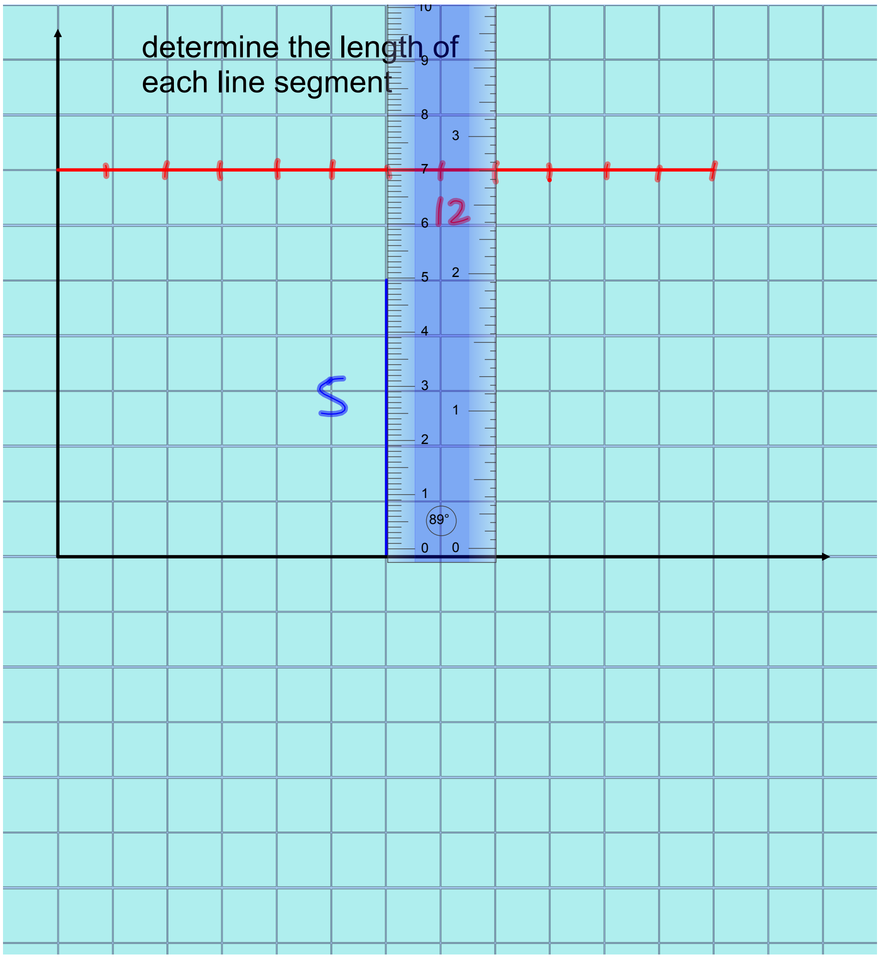
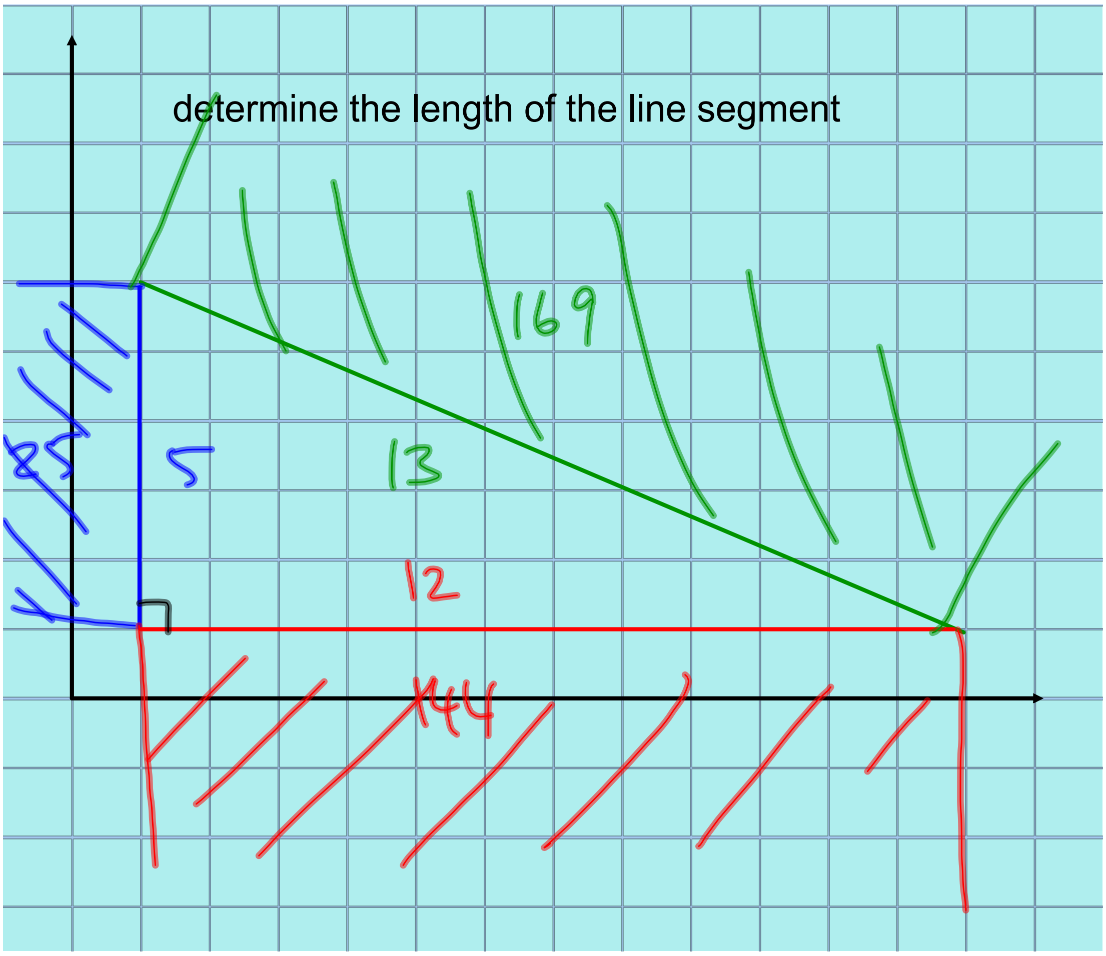
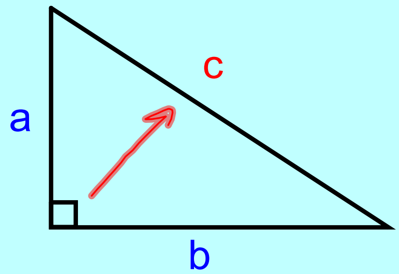

