How do you find the distance (length) between two points on a number line?

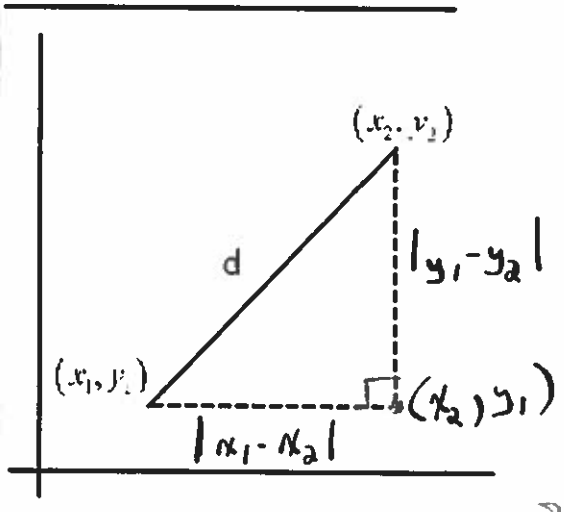
$AB =$ [1] $y - x \quad (y > x)$

[2] $|y - x|$

[3] Find the positive difference between the coordinates.

Using Coordinate Geometry:

The Distance Formula:



Pythagorean Theorem

$hyp^2 = leg_1^2 + leg_2^2$

$d^2 = [|x_1 - x_2|]^2 + [|y_1 - y_2|]^2$

$d^2 = (x_1 - x_2)^2 + (y_1 - y_2)^2$

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

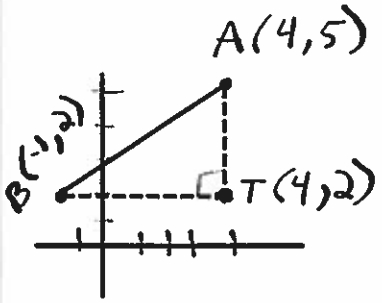
$d > 0$

$(1-\infty)$

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

For Examples 1 and 2:
(1) Plot points A and B, and T (the vertex of the right triangle).
(2) Find AT, BT, and AB.

Ex 1: A(4, 5) B(-1, 2)



$AT = 5-2$ $BT = 4-(-1)$

$AT = 3$ $BT = 5$

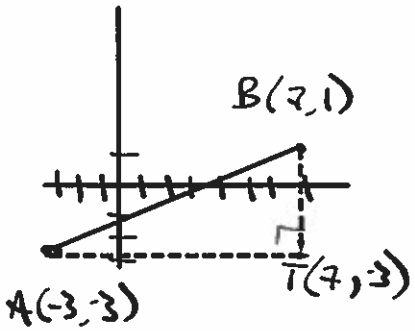
$AB = \sqrt{(4-(-1))^2 + (5-2)^2}$

$AB = \sqrt{5^2 + 3^2}$

$AB = \sqrt{25+9}$

$AB = \sqrt{34}$

Ex 2: A(-3, -3) B(7, 1)



$AT = 7-(-3)$ $BT = 1-(-3)$

$AT = 10$ $BT = 4$

$AB = \sqrt{(7-(-3))^2 + (1-(-3))^2}$

$AB = \sqrt{10^2 + 4^2}$

$AB = \sqrt{116}$

$AB = \sqrt{4(29)}$

$AB = 2\sqrt{29}$

Ex 3: A(9, -4) B(1, 8) Find AB only.

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

$$AB = \sqrt{(9-1)^2+(8-(-4))^2}$$

$$AB = \sqrt{8^2+12^2}$$

$$AB = \sqrt{64+144}$$

$$AB = \sqrt{208}$$

$$AB = \sqrt{4}\sqrt{52}$$

$$AB = 2\sqrt{4}\sqrt{13}$$

$$\boxed{AB = 4\sqrt{13}}$$

Using Coordinate Geometry:

The slope of the line containing two points (x_1, y_1) and (x_2, y_2):

$$m = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

Find the slope of. $\overleftrightarrow{AB}$

Ex 1: A(-3, 7) B(2, 5)

$$m = \frac{\Delta y}{\Delta x} = \frac{5-7}{2-(-3)} = \frac{-2}{5}$$

$$\boxed{m = -\frac{2}{5}}$$

Ex 2: A(1/2, 3) B(-1, 2/3)

$$m = \frac{\Delta y}{\Delta x} = \frac{3-\frac{2}{3}}{\frac{1}{2}-(-1)} = \frac{\frac{7}{3}}{\frac{3}{2}}$$

$$m = \frac{7}{3}\left(\frac{2}{3}\right) = \frac{14}{9}$$

$$\boxed{m = \frac{14}{9}}$$

Algebra Review: Do you remember how to write the equation of a line in slope-intercept form?

What information do we need to write a linear equation in Slope-Intercept Form?

$$y = mx + b$$

We need two pieces of information to write the equation.

☆ 1. Slope 2. y-coordinate of the y-intercept

Using Slope:

Lines with the same slope are parallel.

Lines with opposite reciprocal slopes are perpendicular.

Write the equation of the line described in slope-intercept form.

1. Passes through (2, 0) and is parallel to $3x - 2y = 5$.

$-2y = -3x + 5$

$y = \frac{3}{2}x + (-\frac{5}{2})$

$m = \frac{3}{2}$ (2,0)

$y = mx + b$

$0 = \frac{3}{2}(2) + b$

$0 = 3 + b$

$b = -3$

$y = \frac{3}{2}x - 3$

2. Passes through (2, 0) and is perpendicular to $3x - 2y = 5$.

$m = -\frac{2}{3}$ (2,0)

$y = mx + b$

$0 = -\frac{2}{3}(2) + b$

$0 = -\frac{4}{3} + b$

$b = \frac{4}{3}$

$y = -\frac{2}{3}x + \frac{4}{3}$

Write the equation of the line with the given information.

Ex 1: m = 2 and passes through (1, 0)

- (1, 0) is NOT the y-intercept!
- (1, 0) must be a solution to $y = mx + b$.
- Substitute 2 for m, 1 for x, 0 for y, and solve for b.
- $y = mx + b$

$0 = 2(1) + b$

$0 = 2 + b$

$b = -2$

$\boxed{y = 2x + (-2)}$

Parallel Line $\rightarrow y = 2x + 5$

Perpendicular Line $\rightarrow y = -\frac{1}{2}x + 1$

$y = -\frac{1}{2}x + (-2)$

Ex 2: Passes through both (-2, 1) and (2, 5)

- Find the slope first.

$m = \frac{\Delta y}{\Delta x} = \frac{5-1}{2-(-2)} = \frac{4}{4} = 1$

- Substitute 1 for m, -2 for x, 1 for y, and solve for b.

$y = mx + b$

$5 = 1(2) + b$

$5 = 2 + b$

$b = 3$

$\boxed{y = x + 3}$

Parallel Line $\rightarrow y = x + 5$

Perpendicular Line $\rightarrow y = -x + 4$

$y = -x + 3$

Assignment #39

13-1 The Distance Formula

p. 523-527 CE #4-10 and WE #1-12, 27, 28

13-2 Slope of a Line

p. 529-533 CE #1-6 and WE #3-15

p. 536-537 CE #1-9 and WE #7-10