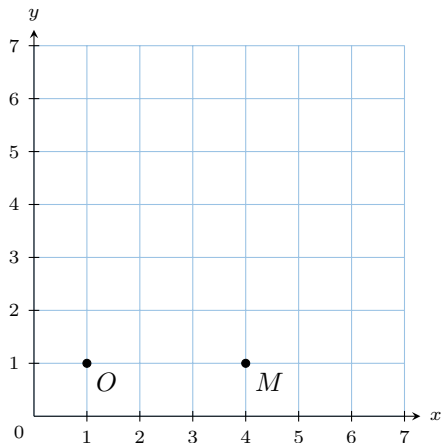# HOMOTHETY

A WHAT IS A HOMOTHETY?

A.1 FINDING THE IMAGE OF A POINT
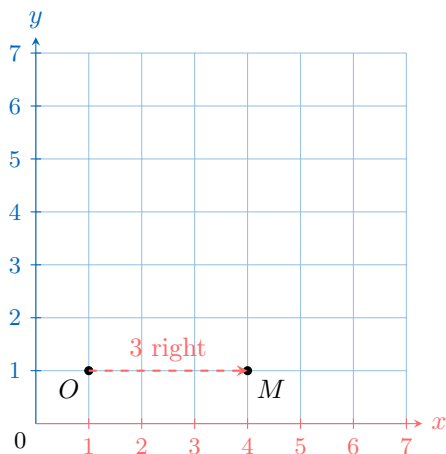
Ex 1: Find the coordinates of the image of point M under a homothety with center O and scale factor $k = 2$.
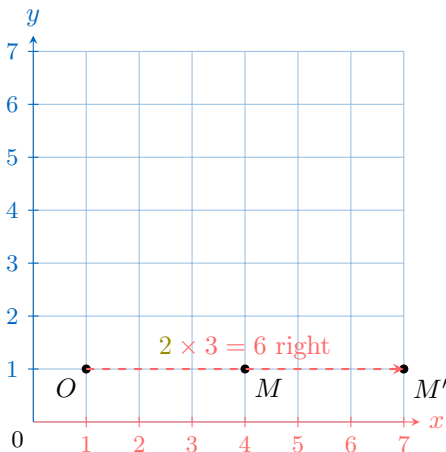

$$M'(\boxed{7}, \boxed{1})$$

Answer:

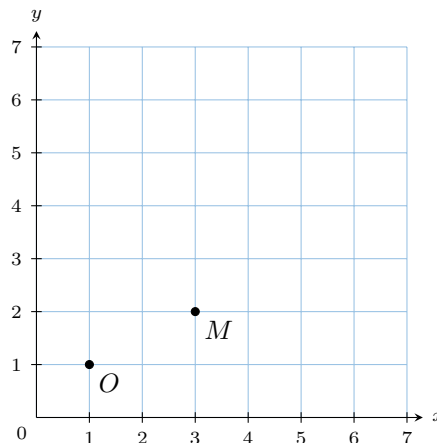- $\overrightarrow{OM}$:

- $\overrightarrow{OM'} = 2\overrightarrow{OM}$:
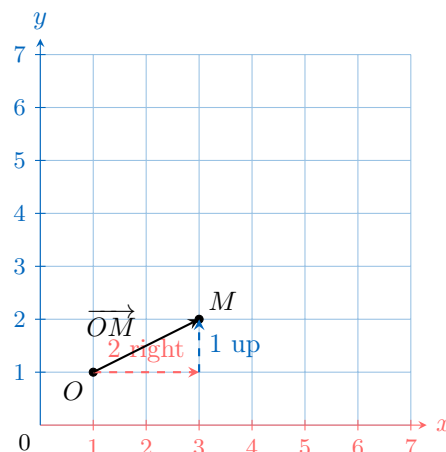

- $M'(7, 1)$

Ex 2: Find the coordinates of the image of point M under a homothety with center O and scale factor $k = 2$.
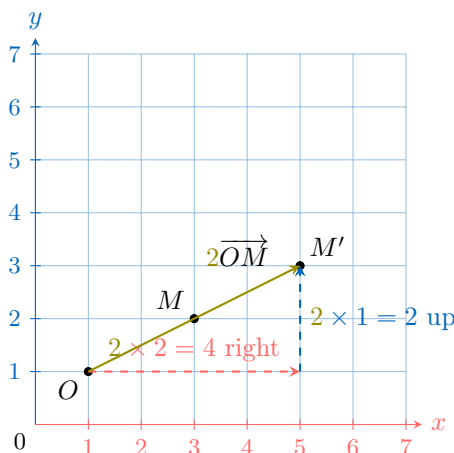

$$M'(\boxed{5}, \boxed{3})$$
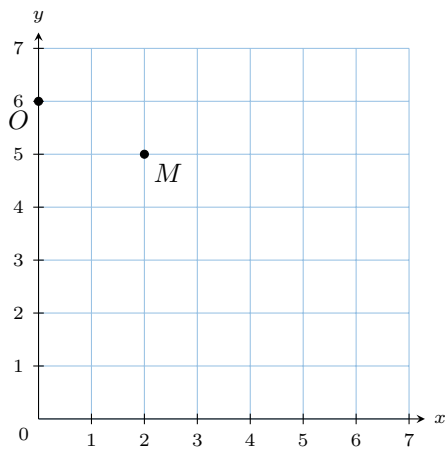
Answer:

- $\overrightarrow{OM}$:

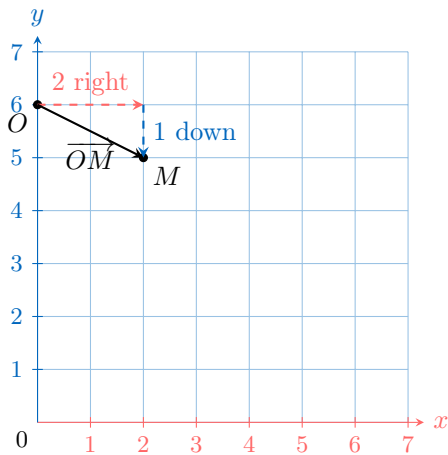- $\overrightarrow{OM'} = 2\overrightarrow{OM}$:

- $M'(5, 3)$

Ex 3: Find the coordinates of the image of point M under a homothety with center O and scale factor $k = 3$.

$$M'(\boxed{6},\boxed{3})$$

$$M'(\boxed{1},\boxed{1})$$

Answer:

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'} = 3\overrightarrow{OM}$:

- $M'(6, 3)$

Answer:

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'} = -1\overrightarrow{OM}$:
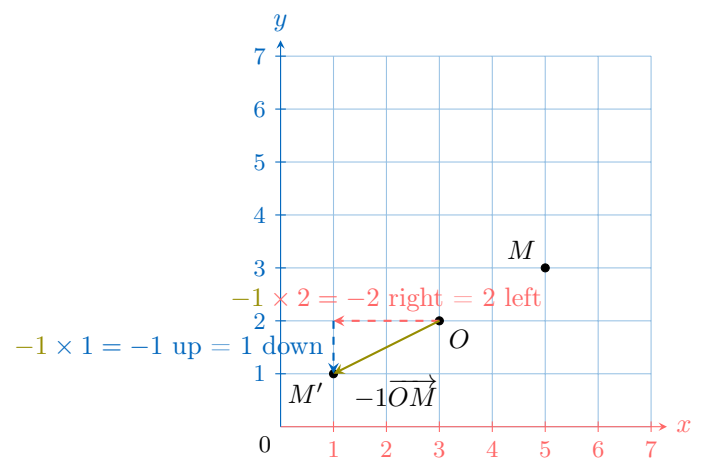
- $M'(1, 1)$

