
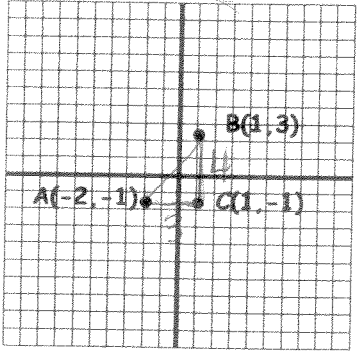


1-3 Distance and Midpoints

Name Master
Date _____ Block _____

Objectives: The student will be able to:

- *find the distance on the number line
- *find the distance in the coordinate plane

Distance on a Number Line	Distance in the Coordinate Plane
<p>★ The distance between 2 points is the <u>length</u> of the segment with those points as its <u>endpoints</u>.</p>  <p>$AB = b - a$ or $a - b$</p>	<p>Pythagorean Theorem: $a^2 + b^2 = c^2$</p> <p>Distance Formula: $d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$</p> <p>$AB = \sqrt{(1 - (-2))^2 + (3 - (-1))^2}$ $= \sqrt{3^2 + 4^2} = \sqrt{9 + 16} = \sqrt{25} = 5$</p> 

Example 1: Find AB.



$$AB = |(-4) - 2|$$

$$= |-6|$$

$$= 6$$

Try These:

Example 2: Find the distance between A(-2, -1) and B(1, 3).

Use Pythagorean Theorem:

or

Use Distance Formula:

$$(AB)^2 = (AC)^2 + (BC)^2$$

$$(AB)^2 = (3)^2 + (4)^2$$

$$(AB)^2 = 9 + 16$$

$$(AB)^2 = 25$$

$$AB = \sqrt{25} = 5$$

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

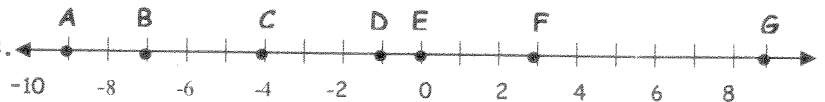
$$AB = \sqrt{(1 - (-2))^2 + (3 - (-1))^2}$$

$$AB = \sqrt{(3)^2 + (4)^2}$$

$$= \sqrt{25}$$

$$= 5$$

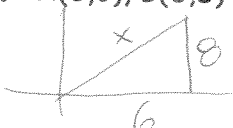
Use the number line to find each measure.



- BD = 6
- DG = 10
- AF = 12
- EF = 3
- BG = 16
- AG = 18
- BE = 7
- DE = 1

Use the Pythagorean Theorem to find the distance between each pair of points.

9. A(0,0), B(6,8)




$$6^2 + 8^2 = AB^2$$

$$100 = AB^2$$

$$10 = AB$$

10. R(-2,3), S(3,15)



$$5^2 + 12^2 = RS^2$$

$$169 = RS^2$$

$$13 = RS$$

Use the Distance Formula to find the distance between each pair of points.

11. A(0,0), B(15, 20)

$$\sqrt{15^2 + 20^2}$$

$$\sqrt{625} = 25$$

12. E(-2,10), F(-4, 3)

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

$$\sqrt{4 + 49} = \sqrt{53}$$

Objectives: The student will be able to:

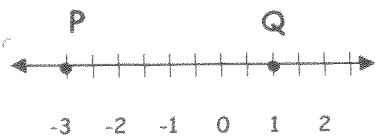
*find the midpoint of a segment on a number line.

*find the midpoint of a segment in a coordinate plane.

*use algebra to find measures of segments.

Midpoint on a number line	Midpoint on a coordinate plane
<p>★ The midpoint of a segment is the <u>point</u> that is <u>halfway</u> between the endpoints of the segment.</p> <p>★ Any segment, <u>line</u>, or <u>plane</u> that <u>intersects</u> a segment at its midpoint is called a segment <u>bisector</u>.</p> <p>★ If the coordinates of the endpoints of a segment are a and b, then the coordinate of the midpoint of the segment is:</p> $\frac{a + b}{2}$	<p>★ If a segment has endpoints with coordinates (x_1, y_1) and (x_2, y_2), then the coordinates of the midpoint of the segment are:</p> $M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$ <p>★ If M is the midpoint of \overline{PQ}, then $\overline{PM} \cong \overline{MQ}$ (See the figure in example 1)</p>

Example 1: Find the coordinate of the midpoint of segment \overline{PQ} .



The coordinates of P and Q are -3 and 1.

If M is the midpoint of \overline{PQ} , then the coordinate of M is -1.

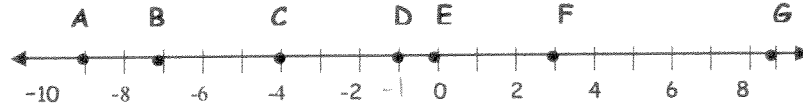
Example 2:

Find the coordinates of M if M is the midpoint of \overline{PQ} for $P(-2, 4)$ and $Q(4, 1)$.

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) = \left(\frac{-2 + 4}{2}, \frac{4 + 1}{2} \right) = \left(\frac{2}{2}, \frac{5}{2} \right) \text{ or } (1, 2.5)$$

Try these:

Use the number line to find the coordinate of the midpoint of each segment.



1. \overline{CE} -2

2. \overline{DG} 4

3. \overline{AF} -3

4. \overline{EG} 4.5

5. \overline{AB} -8

6. \overline{BG} 1

7. \overline{BD} -4

8. \overline{DE} $-\frac{1}{2}$

Find the coordinates of the midpoint of a segment having the given endpoints.

9. $A(0,0), B(12,8)$ (6,4)

10. $R(-12,8), S(6,12)$ (-3, 10)

Find the endpoint of the segment if the midpoint and one endpoint are given.

11. $M(11,-2), N(9,3)$ $?(x,y)$ (13, -7)

$$\frac{9+x}{2} = 11 \quad \frac{3+y}{2} = -2$$

$$9+x = 22 \quad 3+y = -4$$

$$x = 13 \quad y = -7$$

12. $M(-2,6), F(-9,3)$ $?(x,y)$ (5, -15)

$$\frac{-9+x}{2} = -2 \quad \frac{3+y}{2} = 6$$

$$-9+x = -4 \quad 3+y = 12$$

$$x = 5 \quad y = 9$$