

8300

GCSE MATHEMATICS

Foundation and Higher tier – Questions by Topic

Geometry

Understanding column vectors

v1.0

Name _____

Materials

For this paper you must have:

- Mathematical instruments

Information

- The marks for questions are shown in brackets

Advice

- In all calculations, show clearly how you work out your answer

For questions 1 to 7 you must **NOT** use a calculator.



Q1.

The vector $\begin{pmatrix} -3 \\ 7 \end{pmatrix}$ translates A to B.
Write down the vector that translates B to A.

(Total 1 mark)

Q2.

The vector $\begin{pmatrix} -2 \\ 3 \end{pmatrix}$ translates A to B.
Circle the vector that translates B to A.

$$\begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

$$\begin{pmatrix} 2 \\ -3 \end{pmatrix}$$

(Total 1 mark)

Q3.

Circle the vector that translates the point $(-2, 7)$ to the point $(3, -1)$

$$\begin{pmatrix} 5 \\ -6 \end{pmatrix}$$

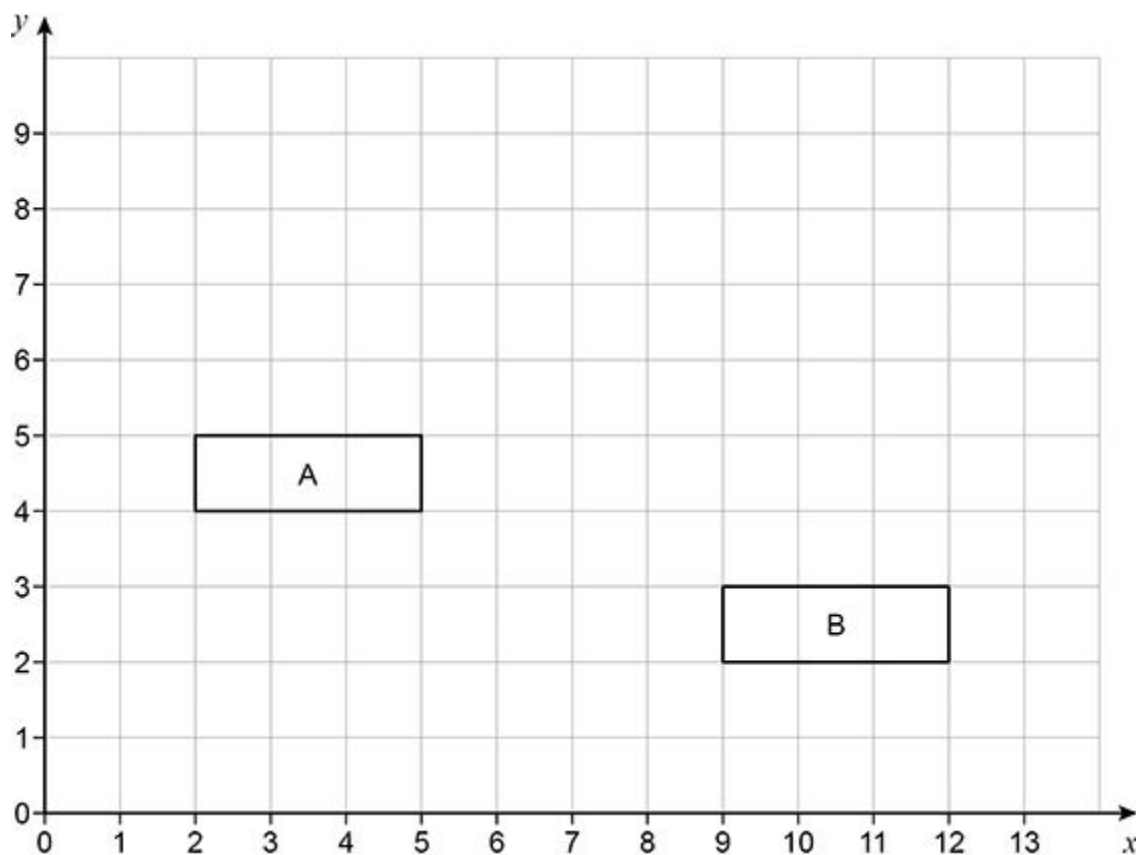
$$\begin{pmatrix} 5 \\ -8 \end{pmatrix}$$

$$\begin{pmatrix} -5 \\ 8 \end{pmatrix}$$

$$\begin{pmatrix} -5 \\ 6 \end{pmatrix}$$

(Total 1 mark)

Q4.



