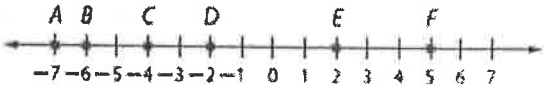
LESSON 1-3 Distance and Midpoints NOTES

Target: I will be able to find the distance between two points and find the midpoint of a segment.

KeyConcept Distance Formula (on Number Line)

Words	The distance between two points is the absolute value of the difference between their coordinates.
Symbols	If P has coordinate x_1 and Q has coordinate x_2, $PQ = \lvert x_2 - x_1 \rvert$ or $\lvert x_1 - x_2 \rvert$.

#'s 1,2,13-18: Use the number line to find each measure.



1. AC $= |-7 - -4| = |-7+4|$
$= |-3| = 3$

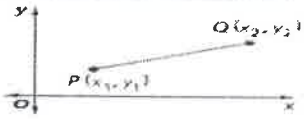
2. CF $= |-4-5| = |-9| = 9$

p.31: 14

KeyConcept Distance Formula (in Coordinate Plane)

If P has coordinates (x_1, y_1) and Q has coordinates (x_2, y_2), then

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



The order of the x- and y-coordinates in each set of parentheses is not important.

#'s 3-5,19-32: Find the distance between each pair of points.

3. E(-8,6), P(-5,10)
$x_1\ y_1 \quad x_2\ y_2$

$\sqrt{(-5 - -8)^2 + (10-6)^2}$

$\sqrt{(-5+8)^2 + (4)^2}$

$\sqrt{(3)^2 + 16}$

$\sqrt{9+16} = \sqrt{25} = 5$ units

4. J(4,3), K(-3,-7)

$\sqrt{(-3-4)^2 + (-7-3)^2}$

$\sqrt{(-7)^2 + (-10)^2}$

$\sqrt{49+100}$

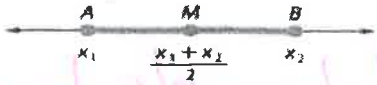
$\sqrt{149} \approx 12.2$

p.31: 30

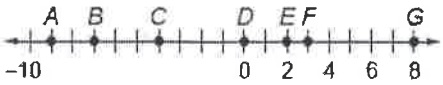
KeyConcept Midpoint Formula (on Number Line)

If $\overline{AB}$ has endpoints at x_1 and x_2 on a number line, then the midpoint M of $\overline{AB}$ has coordinate

$$\frac{x_1 + x_2}{2}.$$



#'s 7,8,33-38: Use the number line to find the coordinate of the midpoint of each segment.



5. $\overline{CE}$ $\quad \frac{-4+2}{2} = \frac{-2}{2} = -1$

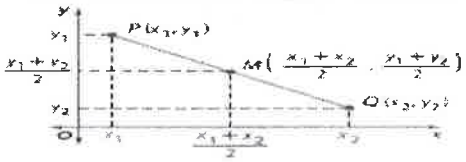
6. $\overline{AF}$ $\quad \frac{-9+3}{2} = \frac{-6}{2} = -3$

p.32: 34

KeyConcept Midpoint Formula (in Coordinate Plane)

If $\overline{PQ}$ has endpoints at $P(x_1, y_1)$ and $Q(x_2, y_2)$ in the coordinate plane, then the midpoint M of $\overline{PQ}$ has coordinates

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



When finding the midpoint of a segment, the order of the coordinates of the endpoints is not important.

#'s 9,10,39-46: Find the coordinates of the midpoint of a segment with the given endpoints.

7. A(5,12), B(-4,8)
$x_1 y_1 \; x_2 y_2$

$$\left(\frac{5+-4}{2}, \frac{12+8}{2}\right)$$

$$\left(\frac{1}{2}, \frac{20}{2}\right)$$

$$(0.5, 10)$$

p.32: 42

8. C(-8,-2), D(5,1)

$$\left(\frac{-8+5}{2}, \frac{-2+1}{2}\right)$$

$$\left(-\frac{3}{2}, \frac{-1}{2}\right)$$

$$(-1.5, -0.5)$$

#'s 11,47-52: Find the coordinates of the missing endpoint if P is the midpoint of $\overline{EG}$.

9. E(-8,6), P(-5,10)

x_1, y_1

$G(x_2, y_2)$

$$\left(\frac{x_1+x_2}{2}, \frac{y_1+y_2}{2}\right) = (-5, 10)$$

$$\left(\frac{-8+x_2}{2}, \frac{6+y_2}{2}\right) = (-5, 10)$$

$$\frac{-8+x_2}{2} = -5 \qquad \frac{6+y_2}{2} = 10$$

$$-8+x_2 = -10 \qquad 6+y_2 = 20$$

$$x_2 = -2 \qquad y_2 = 14$$

$$(-2, 14)$$

10. P(-1,3), G(5,6)

$$\left(\frac{5+x_2}{2}, \frac{6+y_2}{2}\right) = (-1, 3)$$

$$\frac{5+x_2}{2} = -1 \qquad \frac{6+y_2}{2} = 3$$

$$5+x_2 = -2 \qquad 6+y_2 = 6$$

$$x_2 = -7 \qquad y_2 = 0$$

$$(-7, 0)$$

p. 32:48

$$(-1, 0)$$

$$x^5 = -1 \qquad y^5 = 0$$

$$2 + x^5 = -5 \qquad 2 + y^5 = 2$$

$$\frac{5}{2 + x^5} = -1 \qquad \frac{5}{2 + y^5} = 3$$

$$\left(\frac{5}{2 + x^5}, \frac{5}{2 + y^5}\right) = (-1, 3)$$