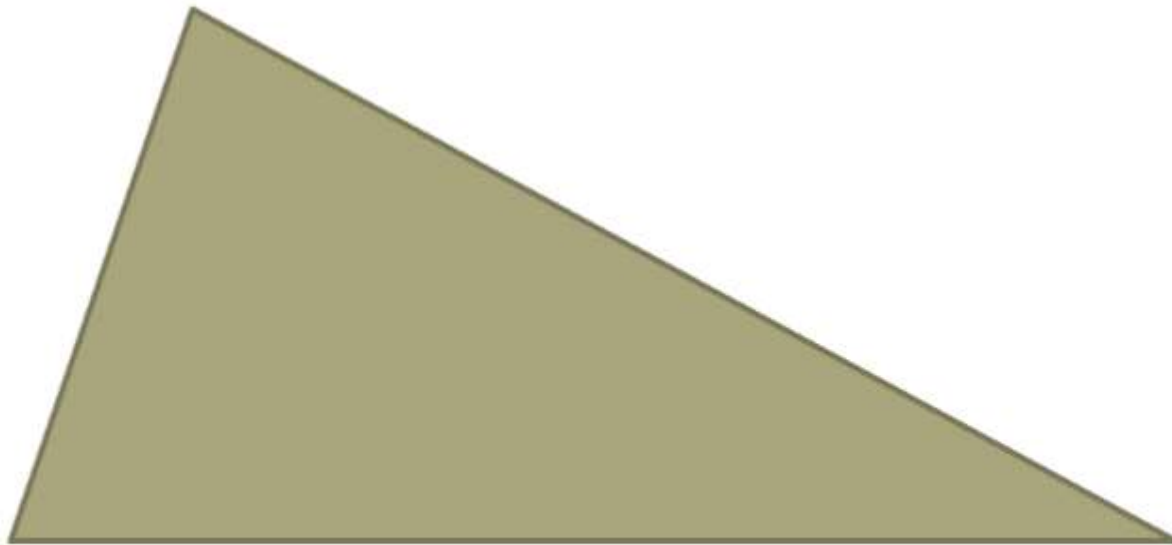


6)

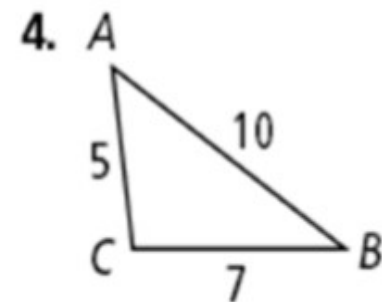
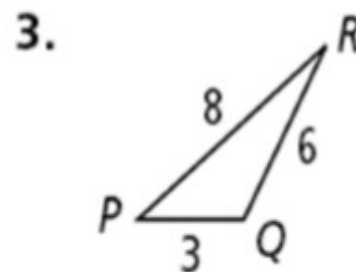
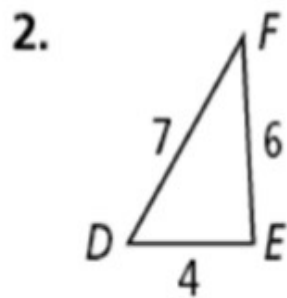


