

NOTICE • FIND • PRACTICE

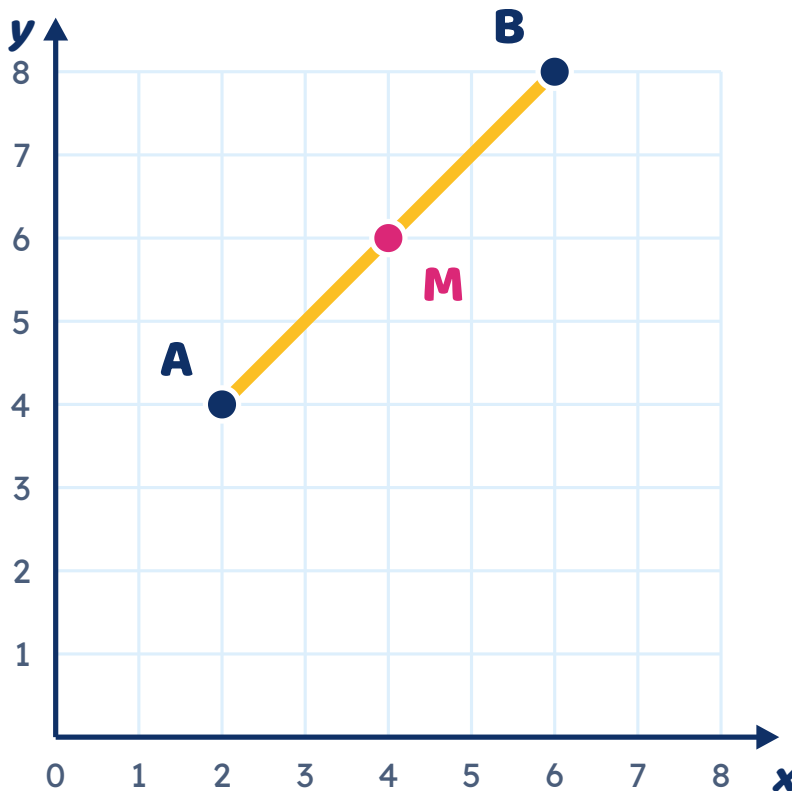
Midpoint Match

Explore three examples, then discover the rule for the point exactly halfway between two points.

You need: a pencil, and some practice plotting points like $(3, 5)$ on a grid.

1 Let's notice the pattern

In each graph, **M** is exactly halfway between **A** and **B**. Read the coordinates of **M** from the grid and write them in the blanks.



Example 1

A $(2, 4)$

B $(6, 8)$

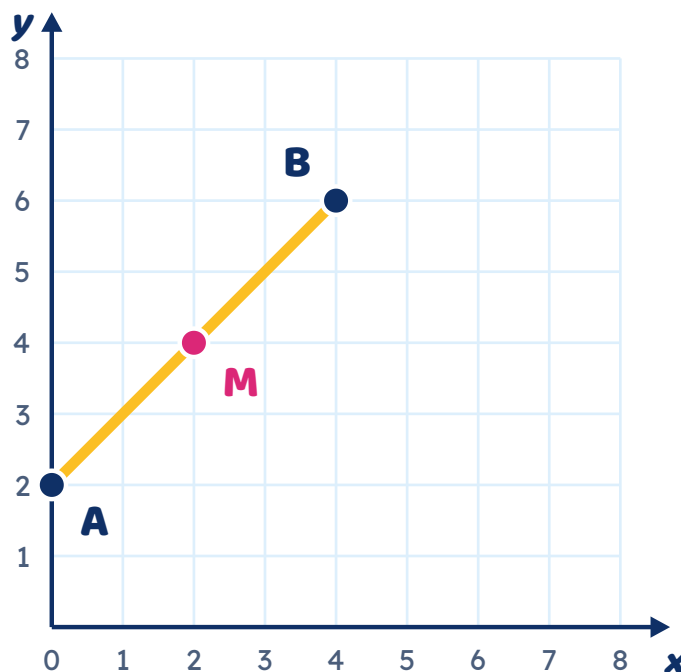
Read **M** from the graph:

M $(\underline{\quad}, \underline{\quad})$

Reading a point: start at 0, go **across** to the x-value first, then **up** to the y-value. So $(4, 6)$ means 4 across, 6 up.

