

# Transformations and Vectors

ANSWERS

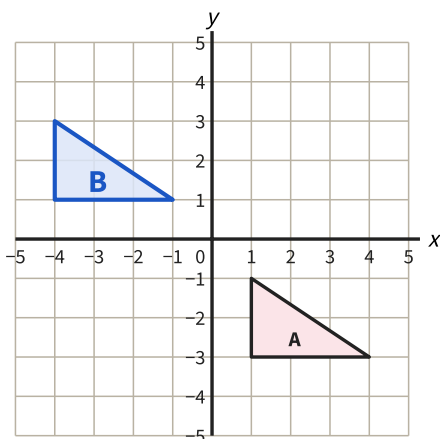
Ruler and tracing paper | 30 minutes | Total marks: 40

Name .....

Class .....

1

(a)



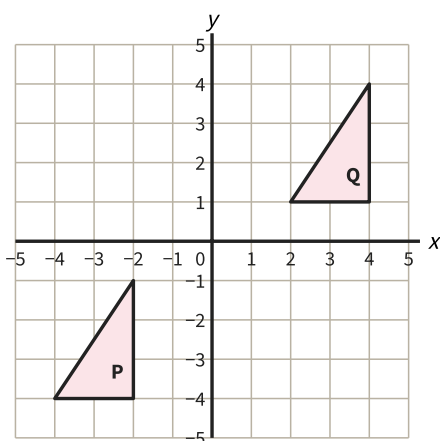
Translate triangle A by the vector  $\begin{pmatrix} -5 \\ 4 \end{pmatrix}$

Label the new triangle B.

[2 marks]

5 left (1) 4 up (1)

(b)



Describe fully the single transformation that maps triangle P onto triangle Q.

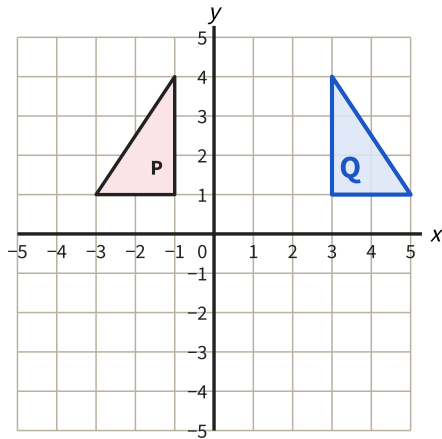
Translation (1)

by the vector  $\begin{pmatrix} 6 \\ 5 \end{pmatrix}$  (1)

[2 marks]

2

(a)

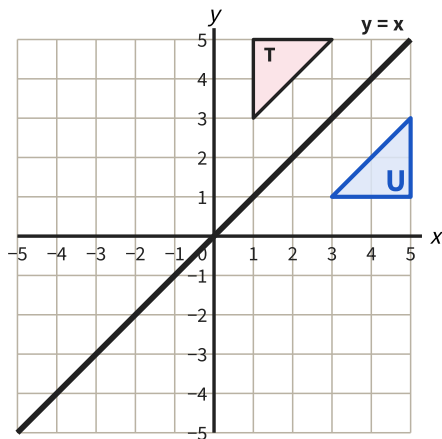


Reflect triangle P in the line  $x = 1$ .  
Label the new triangle Q.

[2 marks]

Reflection in a vertical line (1) Correct position (1)

(b)

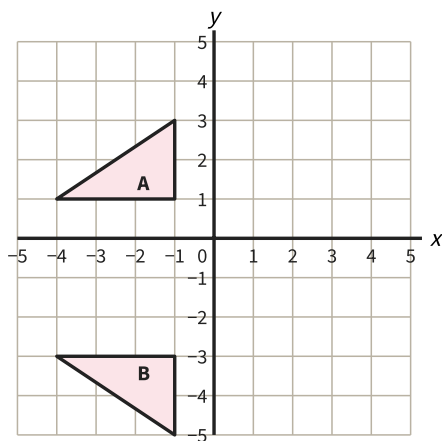


The line  $y = x$  is drawn on the grid.  
Reflect triangle T in the line  $y = x$ .  
Label the new triangle U.

[2 marks]

2 corners correct (1) All correct (1)

(c)



Describe fully the single transformation that maps triangle A onto triangle B.

