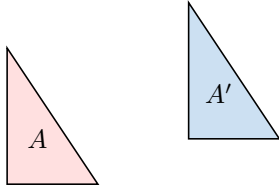


# TRANSFORMATIONS

## A TYPES OF TRANSFORMATIONS

### A.1 IDENTIFYING THE TRANSFORMATIONS

**Ex 1:** Identify the transformation that maps figure  $A$  (blue) onto figure  $A'$  (red).



☐ reflection

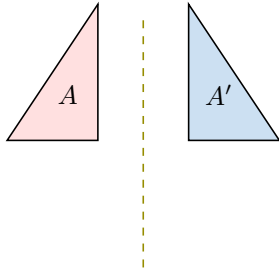
☐ rotation

☐ translation

☐ homothety

The transformation is an

**Ex 2:** Identify the transformation that maps figure  $A$  (blue) onto figure  $A'$  (red).



☐ reflection

☐ rotation

☐ translation

☐ homothety

The transformation is a

**Ex 3:** Identify the transformation that maps figure  $A$  (blue) onto figure  $A'$  (red).



☐ reflection

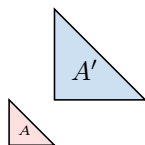
☐ rotation

☐ translation

☐ homothety

The transformation is a

**Ex 4:** Identify the transformation that maps figure  $A$  (blue) onto figure  $A'$  (red).



$O \bullet$

☐ reflection

☐ rotation

☐ translation

☐ homothety

The transformation is a

**Ex 5:** Which transformation matches the description?

☐ reflection

☐ rotation

☐ translation

☐ homothety

1. "A mirror image across a line."  $\rightarrow$

2. "Turning around a fixed point."  $\rightarrow$

☐ reflection

☐ rotation

☐ translation

☐ homothety

☐ reflection

☐ rotation

☐ translation

☐ homothety

3. "Sliding in a straight line."  $\rightarrow$

4. "Resizing (enlarging or reducing)."  $\rightarrow$

☐ reflection

☐ rotation

☐ translation

☐ homothety

## B TRANSLATION

### B.1 DETERMINING THE IMAGE UNDER A TRANSLATION

**Ex 6:** Find the coordinates of the image of point  $M(1, 2)$  under a translation by vector  $\vec{v} \begin{pmatrix} 2 \\ 1 \end{pmatrix}$ .

$M'(\square, \square)$

**Ex 7:** Find the coordinates of the image of point  $M(3, 2)$  under a translation by vector  $\vec{v} \begin{pmatrix} -1.5 \\ 2 \end{pmatrix}$ .

$M'(\square, \square)$

**Ex 8:** Find the coordinates of the image of point  $M(-2, 4)$  under a translation by vector  $\vec{v} \begin{pmatrix} 5 \\ -3 \end{pmatrix}$ .

$M'(\square, \square)$

**Ex 9:** Find the coordinates of the image of point  $M(0, -3)$  under a translation by vector  $\vec{v} \begin{pmatrix} -2 \\ 4 \end{pmatrix}$ .

$M'(\square, \square)$

## B.2 DETERMINING THE ORIGINAL POINT UNDER A TRANSLATION

**Ex 10:** Find the coordinates of the point  $M$  whose image is  $M'(3, 3)$  under a translation by vector  $\vec{v}\begin{pmatrix} 2 \\ 1 \end{pmatrix}$ .

$$M(\square, \square)$$

**Ex 11:** Find the coordinates of the point  $M$  whose image is  $M'(1.5, 4)$  under a translation by vector  $\vec{v}\begin{pmatrix} -1.5 \\ 2 \end{pmatrix}$ .

$$M(\square, \square)$$

**Ex 12:** Find the coordinates of the point  $M$  whose image is  $M'(3, 1)$  under a translation by vector  $\vec{v}\begin{pmatrix} 5 \\ -3 \end{pmatrix}$ .

$$M(\square, \square)$$

**Ex 13:** Find the coordinates of the point  $M$  whose image is  $M'(-2, 1)$  under a translation by vector  $\vec{v}\begin{pmatrix} -2 \\ 4 \end{pmatrix}$ .

$$M(\square, \square)$$

## B.3 DETERMINING THE IMAGE OF A LINEAR EQUATION UNDER A TRANSLATION

**Ex 14:** Find the equation of the image of the line  $y = 2x + 1$  under a translation by the vector  $\begin{pmatrix} 1 \\ -1 \end{pmatrix}$ .

$$y = \square$$

**Ex 15:** Find the equation of the image of the line  $y = -x + 1$  under a translation by the vector  $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$ .

$$y = \square$$

**Ex 16:** Find the equation of the image of the line  $y = \frac{x}{2}$  under a translation by the vector  $\begin{pmatrix} -2 \\ 2 \end{pmatrix}$ .

$$y = \square$$

## C HOMOTHETY

### C.1 DETERMINING THE IMAGE UNDER A HOMOTHETY

**Ex 17:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under a homothety with center  $A(0, 0)$  and scale factor 2.

$$M'(\square, \square)$$

**Ex 18:** Find the coordinates of the image point  $M'$  of point  $M(2, 3)$  under a homothety with center  $A(1, 1)$  and scale factor  $-1$ .

