Integrated Math 3
Unit 1: Analytic Geometry
1.3

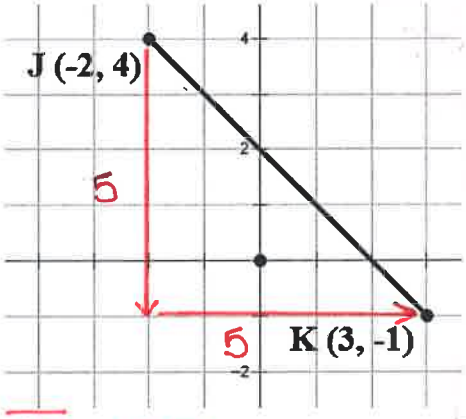
Name: _____

Date:_____ Period:_____

Objective: Determine the distance between two points.

Warm Up:

Find the length of $\overline{JK}$



$\overline{JK} = 5\sqrt{2}$ units

Option 1: Pythagorean Thm.

$5^2 + 5^2 = c^2$

$25 + 25 = c^2$

$50 = c^2$

$c = \sqrt{50}$

$c = \sqrt{25 \cdot 2}$

$c = 5\sqrt{2}$

Option 2: Distance Formula

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

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

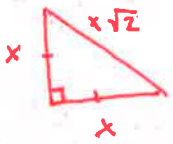
$= \sqrt{25+25}$

$= \sqrt{50}$

$= 5\sqrt{2}$

Option 3: 45-45-90 triangle

$5\sqrt{2}$



Key terms:

Pythagorean theorem: $a^2 + b^2 = c^2$ * careful: this can only be used on a right triangle!

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

Examples:

1. Determine the distance (d) between the following points.

A.) (3, 2) and (−5, 17)

$d = \sqrt{(3-(-5))^2 + (2-17)^2}$

$= \sqrt{8^2 + (-15)^2}$

$= \sqrt{64 + 225}$

$= \sqrt{289}$

$=$ 17 units

B.) (−1, 4) and (−4, 8)

$d = \sqrt{(-4-(-1))^2 + (8-4)^2}$

$= \sqrt{3^2 + 4^2}$

$= \sqrt{9 + 16}$

$= \sqrt{25}$

$=$ 5 units

2. Given the points and a distance, find the value of the variable.

a. $(0,1)$, $(x,4)$ and $d=\sqrt{34}$

$\sqrt{34}=\sqrt{(x-0)^2+(4-1)^2}$

$\sqrt{34}=\sqrt{x^2+3^2}$

$(\sqrt{34})^2=(\sqrt{x^2+9})^2$

$34=x^2+9$

$-9 \quad -9$

$\pm\sqrt{25}=\sqrt{x^2}$

$\boxed{x=\pm 5}$

b. $(4,-8)$, $(10,y)$ and $d=5\sqrt{5}$

$5\sqrt{5}=\sqrt{(10-4)^2+(y-(-8))^2}$

$5\sqrt{5}=\sqrt{6^2+(y+8)^2}$

$(5\sqrt{5})^2=(\sqrt{36+(y+8)^2})^2$

$25\cdot 5=36+(y+8)^2$

$125=36+(y+8)^2$

$-36 \quad -36$

$\pm\sqrt{89}=\sqrt{(y+8)^2}$

$\pm\sqrt{89}=y+8$

$-8 \quad -8$

$\boxed{y=\pm\sqrt{89}-8}$

3. Classify the triangle by side lengths using the given coordinates: $(4,6)$, $(6,1)$ and $(1,3)$.

Side 1: $(4,6)$ and $(6,1)$

$d=\sqrt{(6-4)^2+(1-6)^2}$

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

$=\sqrt{4+25}$

$=\boxed{\sqrt{29}}$

Side 2: $(6,1)$ and $(1,3)$

$d=\sqrt{(1-6)^2+(3-1)^2}$

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

$=\sqrt{25+4}$

$=\boxed{\sqrt{29}}$

Side 3: $(4,6)$ and $(1,3)$

$d=\sqrt{(1-4)^2+(3-6)^2}$

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

$=\sqrt{9+9}$

$=\sqrt{18}$

$=\sqrt{9\cdot 2}$

$=\boxed{3\sqrt{2}}$

Isosceles: two sides are congruent