determine the length of each line segment
12
5

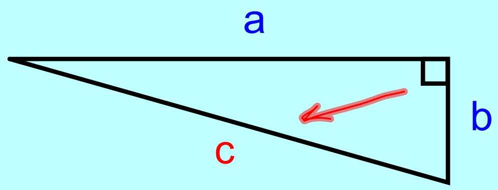

determine the length of the line segment
169
13
25
5
12
144

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

In a right-triangle, $a^2 + b^2 = c^2$, where

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





Length of a Line Segment

Oct 3/2011

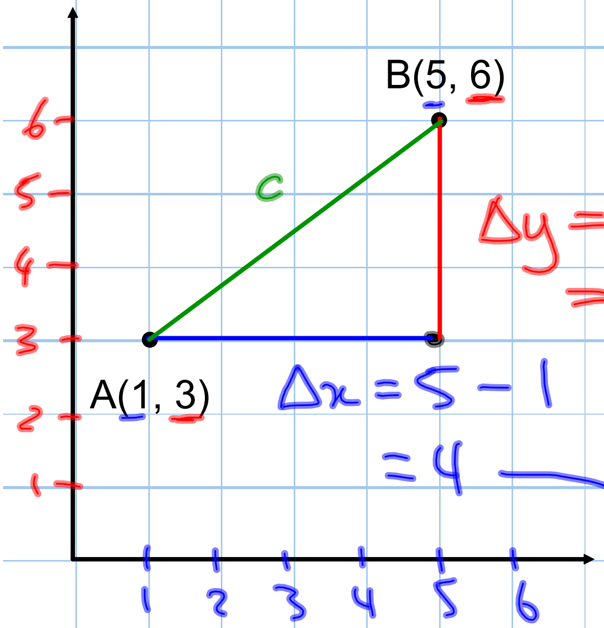
A line segment is a straight line between two points. The length of a line segment can be determined from the coordinates of the two points:

