

Name _____

Date _____

14.6 Enlargement — worksheet

Enlarge shapes by a positive integer scale factor about a centre, identify an enlargement, and understand that the image is mathematically similar to the object. · 58 questions · Show your working.

Remember

- An **enlargement** multiplies every length by a **scale factor**.
- It needs **two** things: the scale factor and the centre of enlargement.
- From the origin: $(x, y) \rightarrow (kx, ky)$.
- From any other centre: multiply the **offset from the centre** by k , then add the centre back on.
- **Angles do not change**. Only lengths do.
- The image is **mathematically similar** to the object — same shape, different size. It is **not** congruent unless $k = 1$.
- **Lengths and perimeters** are multiplied by k .
- **Areas** are multiplied by k^2 , because an area is a length times a length.
- The centre of enlargement is the one point that does not move.
- A scale drawing is an enlargement — section 14.2 was doing this all along.

A · Fluency — Multiply by the scale factor, and see what it does.

- 1 Enlarge the point $(2, 3)$ by scale factor 2, centre the origin.

- 2 Enlarge the point $(1, 4)$ by scale factor 3, centre the origin.

- 3 Enlarge the point $(3, 1)$ by scale factor 2, centre the origin.

- 4 Enlarge the point $(-2, 1)$ by scale factor 3, centre the origin.

- 5 Enlarge the point $(2, -3)$ by scale factor 2, centre the origin.

- 6 Enlarge the point $(-1, -2)$ by scale factor 4, centre the origin.

- 7 Enlarge the point $(4, 2)$ by scale factor 2, centre the origin.

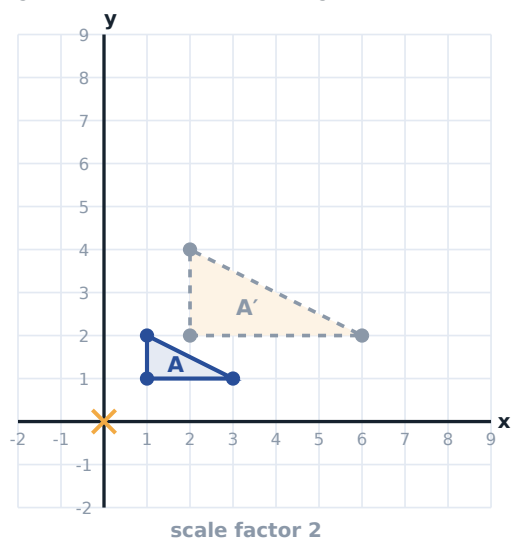
- 8 Enlarge the point $(1, 1)$ by scale factor 5, centre the origin.

- 9 Enlarge the point $(-3, 2)$ by scale factor 2, centre the origin.

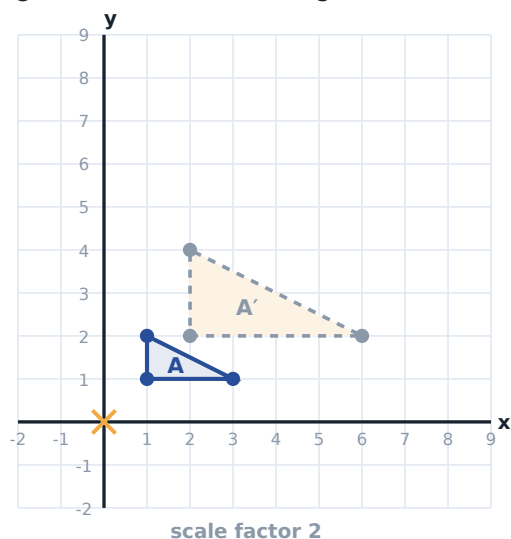
- 10 Enlarge the point $(2, 2)$ by scale factor 3, centre the origin.

