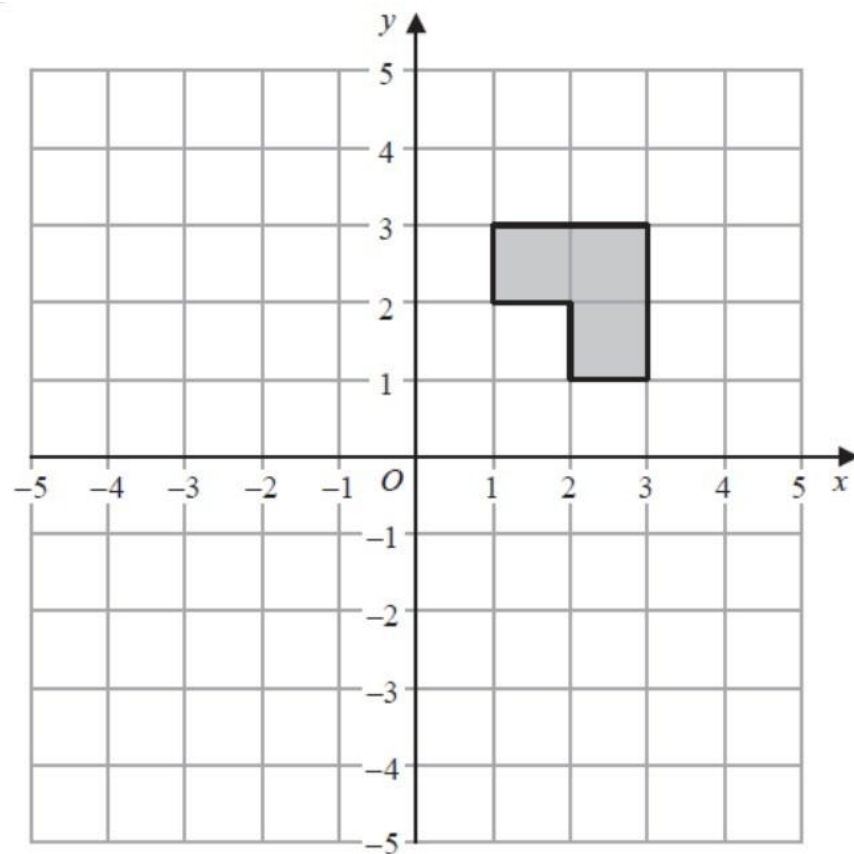


G65(H)...Invariant Transformations

OCR

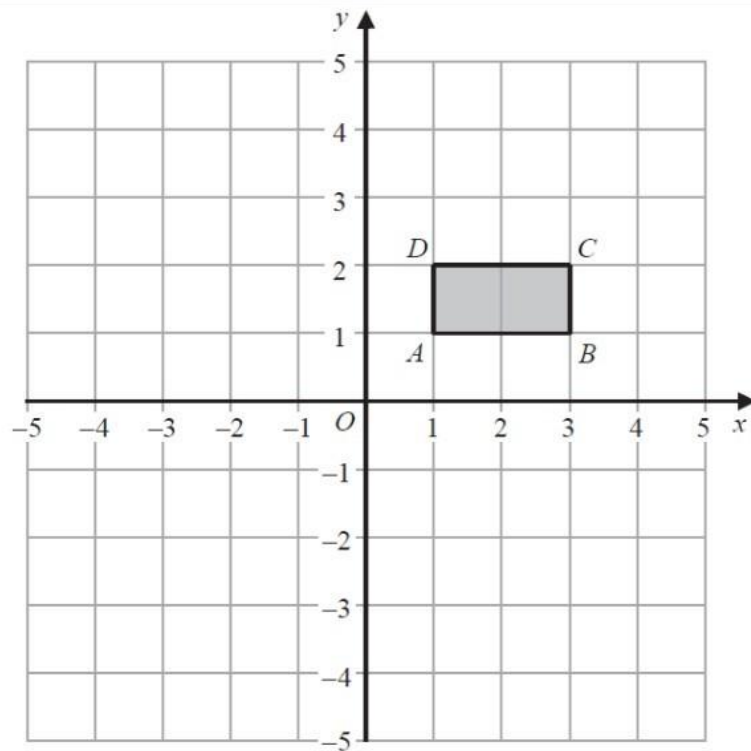
EDEXCEL



The shaded shape is rotated 180° about the point (2, 2)

(a) How many of the vertices of the shaded shape are invariant?