Ex 4: Find the coordinates of the image of point M under a homothety with center O and scale factor $k = -1$.
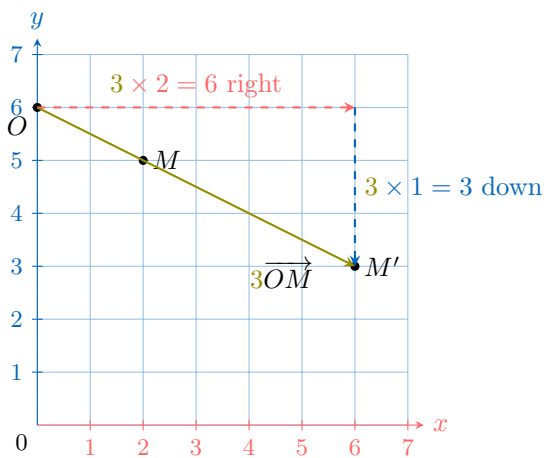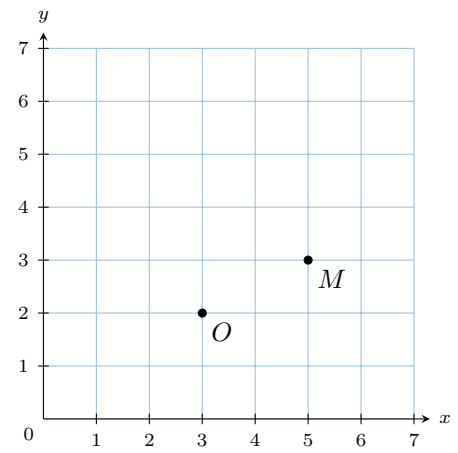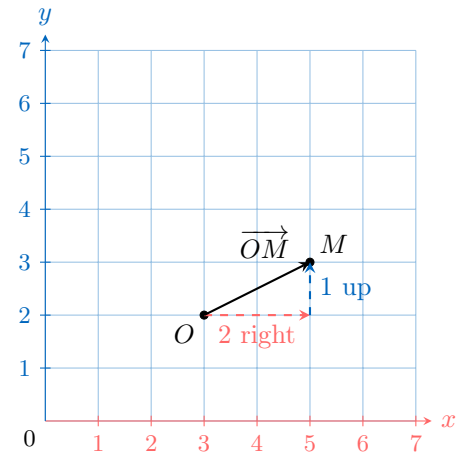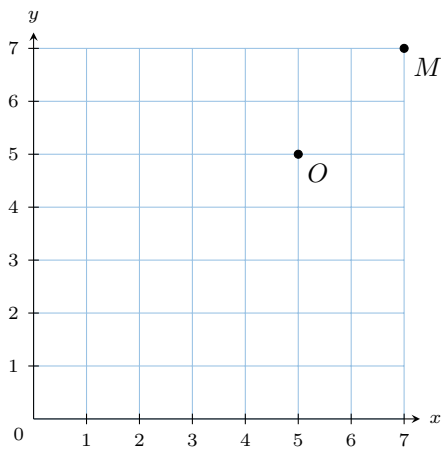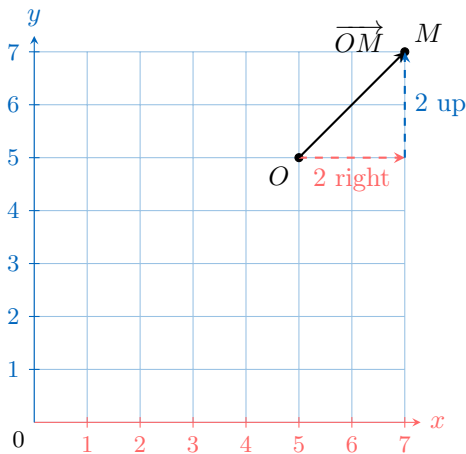
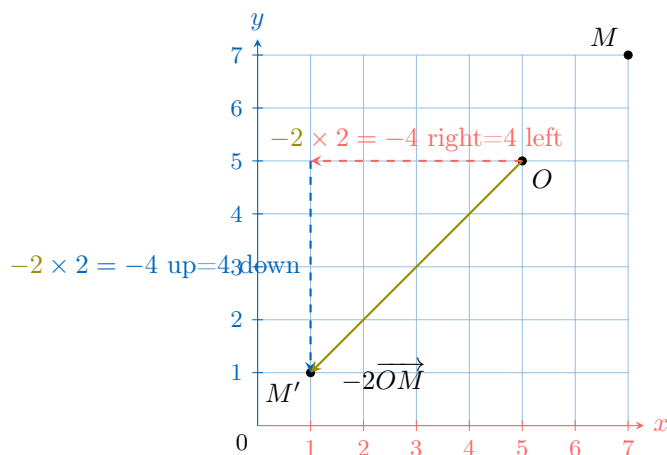**Ex 5:** Find the coordinates of the image of point M under a homothety with center O and scale factor $k = -2$.

$$M'(\boxed{1}, \boxed{1})$$

Find the scale factor.

$$k = \boxed{2}$$

Answer:

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'} = -2\overrightarrow{OM}$:

- $M'(1, 1)$

Answer:
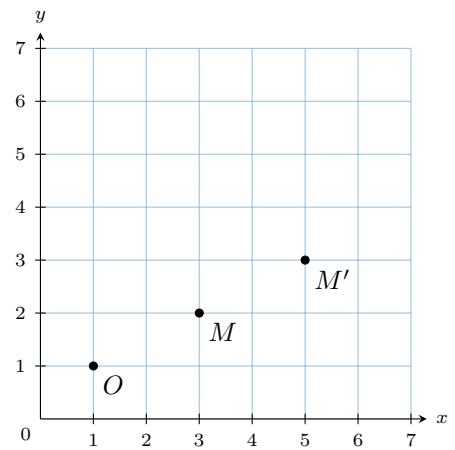
- $\overrightarrow{OM}$:

- $\overrightarrow{OM'}$:

- $\overrightarrow{OM'} = 2\overrightarrow{OM}$

- $k = 2$

A.2 FINDING THE SCALE FACTOR

Ex 6: The point M' is the image of the point M by homothety of center O and scale factor k.

