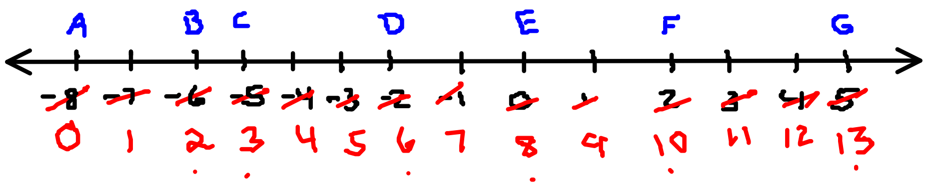
Lengths of Segments, Distance and Midpoint Formulas

Ruler Postulate - Two points on any line can be paired with real numbers so that, given any two points P and Q on the line, P corresponds to zero, and Q corresponds to a positive number.

1. Refer to the number line below to find each measure.



a) AE $\quad |8-0| = 8$ $\quad |0--8| = 8$ $\quad \boxed{AE = 8}$

b) BD $\quad |6-2| = 4$ $\quad \boxed{BD = 4}$

c) EC $\quad |8-3| = 5$ $\quad \boxed{EC = 5}$

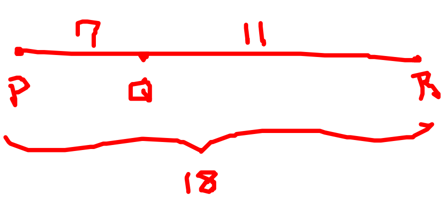
d) FD $\quad |10-6| = 4$ $\quad \boxed{FD = 4}$

e) GA $\quad |13-0| = 13$ $\quad \boxed{GA = 13}$

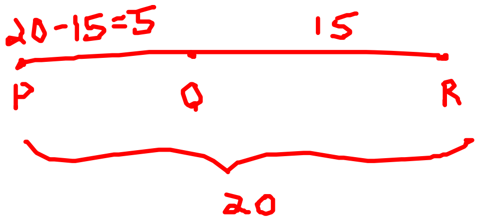
Segment Addition Postulate - If Q is between P and R then $PQ + QR = PR$.

2. If Q is between P and R, find each missing measure.

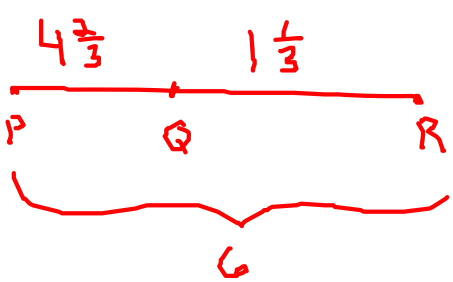
a) $PQ = 7$, $QR = 11$, $\boxed{PR = 18}$



b) $RQ = 15$, $PR = 20$, $\boxed{QP = 5}$



c) $PQ = 4\frac{2}{3}$, $QR = 1\frac{1}{3}$, $\boxed{RP = 6}$



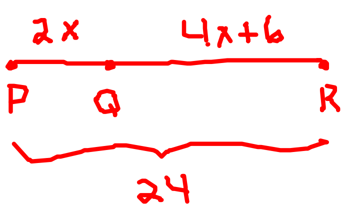
$4\frac{2}{3} + 1\frac{1}{3} = 5\frac{3}{3} = 6$