- 11** A square has sides of 3 cm. It is enlarged by scale factor 2. How long is each side of the image, in centimetres?
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- 12** A square has sides of 5 cm. It is enlarged by scale factor 2. How long is each side of the image, in centimetres?
-
- 13** A square has sides of 4 cm. It is enlarged by scale factor 3. How long is each side of the image, in centimetres?
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- 14** A square has sides of 2 cm. It is enlarged by scale factor 4. How long is each side of the image, in centimetres?
-
- 15** A square has sides of 6 cm. It is enlarged by scale factor 2. How long is each side of the image, in centimetres?
-
- 16** A square has sides of 3 cm. It is enlarged by scale factor 3. How long is each side of the image, in centimetres?
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- 17** A square has sides of 10 cm. It is enlarged by scale factor 2. How long is each side of the image, in centimetres?
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- 18** A square has sides of 7 cm. It is enlarged by scale factor 2. How long is each side of the image, in centimetres?
-
- 19** A square has sides of 3 cm. It is enlarged by scale factor 2. What is the area of the image, in square centimetres?
-
- 20** A square has sides of 5 cm. It is enlarged by scale factor 2. What is the area of the image, in square centimetres?
-
- 21** A square has sides of 4 cm. It is enlarged by scale factor 3. What is the area of the image, in square centimetres?
-
- 22** A square has sides of 2 cm. It is enlarged by scale factor 4. What is the area of the image, in square centimetres?
-
- 23** A square has sides of 6 cm. It is enlarged by scale factor 2. What is the area of the image, in square centimetres?
-
- 24** A square has sides of 3 cm. It is enlarged by scale factor 3. What is the area of the image, in square centimetres?
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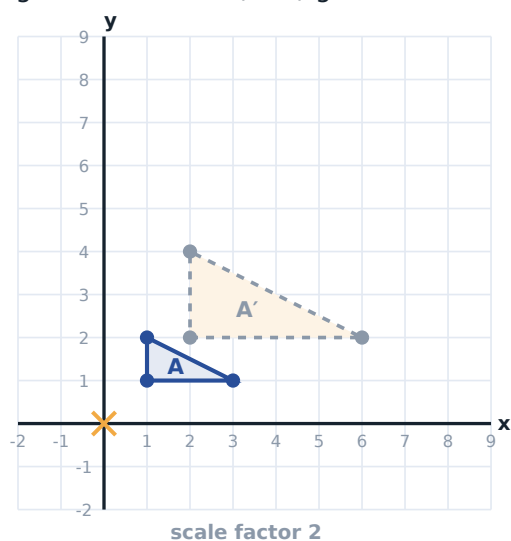
- 25** Triangle A has vertices $(1, 1)$, $(3, 1)$ and $(1, 2)$. It is enlarged by scale factor 2, centre the origin. Where does $(1, 1)$ go?



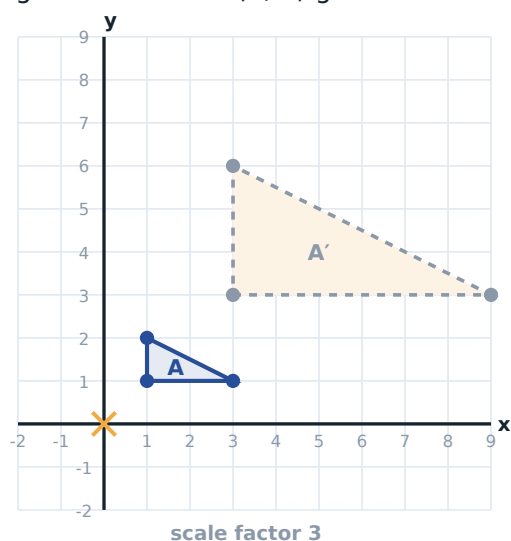
- 26** Triangle A has vertices $(1, 1)$, $(3, 1)$ and $(1, 2)$. It is enlarged by scale factor 2, centre the origin. Where does $(3, 1)$ go?



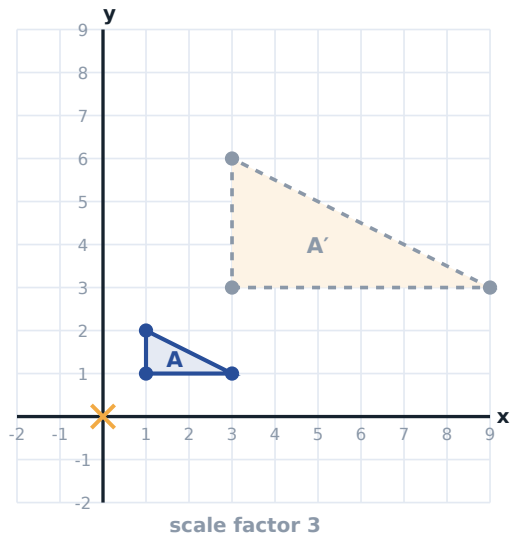
- 27** Triangle A has vertices $(1, 1)$, $(3, 1)$ and $(1, 2)$. It is enlarged by scale factor 2, centre the origin. Where does $(1, 2)$ go?