.....
(1)



Rectangle $ABCD$ is transformed by a combination of two transformations so that

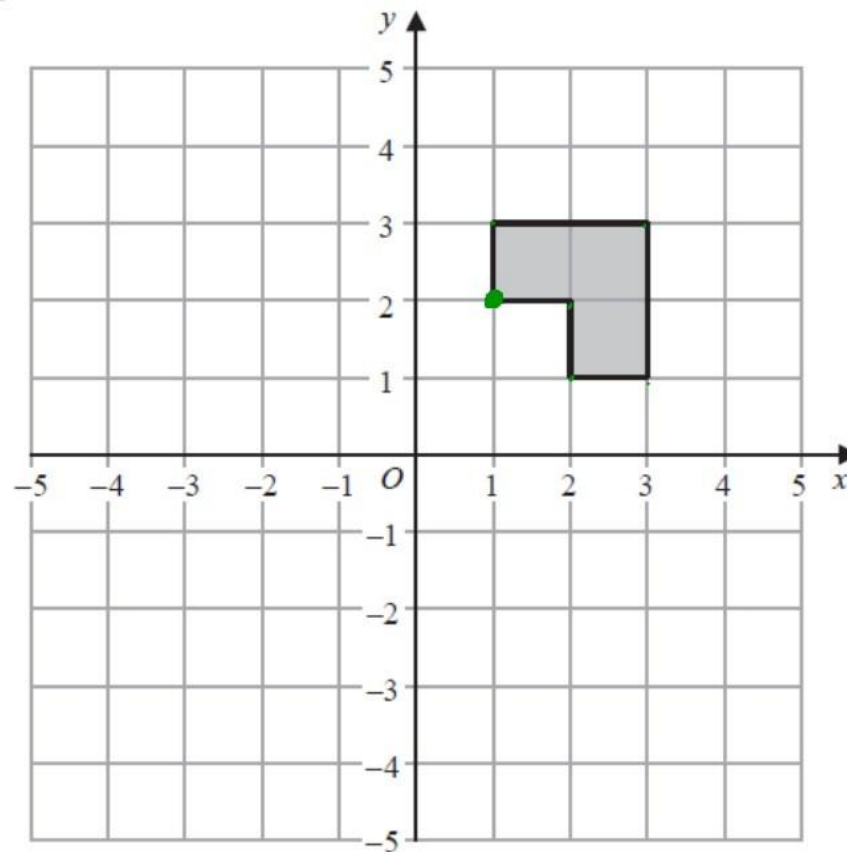
all points on AB are invariant
and there are no other invariant points.

The first transformation is

a reflection in the line with equation $y = k$, where k is an integer and $k \neq 1$

(b) Describe fully the second transformation.

(2)



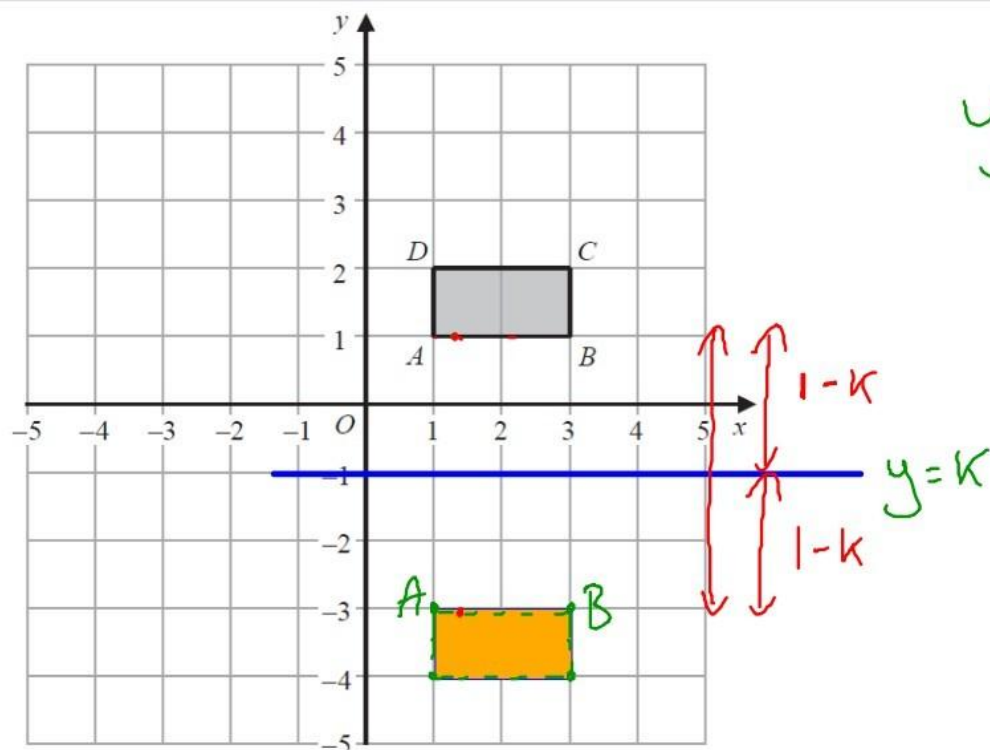
The shaded shape is rotated 180° about the point $(2, 2)$

(a) How many of the vertices of the shaded shape are invariant?

don't move

(1)





$y = \text{horizontal}$

$$(1-k) \times 2$$

Translation ✓

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

Rectangle $ABCD$ is transformed by a combination of two transformations so that

all points on AB are invariant
 and there are no other invariant points.