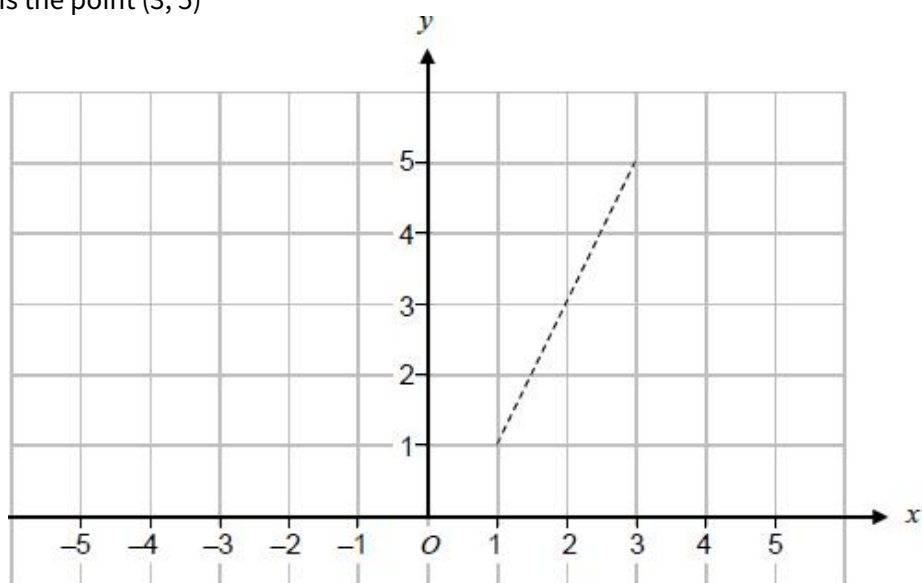
Work out the vector that translates shape A to shape B.

Answer $\begin{pmatrix} \\ \end{pmatrix}$

(Total 2 marks)

Q5.

- (a) AC is a diagonal of kite $ABCD$.
 A is the point $(1, 1)$
 C is the point $(3, 5)$



The diagonals of the kite intersect at M , the midpoint of AC .

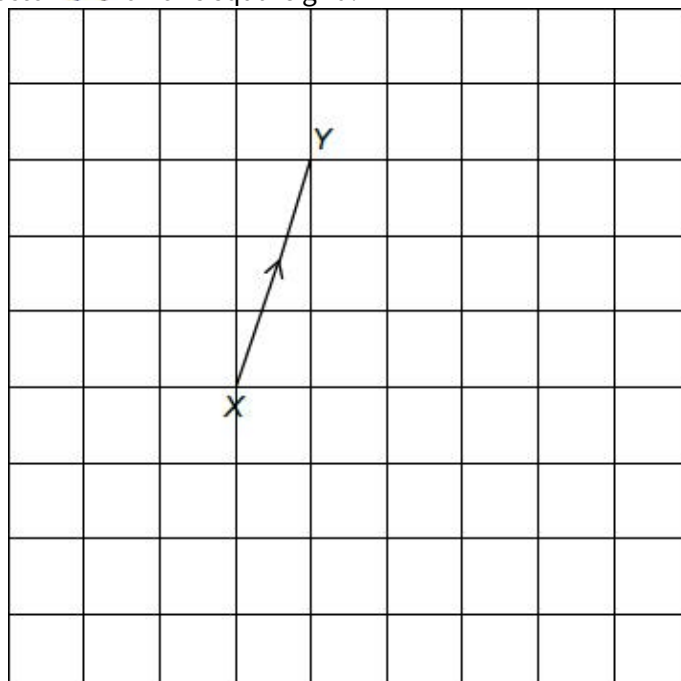
$$AM = BM$$

$$BM : MD = 1 : 2$$

Work out possible coordinates of B and D .

