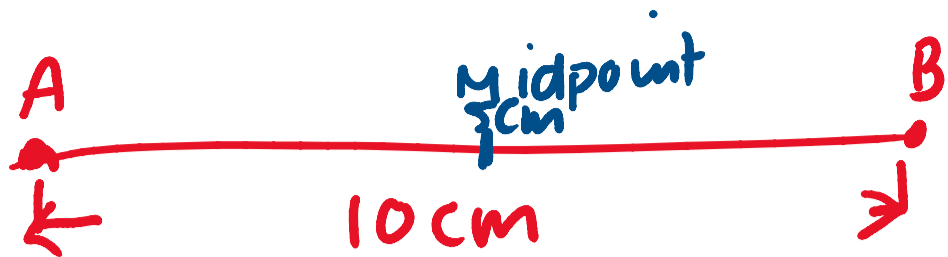


Midpoint

05 March 2019 13:59



Formula Log tables Pg 18

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

Eg 1) Find the midpoint of the line segment joining the points $(2, 4)$ and $(6, 2)$

$$\begin{aligned} \text{Midpoint} &= \left(\frac{2+6}{2}, \frac{4+2}{2} \right) \\ &= \left(\frac{8}{2}, \frac{6}{2} \right) = (4, 3) \end{aligned}$$

Method

- 1) Label points (x_1, y_1) (x_2, y_2)
- 2) Sub in to formula
- 3) Answer (x, y)

C1W

Pg 55

Q 1(ii) - (vi)



midpoint

PROJECT MATHS

Text & Tests

Leaving 3 Certificate

Key words

Cartesian plane origin axis quadrant vertex horizontal
vertical slope parallel perpendicular positive negative
linear equation area translation intersection collinear

Section 3.3 The midpoint of a line segment

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Notes

Section 3.3 The midpoint of a line segment

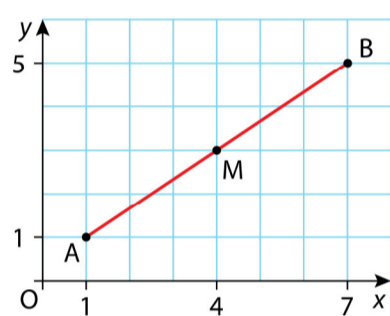
Here is a line segment [AB].

The coordinates of A are (1, 1).

The coordinates of B are (7, 5).

M is the **midpoint** of the line segment [AB].

The coordinates of M are (4, 3).

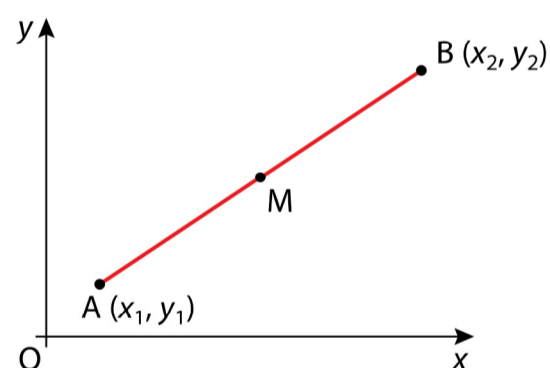


These coordinates are found as follows:

1. Add the x-coordinates of A and B and divide by 2, i.e. $\frac{1+7}{2} = 4$.
2. Add the y-coordinates of A and B and divide by 2, i.e. $\frac{1+5}{2} = 3$.

The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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



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Example 1

Find the midpoint of the line segment joining $A(-1, 3)$ and $B(5, 7)$.

The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

$$\begin{array}{cc} (-1, 3) & (5, 7) \\ \downarrow & \downarrow \\ (x_1, y_1) & (x_2, y_2) \end{array}$$

$$\begin{aligned} \text{Midpoint of } [AB] &= \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \\ &= \left(\frac{-1 + 5}{2}, \frac{3 + 7}{2} \right) \\ &= \left(\frac{4}{2}, \frac{10}{2} \right) = (2, 5). \end{aligned}$$

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Exercise 3.3

The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

1. Find the midpoint of the line segment joining these points:

- (i) $(2, 4)$ and $(6, 2)$ (ii) $(2, 4)$ and $(0, 2)$ (iii) $(2, -1)$ and $(4, 3)$
(iv) $(-2, 4)$ and $(4, -2)$ (v) $(2, -3)$ and $(0, -1)$ (vi) $(-3, 4)$ and $(-1, -4)$.

