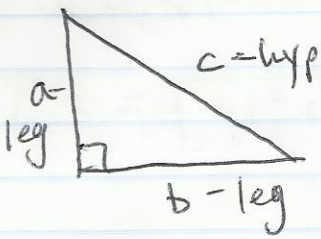
9/17/12

1-8: Distance + Midpoint Formula in the Coordinate Plane

Pythagorean Theorem: $a^2 + b^2 = c^2$



$a = 5$
$b = 10$
$c = ?$

$5^2 + 10^2 = c^2$

$25 + 100 = c^2$

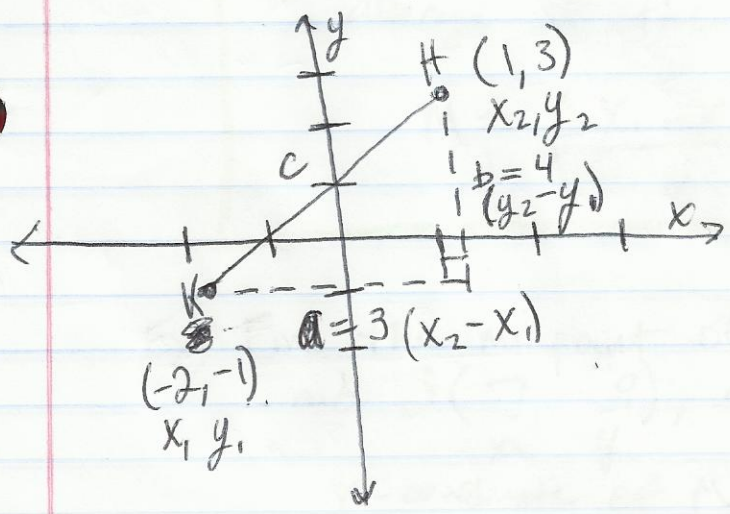
$c^2 = 125$

$c = \sqrt{125}$

factor out perfect squares → $c = \sqrt{25 \cdot 5}$

$c = 5\sqrt{5}$

★ memorize perfect squares $1^2 - 15^2$ to make simplifying radicals easier.



Find HK.

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

$c = \sqrt{a^2 + b^2}$

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

Distance formula: Distance b/t any two points with coordinates (x_1, y_1) and (x_2, y_2) is

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

Ex 1) Find PQ if $P(\overset{x_1, y_1}{-3, -5})$ and $Q(\overset{x_2, y_2}{-4, 6})$

$PQ = \sqrt{(-4-{-3})^2 + (6-{-5})^2}$

$PQ = \sqrt{(-4+3)^2 + (6+5)^2}$

$PQ = \sqrt{-1^2 + 11^2}$

$\boxed{PQ = \sqrt{122}}$

Midpoint Formula: The coordinates of the midpoint b/t (x_1, y_1) and (x_2, y_2) is the average of the x and the average of the y coordinates.

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Ex) Find the midpoint of $\overline{QS}$, if $Q(\overset{x_1, y_1}{3, 5})$ and $S(\overset{x_2}{7}, \overset{y_2}{-9})$, at point M.

x-coordinate of $M = \frac{x_1 + x_2}{2} = \frac{3+7}{2} = \boxed{5}$

y-coordinate of $M = \frac{y_1 + y_2}{2} = \frac{5+-9}{2} = \boxed{-2}$

$\boxed{M(5, -2)}$

Finding Endpoint, given Midpoint:

Ex) The midpoint of $\overline{AB}$ is $M(3,4)$. One endpoint is $A(\underset{x_1}{-3}, \underset{y_1}{-2})$. Find the coordinates of B.

$$M = \left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right)$$

x: $\quad 3 = \frac{-3+x}{2} \rightarrow 6 = -3+x$

$\boxed{x = 9}$

y: $\quad 4 = \frac{-2+y}{2} \rightarrow 8 = -2+y$

$\boxed{y = 10}$

$\boxed{B(9, 10)}$

★ Homework :- pg. 56 #1-37 odd
- memorize perfect squares through 15^2.
- watch Khan Academy video on simplifying radicals (link on class website).