$$M'(\square, \square)$$

**Ex 19:** Find the coordinates of the image point  $M'$  of point  $M(2, 3)$  under a homothety with center  $A(-1, 2)$  and scale factor 3.

$$M'(\square, \square)$$

### C.2 DETERMINING THE ORIGINAL POINT UNDER A HOMOTHETY

**Ex 20:** Find the coordinates of the point  $M$  whose image is  $M'(2, 4)$  under a homothety with center  $A(0, 0)$  and scale factor 2.

$$M(\square, \square)$$

**Ex 21:** Find the coordinates of the point  $M$  whose image is  $M'(0, -1)$  under a homothety with center  $A(1, 1)$  and scale factor  $-1$ .

$$M(\square, \square)$$

**Ex 22:** Find the coordinates of the point  $M$  whose image is  $M'(8, 5)$  under a homothety with center  $A(-1, 2)$  and scale factor 3.

$$M(\square, \square)$$

## D SPECIFIC REFLECTIONS

### D.1 DETERMINING THE IMAGE UNDER A REFLECTION

**Ex 23:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under reflection over the  $x$ -axis.

$$M'(\square, \square)$$

**Ex 24:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under reflection over the  $y$ -axis.

$$M'(\square, \square)$$

**Ex 25:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under reflection over the line  $y = x$ .

$$M'(\square, \square)$$

**Ex 26:** Find the coordinates of the image point  $M'$  of point  $M(-2, 3)$  under reflection over the  $x$ -axis.

$$M'(\square, \square)$$

**Ex 27:** Find the coordinates of the image point  $M'$  of point  $M(-2, 3)$  under reflection over the  $y$ -axis.

$$M'(\square, \square)$$

**Ex 28:** Find the coordinates of the image point  $M'$  of point  $M(-2, 3)$  under reflection over the line  $y = x$ .

$$M'(\square, \square)$$

## D.2 DETERMINING THE IMAGE OF A LINEAR EQUATION UNDER A REFLECTION

**Ex 29:** Find the image equation of  $y = 2x + 1$  under a reflection over the  $x$ -axis.

$$y = \boxed{\phantom{000}}$$

**Ex 30:** Find the image equation of  $y = 2x + 1$  under a reflection over the  $y$ -axis.

$$y = \boxed{\phantom{000}}$$

**Ex 31:** Find the image equation of  $y = 2x + 1$  under a reflection over the line  $y = x$ .

$$y = \boxed{\phantom{000}}$$

**Ex 32:** Find the image equation of  $y = \frac{x}{2} - 1$  under a reflection over the  $x$ -axis.

$$y = \boxed{\phantom{000}}$$

**Ex 33:** Find the image equation of  $y = \frac{x}{2} - 1$  under a reflection over the  $y$ -axis.

$$y = \boxed{\phantom{000}}$$

**Ex 34:** Find the image equation of  $y = \frac{x}{2} - 1$  under a reflection over the line  $y = x$ .

$$y = \boxed{\phantom{000}}$$

## E SPECIFIC ROTATIONS

### E.1 DETERMINING THE IMAGE UNDER A ROTATION

**Ex 35:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under a rotation of  $90^\circ$  (counterclockwise) around the origin.

$$M'(\boxed{\phantom{00}}, \boxed{\phantom{00}})$$

**Ex 36:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under a rotation of  $-90^\circ$  (clockwise) around the origin.

$$M'(\boxed{\phantom{00}}, \boxed{\phantom{00}})$$

**Ex 37:** Find the coordinates of the image point  $M'$  of point  $M(1, 2)$  under a rotation of  $180^\circ$  around the origin.

$$M'(\boxed{\phantom{00}}, \boxed{\phantom{00}})$$

**Ex 38:** Find the coordinates of the image point  $M'$  of point  $M(-3, 1)$  under a rotation of  $90^\circ$  (counterclockwise) around the origin.

$$M'(\boxed{\phantom{00}}, \boxed{\phantom{00}})$$

**Ex 39:** Find the coordinates of the image point  $M'$  of point  $M(-3, 1)$  under a rotation of  $-90^\circ$  (clockwise) around the origin.

$$M'(\boxed{\phantom{00}}, \boxed{\phantom{00}})$$

**Ex 40:** Find the coordinates of the image point  $M'$  of point  $M(-3, 1)$  under a rotation of  $180^\circ$  around the origin.

$$M'(\boxed{\phantom{00}}, \boxed{\phantom{00}})$$

## E.2 DETERMINING THE IMAGE OF A LINEAR EQUATION UNDER A ROTATION

**Ex 41:** Find the image equation of  $y = 2x + 1$  under a rotation of  $90^\circ$  (counterclockwise) around the origin.

$$y = \boxed{\phantom{000}}$$

**Ex 42:** Find the image equation of  $y = 2x + 1$  under a rotation of  $-90^\circ$  (clockwise) around the origin.

$$y = \boxed{\phantom{000}}$$

**Ex 43:** Find the image equation of  $y = 2x + 1$  under a rotation of  $180^\circ$  around the origin.

$$y = \boxed{\phantom{000}}$$