*Reflection* (1)

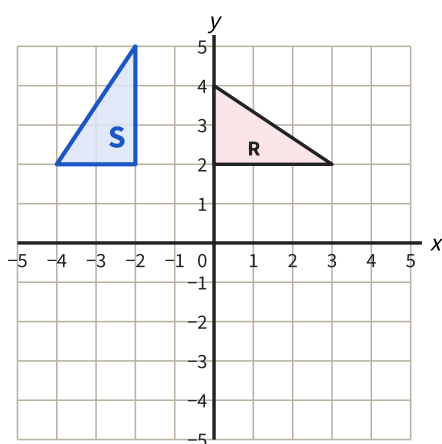
*in the line  $y = -1$*  (1)

[2 marks]

3

You may use tracing paper.

(a)



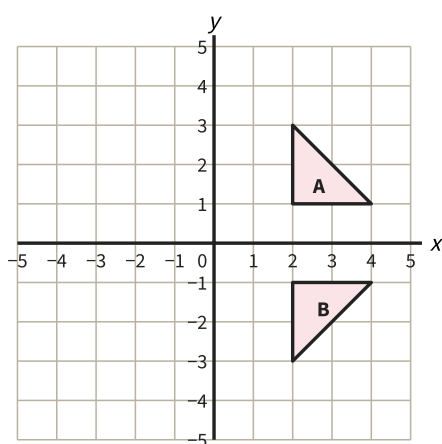
Rotate triangle R  $90^\circ$  anticlockwise about the point  $(-1, 1)$

Label the new triangle S.

[3 marks]

Turned  $90^\circ$  anticlockwise (1) 1 corner correct (1) All correct (1)

(b)



Describe fully the single transformation that maps triangle A onto triangle B.

Rotation (1)

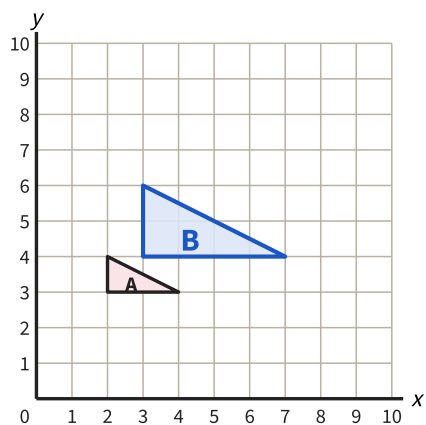
$90^\circ$  clockwise (1)

about the point  $(1, 0)$  (1)

[3 marks]

4

(a)

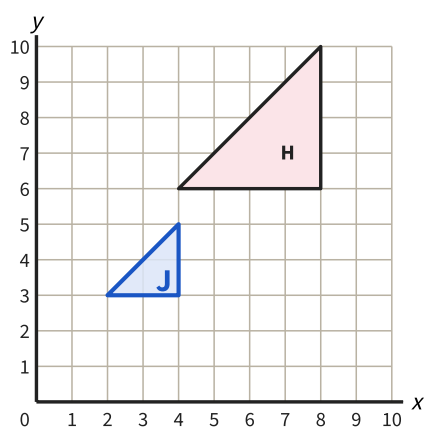


Enlarge triangle A by scale factor 2, centre (1, 2)  
Label the new triangle B.

[2 marks]

**Sides twice as long (1) Correct position (1)**

(b)

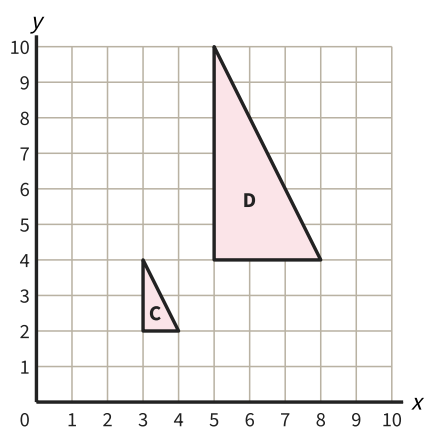


Enlarge triangle H by scale factor  $\frac{1}{2}$ , centre (0, 0)  
Label the new triangle J.

[2 marks]

**Sides half as long (1) Correct position (1)**

(c)



Describe fully the single transformation that maps triangle C onto triangle D.

*Enlargement* (1)

*scale factor 3* (1)

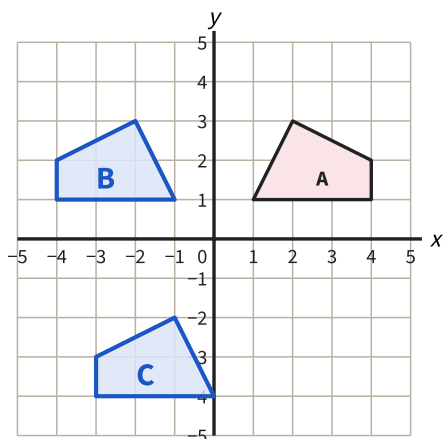
*centre (2, 1)* (1)

[3 marks]

- (d) A rectangle has a perimeter of 18 cm.  
It is enlarged by scale factor 3  
Work out the perimeter of the enlarged rectangle.

