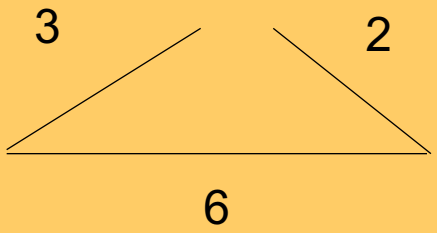
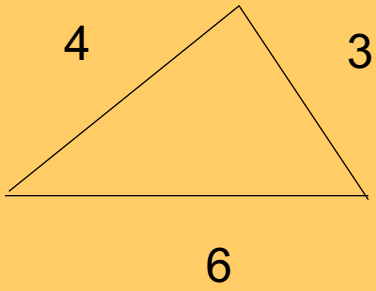
Triangle Inequality Theorem

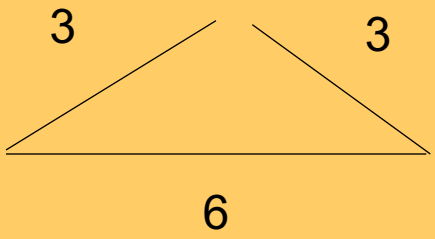
- The sum of the lengths of any two sides of a triangle is greater than the length of the third side

Inequalities in One Triangle

- They have to be able to reach!!



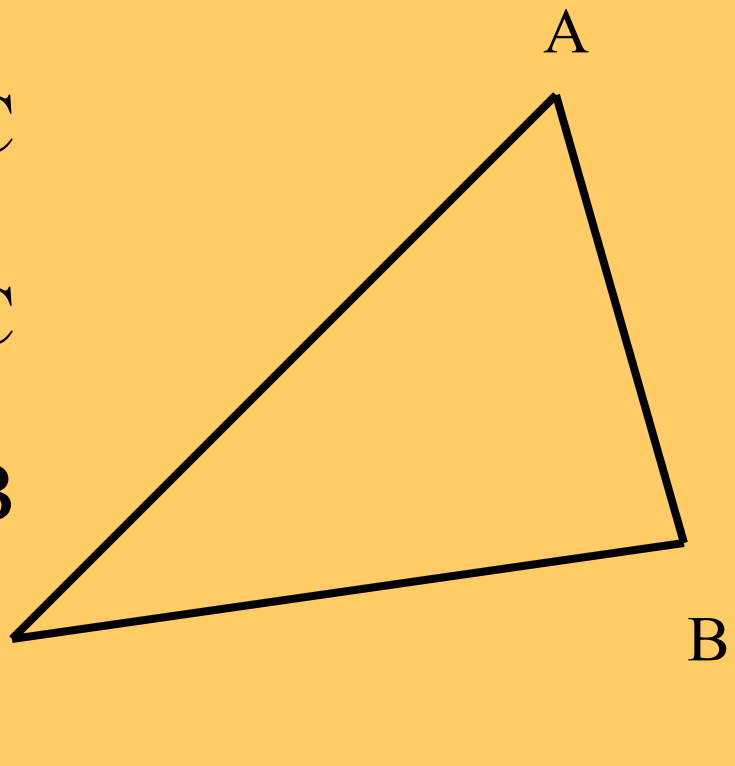




Note that there is only one situation that you can have a triangle; when the sum of two sides of the triangle are greater than the third.

