

GCSE MATHS

Coordinates and column vectors

Worked Solutions

Q1

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$$P = (-3, 2)$$

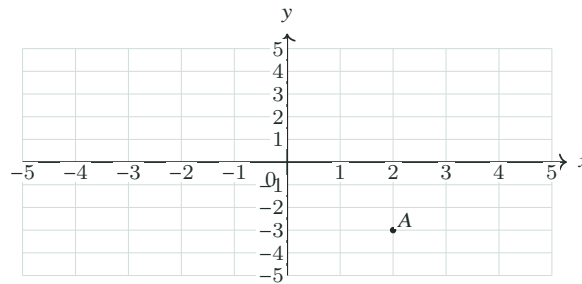
Read x first, then y .

Q2

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$$A = (2, -3)$$

Move right two, then down three.



Q3

★★

$$M = ((-6 + 2)/2, (4 - 2)/2) = (-2, 1)$$

Average corresponding coordinates.

Q4

★★

$$B = (2 \times 4 - 1, 2 \times 3 - 7) = (7, -1)$$

Double the midpoint and subtract A.

Q5

★★

$$AB = 5 - (-3) = 8$$

The segment is horizontal.

Q6

★★

$$AB = 6$$

Subtract coordinates along each side.

$$BC = 4$$

$$A = 6 \times 4 = 24$$

Multiply length by width.

Q7

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$$\begin{pmatrix} 5 - (1) \\ -1 - (2) \end{pmatrix} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}$$

Subtract the starting coordinate from the finishing coordinate.

Q8

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$$\begin{pmatrix} 2 - (-3) \\ -2 - (4) \end{pmatrix} = \begin{pmatrix} 5 \\ -6 \end{pmatrix}$$

Subtract the starting coordinate from the finishing coordinate.

Q9

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$$\begin{pmatrix} 2 - (6) \\ 5 - (1) \end{pmatrix} = \begin{pmatrix} -4 \\ 4 \end{pmatrix}$$

Subtract the starting coordinate from the finishing coordinate.

Q10

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$$B = (3 - 5, -2 + 7) = (-2, 5)$$

Add the displacement to the start.

Q11

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$$A = (6 - 4, 1 - (-3)) = (2, 4)$$

Subtract the displacement from the destination.

Q12

$$t = \begin{pmatrix} 6 \\ -6 \end{pmatrix}$$

Find the displacement of the given point.

$$(3 + 6, 2 - 6) = (9, -4)$$

Apply it to the second point.

Q13

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$$\begin{pmatrix} 2 + (-3) \\ 5 + 1 \end{pmatrix} = \begin{pmatrix} -1 \\ 6 \end{pmatrix}$$

Add the corresponding components.

Q14

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$$\begin{pmatrix} 4 - 1 \\ -2 - 3 \end{pmatrix} = \begin{pmatrix} 3 \\ -5 \end{pmatrix}$$

Subtract the corresponding components.

Q15

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$$3a = \begin{pmatrix} 3(-2) \\ 3(3) \end{pmatrix} = \begin{pmatrix} -6 \\ 9 \end{pmatrix}$$

Multiply both components by three.

Q16

$$\begin{pmatrix} 2(1) + (-3)(3) \\ 2(-4) + (-3)(2) \end{pmatrix} = \begin{pmatrix} -7 \\ -14 \end{pmatrix}$$

Multiply components, then add.

Q17

$$\begin{pmatrix} -1(5) + (2)(-1) \\ -1(1) + (2)(2) \end{pmatrix} = \begin{pmatrix} -7 \\ 3 \end{pmatrix}$$

Multiply components, then add.

Q18

$$\begin{pmatrix} 3(2) + (1)(-4) \\ 3(-3) + (1)(6) \end{pmatrix} = \begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

Multiply components, then add.

Q19

$$2k = 6 \Rightarrow k = 3$$

Compare horizontal components.

$$-3(3) = -9$$

Check the vertical component.

Q20

$$4/6 = 2/3$$

Find the horizontal scale factor.

$$t = 9(2/3) = 6$$

Apply it vertically.

Q21

$$\overrightarrow{AB} = \begin{pmatrix} 6 \\ 3 \end{pmatrix}$$

Subtract A from B.

$$P = (1 + 6/3, 2 + 3/3) = (3, 3)$$

Add one third of the displacement.

Q22

$$\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

$$D = (-1 + 2, 2 + 4) = (1, 6)$$

Opposite sides have equal vectors.

Add BC to A .

Q23

$$\overrightarrow{AB} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$$

$$\overrightarrow{BC} = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$$

$$\overrightarrow{BC} = \frac{3}{2}\overrightarrow{AB}$$

Find both displacement vectors.

Parallel segments sharing B lie on one line.

Q24

$$2p - q = 1$$

$$p + 3q = 11$$

$$q = 2p - 1$$

$$p + 3(2p - 1) = 11 \Rightarrow p = 2$$

$$q = 3$$

Compare components.

Rearrange the first equation.

Substitute and solve.

Return to the first equation.