## Inequalities in One Triangle

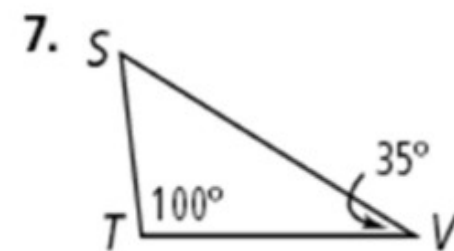
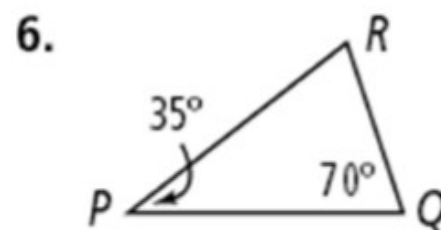
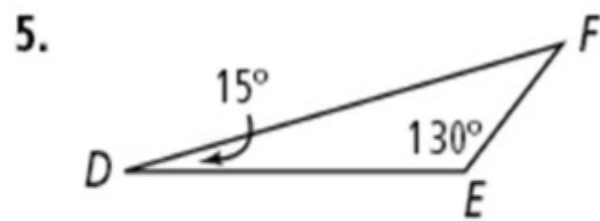
For any triangle, if two sides are not congruent, then the larger angle is opposite the longer side (Theorem 33). Conversely, if two angles are not congruent, then the longer side is opposite the larger angle (Theorem 34).



Which are the largest and smallest angles of each triangle?



Which are the longest and shortest sides of each triangle?



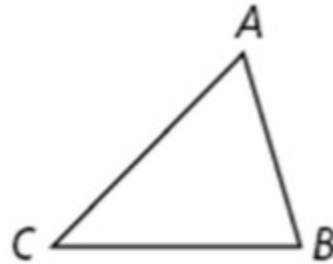
## Triangle Inequality Theorem

For any triangle, the sum of the lengths of any two sides is greater than the length of the third side. This is the *Triangle Inequality Theorem*.

$$AB + BC > AC$$

$$AC + BC > AB$$

$$AB + AC > BC$$



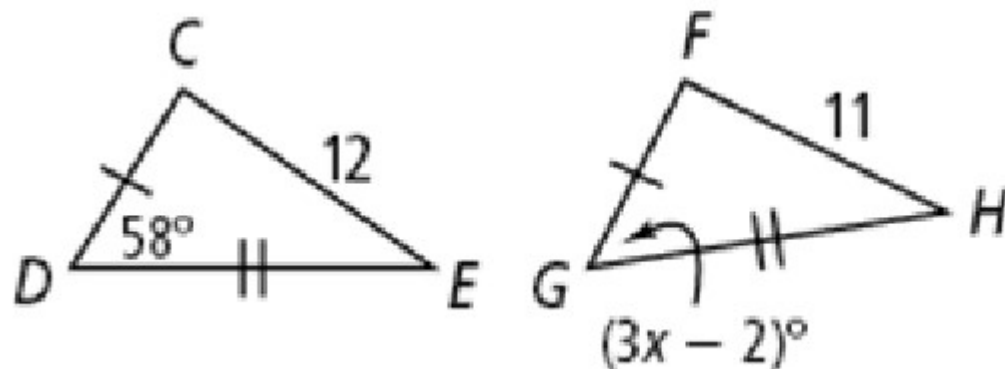
1. Can a triangle have side lengths 2, 3, 7?

2. Can a triangle have side lengths 7, 12, 13?
3. Can a triangle have side lengths 6, 8, 9?
4. Two sides of a triangle are 5 cm and 3 cm. What could be the length of the third side?
5. Two sides of a triangle are 12 ft and 15 ft. What could be the length of the third side?

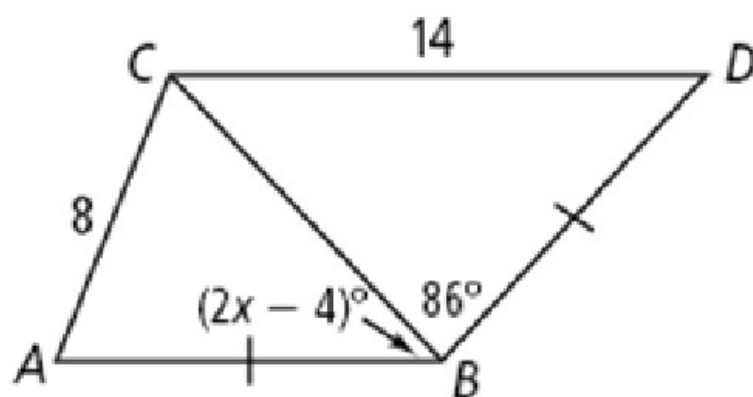
## Exercises

Find the range of possible values for each variable.