(2)

- (b) $\vec{XY}$ is the vector $\begin{pmatrix} 1 \\ 3 \end{pmatrix}$ on this square grid.



Write down a vector that is

the same size as $\vec{XY}$

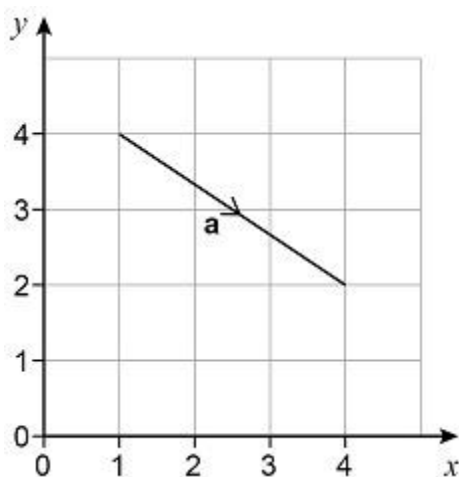
and perpendicular to $\vec{XY}$

(2)

(Total 4 marks)

Q6.

Here is vector **a**.



Circle the column vector that represents **a**.

$$\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} 3 \\ -2 \end{pmatrix}$$

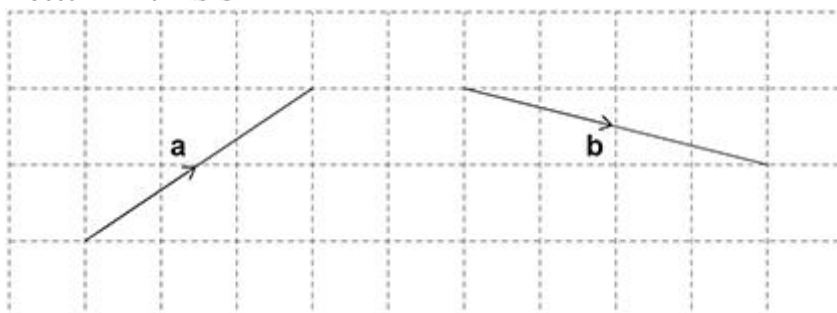
$$\begin{pmatrix} -3 \\ -2 \end{pmatrix}$$

(Total 1 mark)

Q7.

The diagram shows the vectors **a** and **b**.

As a column vector $\mathbf{a} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$



(a) What is **b** as a column vector?

$$\begin{pmatrix} \\ \end{pmatrix}$$

Answer

(2)

(b) Work out $4\mathbf{a}$ as a column vector.

$$\begin{pmatrix} \\ \end{pmatrix}$$

Answer

(1)

(c) $\mathbf{a} + \mathbf{c} = \begin{pmatrix} 3 \\ 0 \end{pmatrix}$

Work out **c** as a column vector.

Circle your answer.

$$\begin{pmatrix} 2 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ 2 \end{pmatrix}$$

$$\begin{pmatrix} -2 \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} 0 \\ -2 \end{pmatrix}$$

(1)

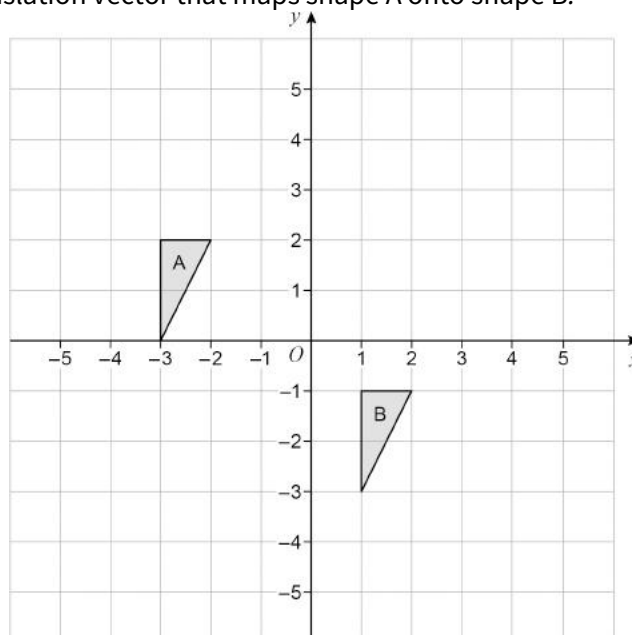
(Total 4 marks)

For the rest of the questions, you may use a calculator.



