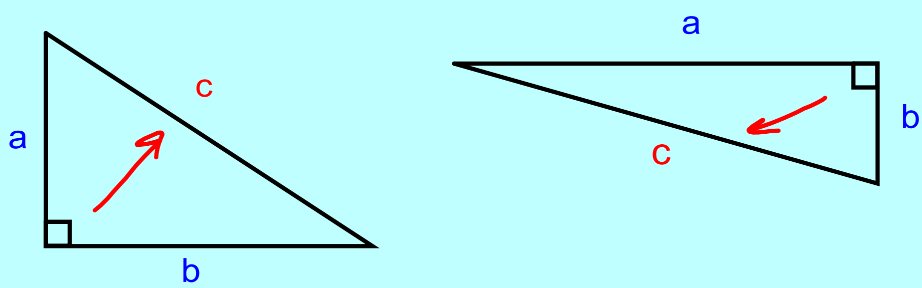
Recall: The Pythagorean theorem (see p.68 to review)

In a <u>right-triangle</u>, $a^2 + b^2 = c^2$, where

c is the hypotenuse
a, b are the other two sides



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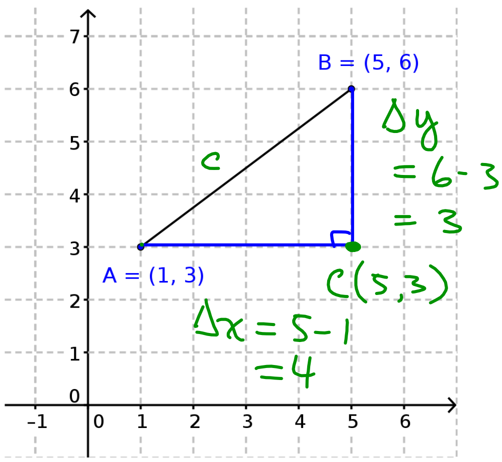
<u>Length of a Line Segment</u>

March 1/2016

Ex.1 Determine the length of AB (d_{AB} or $\overline{AB}$)



$c^2 = (\Delta x)^2 + (\Delta y)^2$

$c^2 = 4^2 + 3^2$

$c^2 = 16 + 9$

$c^2 = 25$

$c = \pm 5$

$c = 5$
OR
$c = -5$

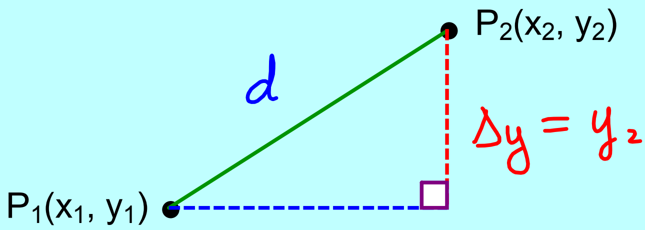
but c is a length or distance

$\therefore c = 5$

Feb 16-9:39 PM

To derive a formula, consider two general points,

Point #1 is $P_1(x_1, y_1)$ Point #2 is $P_2(x_2, y_2)$



$\Delta y = y_2 - y_1$

$\Delta x = x_2 - x_1$

$$c^2 = a^2 + b^2$$

$$d^2 = (\Delta x)^2 + (\Delta y)^2$$

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

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

Feb 28-11:44 AM

Summary:

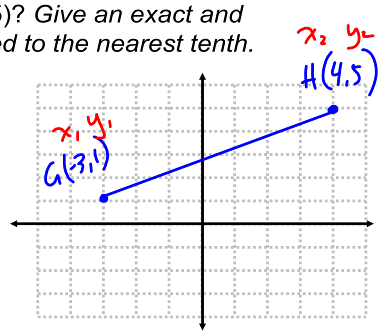
A <u>line segment</u> is a straight line between two points. The length of a line segment can be determined from the coordinates of the two points:

1. Connect the points with a line segment.
2. Construct a right-triangle, where the line segment is the <u>hypotenuse</u>.
3. Use the <u>Pythagorean theorem</u> to find the length of the line segment (hypotenuse).