Ex 7: The point M' is the image of point M under a homothety with center O and scale factor k.
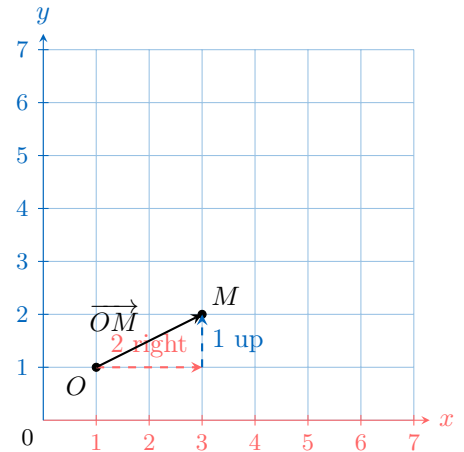
Find the scale factor.

$$k = \boxed{2}$$

Answer:

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'}$:

- $\overrightarrow{OM'} = 2\overrightarrow{OM}$

- $k = 2$

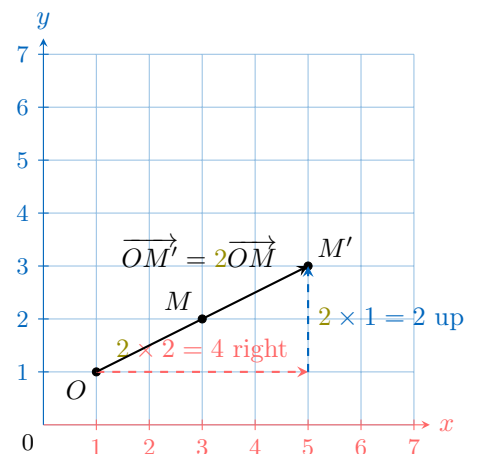**Find the scale factor.**

$$k = \boxed{2}$$

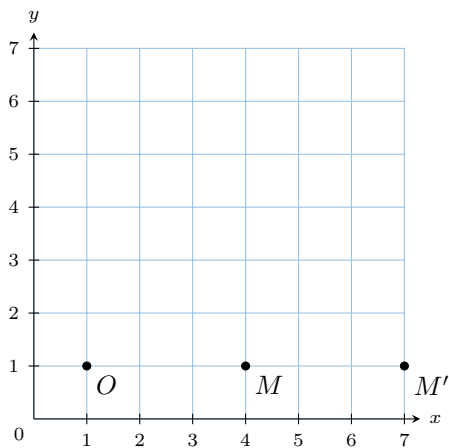*Answer:*

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'}$:

- $\overrightarrow{OM'} = 2\overrightarrow{OM}$

- $k = 2$

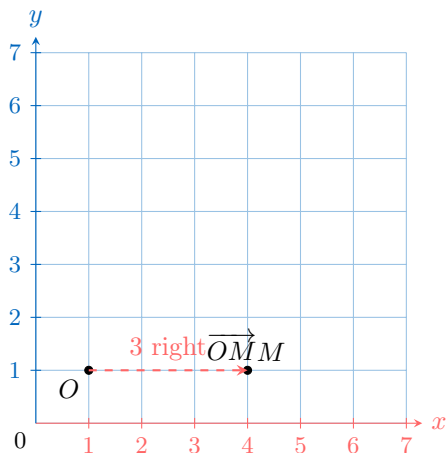**Ex 8:** The point M' is the image of point M under a homothety with center O and scale factor k.

Ex 9: The point M' is the image of point M under a homothety with center O and scale factor k.

Find the scale factor.

$$k = \boxed{3}$$

Answer:

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'}$:

- $\overrightarrow{OM'} = 3\overrightarrow{OM}$

- $k = 3$

Ex 10: The point M' is the image of point M under a homothety with center O and scale factor k.
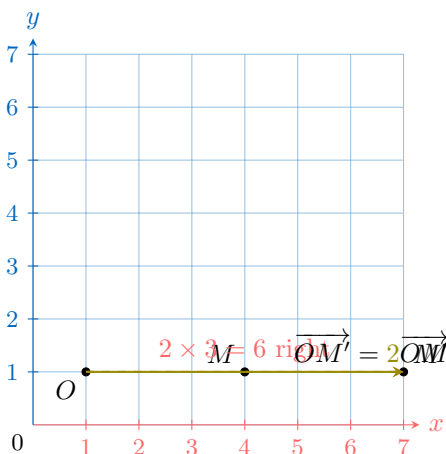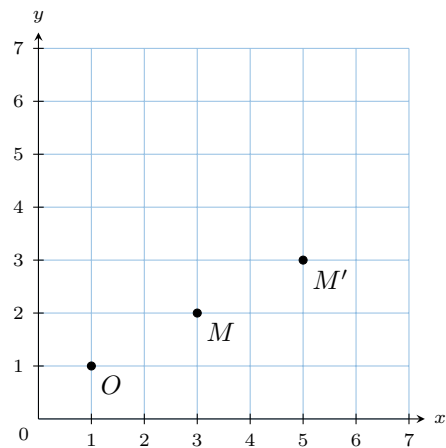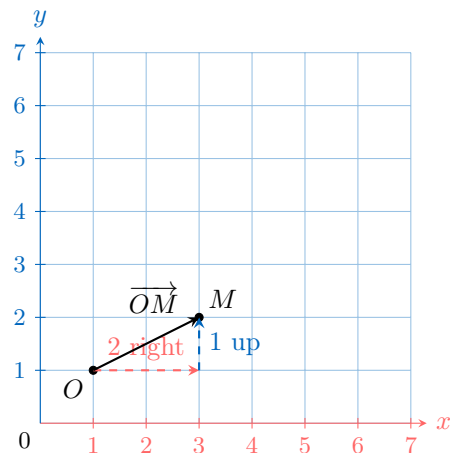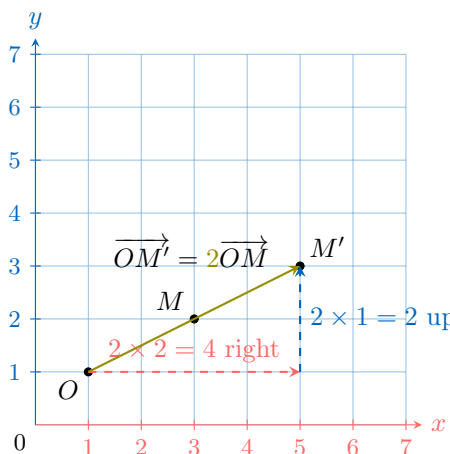

Find the scale factor.