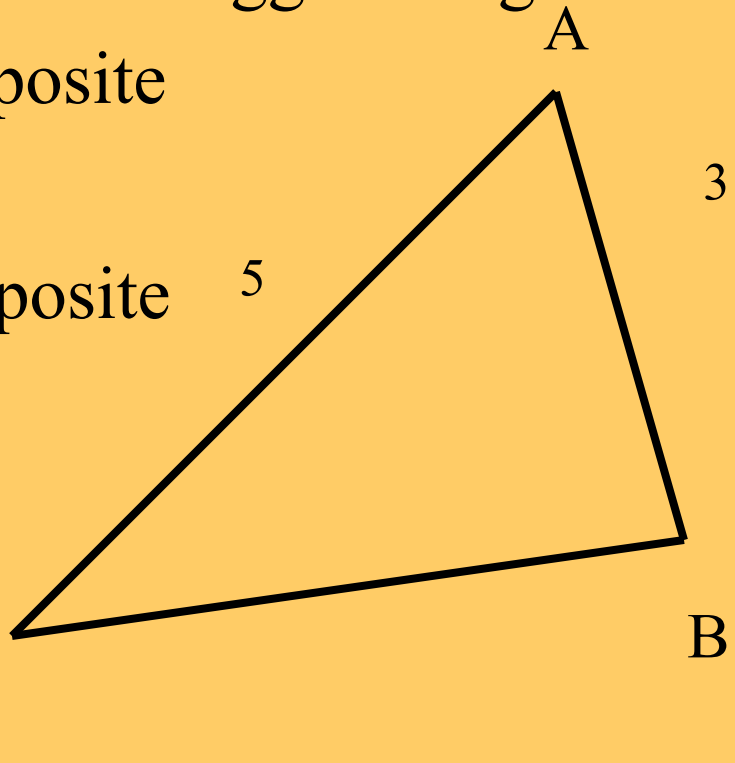
Triangle Inequality Theorem

- AB + AC > BC
- AB + BC > AC
- AC + BC > AB



Triangle Inequality Theorem

- Biggest Side Opposite Biggest Angle
- Medium Side Opposite Medium Angle
- Smallest Side Opposite Smallest Angle



m<B is greater than m<C

Triangle Inequality Theorem

- Converse is true also
- Biggest Angle Opposite

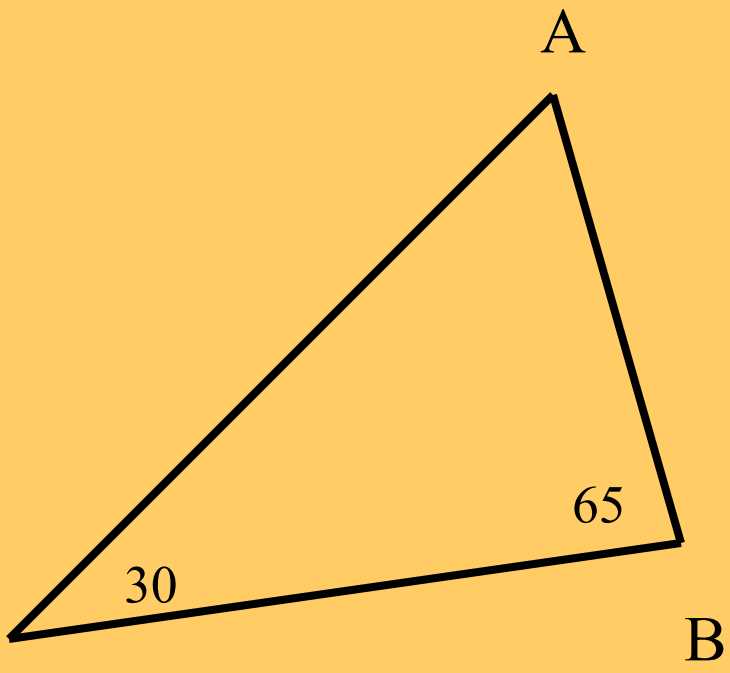
_____

- Medium Angle Opposite

_____

- Smallest Angle Opposite

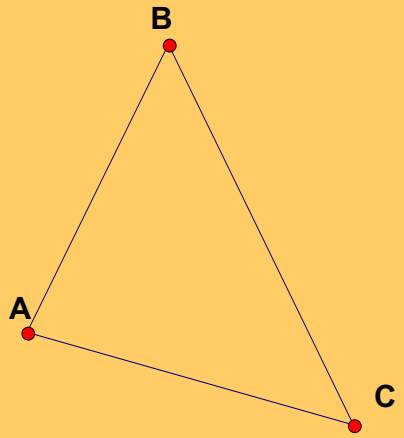
_____



Angle A > Angle B > Angle C

So CB >AC > AB

Example: List the measures of the sides of the triangle, in order of least to greatest.