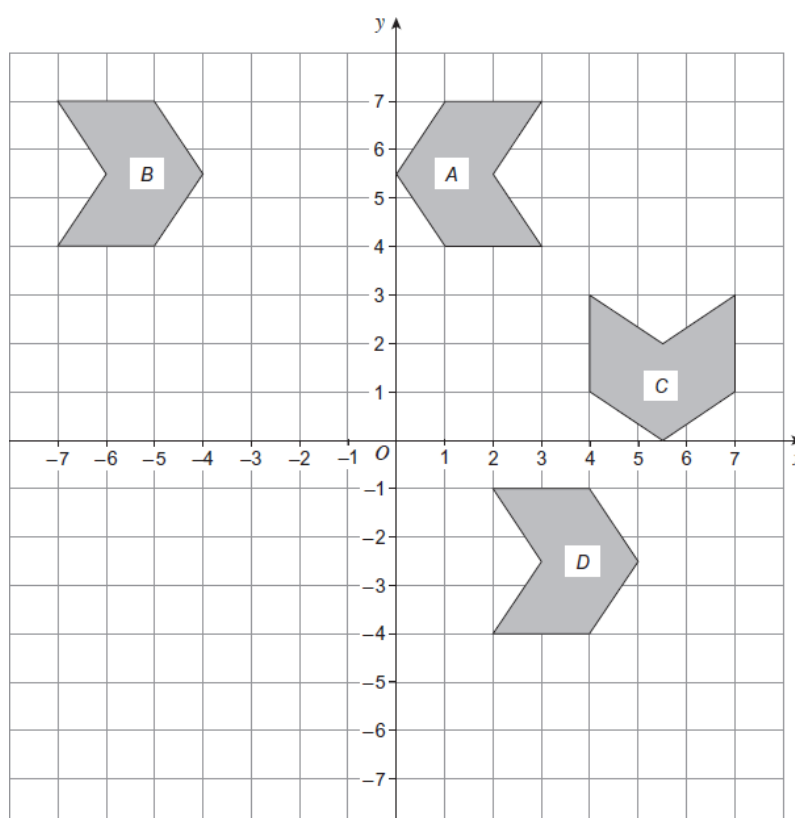
Q8.

Write down the translation vector that maps shape A onto shape B.



(Total 2 marks)

Q9.



- On the grid draw the mirror line that reflects shape A to shape B.
- On the grid draw the mirror line that reflects shape A to shape C.
- Describe fully the single transformation that takes shape B to shape D.

(1)