3.

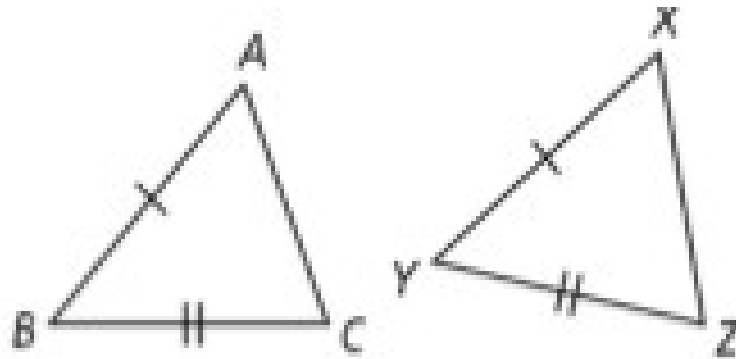


4.



# The Hinge Theorem

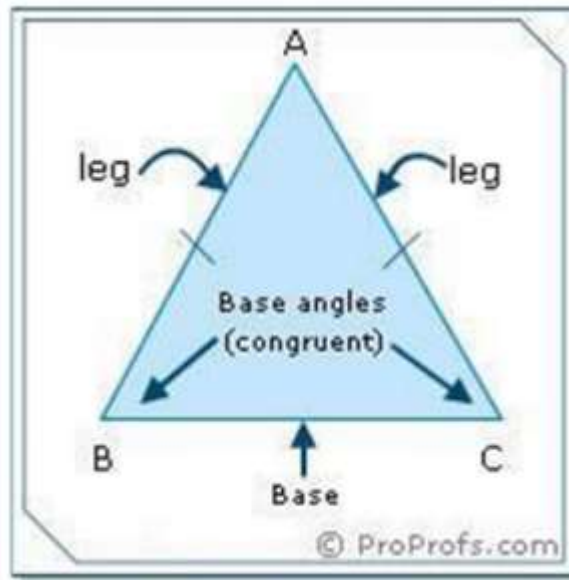
Consider  $\triangle ABC$  and  $\triangle XYZ$ . If  $\overline{AB} \cong \overline{XY}$ ,  $\overline{BC} \cong \overline{YZ}$ , and  $m\angle Y > m\angle B$ , then  $XZ > AC$ . This is the *Hinge Theorem* (SAS Inequality Theorem).



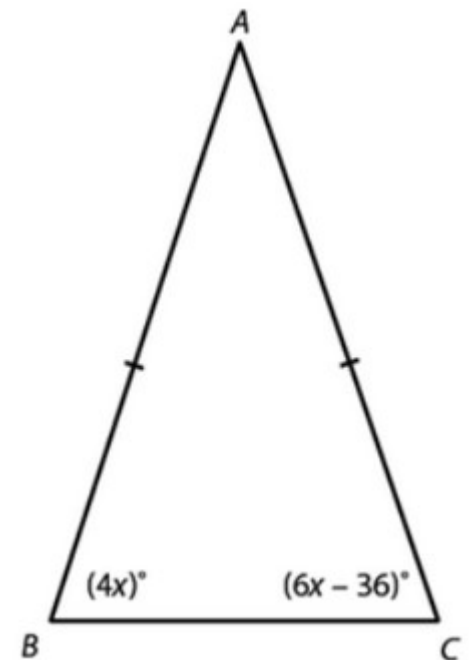
It is important that the two given angles are between the two given sides!!!