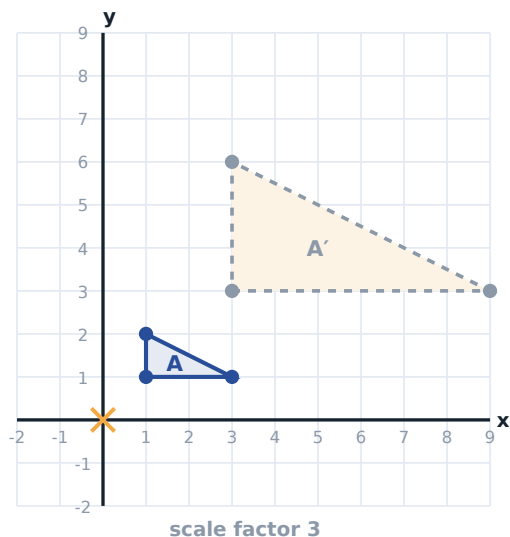
- 28** Triangle A has vertices $(1, 1)$, $(3, 1)$ and $(1, 2)$. It is enlarged by scale factor 3, centre the origin. Where does $(1, 1)$ go?



- 29** Triangle A has vertices $(1, 1)$, $(3, 1)$ and $(1, 2)$. It is enlarged by scale factor 3, centre the origin. Where does $(3, 1)$ go?



- 30** Triangle A has vertices $(1, 1)$, $(3, 1)$ and $(1, 2)$. It is enlarged by scale factor 3, centre the origin. Where does $(1, 2)$ go?



B · Reasoning — Similar against congruent, and why areas behave differently.

- 31** After an enlargement with scale factor 3, the image is ...

- ☐ congruent to the object
- ☐ mathematically similar to the object
- ☐ a mirror image
- ☐ unchanged

- 32** What happens to the angles in an enlargement?

- ☐ They are multiplied by the scale factor
- ☐ They stay the same
- ☐ They are divided by the scale factor
- ☐ They double

- 33** A shape is enlarged by scale factor 3. Its area is multiplied by ...
☐ 3
☐ 6
☐ 9
☐ 27
- 34** A shape is enlarged by scale factor 2. Its perimeter is multiplied by ...
☐ 2
☐ 4
☐ 8
☐ It does not change
- 35** Enlarging from the origin by scale factor k does what to the coordinates?
☐ adds k
☐ multiplies both by k
☐ multiplies x only by k
☐ subtracts k
- 36** Does an enlargement with scale factor 1 change the shape?
☐ Yes
☐ No
- 37** Which point does not move in an enlargement?
☐ The origin always
☐ The centre of enlargement
☐ Every point moves
☐ The first vertex
- 38** How do you describe an enlargement fully?
☐ Give the scale factor only
☐ Give the centre only
☐ Give the scale factor and the centre
☐ Give the direction
- 39** Is a scale drawing an enlargement?
☐ Yes
☐ No
- 40** Two shapes are mathematically similar. That means ...
☐ they are identical
☐ they have the same shape but possibly different sizes
☐ they have the same area
☐ they are congruent

C · Challenge — Centres away from the origin, and working backwards.

- 41** Enlarge the point (3, 2) by scale factor 2, centre (1, 1).

- 42** Enlarge the point (4, 5) by scale factor 3, centre (2, 3).

- 43** Enlarge the point (0, 4) by scale factor 2, centre (0, 2).

- 44** Enlarge the point (5, 1) by scale factor 2, centre (1, 1).

- 45** Enlarge the point (−1, 3) by scale factor 3, centre (1, 1).

- 46** A rectangle is 4 cm by 6 cm. It is enlarged by scale factor 3. What is the area of the image, in square centimetres?

- 47** A triangle has area 5 cm². It is enlarged by scale factor 4. What is the area of the image, in square centimetres?

- 48** A shape has perimeter 14 cm. After an enlargement its perimeter is 42 cm. What was the scale factor?

- 49** A photograph 5 cm wide is enlarged so that it is 20 cm wide. By what scale factor?

- 50** A square of side 3 cm is enlarged by scale factor 5. How many times bigger is the area?

D · Word problems — Photographs, models, rugs and frames.

- 51** A photograph is 6 cm by 4 cm. It is enlarged by scale factor 3 for a poster. What is the longer side of the poster, in centimetres?

- 52** A model house is built at scale factor 25 from a plan. A wall is 8 cm on the plan. How long is the model wall, in centimetres?

- 53** A logo has a corner at (2, 3). It is enlarged by scale factor 4 from the origin. Where is that corner now?

- 54** A rug measures 2 m by 3 m. A similar rug has been enlarged by scale factor 2. What is its area, in square metres?

- 55** A map is redrawn twice as large. A road was 7 cm; how long is it now, in centimetres?

- 56** A tile design of area 12 cm² is enlarged by scale factor 3. How much larger is the new area, in square centimetres?

- 57** A pattern point at (1, 2) is enlarged by scale factor 3 from the centre (1, 1). Where does it go?

- 58** A picture frame is enlarged by scale factor 2. The original used 60 cm of wood. How many centimetres of wood does the new one need?