3. If Q is between P and R, find the value of x and the length of each segment.

a) $PQ = 2x = 6$

$QR = 4x + 6 = 18$

$PR = 24$



$PQ + QR = PR$

$2x + 4x + 6 = 24$

$6x + 6 = 24$

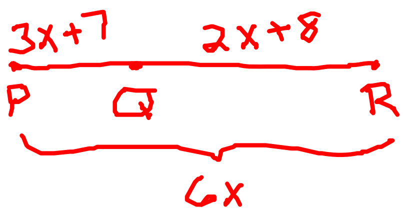
$-6 \quad -6$

$\frac{6x}{6} = \frac{18}{6}$

$\boxed{x = 3}$

$\boxed{\begin{array}{l} PQ = 6 \\ QR = 18 \\ PR = 24 \end{array}}$

b) $QP = 3x+7 = 52$
$RQ = 2x+8 = 38$
$RP = 6x = 90$



$PQ + QR = PR$

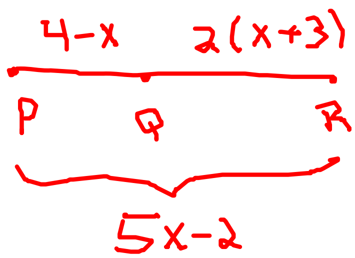
$3x+7+2x+8 = 6x$

$5x + 15 = 6x$

$-5x \qquad\qquad -5x$

$\boxed{x = 15}$

c) $PQ = 4-x = 1$
$RQ = 2(x+3) = 12$
$RP = 5x-2 = 13$



$PQ + QR = PR$

$4-x+2(x+3) = 5x-2$

$4-x+2x+6 = 5x-2$

$x+10 = 5x-2$

$-x \qquad\qquad -x$

$10 = 4x-2$

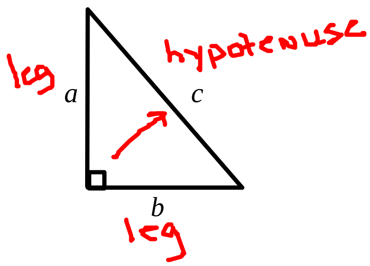
$+2 \qquad\qquad +2$

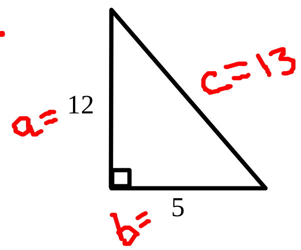
$12 = 4x$

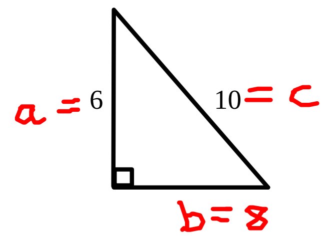
$\frac{12}{4} = \frac{4x}{4}$

$\boxed{x = 3}$

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







$$a^2 + b^2 = c^2$$
$$12^2 + 5^2 = c^2$$
$$144 + 25 = c^2$$
$$\sqrt{169} = \sqrt{c^2}$$
$$\boxed{c = 13}$$

$$a^2 + b^2 = c^2$$
$$6^2 + b^2 = 10^2$$
$$36 + b^2 = 100$$
$$-36 \qquad -36$$
$$\sqrt{b^2} = \sqrt{64}$$
$$\boxed{b = 8}$$

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

$x_1\ y_1 \quad x_2\ y_2$

$(0,1)$ and $(3,2)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d = \sqrt{(3-0)^2 + (2-1)^2}$$
$$d = \sqrt{(3)^2 + (1)^2}$$
$$d = \sqrt{9+1} = \sqrt{10} = \boxed{3.16}$$

$x_1\ y_1 \quad x_2\ y_2$

$(-4,6)$ and $(-3,-1)$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$
$$d = \sqrt{(-3+4)^2 + (-1-6)^2}$$
$$d = \sqrt{(1)^2 + (-7)^2}$$
$$d = \sqrt{1+49} = \sqrt{50} = \boxed{7.07}$$

4. Use the coordinate plane to find the measure of $\overline{AB}$. Round your answer to the nearest hundredth.

$x_1\ y_1 \qquad x_2\ y_2$

$A(5,4) \qquad B(-4,1)$

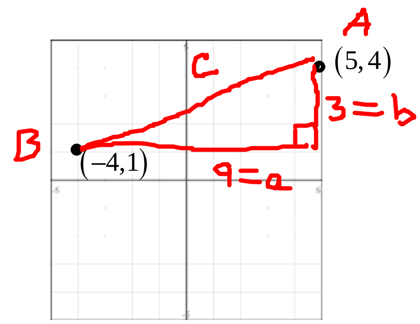
$d = \sqrt{(x_2-x_1)^2+(y_2-y_1)^2}$

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

$d = \sqrt{(-9)^2+(-3)^2}$

$d = \sqrt{81+9}$

$d = \sqrt{90} = \boxed{9.49}$



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

$9^2+3^2=c^2$

$81+9=c^2$

$\sqrt{90}=\sqrt{c^2}$

$\boxed{c = 9.49}$

Midpoint Formula $\quad (x_m, y_m) = \left(\dfrac{x_1+x_2}{2}, \dfrac{y_1+y_2}{2}\right)$

$x_1\ y_1 \qquad x_2\ y_2$

$(8,7)$ and $(-4,1)$

$\left(\dfrac{x_1+x_2}{2}, \dfrac{y_1+y_2}{2}\right)$

$\left(\dfrac{8+-4}{2}, \dfrac{7+1}{2}\right)$

$\left(\dfrac{4}{2}, \dfrac{8}{2}\right) = \boxed{(2,4)}$

$x_1\ y_1 \qquad x_2\ y_2$

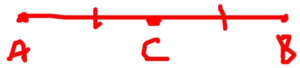
$(-4,6)$ and $(-3,-1)$

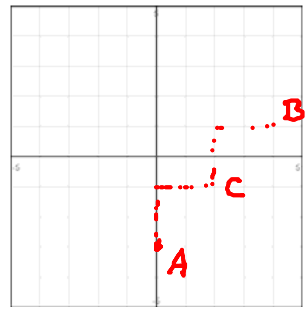
$\left(\dfrac{x_1+x_2}{2}, \dfrac{y_1+y_2}{2}\right)$

$\left(\dfrac{-4+-3}{2}, \dfrac{6+-1}{2}\right)$

$\left(\dfrac{-7}{2}, \dfrac{5}{2}\right) = \boxed{(-3.5, 2.5)}$

5. Find the coordinates of point A if $C(2,-1)$ is the midpoint of $\overline{AB}$ and the coordinates of B are $(4,1)$.

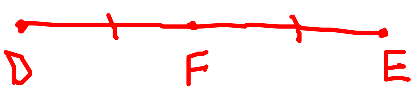




$\boxed{A(0,-3)}$

6. If F is the midpoint of $\overline{DE}$, $DF = 3x+4$ and $FE = 2x+12$, find the value of x and the measure of $\overline{DE}$.

$3x+4=28$ $2x+12=28$



$\boxed{DE = 28+28 = 56}$

$3x+4 = 2x+12$
$-2x \qquad -2x$

$x+4=12$
$-4 \quad -4$

$\boxed{x=8}$