The first transformation is

a reflection in the line with equation $y = k$, where k is an integer and $k \neq 1$

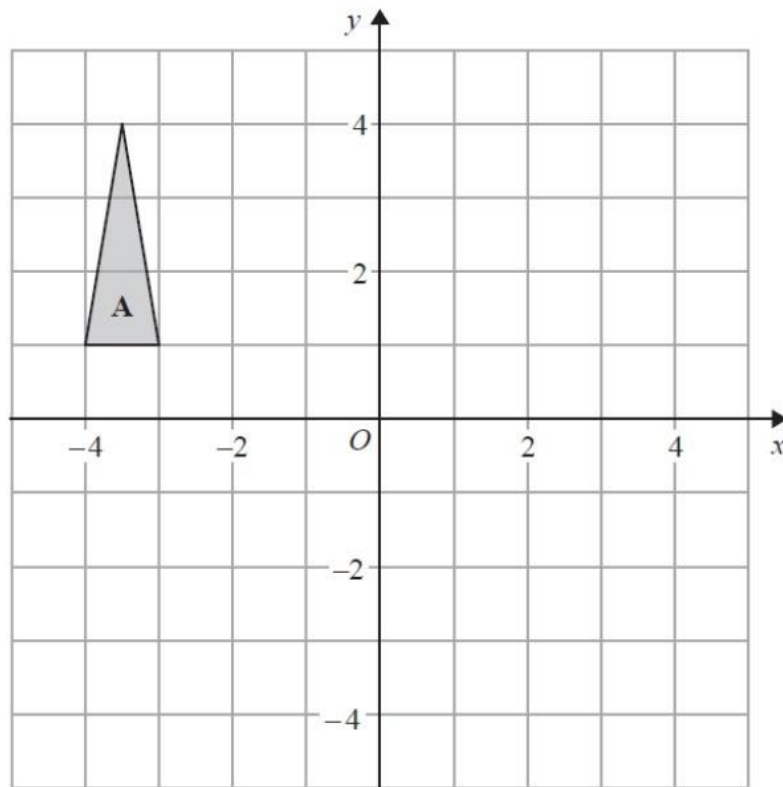
(b) Describe fully the second transformation.

(2)

20

G42

G65



Triangle **A** is transformed by the combined transformation of a rotation of 180° about the point $(-2, 0)$ followed by a translation with vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

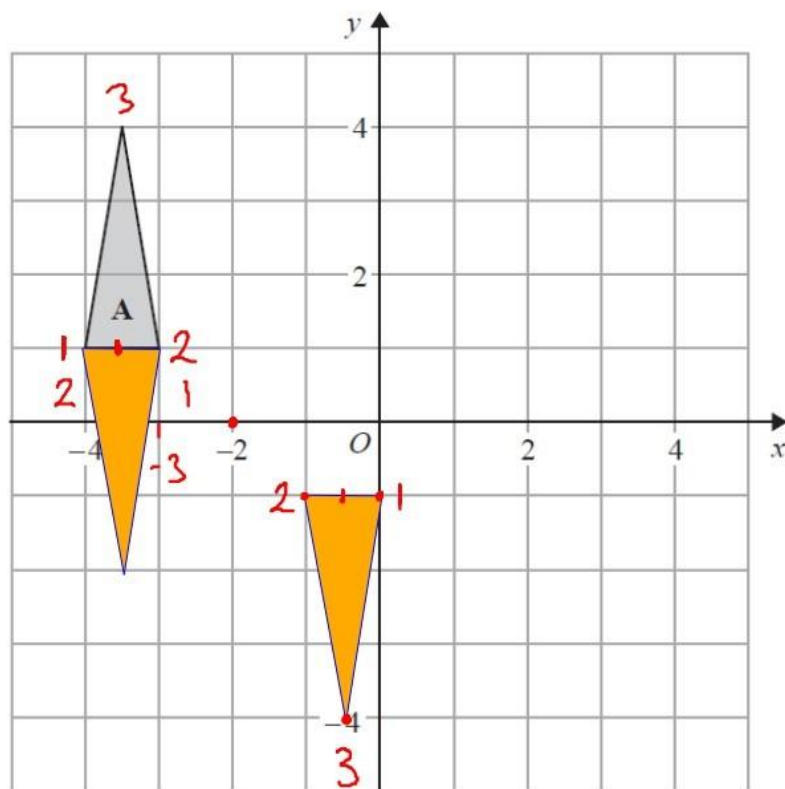
One point on triangle **A** is invariant under the combined transformation.

Find the coordinates of this point.

(..... ,)

(Total for Question 20 is 2 marks)

G42



Triangle **A** is transformed by the combined transformation of a rotation of 180° about the point $(-2, 0)$ followed by a translation with vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

One point on triangle **A** is invariant under the combined transformation.

Find the coordinates of this point.