STEP 1 CONTINUED

Example 2



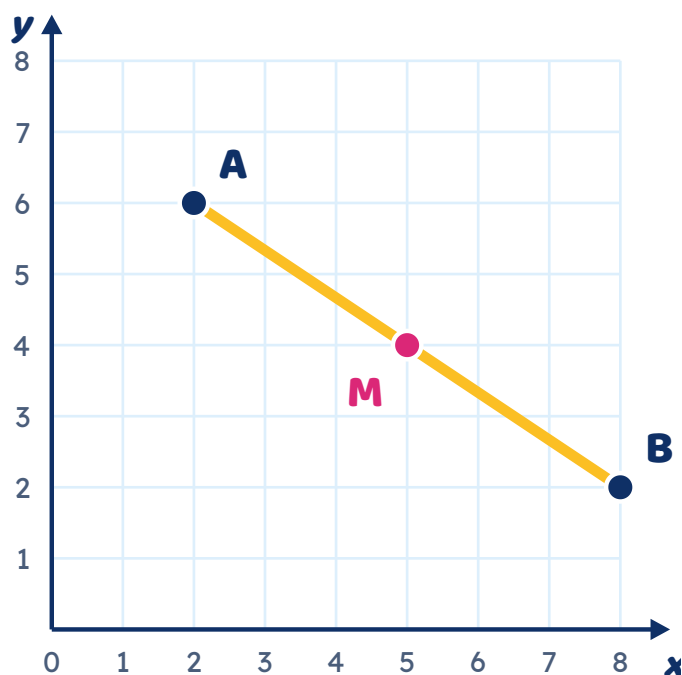
A (0, 2)

B (4, 6)

Read M from the graph:

M (,)

Example 3



A (2, 6)

B (8, 2)

Read M from the graph:

M (,)

SPOT THE RULE

2 Let's find the formula

Copy your answers for M into the table. Look across each row.

	x-coordinates			y-coordinates		
	A	B	M	A	B	M
Example 1	2	6		4	8	
Example 2	0	4		2	6	
Example 3	2	8		6	2	

Think: What calculation takes the two numbers from A and B to the number for M? Does the same calculation work in every row, for both x and y ?

Complete the rule: *Add the two x-coordinates and divide by _____. Do the same for the y-coordinates.*

Now write it for any two points $A(x_1, y_1)$ and $B(x_2, y_2)$:

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

Test your rule

Try it on Example 3, where A is (2, 6) and B is (8, 2):

$$\frac{2 + 8}{2} = \underline{\quad\quad} \quad \frac{6 + 2}{2} = \underline{\quad\quad}$$

Do you get the same M that you read from the graph?

YOUR TURN

3 Let's practise

Use your rule to find each midpoint. Fill in the boxes, then the blanks.

1 A familiar pair: (2, 4) and (6, 8)

$$\text{x: } \frac{\boxed{} + \boxed{}}{2} = \underline{} \quad \text{y: } \frac{\boxed{} + \boxed{}}{2} = \underline{}$$

Midpoint: (,)

2 With negative numbers: (−3, 1) and (5, −7)

$$\text{x: } \frac{\boxed{} + \boxed{}}{2} = \underline{} \quad \text{y: } \frac{\boxed{} + \boxed{}}{2} = \underline{}$$

Midpoint: (,)

3 A vertical segment: (1, 7) and (1, −3)

$$\text{x: } \frac{\boxed{} + \boxed{}}{2} = \underline{} \quad \text{y: } \frac{\boxed{} + \boxed{}}{2} = \underline{}$$

Midpoint: (,)

Tip: with negative numbers, put brackets around them: $1 + (-7) = -6$.

CHECK • DISCUSS • BUILD CONFIDENCE

Answers & parent guide

Use this page after your child has tried the lesson.

A little guidance before you begin

Let your child read M from all three graphs before looking for the rule. Ask: “How could you use the two x-coordinates to get the x-coordinate of M? Does that work for the y-coordinates too?” Invite them to test their idea on every example.

The pattern and the formula

Example 1: $M = (4, 6)$ · Example 2: $M = (2, 4)$ · Example 3: $M = (5, 4)$

Each coordinate of M is halfway between the matching coordinates of A and B, so add each pair and divide by 2. Every blank is 2:

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

Worked answers

1 $x = \frac{2 + 6}{2} = 4, \quad y = \frac{4 + 8}{2} = 6 \quad \Rightarrow \quad M = (4, 6)$

2 $x = \frac{-3 + 5}{2} = 1, \quad y = \frac{1 + (-7)}{2} = -3 \quad \Rightarrow \quad M = (1, -3)$

3 $x = \frac{1 + 1}{2} = 1, \quad y = \frac{7 + (-3)}{2} = 2 \quad \Rightarrow \quad M = (1, 2)$

One useful question to finish

“In question 3, why does the x-coordinate stay at 1?” Both endpoints have $x = 1$, so every point on that vertical segment does too, including the midpoint.

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