Transformations

Information

Common core icons

This icon indicates a slide where the Standards for Mathematical Practice are being developed. Details of these are given in the Notes field.

Slides containing examples of mathematical modeling are marked with this stamp.

This icon indicates an opportunity for discussion or group work.

The **Standards for Mathematical Practice** outlined in the Common Core State Standards for Mathematics describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

These are:

1) Make sense of problems and persevere in solving them.

2) Reason abstractly and quantitatively.

3) Construct viable arguments and critique the reasoning of others.

4) Model with mathematics.

5) Use appropriate tools strategically.

6) Attend to precision.

7) Look for and make use of structure.

8) Look for and express regularity in repeated reasoning.

This icon indicates that the slide contains activities created in Flash. These activities are not editable.

This icon indicates teacher's notes in the Notes field.

Introducing transformations

A **transformation** is a change in a shape's position or size.

- **Rotation**, **reflection** and **translation** are transformations that change the **position** of an object.

- **Dilations** are transformations that change the **size** of an object.

After a transformation, the resulting shape is called an **image**. The original shape is called the **pre-image**.

Introducing rotation

A **rotation** occurs when an object is turned around a fixed point.

Which of these are examples of rotation in real life?

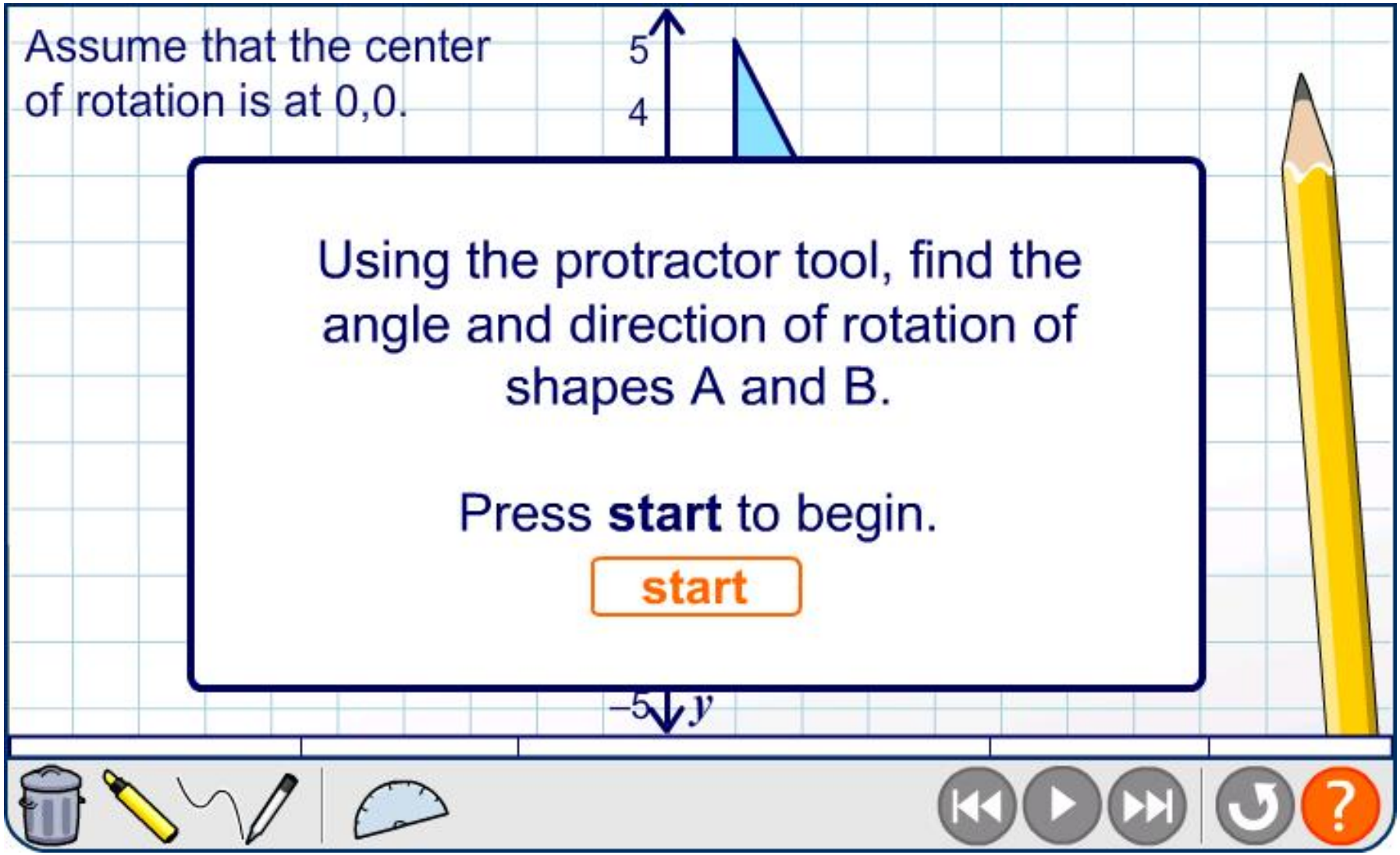
- riding on a Ferris wheel
- walking up stairs
- opening a door
- bending your arm
- opening your mouth
- opening a drawer.