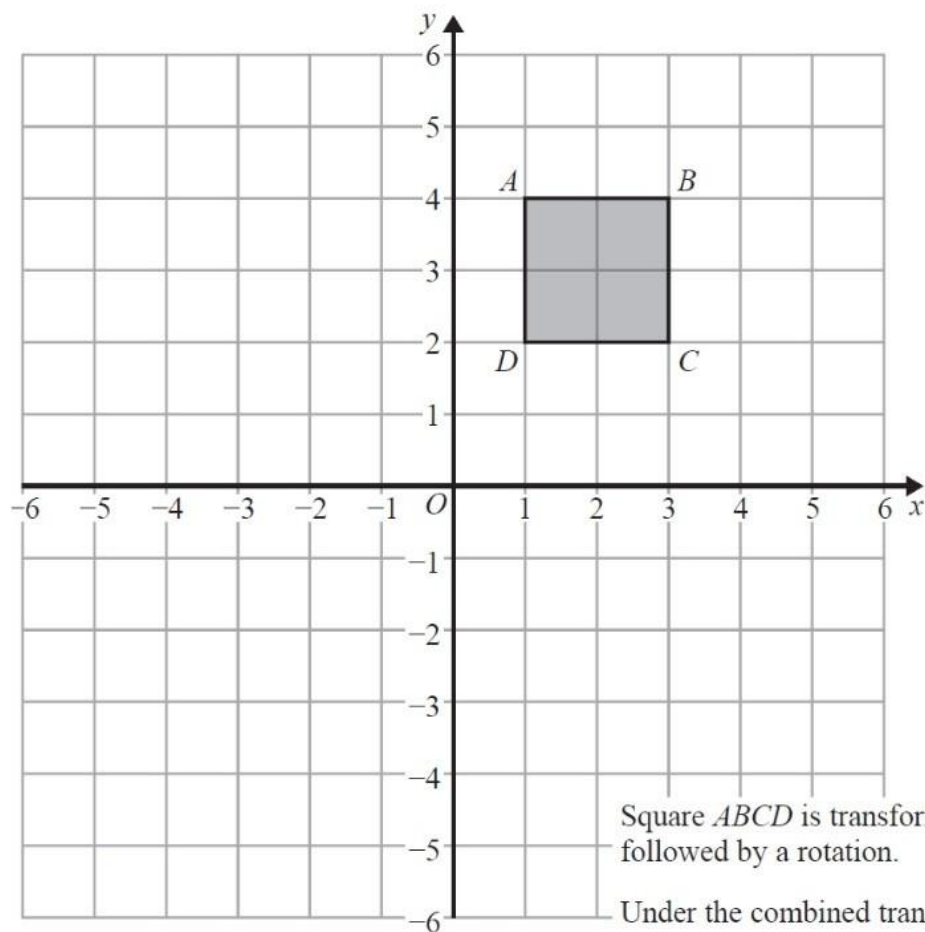
→ does not move

(-3.5, 1) ✓

(Total for Question 20 is 2 marks)

24

G65



Square $ABCD$ is transformed by a combined transformation of a reflection in the line $x = -1$ followed by a rotation.

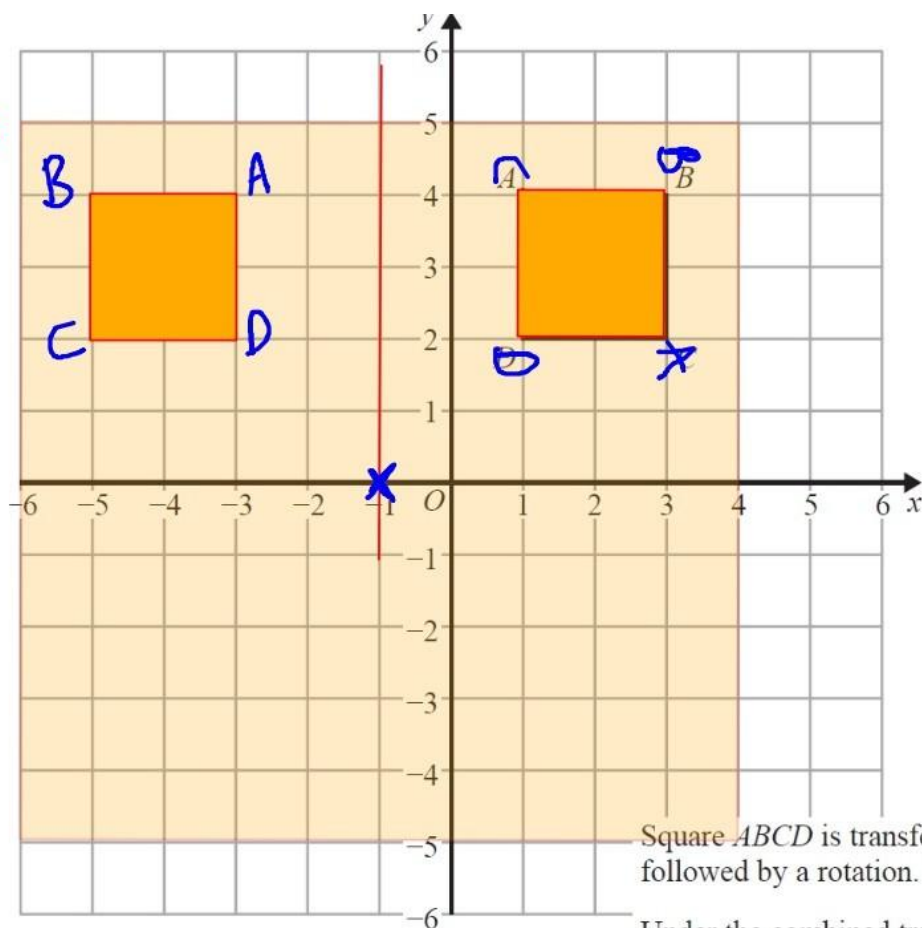
Under the combined transformation, two vertices of the square $ABCD$ are invariant.

