Midpoint of a line segment

Worked solutions

GCSE Maths topic practice

This topic online

1 A is the point (2, 4) and B is the point (8, 10).

Write down the coordinates of the midpoint of AB. (1 mark)

$$x = \frac{2+8}{2} = 5$$

$$y = \frac{4+10}{2} = 7$$

$$\boxed{(5, 7)}$$

2 P is the point (1, 6) and Q is the point (7, 2).

Write down the coordinates of the midpoint of PQ. (1 mark)

$$x = \frac{1+7}{2} = 4$$

$$y = \frac{6+2}{2} = 4$$

$$\boxed{(4, 4)}$$

3 C is the point (−4, 3) and D is the point (6, −5).

Work out the coordinates of the midpoint of CD. (2 marks)

Keep the minus signs when you add

$$x = \frac{-4+6}{2} = \frac{2}{2} = 1$$

$$y = \frac{3+(-5)}{2} = \frac{-2}{2} = -1$$

$$\boxed{(1, -1)}$$

4 E is the point (2, 5) and F is the point (7, 8).

Work out the coordinates of the midpoint of EF. (2 marks)

$$x = \frac{2+7}{2} = \frac{9}{2} = 4.5$$

$$y = \frac{5+8}{2} = \frac{13}{2} = 6.5$$

Halving an odd number gives .5, that is fine

$$\boxed{(4.5, 6.5)}$$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

5 G is the point (−3, −7) and H is the point (−8, 2).

Work out the coordinates of the midpoint of GH. (2 marks)

$$x = \frac{-3 + (-8)}{2} = \frac{-11}{2} = -5.5$$

$$y = \frac{-7 + 2}{2} = \frac{-5}{2} = -2.5$$

$$(-5.5, -2.5)$$

6 M is the midpoint of the line segment PQ.

P is the point (4, −2) and M is the point (−1, 3.5).

Find the coordinates of Q. (3 marks)

Let Q = (x, y). Average of x's is −1

$$\frac{4 + x}{2} = -1$$

$$4 + x = -2 \quad (\times 2)$$

$$x = -6 \quad (-4)$$

Average of y's is 3.5

$$\frac{-2 + y}{2} = 3.5$$

$$-2 + y = 7 \quad (\times 2)$$

$$y = 9 \quad (+2)$$

$$Q = (-6, 9)$$

7 ABCD is a rectangle drawn on a coordinate grid.

A is the point (1, 2) and C is the point (9, 8). A and C are opposite corners of the rectangle.

The diagonals of the rectangle cross at the centre of the rectangle.

Work out the coordinates of the centre of the rectangle. (2 marks)

Centre = midpoint of the diagonal AC

$$x = \frac{1 + 9}{2} = 5$$

$$y = \frac{2 + 8}{2} = 5$$

$$(5, 5)$$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

8 A circle is drawn on a coordinate grid.

The points (−3, 4) and (5, −2) are the two ends of a diameter of the circle.

Work out the coordinates of the centre of the circle. (2 marks)

Centre = midpoint of the diameter

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

$$y = \frac{4 + (-2)}{2} = \frac{2}{2} = 1$$

$$\boxed{(1, 1)}$$

9 Amara and Ben are in a park. A map of the park uses a coordinate grid where 1 unit represents 1 km.

Amara is at the point (−5, 3) and Ben is at the point (2, −4). They walk in straight lines towards each other and meet at the point exactly halfway between them.

a. Work out the coordinates of the point where they meet.

b. Work out the distance Amara walks, in km. Give your answer correct to 2 decimal places. (4 marks)

a) Halfway = midpoint

$$x = \frac{-5 + 2}{2} = \frac{-3}{2} = -1.5$$

$$y = \frac{3 + (-4)}{2} = \frac{-1}{2} = -0.5$$

$$\boxed{(-1.5, -0.5)}$$

b) Pythagoras for the whole distance

across $= 2 - (-5) = 7$

up $= 3 - (-4) = 7$

$d = \sqrt{(7^2 + 7^2)} = \sqrt{98} = 9.899...$

Amara walks half of it

$9.899... \div 2 = 4.949...$

$$\boxed{4.95 \text{ km}}$$

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.

10 M is the midpoint of the line segment AB.

A is the point (−4, 6) and M is the point (1, 2).

a. Find the coordinates of B.

b. Find the length of AB. Give your answer correct to 1 decimal place.

(4 marks)

a) A to M: 5 across, 4 down, so M to B is the same

$x = 1 + 5 = 6$

$y = 2 - 4 = -2$

$B = (6, -2)$

b) Pythagoras from A to B

across $= 6 - (-4) = 10$

down $= 6 - (-2) = 8$

$AB = \sqrt{(10^2 + 8^2)}$

$= \sqrt{164}$

$= 12.806...$

12.8

Free for classroom and home use: print, photocopy and share. Not for resale or re-hosting.