1. Connect the points with a line segment.

2. Construct a right-triangle, where the line segment is the hypotenuse.

3. Use the Pythagorean theorem to find the length of the line segment (hypotenuse).

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

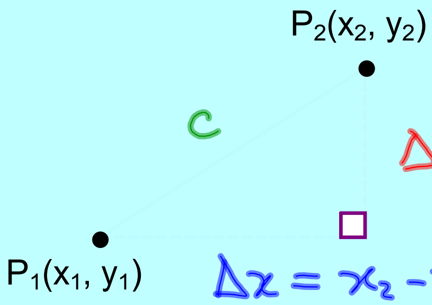


$\Delta y = 6 - 3$
$= 3$

$\Delta x = 5 - 1$
$= 4$

$c^2 = 3^2 + 4^2$
$c^2 = 9 + 16$
$c^2 = 25$
$c = 5$

To derive a formula, consider two general points,
Point #1 is $P_1(x_1, y_1)$ Point #2 is $P_2(x_2, y_2)$



$\Delta y = y_2 - y_1$

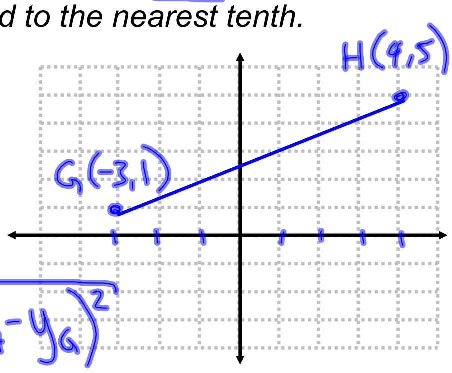
$\Delta x = x_2 - x_1$

$c^2 = \Delta x^2 + \Delta y^2$
$c^2 = (x_2 - x_1)^2 + (y_2 - y_1)^2$

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

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.*

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



$$d_{GH}=\sqrt{(x_H-x_G)^2+(y_H-y_G)^2}$$

$$=\sqrt{(4-(-3))^2+(5-1)^2}$$

$$=\sqrt{(7)^2+(4)^2}$$

$$=\sqrt{49+16}$$

$$=\sqrt{65}$$ exact answer.

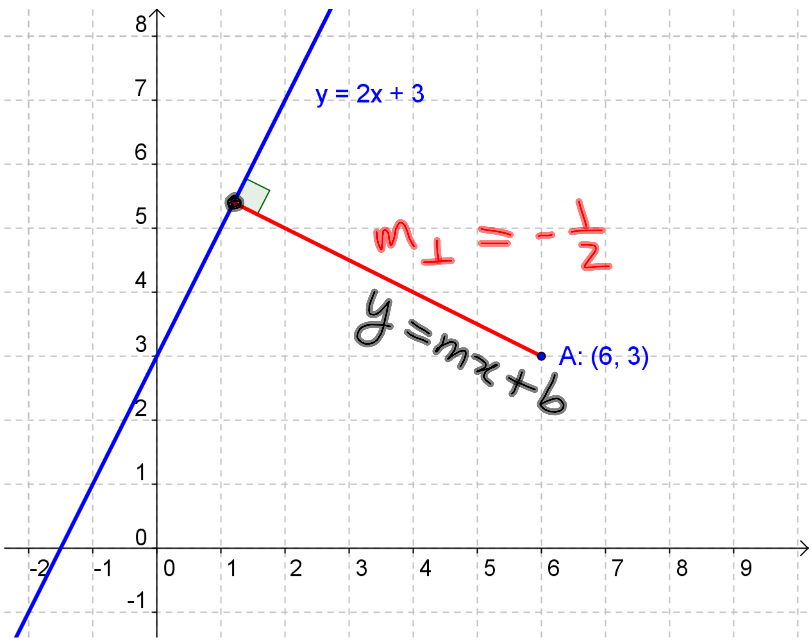
$$\doteq 8.1$$ approximate answer

$\doteq$

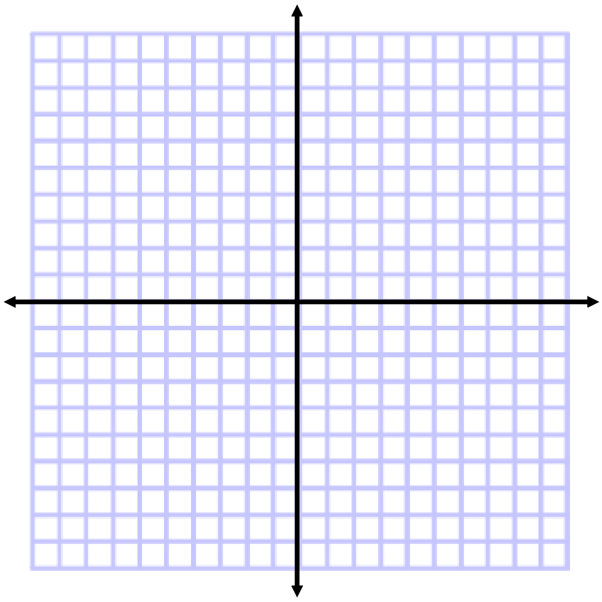
$\cong$

$\approx$

To determine the distance between a point and a straight line, draw the perpendicular line through the point.



