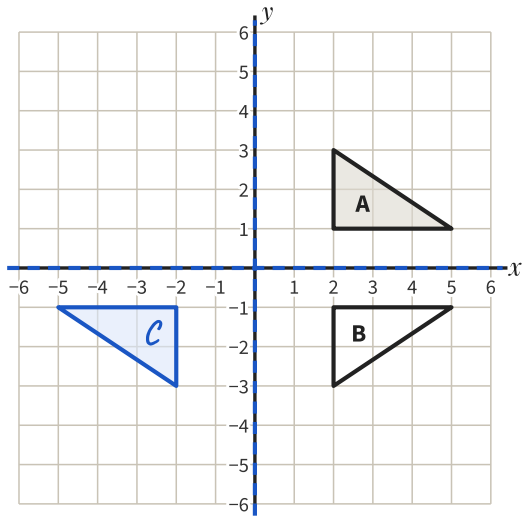
Combined transformations

ANSWERS

1

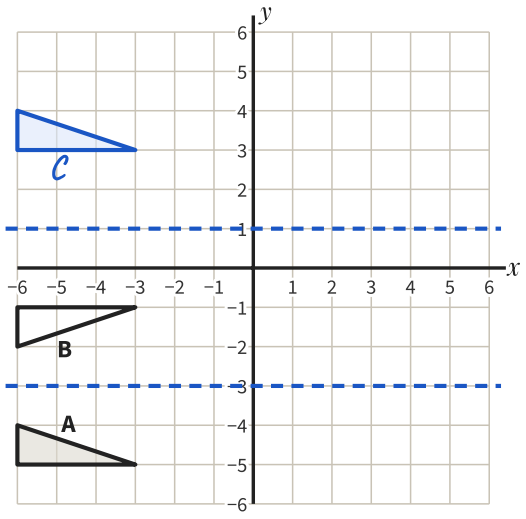


1. Reflect A in the x axis. Label it B. (Done for you.)
2. Reflect B in the y axis. Label it C.
3. Describe fully the **single** transformation that maps A onto C.

reflection (rotation) translation

180° about (0, 0)

2

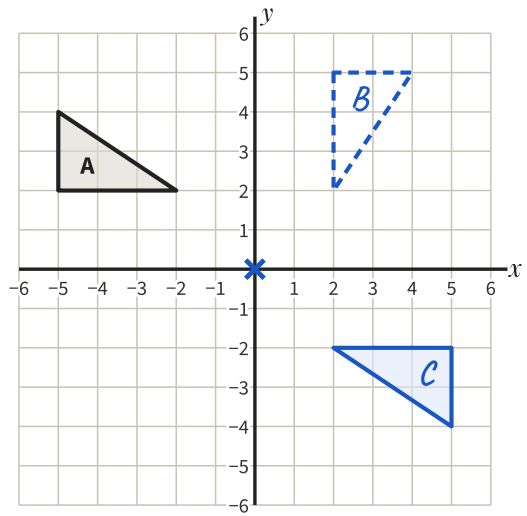


1. Reflect A in the line $y = -3$. Label it B. (Done for you.)
2. Reflect B in the line $y = 1$. Label it C.
3. Describe fully the **single** transformation that maps A onto C.

reflection rotation (translation)

by the vector $\begin{pmatrix} 0 \\ 8 \end{pmatrix}$

3

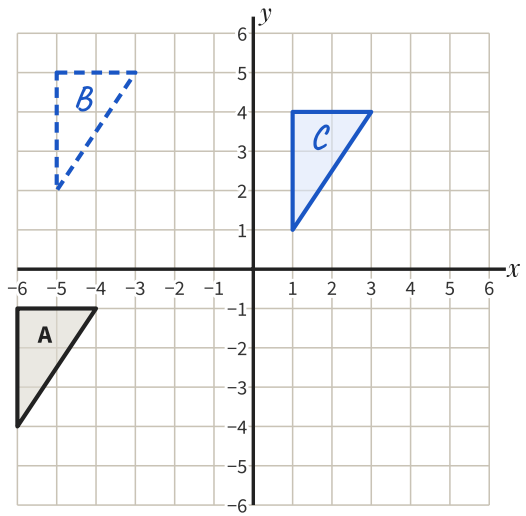


1. Rotate A **90° clockwise** about (0, 0). Label it B.
2. Rotate B **90° clockwise** about (0, 0). Label it C.
3. Describe fully the **single** transformation that maps A onto C.

reflection (rotation) translation

180° about (0, 0)

4



1. Translate A by the vector $\begin{pmatrix} 1 \\ 6 \end{pmatrix}$. Label it B.
2. Translate B by the vector $\begin{pmatrix} 6 \\ -1 \end{pmatrix}$. Label it C.
3. Describe fully the **single** transformation that maps A onto C.