$$k = \boxed{-1}$$
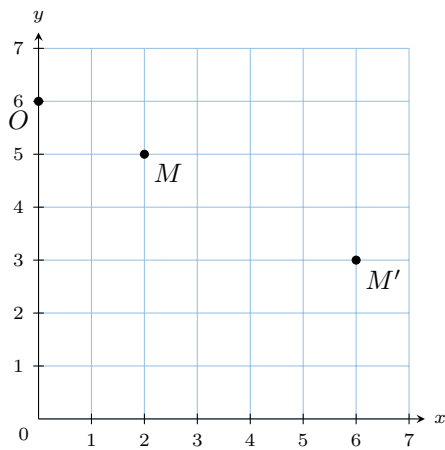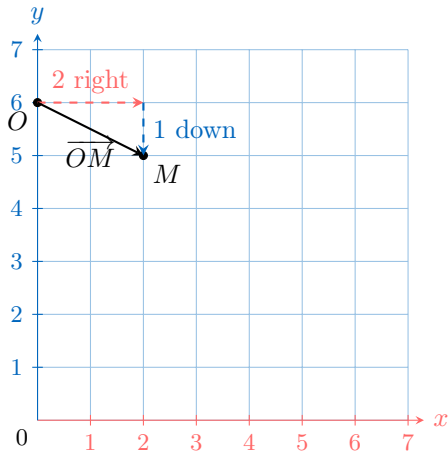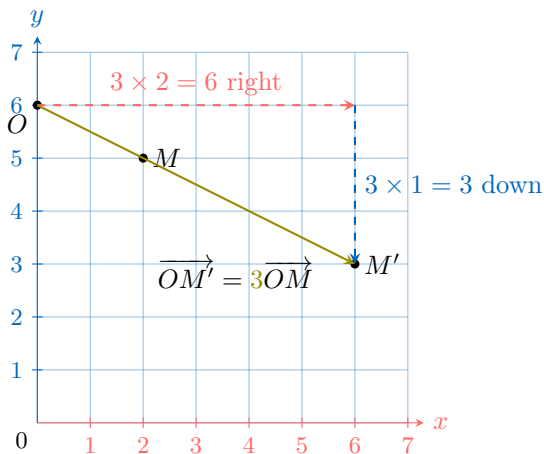
Answer:

- $\overrightarrow{OM}$:

- $\overrightarrow{OM'}$:

- $\overrightarrow{OM'} = -1\overrightarrow{OM}$

- $k = -1$

Ex 11: The point M' is the image of point M under a homothety with center O and scale factor k.

Find the scale factor.

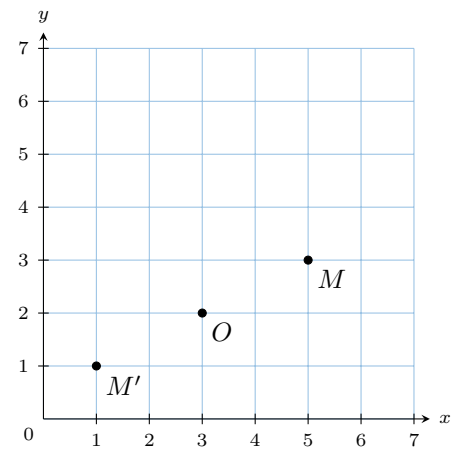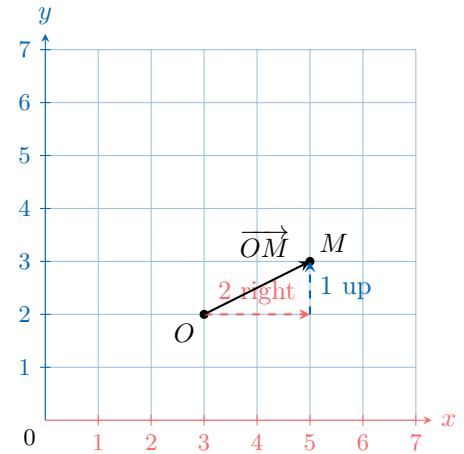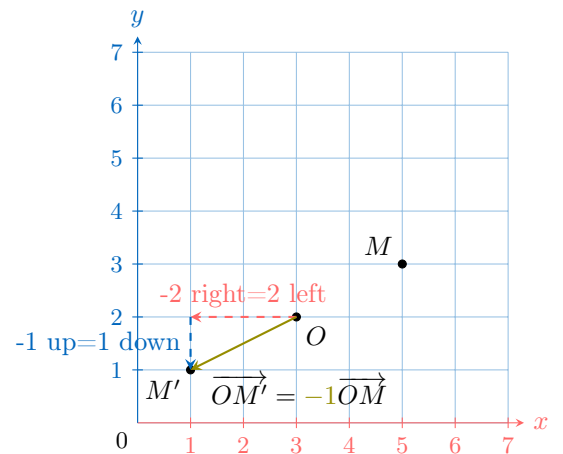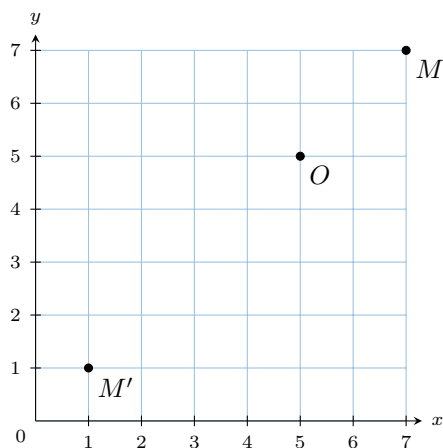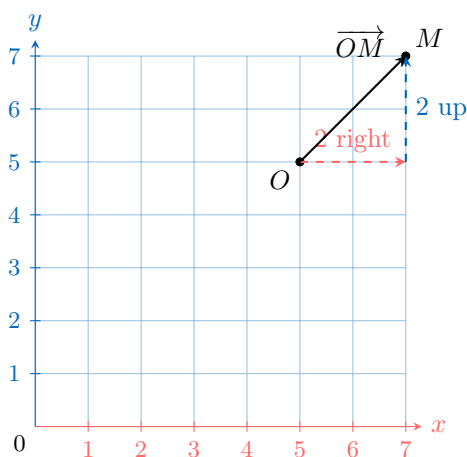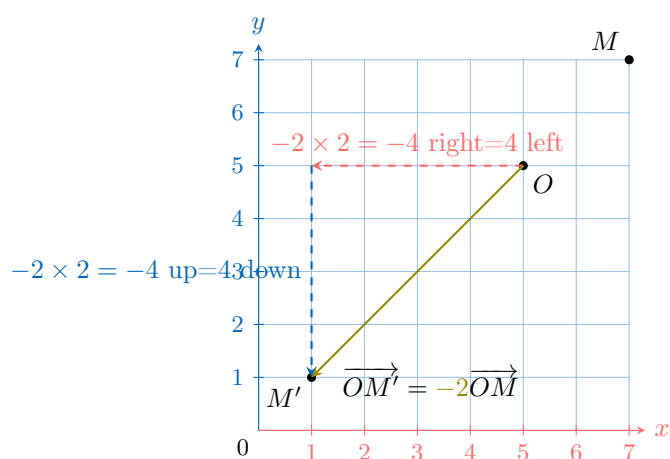$$k = \boxed{-2}$$

Answer:

- $\overrightarrow{OM}$:

$$\overrightarrow{OM}$$ — M

2 up

2 right

O

- $\overrightarrow{OM'}$:

M

$-2 \times 2 = -4 \text{ right} = 4 \text{ left}$

O

$-2 \times 2 = -4 \text{ up} = 4 \text{ down}$

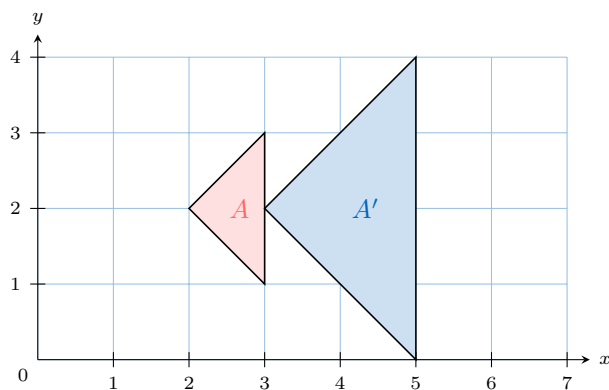M' $\qquad \overrightarrow{OM'} = -2\overrightarrow{OM}$

