

1.3 Distance and Midpoints

Objective: To find the distance 2 points on the number line and coordinate plane

To find the midpoint of a segment

Midpoint formula

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

Distance formula

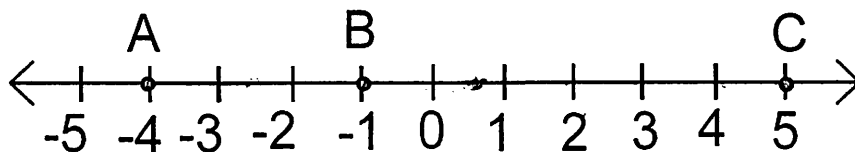
$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

Distance on a number line

$$|x_1 - x_2| \quad \text{or} \quad |x_2 - x_1|$$

- ① Find the lengths and midpoint of the following segments

Take the absolute value of the difference of the points (length). MP(add X's and divide by 2)



$$\begin{aligned} \text{Length} \\ \overline{AC} &= |-4 - 5| = |-9| \\ &= 9 \end{aligned}$$

$$\overline{AB} = |-4 - (-1)| = |-3| = 3$$

$$\overline{BC} = |-1 - 5| = |-6| = 6$$

$$\text{MP} \\ \frac{-4 + 5}{2} = \frac{1}{2}$$

$$\frac{-4 + (-1)}{2} = -\frac{5}{2} = -2\frac{1}{2}$$

$$\frac{-1 + 5}{2} = 2$$

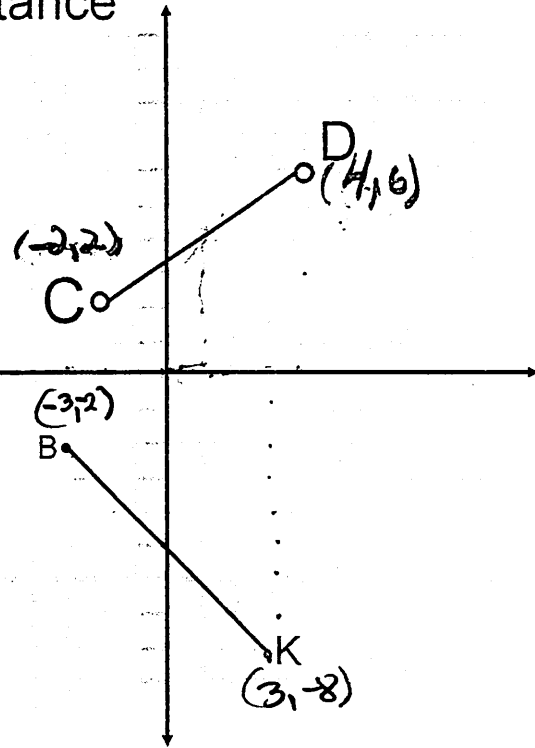
2 Find the midpoint and distance

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

CD midpoint $\left(\frac{-2+4}{2}, \frac{2+6}{2} \right) = (1, 4)$

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

CD Length $d = \sqrt{(4 - (-2))^2 + (6 - 2)^2}$
 $\sqrt{6^2 + 4^2}$
 $\sqrt{36 + 16}$
 $d = \sqrt{52}$



BC midpoint $\left(\frac{-3+3}{2}, \frac{-2+8}{2} \right) = (0, -5)$

DISTANCE $d = \sqrt{(3 - (-3))^2 + (-8 - 2)^2}$
 $\sqrt{6^2 + (-6)^2}$

$$\sqrt{36 + 36} = \sqrt{72} = 6\sqrt{2}$$

3

Find the coordinates of J if K(-1, 2) is the midpoint of JL and

L has coordinates (3, -5)

Solution: the sum of the X's/2 = -1

$$\frac{x_1 + 3}{2} = -1$$

$$x_1 + 3 = -2$$

$$x_1 = -5$$

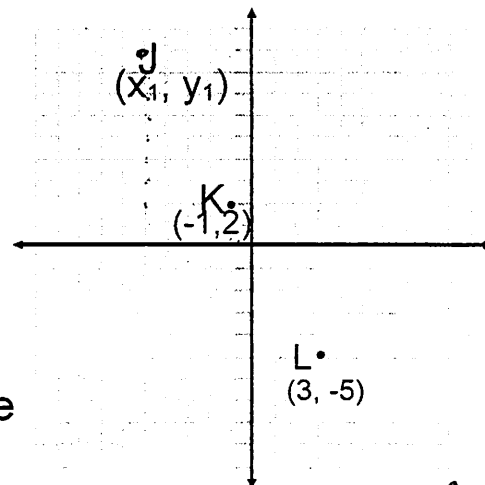
Solution: the sum of the y's/2 = 2

$$\frac{y_1 + (-5)}{2} = 2$$

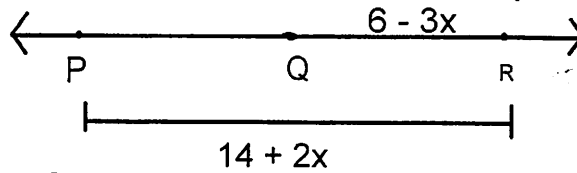
$$y_1 - 5 = 4$$

$$y_1 = 9$$

COORDINATES of J or (-5, 9)



4) Find the measure of \overline{PR} if Q is the midpoint of \overline{PR}



1. Find PQ in terms of x

$$PQ = 14 + 2x - (6 - 3x)$$

$$14 + 2x - 6 + 3x$$

$$5x + 8$$

2. Set expressions = to each other to find X

$$5x + 8 = 6 - 3x$$

$$8x = -2$$

$$x = -\frac{1}{4}$$

3. Substitute

$$\overline{PR} = 14 + 2(-\frac{1}{4})$$

$$= 14 - \frac{1}{2}$$

$$= 13\frac{1}{2}$$

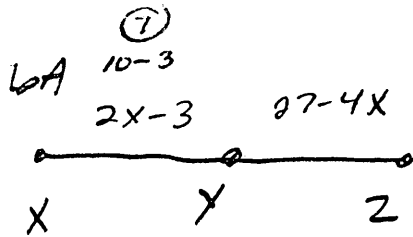
\overline{QR}

$$6 - 3(-\frac{1}{4})$$

$$6 - 3(-\frac{1}{4})$$

$$6 + \frac{3}{4} = 6\frac{3}{4}$$

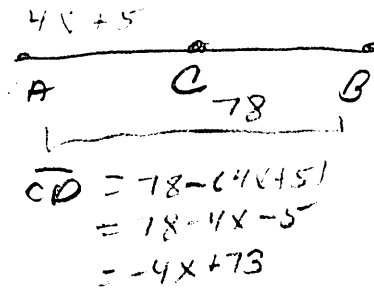
Try 6a and 6b pg:29



$$2x - 3 = 27 - 4x$$

$$6x = 30$$

$$x = 5$$



$$\overline{CB} = 78 - (4x + 5)$$

$$= 78 - 4x - 5$$

$$= -4x + 73$$

$$-4x + 73 = 4x + 5$$

$$-8x = -68$$

$$x = \frac{68}{8} = 8\frac{1}{2}$$

HW: pg: 31-33 #

15, 20, 33, 35, 39, 47, 49, 53, 55, 57, 64