Describe fully one possible rotation.

(Total for Question 24 is 2 marks)

24

G65



Square $ABCD$ is transformed by a combined transformation of a reflection in the line $x = -1$ followed by a rotation.

Under the combined transformation, two vertices of the square $ABCD$ are invariant.

Describe fully one possible rotation.

don't move

90° cw from (-1, 0)

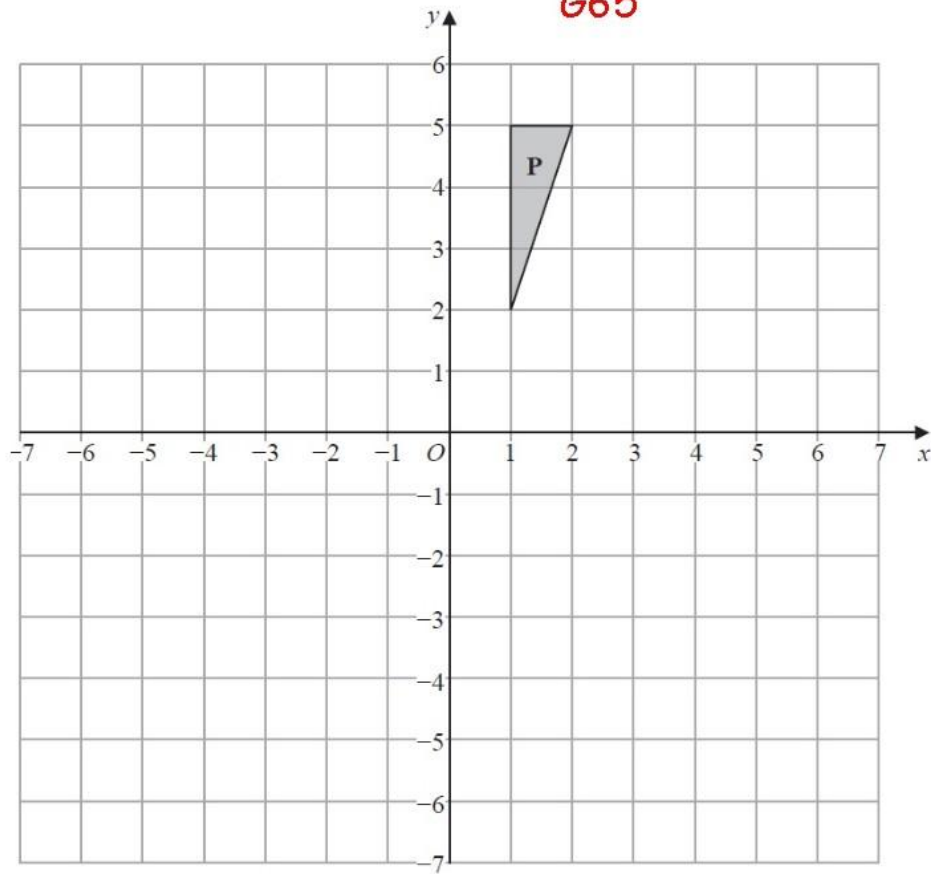
(Total for Question 24 is 2 marks)

11 The diagram shows a triangle **P** on a grid.

Under the transformation that maps triangle **P** onto triangle **R**, the point *A* is invariant.

(b) Write down the coordinates of point *A*.

