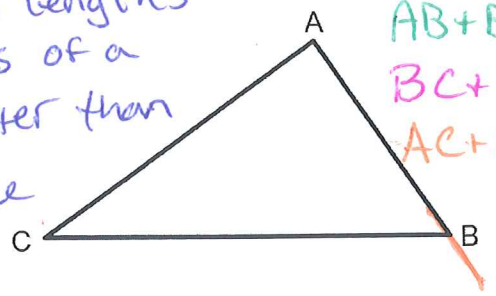
Geometry - 5.4 - The Triangle Inequality

Triangle Inequality Theorem (5.11)

The sum of 2 lengths of any 2 sides of a triangle is greater than the length of the third side.



$AB+BC>AC$

$BC+AC>AB$

$AC+AB>BC$

Ex 1 - Determine whether the given measures can be the lengths of the sides of a triangle.

a) 3, 4, and 6

$3+4>6$

$7>6$ ✓

$4+6>3$

$10>3$ ✓

$6+3>4$

$9>4$ ✓

b) 50, 90, and 40

$50+90>40$

$140>40$ ✓

$90+40>50$

$130>50$ ✓

$50+40>90$

$90>90$ X

c) 67, 32, and 100

$67+32>100$

$99>100$ X

Ex 2 - Find the range for the measure of the third side of a triangle given the measures of two sides.

a) 9 and 16

$9+16>x$

$25>x$

$x<25$

$x+9>16$

$-9\ \ -9$

$x>7$

$7<x<25$

b) 20 and 30

$20+30>x$

$50>x$

$x<50$

$x+20>30$

$-20\ \ -20$

$x>10$

$10<x<50$

c) 1.8 and 3.21

$1.8+3.21>x$

$5.01>x$

$x<5.01$

$x+1.8>3.21$

$-1.8>3.21$

$x>1.41$

$1.41<x<5.01$

Ex 3 - Without graphing, determine whether the given coordinates can be the vertices of a triangle.

a) D(5, 8), E(2, -4), and N(-3, -1)

$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

DE

$=\sqrt{(2-5)^2+(-4-8)^2}$

$=\sqrt{(-3)^2+(-12)^2}$

$=\sqrt{9+144}$

$=\sqrt{153}$

$=12.4$

$=\sqrt{(-3-2)^2+(-1+4)^2}$

$=\sqrt{(-5)^2+(3)^2}$

$=\sqrt{25+9}$

$=\sqrt{34}$

$=5.83$

$\sqrt{(-3-5)^2+(-1-8)^2}$

$\sqrt{(-8)^2+(-9)^2}$

$\sqrt{64+81}$

$\sqrt{145}$

12.04

yes

b) A(1, -4), T(-3, -20), and L(5, 12)

$\sqrt{(-3-1)^2+(-20-1)^2}$

$\sqrt{(-4)^2+(-21)^2}$

$\sqrt{16+442}$

$\sqrt{458}$

$\sqrt{(5+3)^2+(12+20)^2}$

$\sqrt{(8)^2}$

$\sqrt{64+(32)^2}$

$\sqrt{64+1024}$

$\sqrt{1088}$

$\sim\frac{33}{64}$