

Midpoint of a Line Segment

Date: _____

- **Midpoint:** a point that divides a line segment into two EQUAL line segments.

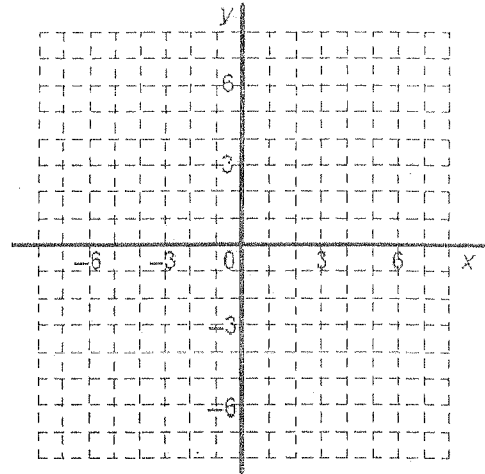
Investigation (modified from McGrawHill Ryerson Principles of Mathematics 10)• *Part I: Horizontal Line Segments*

1. Graph the following line segments.

Endpoints	Midpoints
A (-4, 2) and B (6, 2)	
C (-3, 0) and D (2, 0)	
E (5, -2) and F (-4, -2)	

2. What do they have in common?

3. Label each midpoint with its coordinate.
4. How are the coordinates of the midpoint of each line segment related to the coordinate of its endpoints?



For a _____ Line Segment, the midpoint of (x_1, y) and (x_2, y) is $(\text{_____}, y)$

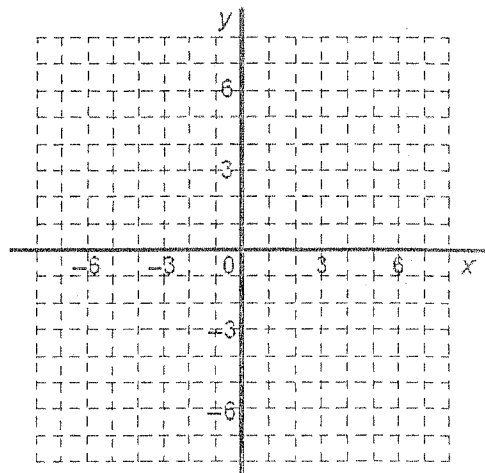
• *Part II: Vertical Line Segments*

5. Graph the following line segments.

Endpoints	Midpoints
G (-4, 2) and H(-4, -6)	
J (-3, 0) and K (-3, -2)	
L (5, -2) and N(5, 7)	

6. What do they have in common?

7. Label each midpoint with its coordinate.
8. How are the coordinates of the midpoint of each line segment related to the coordinate of its endpoints?



For a _____ Line Segment, the midpoint of (x, y_1) and (x, y_2) is $(x, \text{_____})$

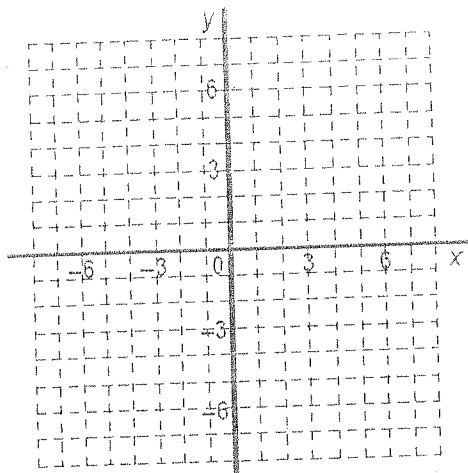
Midpoint of a Line Segment

Part III: Any Line Segments

9. Based on the pattern described, I predict the formula for midpoint for any line segment is

10. Graph the following line segments.

Endpoints	Midpoints
P(1, 1) and Q(7, 5)	
R(-5, -4) and S(-1, 0)	
T(-3, -4) and U(6, 1)	
V(-4, 6) and W(3, 4)	