- $\overrightarrow{OM'} = -2\overrightarrow{OM}$
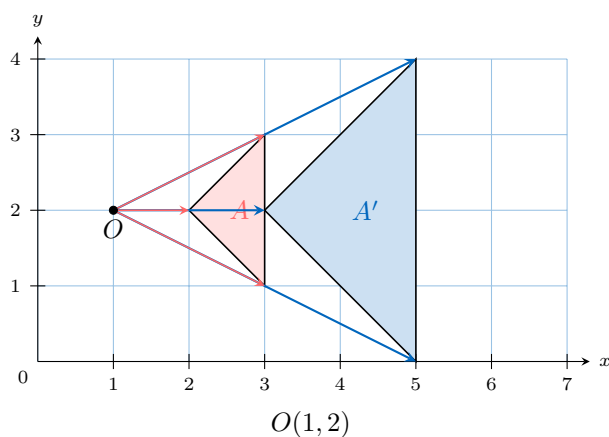
- $k = -2$

A.3 FINDING THE CENTER

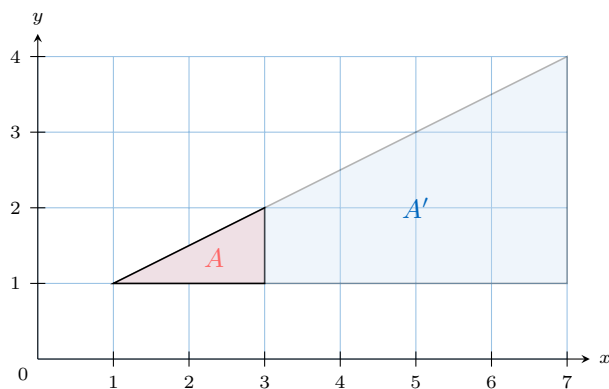**Ex 12:** The figure A' is the image of figure A under a homothety with center O and scale factor $k = 2$.

Find the coordinates of the center O.

$$O(\boxed{1},\boxed{2})$$

Answer:

O $\qquad A \qquad A'$

$$O(1,2)$$

Ex 13: The figure A' is the image of figure A under a homothety with center O and scale factor $k = 3$.

$A \qquad A'$

Find the coordinates of the center O.

$$O(\boxed{1},\boxed{1})$$

Answer:

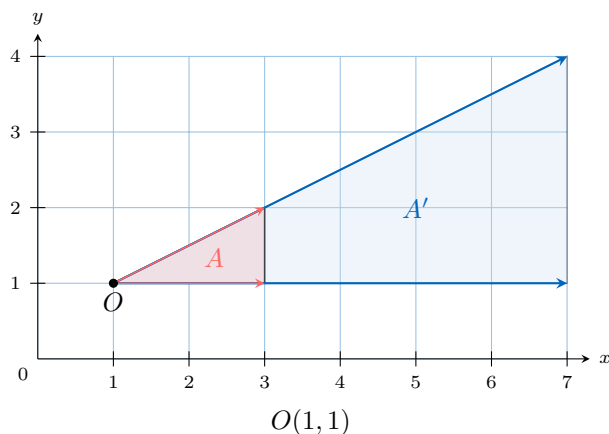O $\qquad A \qquad A'$

$$O(1,1)$$

Ex 14: The figure A' is the image of figure A under a homothety with center O and scale factor $k = -1$.

Find the coordinates of the center O.

$$O(\boxed{3}, \boxed{2})$$

Answer:

$$O(3, 2)$$

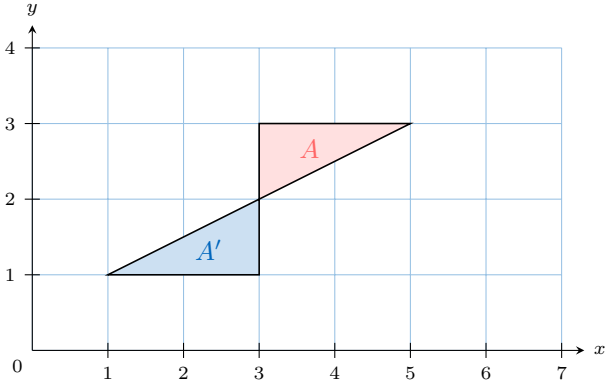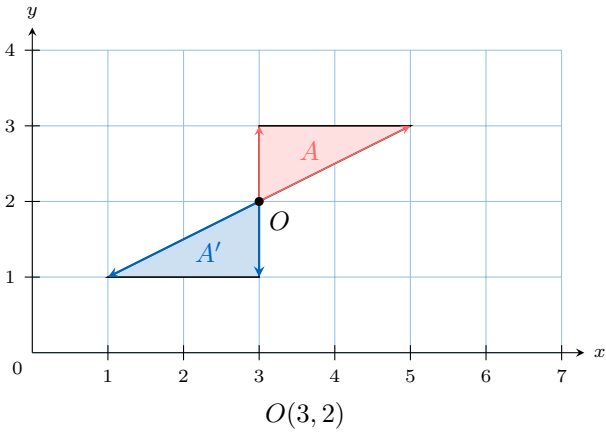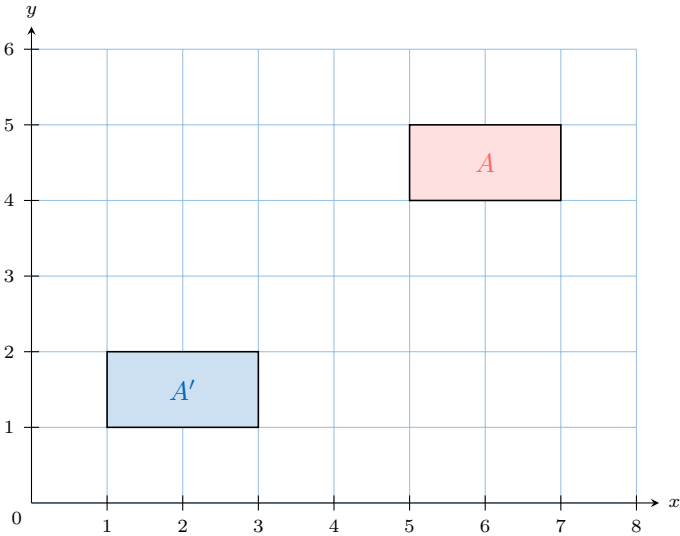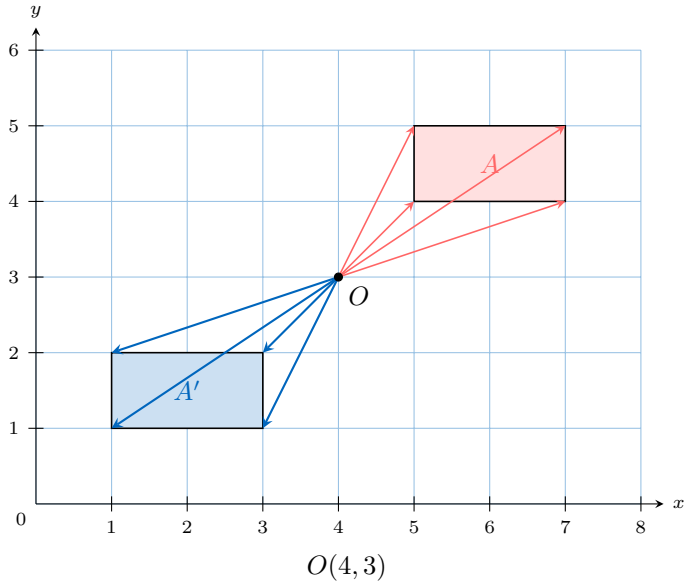**Ex 15:** The figure A' is the image of figure A under a homothety with center O and scale factor $k = -1$.
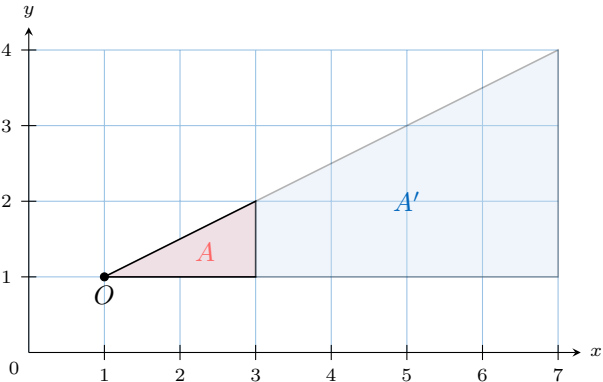