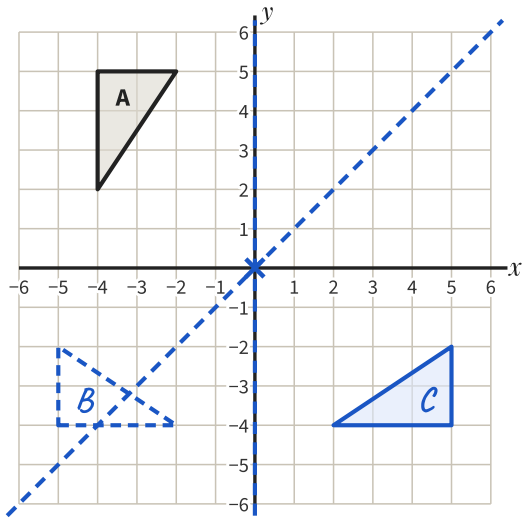
reflection rotation (translation)

by the vector $\begin{pmatrix} 7 \\ 5 \end{pmatrix}$

Combined transformations

ANSWERS

5

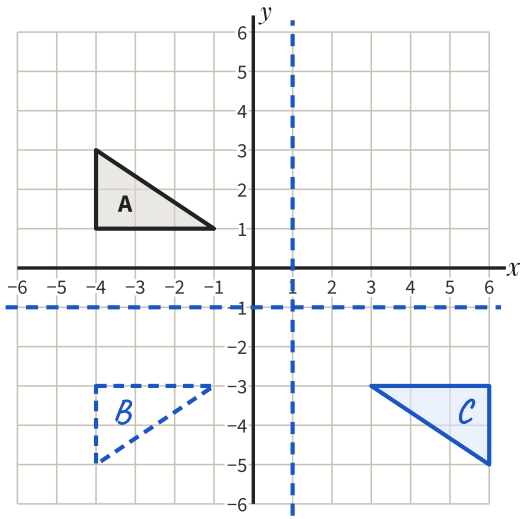


1. Rotate A **90° anticlockwise** about (0, 0). Label it B.
2. Reflect B in the y axis. Label it C.
3. Describe fully the **single** transformation that maps A onto C.
4. Which points do not move under this single transformation?

Reflection in the line y = x

every point on the line y = x

6

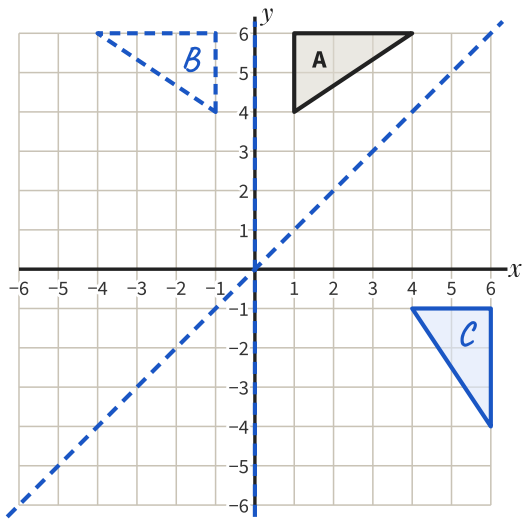


1. Reflect A in the line $y = -1$. Label it B.
2. Reflect B in the line $x = 1$. Label it C.
3. Describe fully the **single** transformation that maps A onto C.

Rotation 180°

about (1, −1)

7

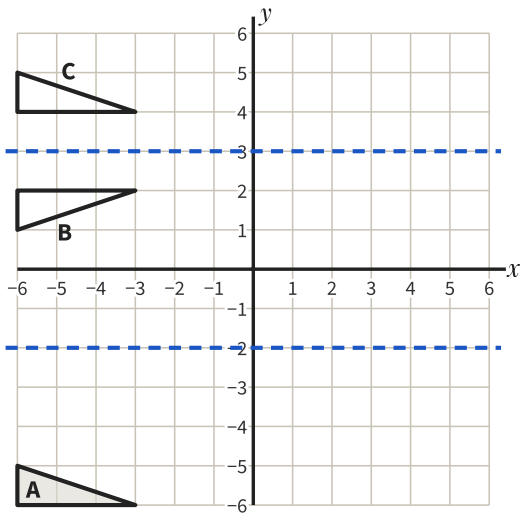


1. Reflect A in the y axis. Label it B.
2. Reflect B in the line $y = x$. Label it C.
3. Describe fully the **single** transformation that maps A onto C.

Rotation 90° clockwise

about (0, 0)

8



A is reflected in the line $y = -2$ to give B, then B in the line $y = 3$ to give C. Asked for the single transformation that maps A onto C, Jo wrote "Reflection in $y = -2$, then reflection in $y = 3$".

1. Why does Jo get no marks?
2. Describe fully the **single** transformation that maps A onto C.

(1) two transformations, not one

(2) Translation by $\begin{pmatrix} 0 \\ 10 \end{pmatrix}$

Combined transformations *further practice*

ANSWERS

9

The point P (3, 4) is reflected in the y axis, then the image is reflected in the x axis.

(a) Where does P end up?

(b) Describe fully the single transformation that does the same.

(a) (−3, −4)

(b) Rotation 180° about (0, 0)

10

Write down the invariant points of each transformation.