Answer 54 (1) cm [1 mark]

5



- (a) Reflect shape A in the  $y$ -axis.  
Label the new shape B.

Reflection in a vertical line (1) Correct position (1)

[2 marks]

- (b) Translate shape B by the vector  $\begin{pmatrix} 1 \\ -5 \end{pmatrix}$   
Label the new shape C.

1 right (1) 5 down (1)

[2 marks]

6

$$\mathbf{a} = \begin{pmatrix} 4 \\ -1 \end{pmatrix} \quad \mathbf{b} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$$

Write each answer as a column vector.

- (a) Work out  $\mathbf{a} + \mathbf{b}$

Answer  $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$  (1) [1 mark]

- (b) Work out  $\mathbf{a} - \mathbf{b}$

Answer  $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$  (1) [1 mark]

- (c) Work out  $4\mathbf{b}$

Answer  $\begin{pmatrix} -8 \\ 12 \end{pmatrix}$  (1) [1 mark]

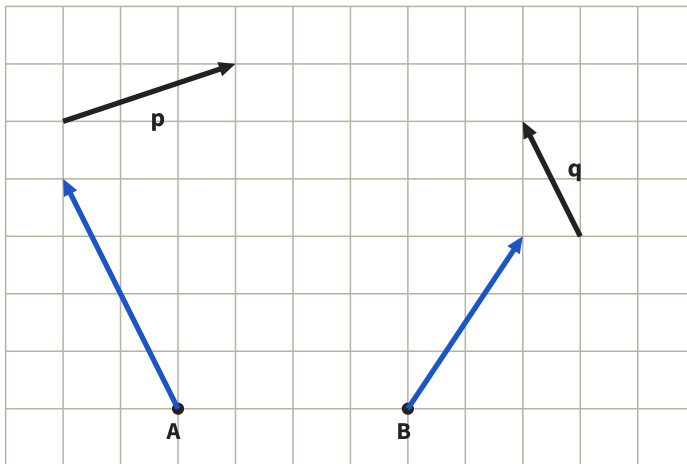
- (d) Work out  $3\mathbf{a} - 2\mathbf{b}$

$$\begin{pmatrix} 12 \\ -3 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad (1)$$

Answer  $\begin{pmatrix} 16 \\ -9 \end{pmatrix}$  (1) [2 marks]

7

Vectors  $\mathbf{p}$  and  $\mathbf{q}$  are drawn on the grid.



(a) Write  $\mathbf{p}$  as a column vector.

Answer  $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$  (1)

[1 mark]

(b) Draw the vector  $2\mathbf{q}$  starting at point A.

Arrow 2 left and 4 up from A (1)

[1 mark]

(c) Draw the vector  $\mathbf{p} + \mathbf{q}$  starting at point B.

(2, 3) seen or used (1) Correct arrow from B (1)

[2 marks]

8

- (a) The point (2, 5) is translated by the vector  $\begin{pmatrix} -3 \\ 4 \end{pmatrix}$   
Write down the coordinates of the new point.

Answer  $(-1, 9)$  (1) [1 mark]

- (b) Point C is translated by the vector  $\begin{pmatrix} 4 \\ -3 \end{pmatrix}$  to the point (1, -2)  
Work out the coordinates of point C.

$$1 - 4 \text{ and } -2 + 3 \text{ (1)}$$

Answer  $(-3, 1)$  (1) [2 marks]

| Question | Topic                                                                                     | RAG |
|----------|-------------------------------------------------------------------------------------------|-----|
| 1        | I can translate a shape by a vector and describe a translation                            |     |
| 2        | I can reflect a shape in a line and describe a reflection                                 |     |
| 3        | I can rotate a shape about any point and describe a rotation                              |     |
| 4        | I can enlarge a shape from a centre, including by a fraction, and describe an enlargement |     |
| 5        | I can carry out one transformation after another                                          |     |
| 6        | I can add, subtract and multiply column vectors                                           |     |
| 7        | I can write, draw and add vectors on a grid                                               |     |
| 8        | I can work forwards and backwards from a translation                                      |     |