Find the coordinates of the center O.

$$O(\boxed{4}, \boxed{3})$$

Answer:

$$O(4, 3)$$

A.4 FINDING THE SCALE FACTOR

Ex 16: The figure A' is the image of figure A under a homothety with center O and scale factor k.

Find the scale factor.

$$k = \boxed{3}$$

Answer:

-
- $k = 3$
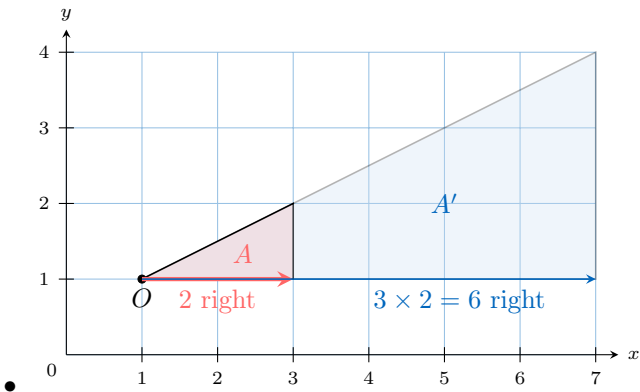
Ex 17: The figure A' is the image of figure A under a homothety with center O and scale factor k.

Find the scale factor.

$$k = \boxed{2}$$
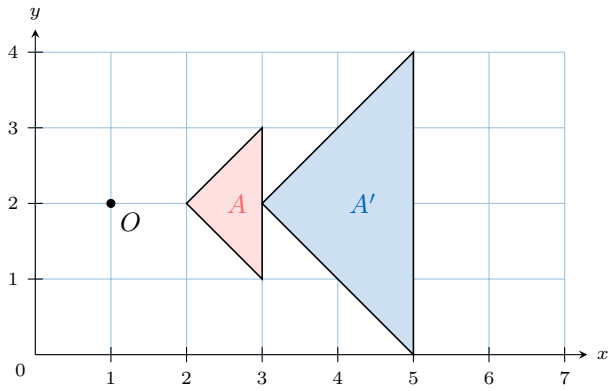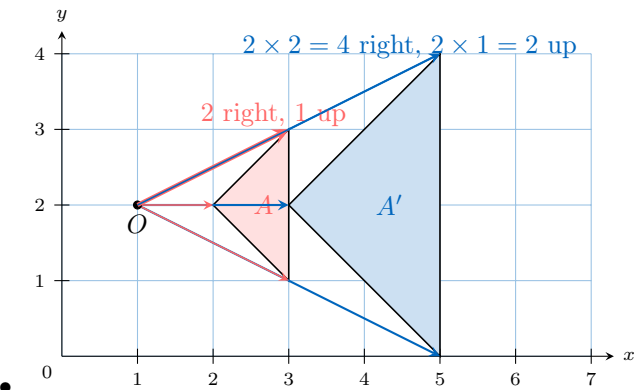
Answer:

- $k = 2$

Ex 18: The figure A' is the image of figure A under a homothety with center O and scale factor k.

Find the scale factor.

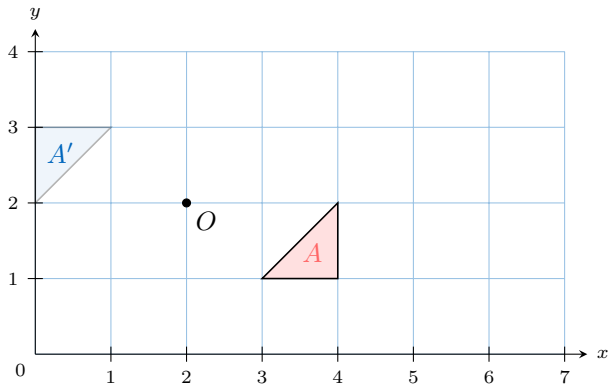$$k = \boxed{-1}$$

Answer:

- $k = -1$
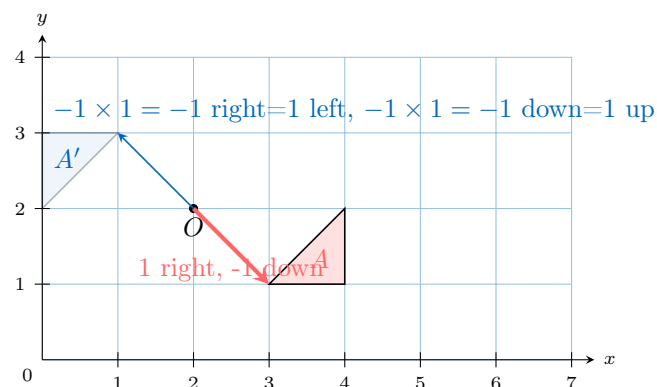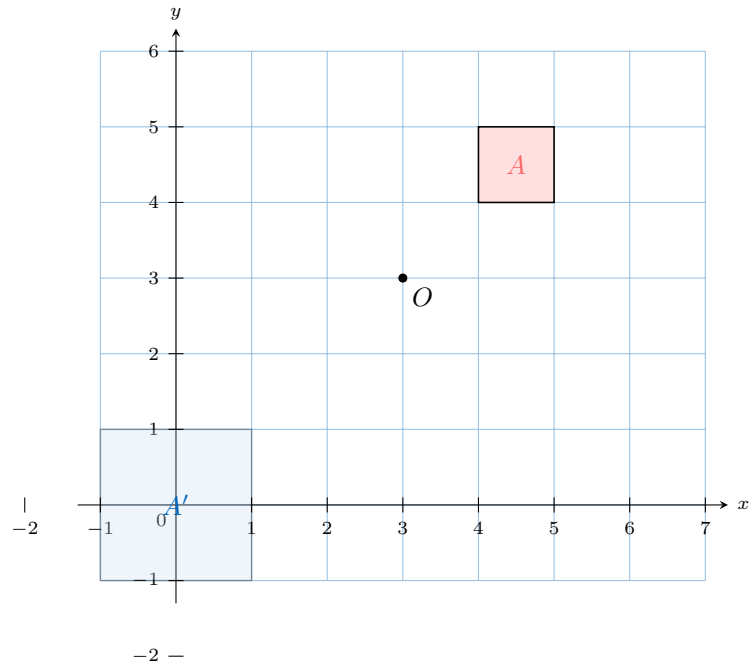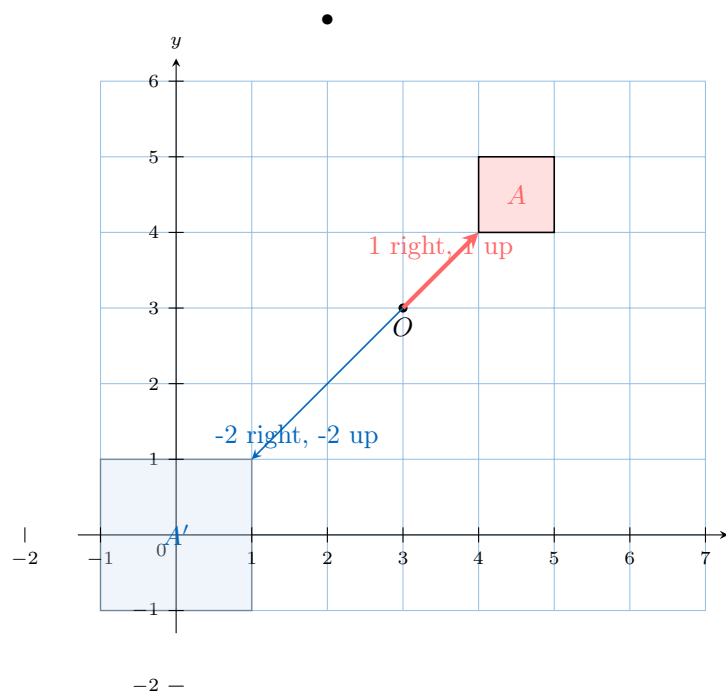
Ex 19: The figure A' is the image of figure A under a homothety with center O and scale factor k.

Find the scale factor.
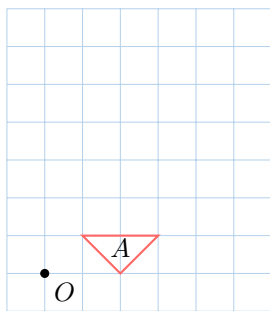
$$k = \boxed{-2}$$

Answer:

- $k = -2$

A.5 DRAWING IMAGES FIGURES

Ex 20: Draw the figure A', the image of figure A under a homothety with center O and scale factor $k = 2$.

1. **Draw the image vertices**: For each vertex, scale its distance from center O by the factor $k = 2$. Place the new points on the grid.

2. **Draw the image figure**: Connect the image vertices with lines in the same order as the original figure.
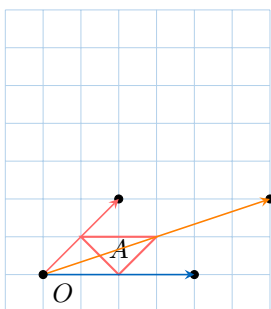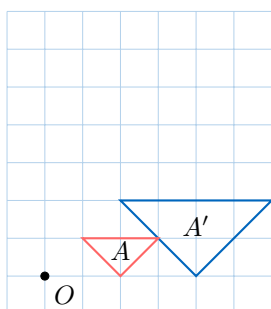

Ex 21: Draw the figure A', the image of figure A under a homothety with center O and scale factor $k = 3$.
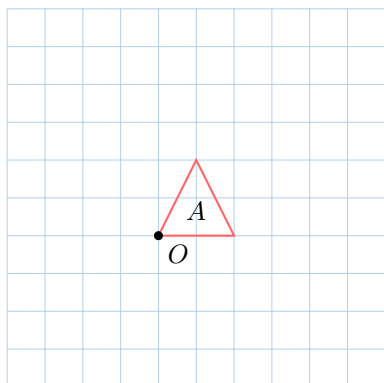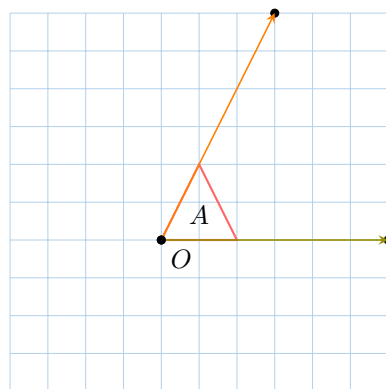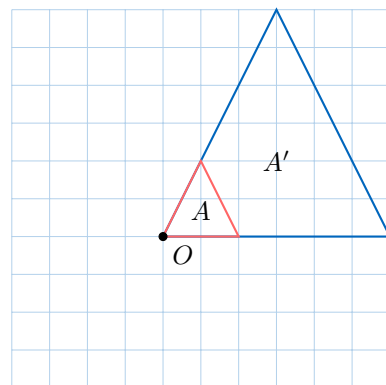

Answer:

1. **Draw the image vertices**: For each vertex, scale its distance from center O by the factor $k = 3$. Place the new points on the grid.

2. **Draw the image figure**: Connect the image vertices with lines in the same order as the original figure.

Ex 22: Draw the figure A', the image of figure A under a homothety with center O and scale factor $k = -2$.
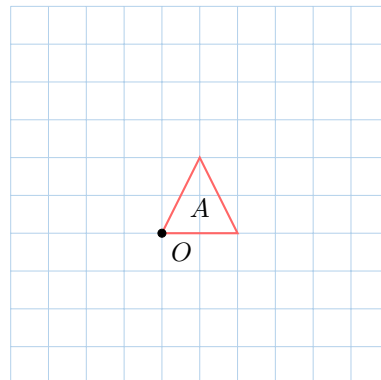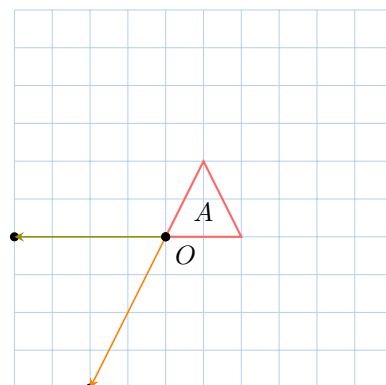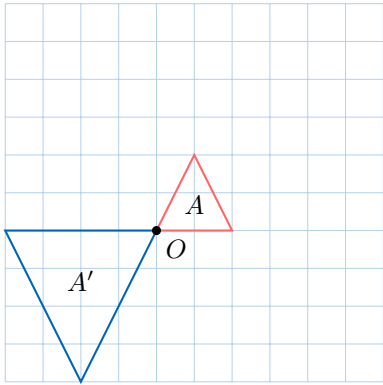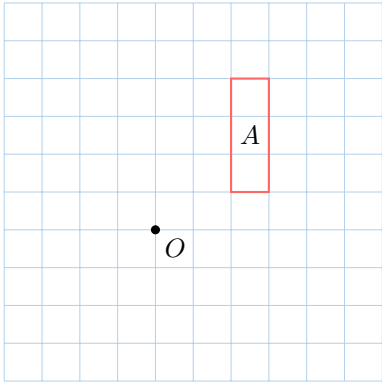

Answer:

1. **Draw the image vertices**: For each vertex, scale its distance from center O by the factor $k = -2$. Place the new points on the grid.