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

Feb 28-11:11 AM

Ex.2 What is the distance between the points G(-3,1) and H(4,5)? *Give an exact and approximate answer rounded to the nearest tenth.*



$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$= \sqrt{(4-(-3))^2 + (5-1)^2}$$
$$= \sqrt{7^2 + 4^2}$$
$$= \sqrt{49+16}$$
$$= \sqrt{65} \leftarrow \text{exact value}$$
$$\doteq 8.1$$

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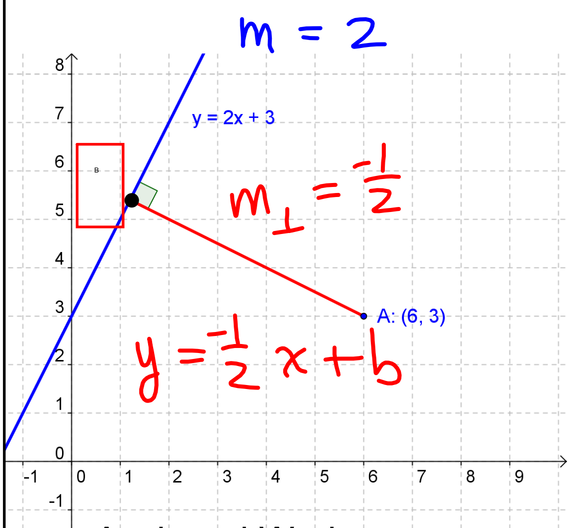
To determine the distance between a point and a straight line, draw the <u>perpendicular</u> line through the point.



1. Determine the equation of a perpendicular line passing through the given point.

2. Determine the point of intersection between the new line and the original line.

3. Calculate the distance between the original point (A) and the new point of intersection (B).

Assigned Work:

p.86-87 # 1ac, 4cd, 6, 7(draw), 12ab, 15

Oct 3-8:28 AM

Assigned Work:

p.86-87 # 1ac, 4cd, 6, 7(draw), 12ab, 15

6. horizontal line, $m = 0$

Vertical line, slope is undefined

(c) $E(-6, 8)$ $F(-6, -9)$

x_1, y_1 x_2, y_2

$$m_{EF} = \frac{-9-8}{-6-(-6)}$$

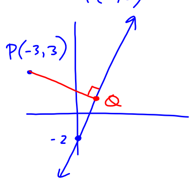
$$= \frac{-17}{0}$$ undefined

Feb 28-12:00 PM

12 (a) $y = 4x - 2$ $P(-3, 3)$

$m = 4$

$m_\perp = \frac{-1}{4}$



$y = m_\perp x + b$

$y = -\frac{1}{4}x + b$

Sub $P(-3,3)$: $3 = -\frac{1}{4}(-3) + b$

$$\frac{3}{1} = \frac{3}{4} + b$$

$$\frac{12}{4} - \frac{3}{4} = b$$

$$b = \frac{9}{4}$$

$y = -\frac{1}{4}x + \frac{9}{4}$

$4y = -x + 9$ ①

$y = 4x - 2$ ②

sub ② into ①

$4(4x-2) = -x + 9$

$16x - 8 = -x + 9$

$\frac{17x}{17} = \frac{17}{17}$

$\boxed{x = 1}$

$y = 4(1) - 2$

$y = 4 - 2$

$\boxed{y = 2}$

$P(\overset{x_1}{-3}, \overset{y_1}{3})$

$Q(\underset{x_2}{1}, \underset{y_2}{2})$

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

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

$$= \sqrt{16+1}$$

$$d_{PQ} = \sqrt{17}$$

Mar 2-12:41 PM

15. $(8,9) \rightarrow (10,7)$

$$d=\sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$$
$$=\sqrt{(10-8)^2+(7-9)^2}$$
$$=\sqrt{2^2+(-2)^2}$$
$$=\sqrt{4+4}$$
$$=\sqrt{8}$$

Mar 2-12:53 PM