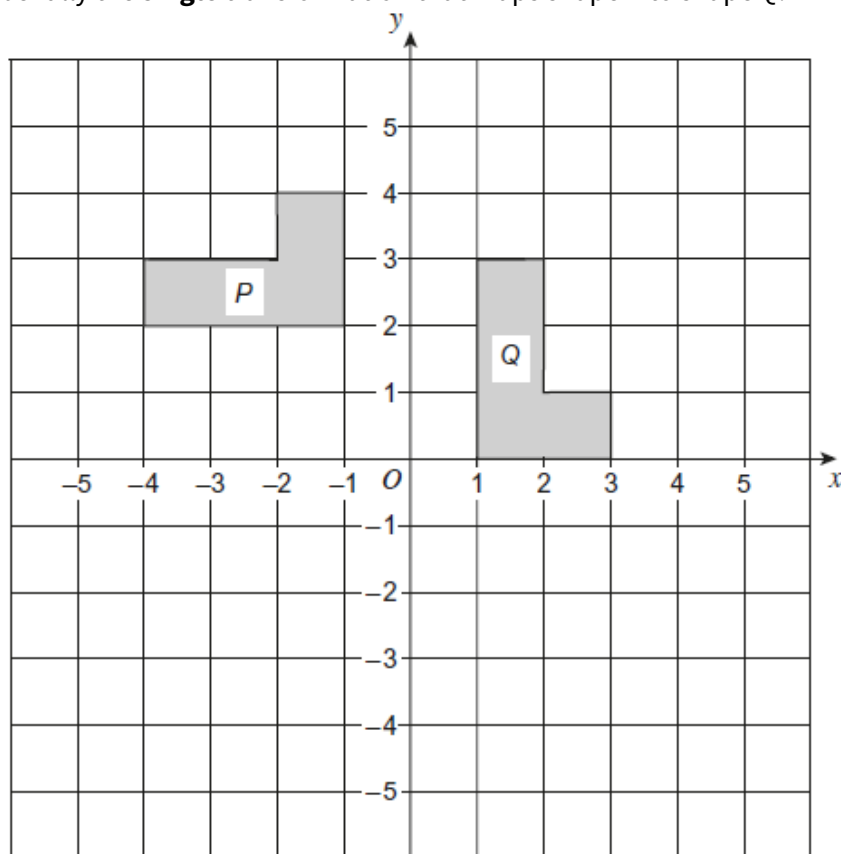
(1)

(2)

(Total 4 marks)

Q10.

- (a) Describe fully the **single** transformation that maps shape *P* to shape *Q*.



(3)

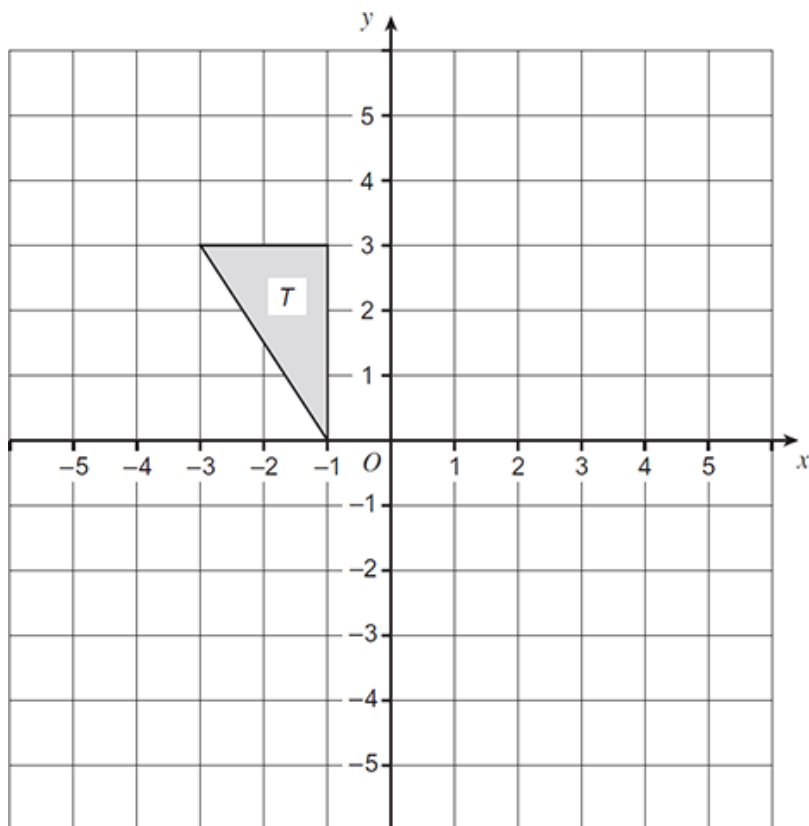
- (b) On the grid, translate shape *Q* by vector $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$

(2)

(Total 5 marks)