Can you think of any other examples?

Rotating shapes

To describe a rotation, we need to know three things:

Finding angles of rotation

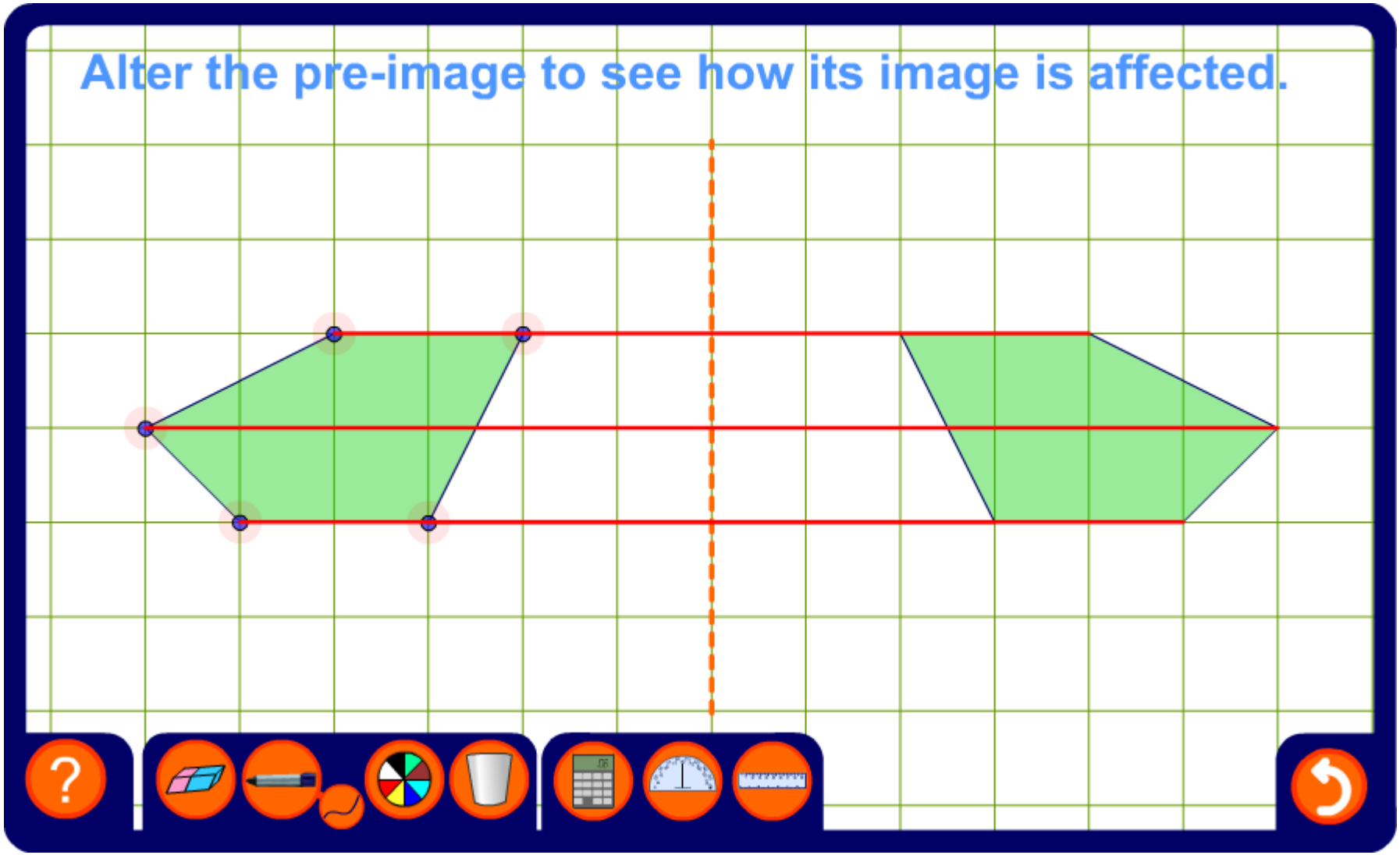


Introducing reflection

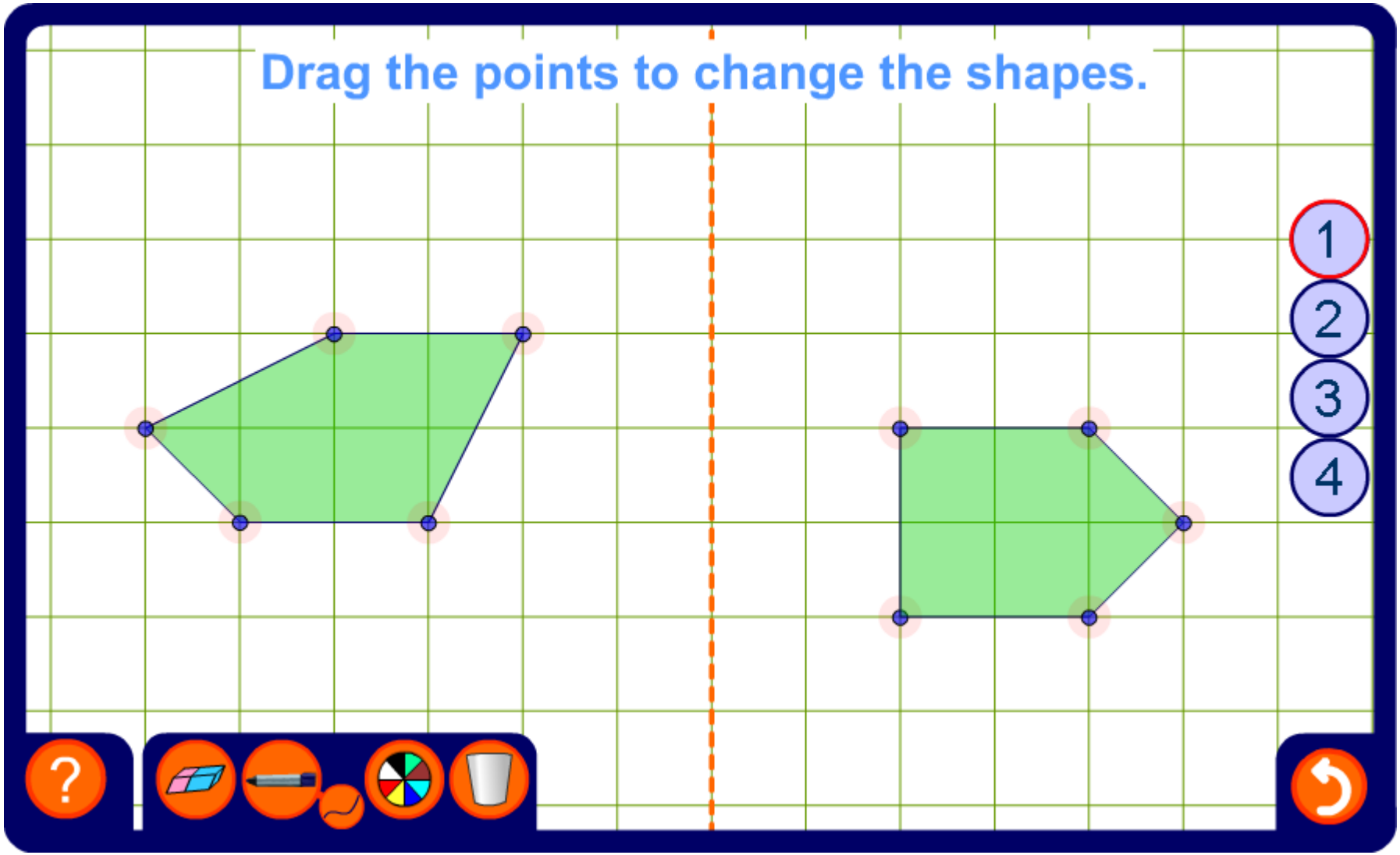
A figure can be **reflected** in a mirror line or **axis of reflection** to produce an image.

Each point in the image is the same distance from the axis of reflection as the corresponding point on the pre-image.