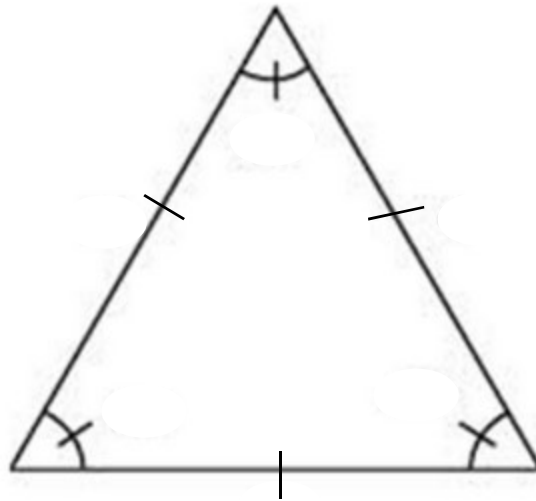
**Isosceles Triangle:** A triangle with two congruent sides (or legs) and congruent base angles.



1. Find the measurement of each angle in  $\triangle ABC$ .

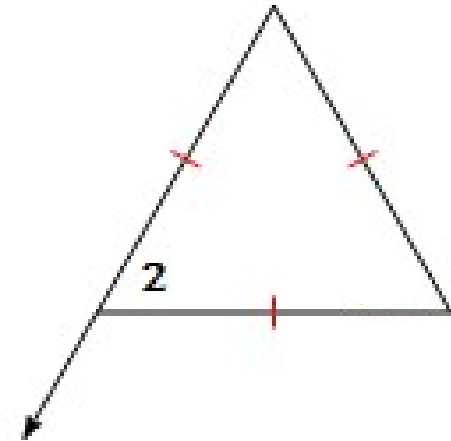


**Equilateral Triangle:** All sides are congruent and all angles are congruent.

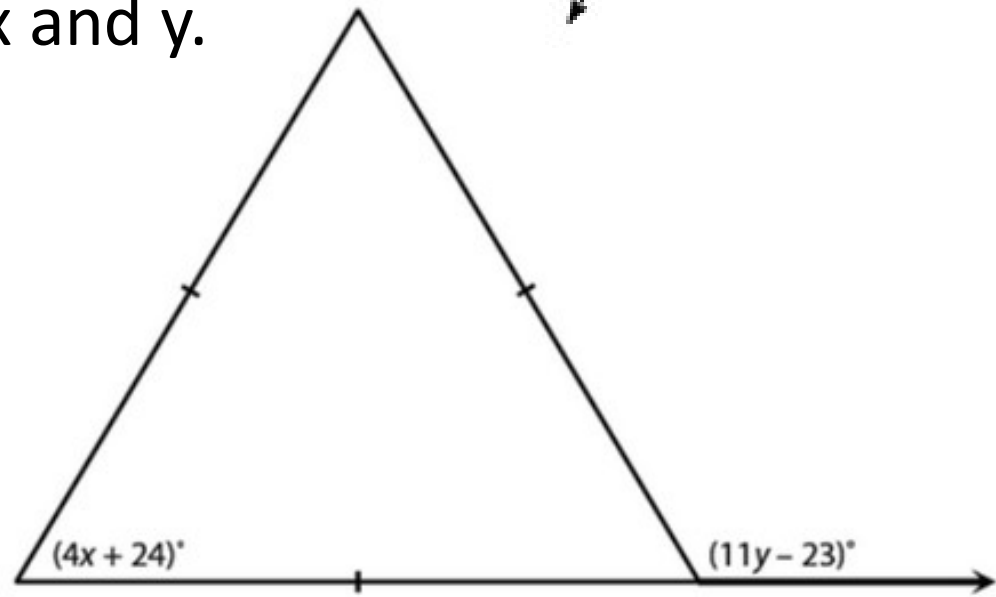


What is the measurement of each angle?

1. Find the  $m\angle 2$ , given that  $m\angle 2 = 6x - 12$



2. Find the values of  $x$  and  $y$ .



*Time to solve an equation! Solve  $x^2 + 5x + 4 = 0$*

Assignment:

Worksheet 8.6 and  
XL8.6