G65

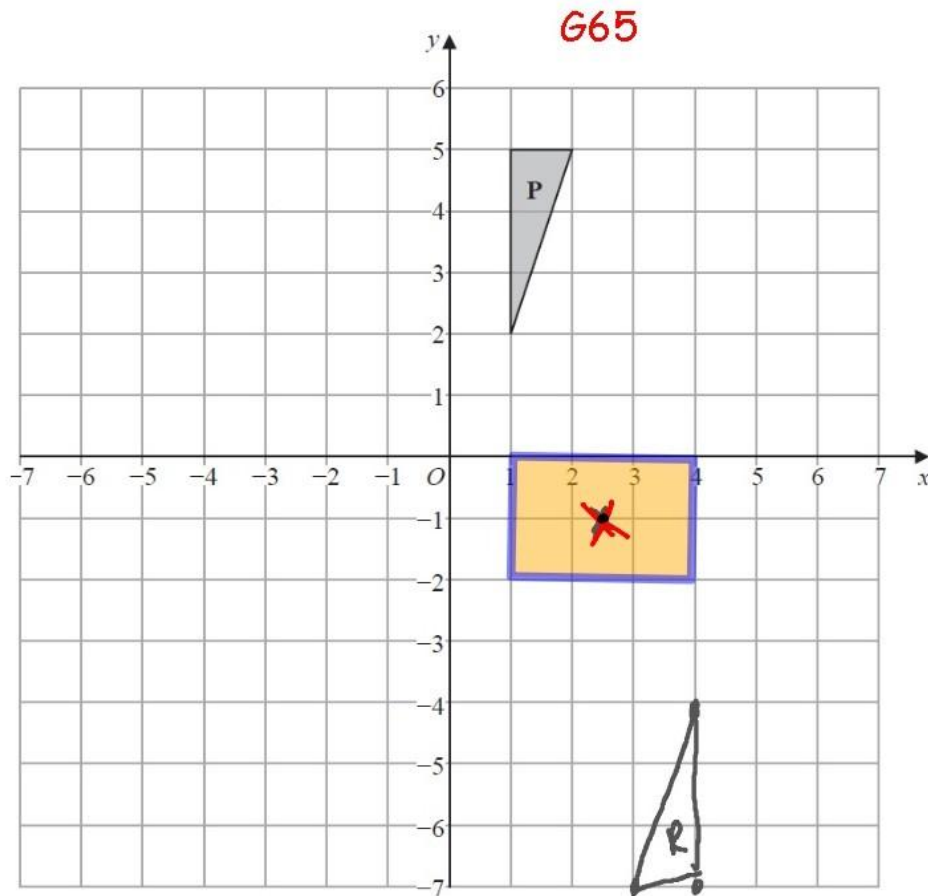


(.....,)
(1)

11 The diagram shows a triangle **P** on a grid.

Under the transformation that maps triangle **P** onto triangle **R**, the point **A** is invariant.

(b) Write down the coordinates of point **A**.



Rotation 180° (2.5, -1)

point lands in the same position

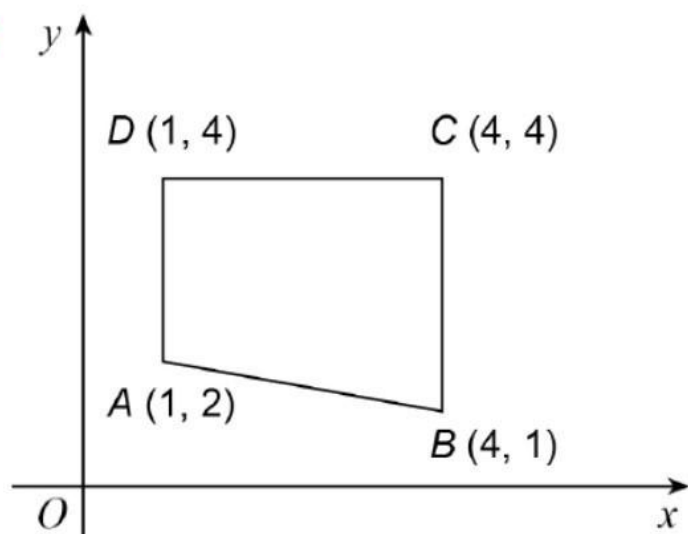
(2.5, -1)

AQA

25

 $ABCD$ is a quadrilateral.

G65

The quadrilateral is reflected in the line $x = 4$

Which vertices are invariant?

Circle your answer.

[1 mark]

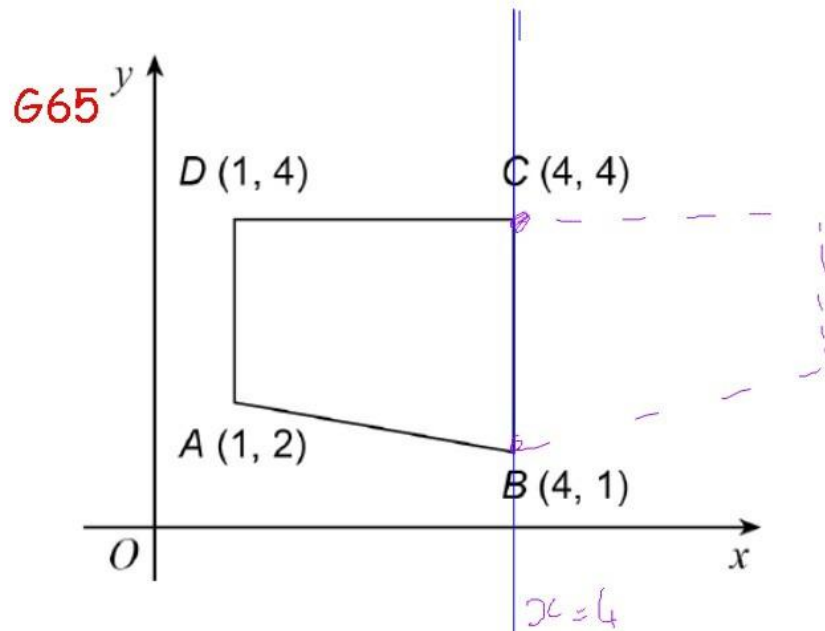
A and D

C and D

B and C

B and D

25

 $ABCD$ is a quadrilateral.