Reflecting shapes



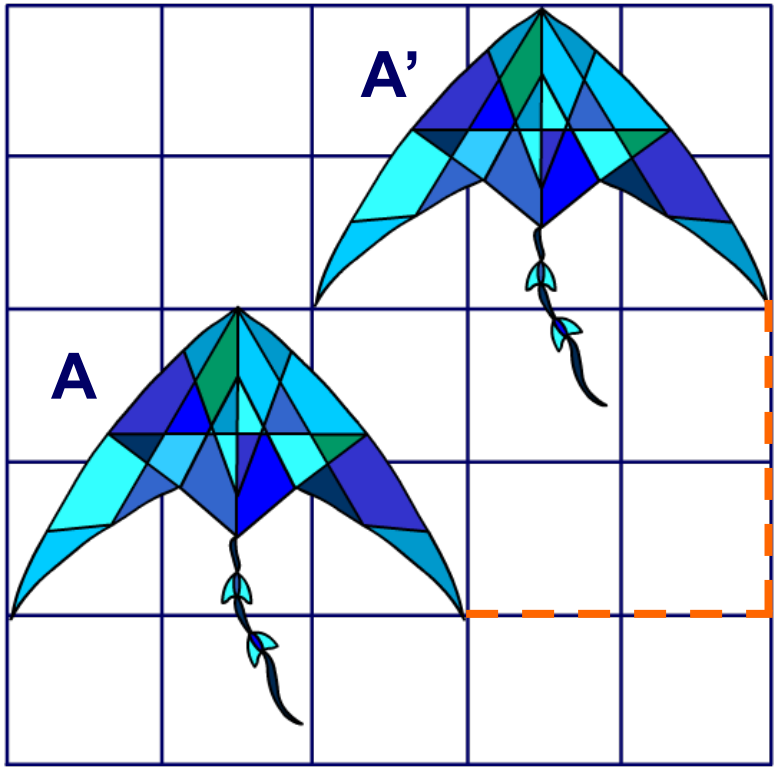
Reflect this shape



Translation

When a figure is moved in a straight line in a given direction, we say that it has been **translated**.

Kite A has been translated to produce the image A’.



Describe the movement of kite A to produce image A’.

Kite A has moved two squares to the right and two squares up.

Every point in the pre-image moves the same distance in the same direction.

Introducing dilation

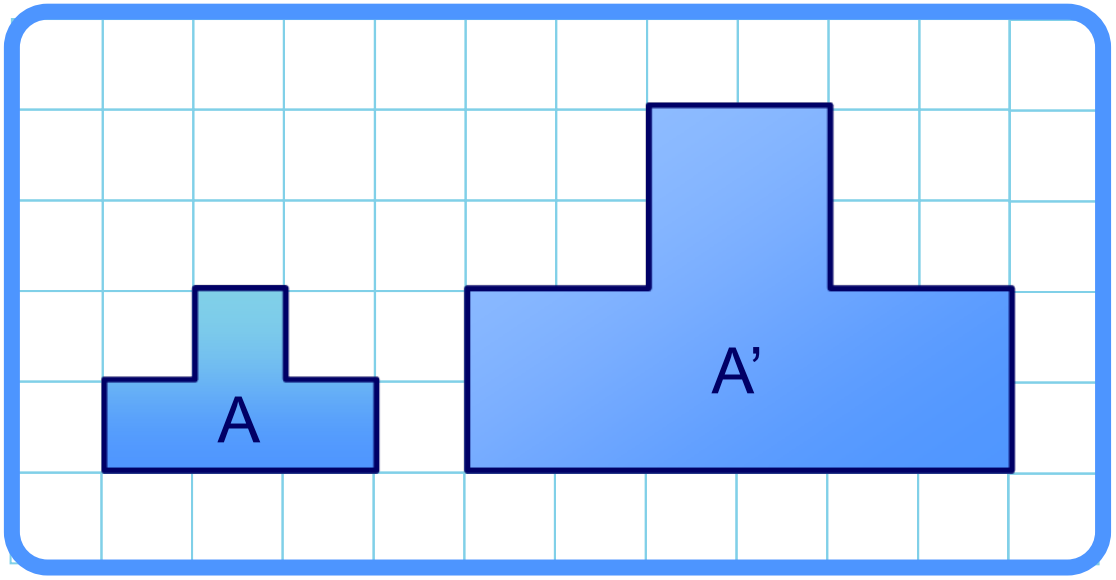
A **dilation** is a change in **size** of an object.

Dilations differ from other transformations because the object itself is altered, rather than just being moved.

A dilation can make an object either smaller or larger.

The amount that an object changes size is called the **scale factor**.

Using dilations



Shape A’ is a **dilation** of shape A.