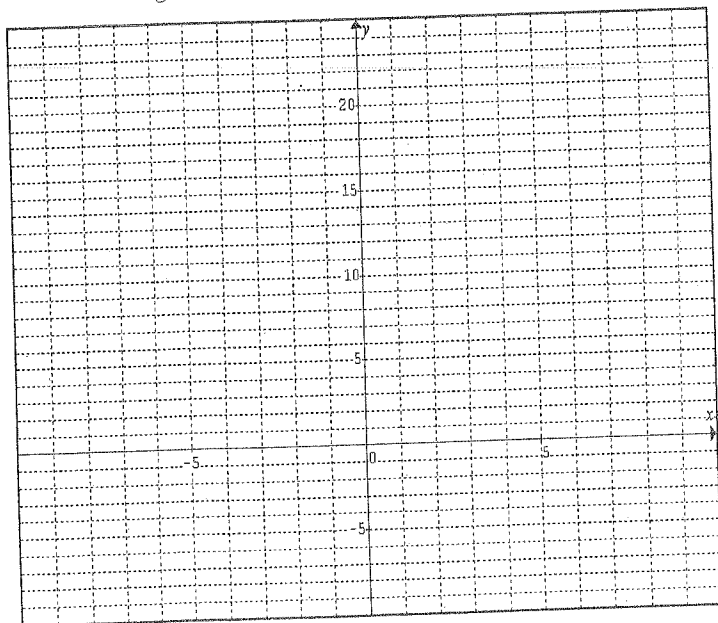


11. Label each midpoint with its coordinate by using a ruler.

12. How are the coordinates of the midpoint of each line segment related to the coordinate of its endpoints?

For a line segment with endpoints (x_1, y_1) and (x_2, y_2) , the midpoint (_____, _____)

Ex Find the end Point B of line segment AB with end point A(2, -5) and midpoint M(-1, 3)



HW: Pg 173 # 2, a, c, e, g, 5, 8, 12, 13

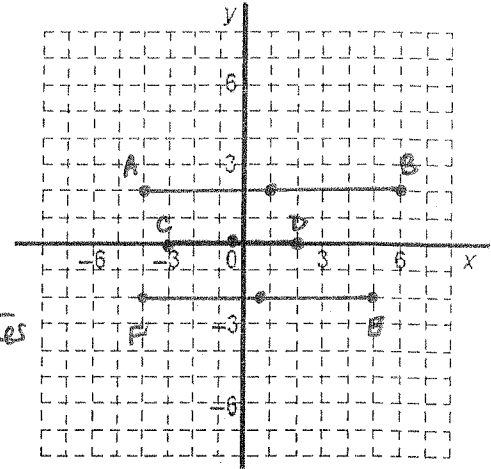
- Midpoint: a point that divides a line segment into two EQUAL line segments.
- Median: (in geometry) a line that joins a vertex of a triangle to the midpoint of the opposite side.

Investigation (modified from McGraw-Hill Ryerson Principles of Mathematics 10)

Part I: Horizontal Line Segments

1. Graph the following line segments.

Endpoints	Midpoints
A (-4, 2) and B (6, 2)	(1, 2)
C (-3, 0) and D (2, 0)	(-0.5, 0)
E (5, -2) and F (-4, -2)	(0.5, -2)



2. What do they have in common?

Horizontal lines so they had the same y-coordinates

3. Label each midpoint with its coordinate.

4. How are the coordinates of the midpoint of each line segment related to the coordinate of its endpoints?

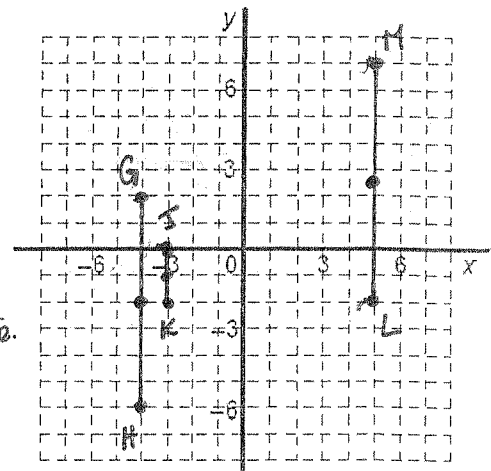
Add the x-coordinates then divide by 2. Y-coordinate stayed the same.