The quadrilateral is reflected in the line $x = 4$

Which vertices are invariant?

— don't move

Circle your answer.

[1 mark]

A and D

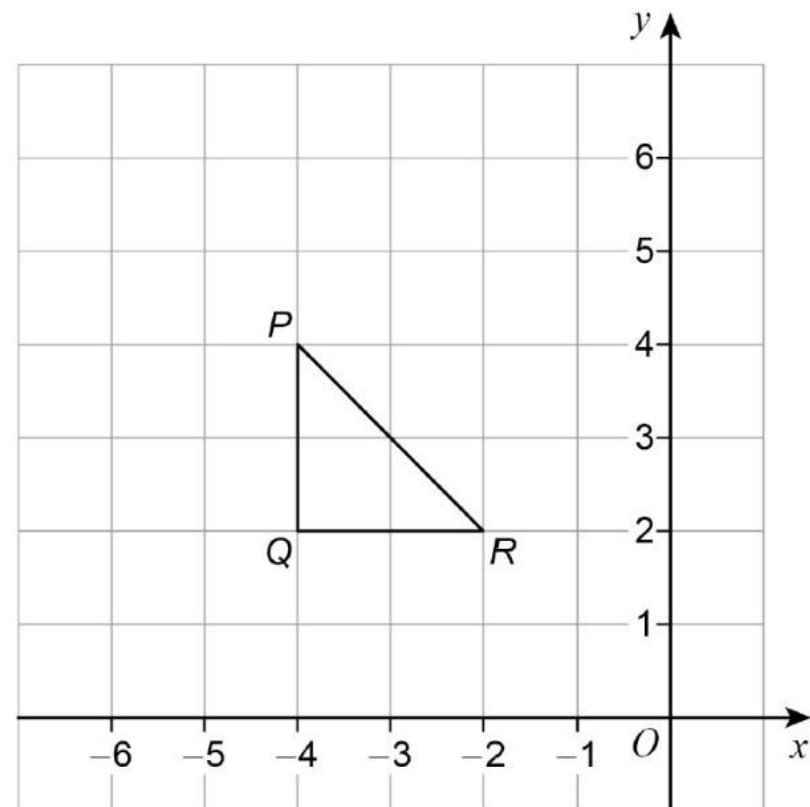
C and D

B and C

B and D

24 (b) Triangle PQR is shown.

G65



When PQR is reflected in a line, P and R are invariant points.

Circle the equation of the line.

[1 mark]

$y = x + 6$

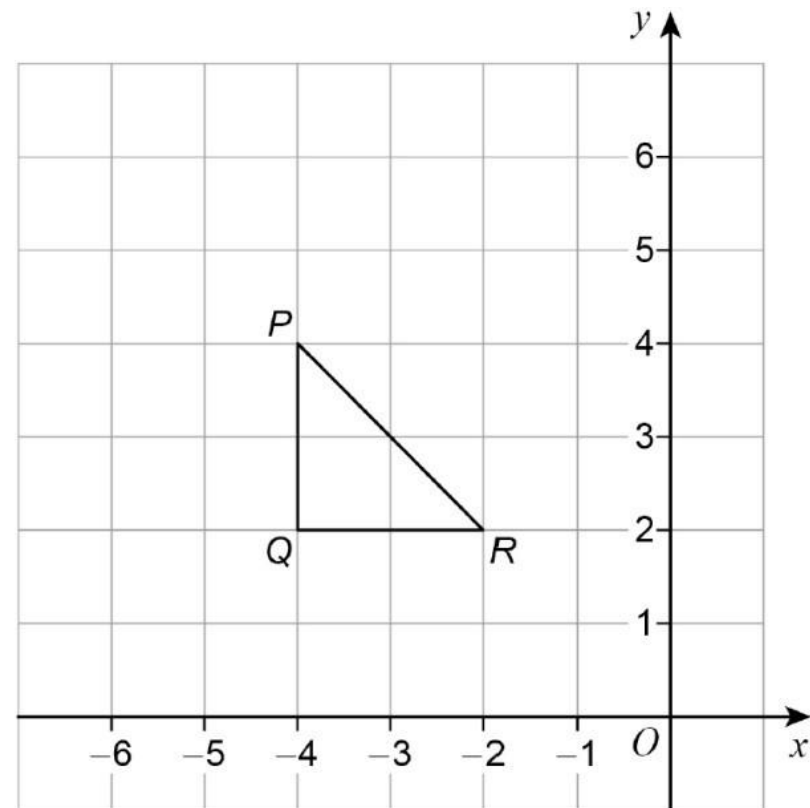
$y = -x$

$y = 2$

$x = -4$

24 (b) Triangle PQR is shown.