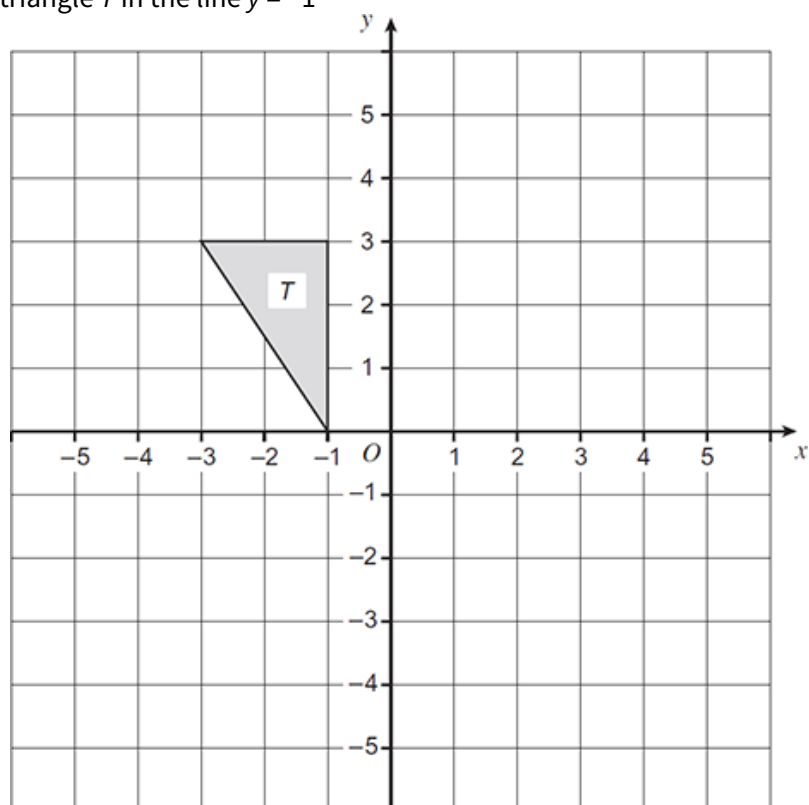
Q11.

- (a) Translate triangle T by the vector $\begin{pmatrix} 4 \\ -5 \end{pmatrix}$



(2)

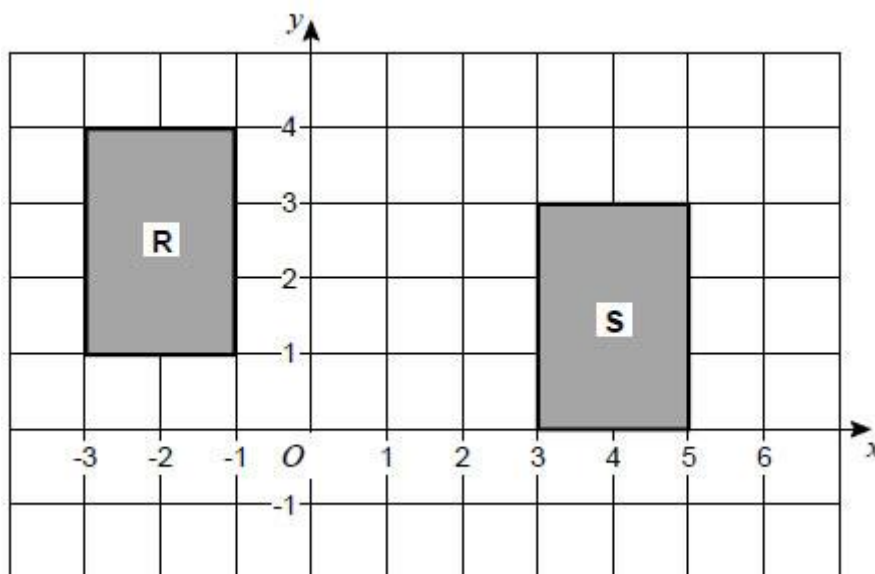
- (b) Reflect triangle T in the line $y = -1$



(2)

(Total 4 marks)

Q12.