$$\text{ii) } \left(\frac{2+6}{2}, \frac{4+2}{2} \right) \\ = (1, 3)$$

$$\text{iii) } \left(\frac{2+4}{2}, \frac{-1+3}{2} \right) \\ = (3, 1)$$

$$\text{iv) } \left(\frac{-2+4}{2}, \frac{4-2}{2} \right) \\ = (1, 1)$$

$$\text{v) } \left(\frac{2+0}{2}, \frac{-3-1}{2} \right) \\ = (1, -2)$$

$$\text{vi) } \left(\frac{-3-1}{2}, \frac{-4+4}{2} \right) \\ = (-2, 0)$$

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Exercise 3.3

The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

2. Find the midpoint of the line segment joining $(-3, 4)$ and $(3, 7)$.
On which axis does the midpoint lie?

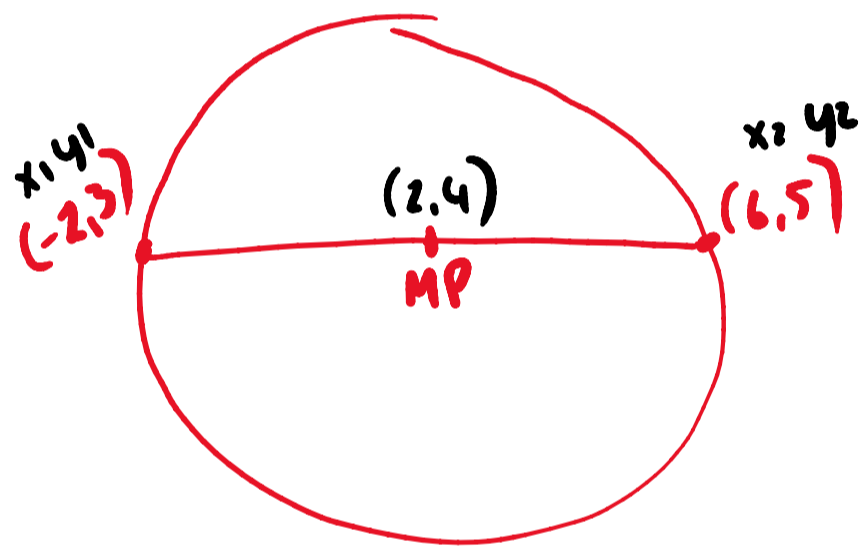
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Exercise 3.3

The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

3. The points $(-2, 3)$ and $(6, 5)$ are the end points of the diameter of a circle.
Find the coordinates of the centre of the circle.



$$\left(\frac{-2+6}{2}, \frac{3+5}{2} \right)$$
$$(2, 4)$$

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Exercise 3.3The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

4. $A(4, 3)$, $B(1, -3)$, $C(-2, -2)$ and $D(1, 4)$ are the vertices of a parallelogram.
Draw a sketch of this parallelogram.
Find the midpoint of $[AC]$.
Verify that the midpoint of $[AC]$ is also the midpoint of $[BD]$.

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Exercise 3.3The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

5. Find M , the midpoint of the line segment joining $A(-3, 4)$ and $B(1, -6)$.
Now show that $|AM| = |MB|$.

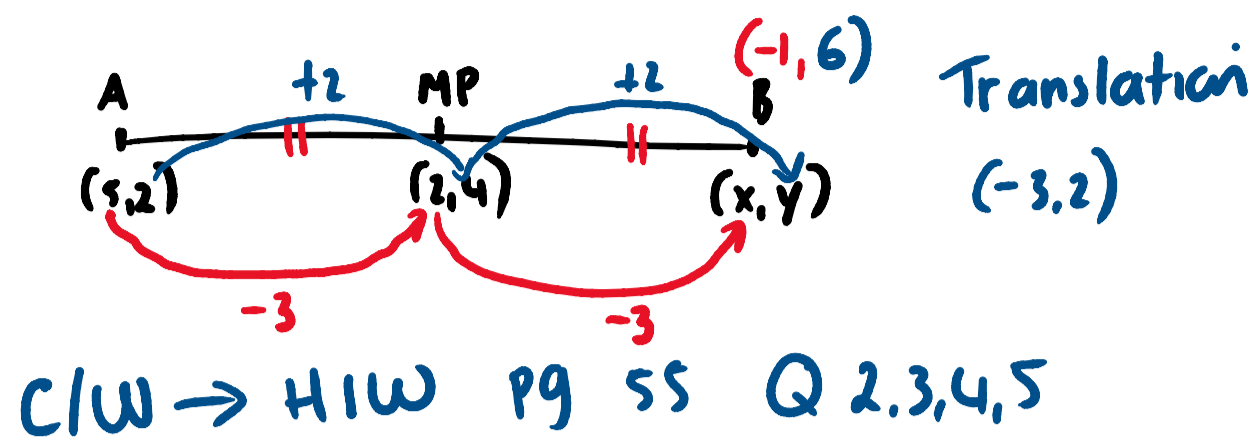
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Exercise 3.3

The midpoint of the line segment joining $A(x_1, y_1)$ and $B(x_2, y_2)$ is

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

6. $A(5, 2)$, and $B(x_1, y_1)$ are two points.
If $M(2, 4)$ is the midpoint of $[AB]$, find the coordinates of B .



Exercise 3.3 Answers

1. (i) $(4, 3)$ (ii) $(1, 3)$ (iii) $(3, 1)$
 (iv) $(1, 1)$ (v) $(1, -2)$ (vi) $(-2, 0)$
2. $(0, \frac{11}{2})$; y-axis
3. $(2, 4)$ 4. $(1, \frac{1}{2})$
5. $(-1, -1)$ 6. $(-1, 6)$