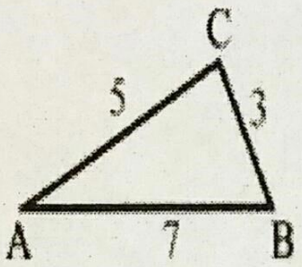
The Triangle Inequality Theorem

Theorem 1:

The sum of the lengths of any two sides of a triangle must be greater than the third side.



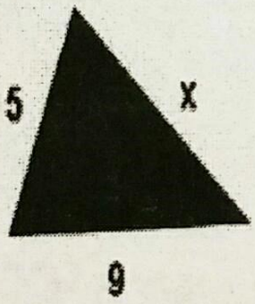
$AC + CB > AB$ $\quad 5+3>7$

$CB + AB > AC$ $\quad 3+7>5$

$AB + AC > CB$ $\quad 7+5>3$

If these inequalities are NOT true, you do not have a triangle!

Example



Suppose we know the lengths of two sides of a triangle, and we want to find the "possible" lengths of the third side.

According to our theorem, the following 3 statements must be true:

$5+x>9$	$5+9>x$	$x+9>5$
So, $x>4$	So, $14>x$	So, $x>-4$
		(no real information is gained here since the lengths of the sides must be positive.)

Putting these statements together, we get that x must be **greater than** 4, **but less than** 14. So any number in the range $4 < x < 14$ can represent the length of the missing side of our triangle.