For a Horizontal Line Segment, the midpoint of (x_1, y) and (x_2, y) is $(\frac{x_1 + x_2}{2}, y)$

Part II: Vertical Line Segments

5. Graph the following line segments.

Endpoints	Midpoints
G (-4, 2) and H(-4, -6)	(-4, -2)
J (-3, 0) and K (-3, -2)	(-3, -1)
L (5, -2) and N(5, 7)	(5, 2.5)



6. What do they have in common?

Vertical lines so they had the same x-coordinate.

7. Label each midpoint with its coordinate.

8. How are the coordinates of the midpoint of each line segment related to the coordinate of its endpoints?

Add the y-coordinates and divide by 2. x-coordinate stays the same.

For a Vertical Line Segment, the midpoint of (x, y_1) and (x, y_2) is $(x, \frac{y_1 + y_2}{2})$

Midpoint of a Line Segment

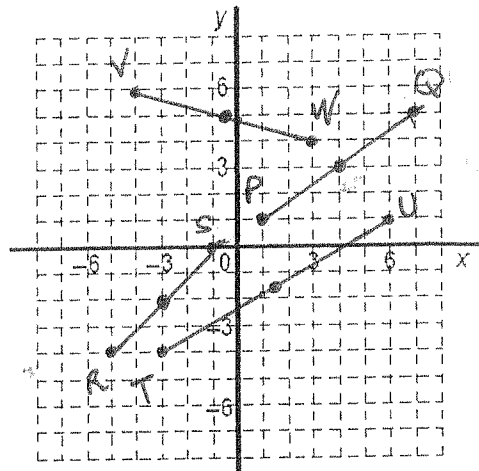
Part III: Any Line Segments

9. Based on the pattern described, I predict the formula for midpoint for any line segment is

$$\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}$$

10. Graph the following line segments.

Endpoints	Midpoints
P(1, 1) and Q(7, 5)	(4, 3)
R(-5, -4) and S(-1, 0)	(-3, -2)
T(-3, -4) and U(6, 1)	(1.5, -1.5)
V(-4, 6) and W(3, 4)	(-0.5, 5)



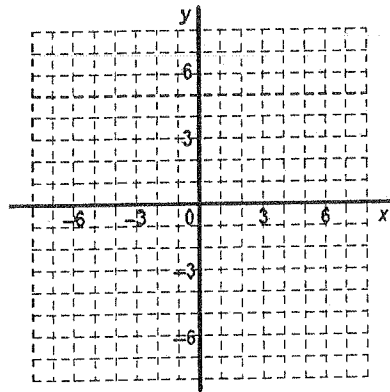
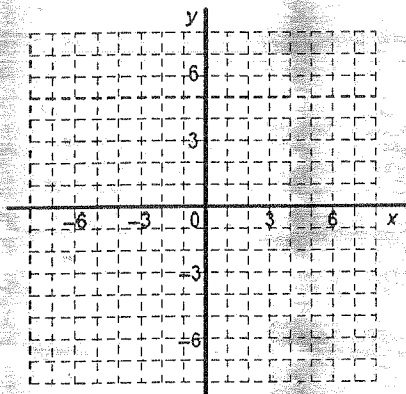
11. Label each midpoint with its coordinate by using a ruler.