Circle the vector that translates shape **R** to shape **S**.

$$\begin{pmatrix} 1 \\ -6 \end{pmatrix} \quad \begin{pmatrix} 6 \\ -1 \end{pmatrix} \quad \begin{pmatrix} -1 \\ 6 \end{pmatrix} \quad \begin{pmatrix} -6 \\ 1 \end{pmatrix}$$

(Total 1 mark)

Q13.

A shape is translated by the vector $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$
In which direction does the shape move?
Circle your answer.

up

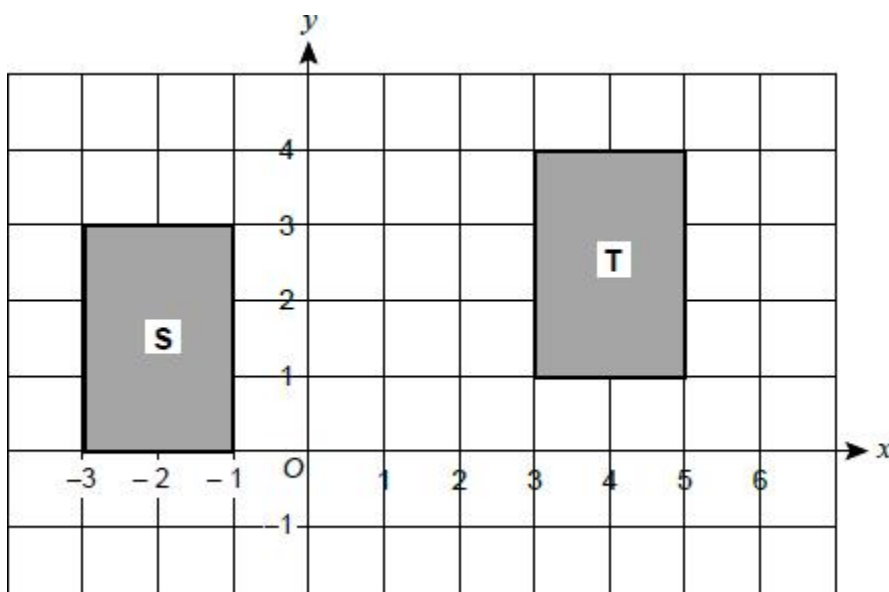
down

left

right

(Total 1 mark)

Q14.

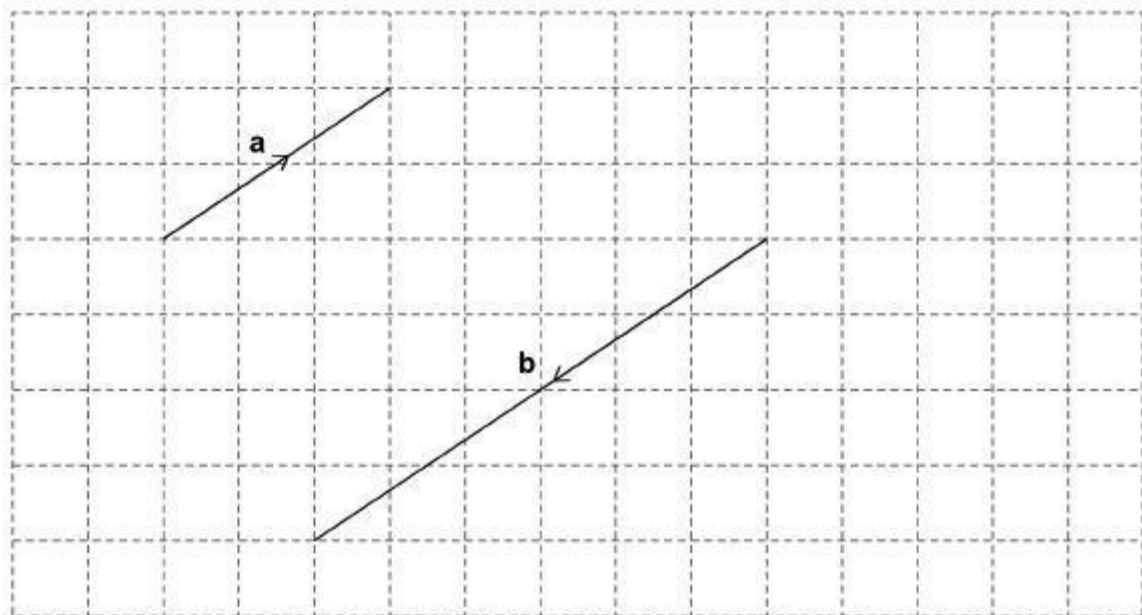


Work out the vector that translates shape **S** to shape **T**

(Total 1 mark)

Q15.