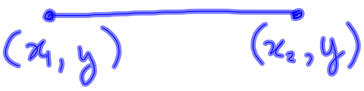
Ex.3 Calculate the distance between the point $G(5,-2)$ and the line $y = 3x + 1$. *Give an <u>exact and approximate</u> answer rounded to the nearest tenth.*



Assigned Work:

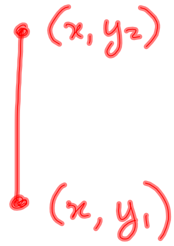
p.86-87 # 1ac, 4cd, 6, 7(draw), 12ab, 15

6.



horizontal lines

y-coordinate does not change



vertical

x-coordinate does not change

(f)

$(-10,-2)$ to $(6,-2)$

$-10 \longrightarrow 6$

16

$x_2 - x_1$
$= 6 - (-10)$
$= 16$

(c)

$(-6,8)$ to $(-6,-9)$

8

$\downarrow 17$

-9

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

12(a) $y = 4x - 2$ ① $(-3,3)$

① need $\perp$ slope

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

② Sub the point $(-3,3)$ into $y = m_\perp x + b$ to find equation of $\perp$ line

$y = -\frac{1}{4}x + b$
$3 = -\frac{1}{4}(-3) + b$
$3 = \frac{3}{4} + b$
$3 - \frac{3}{4} = b$
$\frac{12}{4} - \frac{3}{4} = b$
$\frac{9}{4} = b$

$\therefore \perp$ line is
$y = -\frac{1}{4}x + \frac{9}{4}$ ②

③ solve system of equations

$y = \cancel{4x-2}$ ①

$y = -\frac{1}{4}x + \frac{9}{4}$ ② $\times 4$
$4y = -x + 9$ ③

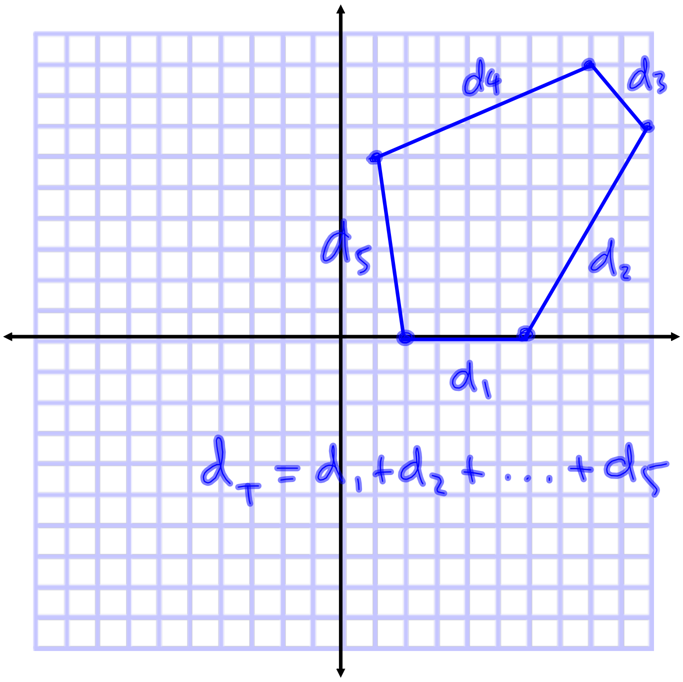
sub ① into ③
$4(4x-2) = -x + 9$
$16x - 8 = -x + 9$
$+x \; +8 \qquad +x \; +8$
$17x = 17$
$\boxed{x = 1}$

sub $x=1$ into ①
$y = 4(1) - 2$
$= 4 - 2$
$\boxed{y = 2}$

④ calculate distance between $(-3,3)$ and $(1,2)$

$d = \sqrt{(x_2-x_1)^2 + (y_2-y_1)^2}$
$= \sqrt{(1-(-3))^2 + (2-3)^2}$
$= \sqrt{(4)^2 + (-1)^2}$
$= \sqrt{16+1}$
$= \sqrt{17}$ exact answer.
$\doteq 4.1$ approximate

15.



$$d_T = d_1 + d_2 + \ldots + d_5$$