G65



When PQR is reflected in a line, P and R are invariant points.

Circle the equation of the line.

[1 mark]

$y = x + 6$

$y = -x$

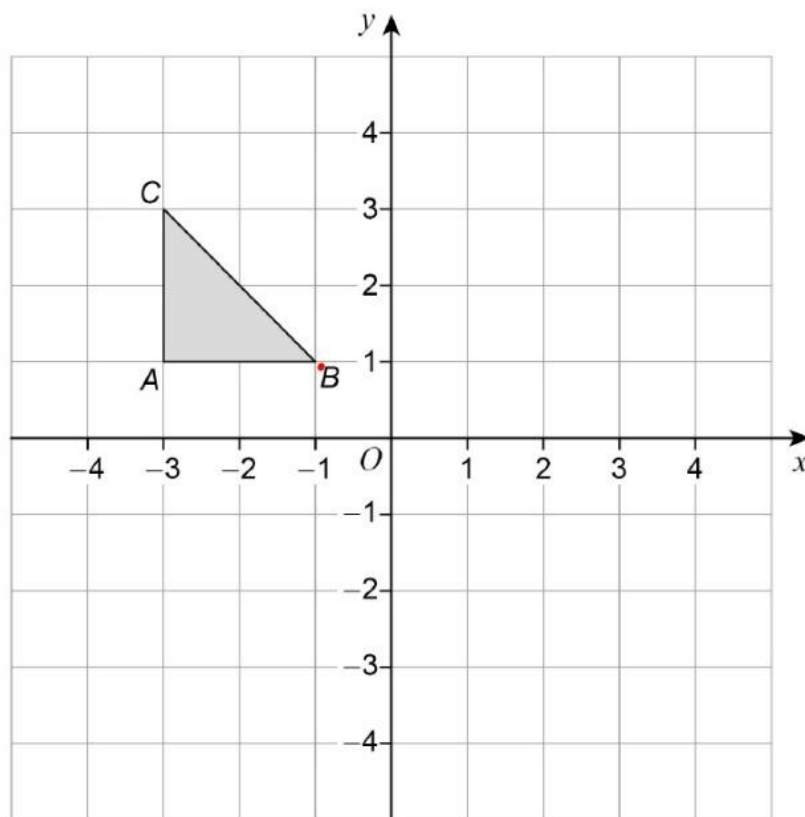
$y = 2$

$x = -4$

29

G65

Here is triangle ABC on a grid.



Describe a **single** transformation of the triangle so that

point B is invariant

point A moves to $(1, 1)$

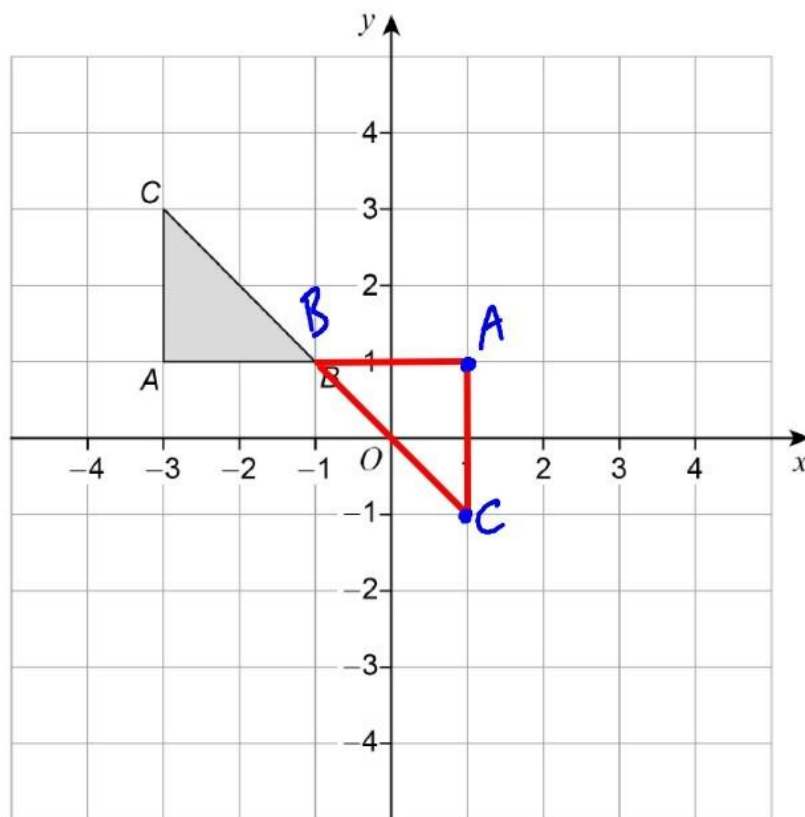
point C moves to $(1, -1)$

[3 marks]

29

G65

Here is triangle ABC on a grid.



Describe a **single** transformation of the triangle so that

point B is invariant

point A moves to $(1, 1)$

point C moves to $(1, -1)$

Rotation

180°

Centre of rotation $(-1, 1)$

[3 marks]