Note: Picture is not to scale

$\angle A = 2x + 1$ $\angle B = 4x$

$\angle C = 4x - 11$

Solving for x:

$2x + 1 + 4x + 4x - 11 = 180$

$10x - 10 = 180$

$10x = 190$

$X = 19$

Plugging back into our Angles:

$\angle A = 39^{o}$; $\angle B = 76$; $\angle C = 65$

Therefore, BC < AB < AC

Using the Exterior Angle Inequality

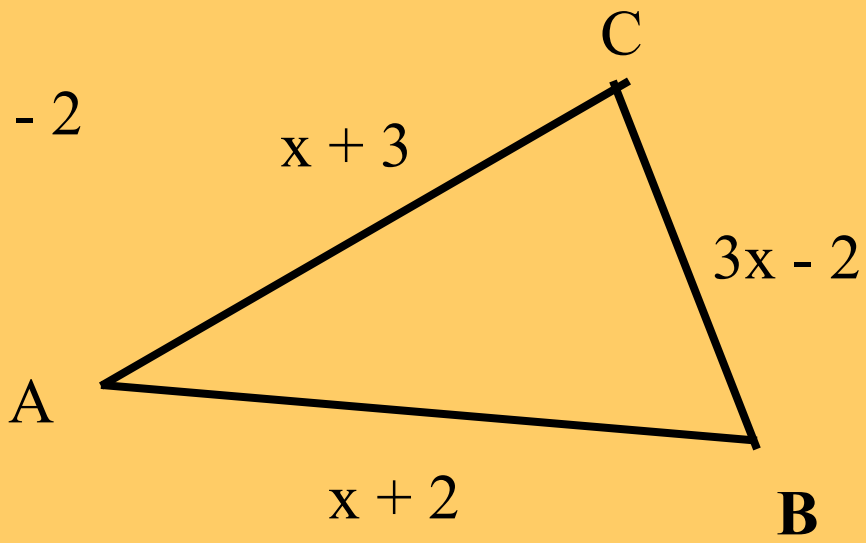
★Example: Solve the inequality if

AB + AC > BC

$(x+3) + (x+2) > 3x - 2$

$2x + 5 > 3x - 2$

$\boxed{x < 7}$



Example: Determine if the following lengths are legs of triangles

A)4, 9, 5

B) 9, 5, 5

We choose the smallest two of the three sides and add them together. Comparing the sum to the third side:

$4 + 5 \ ? \ 9$

$9 \not> 9$

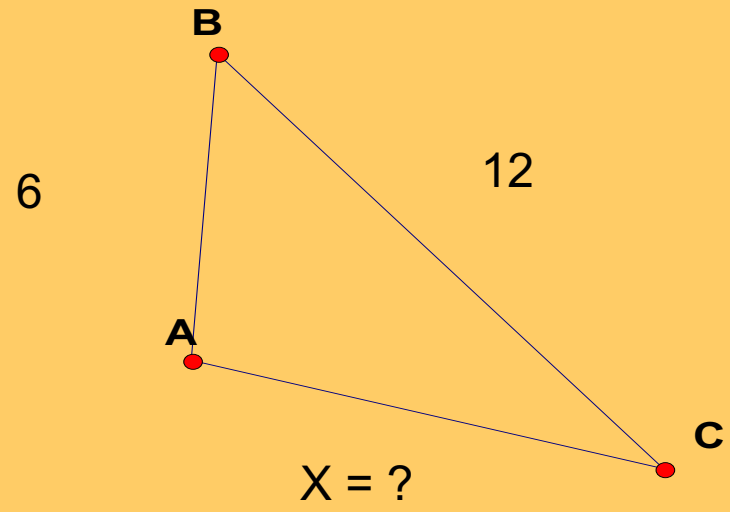
Since the sum is not greater than the third side, this is not a triangle

$5 + 5 \ ? \ 9$

$10 > 9$

Since the sum is greater than the third side, this is a triangle

Example: a triangle has side lengths of 6 and 12; what are the possible lengths of the third side?



12 + 6 = 18

12 – 6 = 6

Therefore:

$6 < X < 18$