12. How are the coordinates of the midpoint of each line segment related to the coordinate of its endpoints?

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

For a line segment with endpoints (x_1, y_1) and (x_2, y_2) , the midpoint is $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right)$

Ex1: Find the equation of the median line from vertex A in $\triangle ABC$, if the coordinates of the vertices are $A(-3, -1)$, $B(3, 5)$ and $C(7, -3)$. (Nelson Mathematics 10)



pg 173 # 2 acegh, 5, 8, 12, 13

Midpoint of a Line Segment

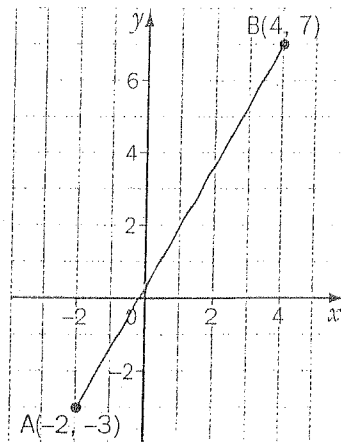
If A has coordinates (x_1, y_1) and B has coordinates (x_2, y_2) , then the coordinates of the midpoint, M, of the segment AB are

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

Example 1 Midpoint of a Line Segment

Determine the coordinates of the midpoint, M, of the line segment with endpoints $A(-2, -3)$ and $B(4, 7)$.

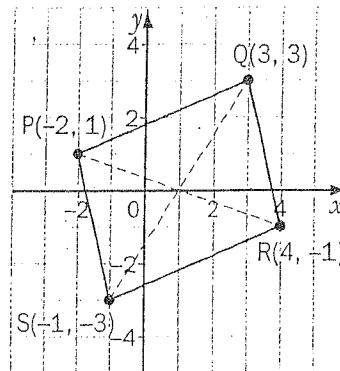
Solution



Example 2 Diagonals of a Parallelogram

Verify that the diagonals of the parallelogram with vertices $P(-2, 1)$, $Q(3, 3)$, $R(4, -1)$, and $S(-1, -3)$ bisect each other.

Solution



Do circled questions only

Name _____

2.3 – Midpoint of a Line Segment

MATHPOWER™ 10, Ontario Edition, pp. 75–80

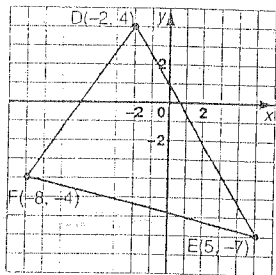
- To find the midpoint, M , of a line segment joining (x_1, y_1) and (x_2, y_2) , use the midpoint formula,

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

✗ Determine the midpoint of each line segment with the given endpoints.

- $(-6, 2)$ and $(4, 8)$
- $(1.5, 3)$ and $(-6, -2.5)$
- $(-200, -100)$ and $(350, 600)$
- $\left(\frac{7}{2}, \frac{1}{4}\right)$ and $\left(-\frac{5}{2}, \frac{3}{4}\right)$
- $(3a, 2b)$ and $(-3a, 5b)$
- $(-6a, 5b)$ and $(11a, 0)$

✗ Find the midpoints of the sides of $\triangle DEF$.



- 3** Communication One endpoint of a line segment is $D(5, -7)$. The midpoint of the line segment is $M(3.5, 1.5)$. Explain how to find the coordinates of the other endpoint, E , of the line segment.

Applications

- 4** The endpoints of the diameter of a circle are $(-3, 11)$ and $(2, 9)$. What are the coordinates of the centre of the circle?

- The endpoints of line segment MN are $M(-6, -10)$ and $N(2, -2)$. Find the coordinates of the point P on the line segment MN such that $MP:PN = 3:1$. Optional

- 6** A square has vertices $K(-4, 3)$, $L(3, 4)$, $M(4, -3)$, and $N(-3, -4)$.

a) Find the coordinates of the midpoint of each side.

b) Find the coordinates of the point of intersection of the diagonals.

c) Find the perimeter of the square formed by joining the midpoints of the sides of square $KLMN$.

- ✗ Vertex V of $\triangle UVW$ has coordinates $(4, 6)$. The coordinates of the midpoint of UV are $(1, 6)$, and the coordinates of the midpoint of VW are $(3, 2)$. Find the coordinates of points U and W .