2. **Draw the image figure**: Connect the image vertices with lines in the same order as the original figure.
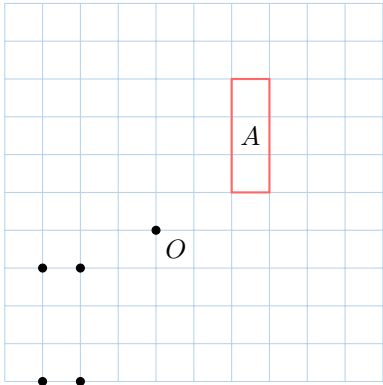

Ex 23: Draw the figure A', the image of figure A under a homothety with center O and scale factor $k = -1$.
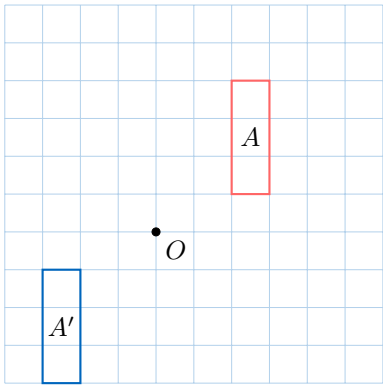

Answer:

1. **Draw the image vertices**: For each vertex, scale its distance from center O by the factor $k = -1$. Place the new points on the grid.
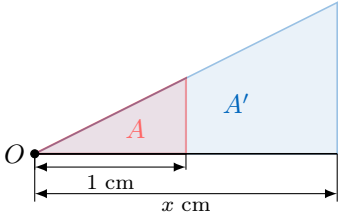

2. **Draw the image figure**: Connect the image vertices with lines in the same order as the original figure.
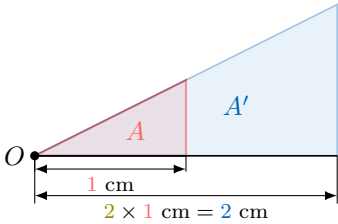

A.6 FINDING AN UNKNOWN LENGTH

Ex 24: The figure A' is the image of figure A under a homothety with center O and scale factor $k = 2$.
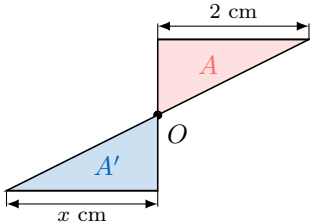

Find x.

$$x = \boxed{2}$$
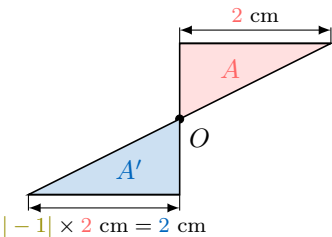
Answer:

$x = 2$

Ex 25: The figure A' is the image of figure A under a homothety with center O and scale factor $k = -1$.
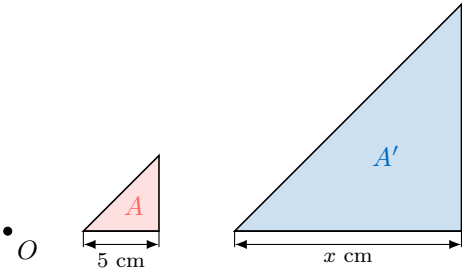

Find x.
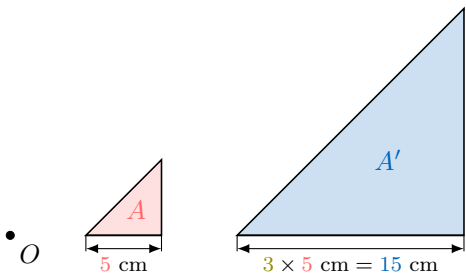
$$x = \boxed{2}$$

Answer:

$x = 2$

Ex 26: The figure A' is the image of figure A under a homothety with center O and scale factor $k = 3$.
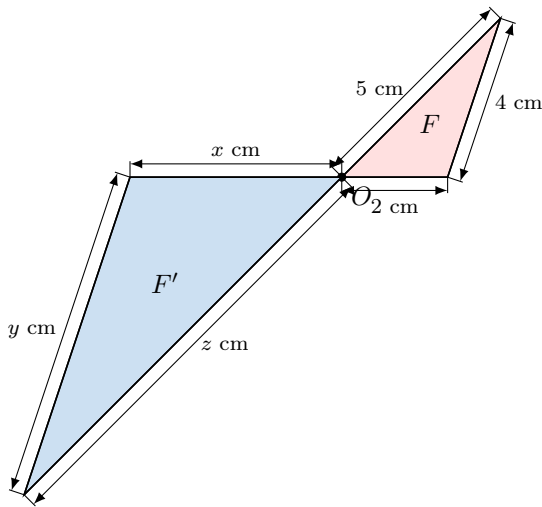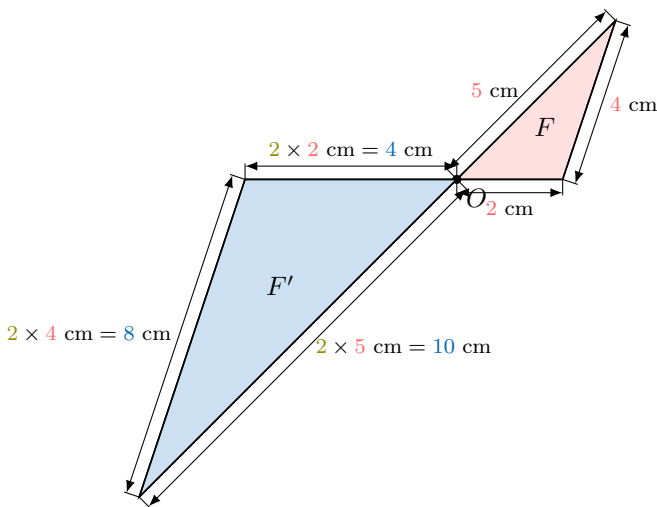
Find x.

$$x = \boxed{15}$$

Answer:

$x = 15$

Ex 27: The figure A' is the image of figure A under a homothety with center O and scale factor $k = -2$.

Find x, y, z.

$$x = \boxed{4}, \; y = \boxed{8}, \; z = \boxed{10}$$

Answer:

$x = 4$, $y = 8$, $z = 10$