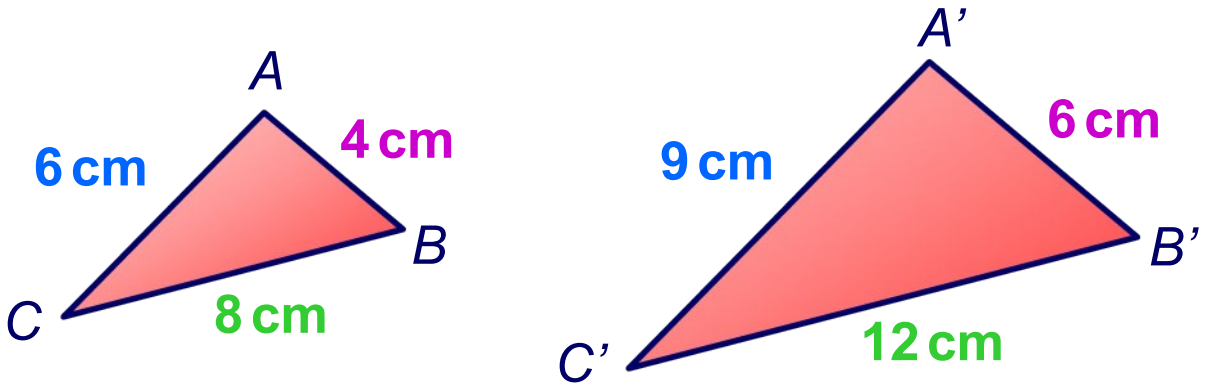
How much larger is shape A’ than shape A?

The length of each side in shape A’ is **twice** the length of each side in shape A.

Shape A has been dilated by **scale factor** 2.

Dilation ratios

When a shape is dilated, the **ratios** of the lengths in the image to the corresponding lengths in the pre-image are equal to the scale factor.



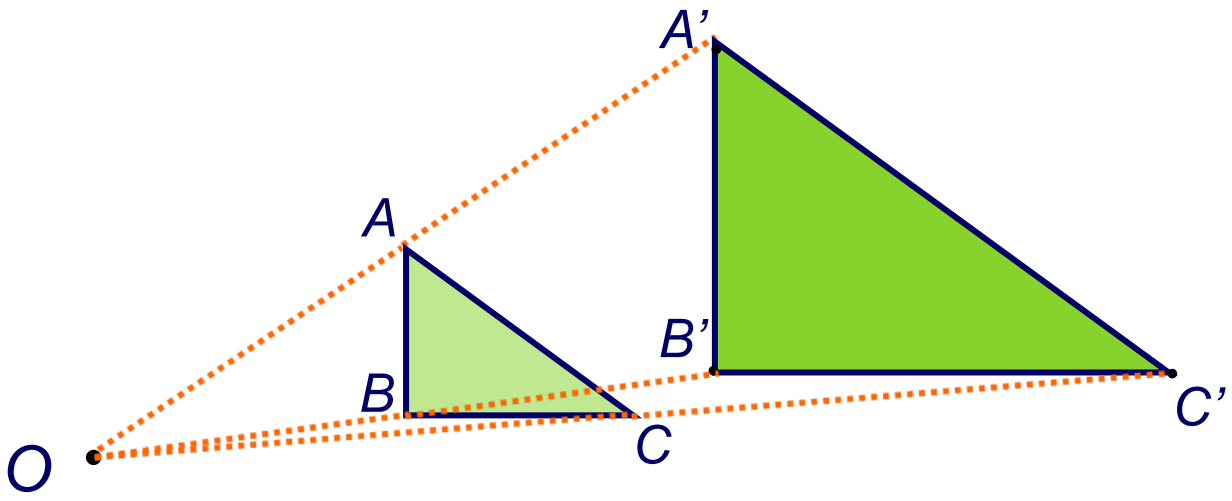
$$\frac{A'B'}{AB} = \frac{B'C'}{BC} = \frac{A'C'}{AC} = \text{the scale factor}$$

$$\frac{6}{4} = \frac{12}{8} = \frac{9}{6} = 1.5$$

Center of dilation

To define a dilation, we need a **scale factor** and a **center of dilation**.

Dilate triangle *ABC* by scale factor 2 from the center of dilation *O*:



$$\frac{OA'}{OA} = \frac{OB'}{OB} = \frac{OC'}{OC} = 2$$

Transformations on a coordinate grid

Press the buttons to see how transformations affect the size and position of different shapes.

rotation | translation

reflection | dilation