(a) Reflection in the line $y = -1$

(b) Rotation 90° clockwise about (2, −3)

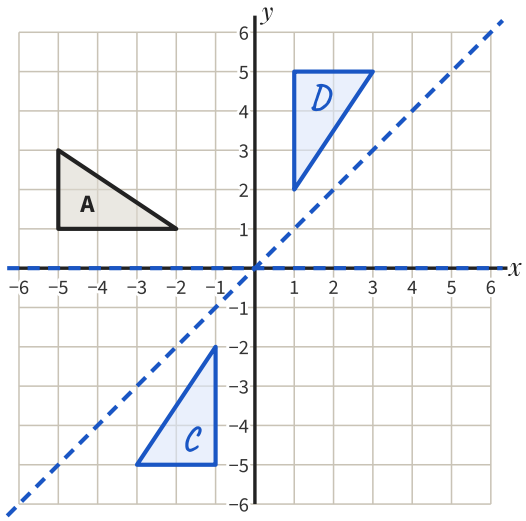
(c) Translation by the vector $\begin{pmatrix} 0 \\ 4 \end{pmatrix}$

(a) every point on the line y = −1

(b) only (2, −3)

(c) none: every point moves

11



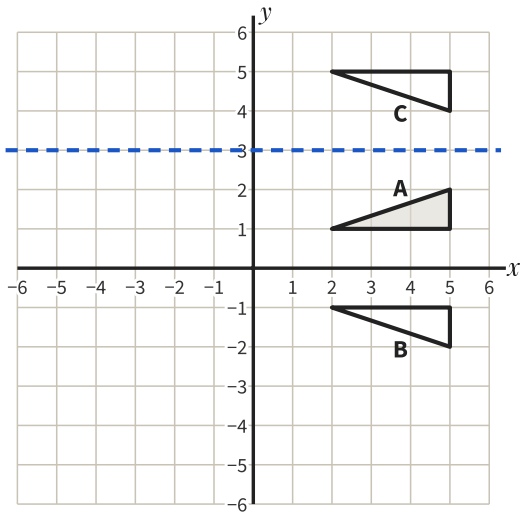
1. Reflect A in the x axis, then in the line $y = x$. Label it C.
2. From A again: the line $y = x$ first, then the x axis. Label it D.
3. Are C and D the same? Describe fully the single transformation that maps A onto each.

C: rotation 90° anticlockwise

D: rotation 90° clockwise

both about (0, 0), so not the same

12



A is reflected in the x axis to give B. Then B is transformed to give C.

1. Describe fully the transformation that maps B onto C.
2. Describe fully the **single** transformation that maps A onto C.

(1) Translation by $\begin{pmatrix} 0 \\ 6 \end{pmatrix}$

(2) Reflection in the line y = 3

Combined transformations *further practice*

ANSWERS

13

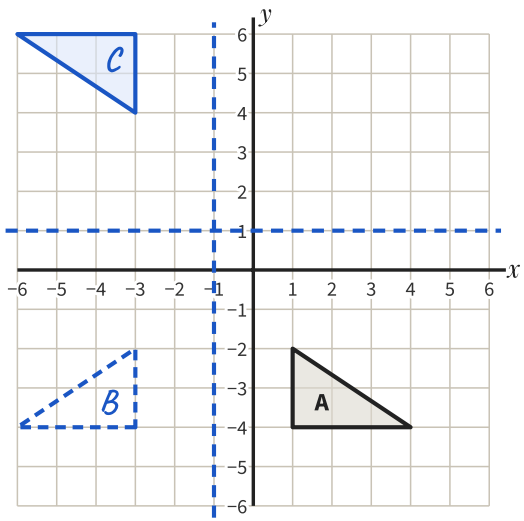
On a phone screen, Amara slides a sticker by the vector $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$, then by the vector $\begin{pmatrix} 5 \\ 1 \end{pmatrix}$.

Describe fully the single transformation that moves the sticker straight to the same place.

−3 + 5 = 2, 2 + 1 = 3

Translation by the vector $\begin{pmatrix} 2 \\ 3 \end{pmatrix}$

14



1. Reflect A in the line $x = -1$. Label it B.
2. Reflect B in the line $y = 1$. Label it C.
3. Mo says one reflection maps A onto C. Explain why Mo is wrong.
4. Describe fully the **single** transformation that maps A onto C.

(3) two flips: C is not flipped over

(4) Rotation 180° about (−1, 1)

15

The point P (3, 2) is on the line $x = 3$. A shape is reflected in the line $x = 3$, then translated by the vector $\begin{pmatrix} 0 \\ 2 \end{pmatrix}$.

Is P an invariant point of the two steps together? Explain.

No. The reflection keeps P at (3, 2),

but the translation moves it to (3, 4).

16

A shape is reflected in the line $x = 2$, then in the line $x = 5$.

Describe fully the single transformation. (Hint: follow the point (0, 0).)

(0, 0) to (4, 0) to (6, 0)

Translation by the vector $\begin{pmatrix} 6 \\ 0 \end{pmatrix}$