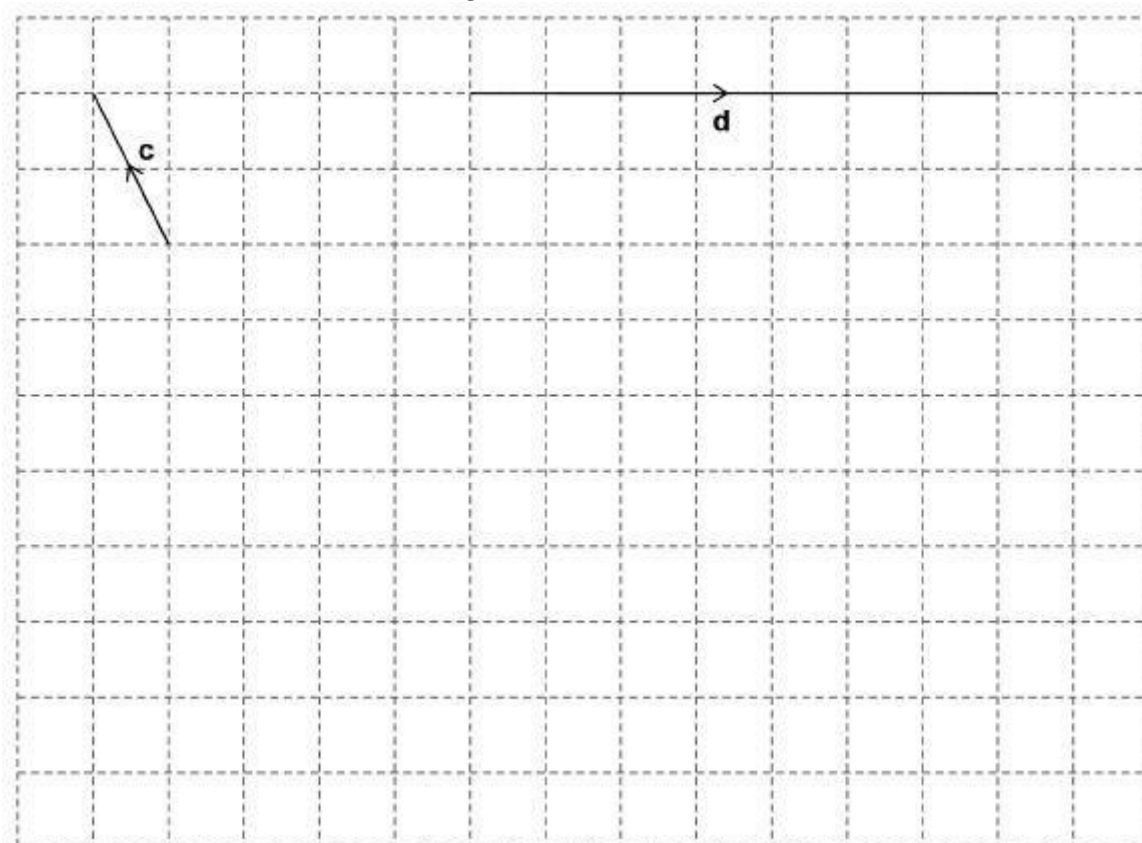
- (a) Vectors **a** and **b** are drawn on a grid.



Write **b** in terms of **a**.

(1)

- (b) Vectors **c** and **d** are drawn on a grid.



On the grid above, draw a vector representing **c - d**

(2)

(Total 3 marks)