

Area scale factor

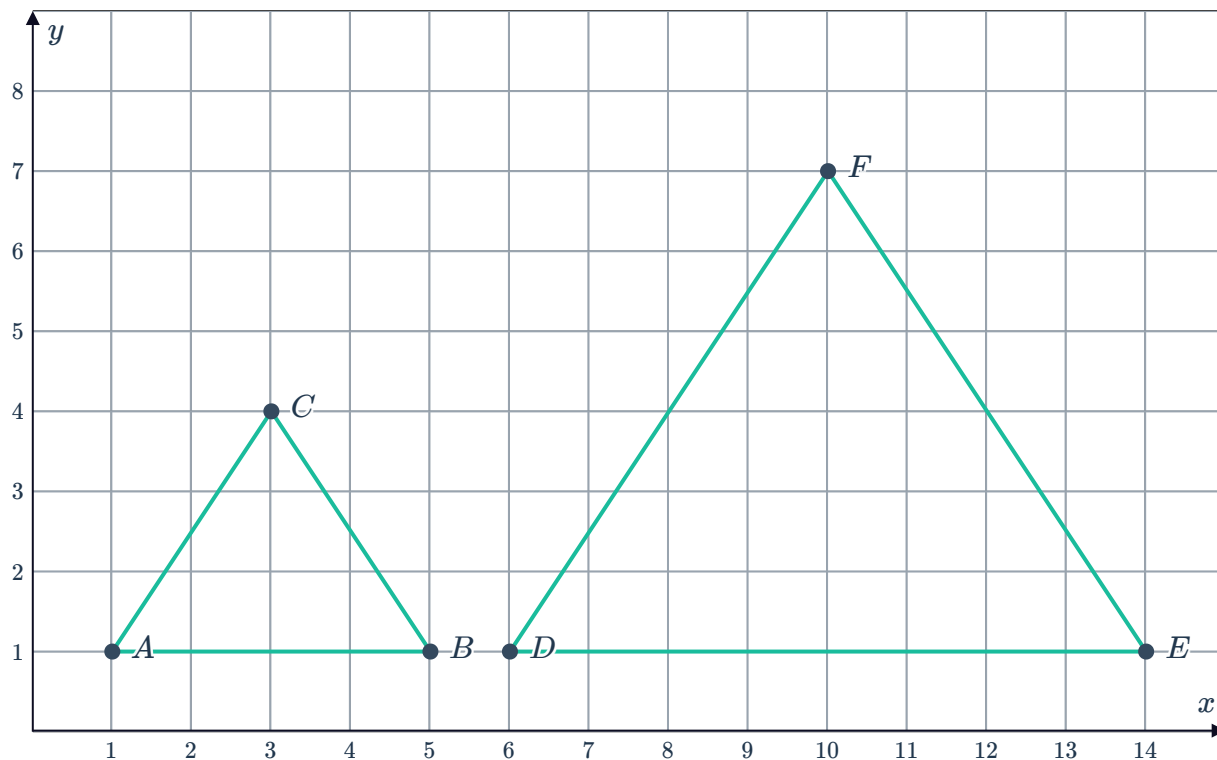
1 Find the area scale factor for each of the following linear scale factors:

a 10

b $\frac{3}{10}$

c $\frac{1}{3}$

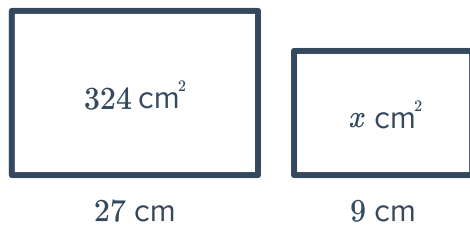
2 Consider the following two triangles:



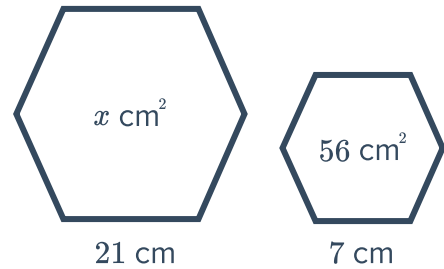
- a What scale factor is used to enlarge the small triangle?
- b What scale factor is used to reduce the large triangle?
- c What is the area of the small triangle?
- d What is the area of the large triangle?
- e What is the enlargement factor for the area of the small triangle?

3 Find the value of x for each of the following pairs of similar shapes:

a

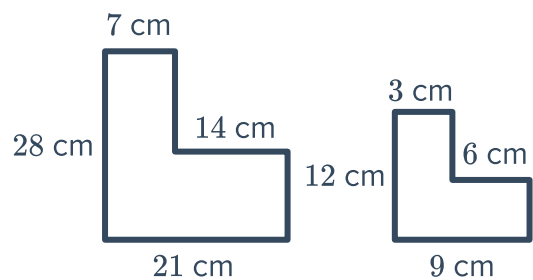


b



4 Consider the following similar figures:

- a Find the length scale factor from the left figure to the right figure.
- b Find the area scale factor from the left figure to the right figure.



5 A square with area 4 cm^2 has its side lengths enlarged by a factor of 3.

- a What is the side length of the original square?
- b What will be the area of the new square?
- c By what factor has the area been enlarged?

6 The area of a square is 30 cm^2 . Its side length is enlarged by a scale factor of 3. What is the area of the new square?

7 A square of side length 6 cm is enlarged using the scale factor 3. Find the area of the enlarged square.

8 The corresponding sides of two similar triangles are 8 cm and 40 cm . If the area of the smaller triangle is 24 cm^2 . Find the area of the larger triangle.

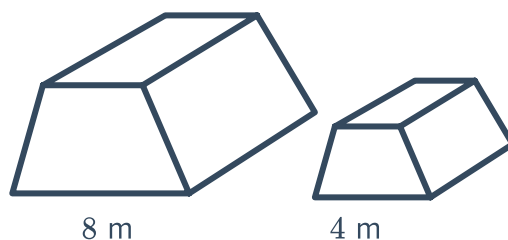
9 If the diameter of a circle is tripled, what will happen to the area of the circle?

- 10** A triangle has side lengths of 7 cm, 10 cm and 16 cm. A similar triangle has 9 times the area of the first triangle.
- a** Find the side lengths of the second triangle.
 - b** Find the perimeter of the second triangle.
- 11** Consider two similar parallelograms with a matching sides in the ratio 6 : 8.
- a** Calculate the area of the larger parallelogram, if the area of the smaller parallelogram is 72 cm^2 .
 - b** Find the length of the base of the smaller parallelogram , if the length of the base of larger parallelogram is 12 cm.
- 12** Consider the formula $A = \frac{1}{2}bh$.
- a** If the value of b doubles, what will happen to the value of A ?
 - b** If the values of both b and h double, what will happen to the value of A ?
- 13** Consider the formula $A = \pi r^2$.
- a** If the value of r were to triple, what will happen to the value of A ?
 - b** If r was decreased by a factor of 4, what will happen to the value of A ?
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Volume scale factor

- 14** Consider the following similar trapezoidal prisms:
Going from the smaller prism to the larger prism, find:

- a** The length scale factor.
- b** The volume scale factor.



- 15** Two similar cones have bases with radius 7 cm and 28 cm respectively.
- a** Find the scale factor of the height of the smaller cone to the height of the larger cone.
 - b** Find the scale factor of the volume of the smaller cone to the volume of the larger cone.
 - c** Find the volume of the larger cone, if the volume of the smaller cone is 852 cm^3 .
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Surface area scale factor

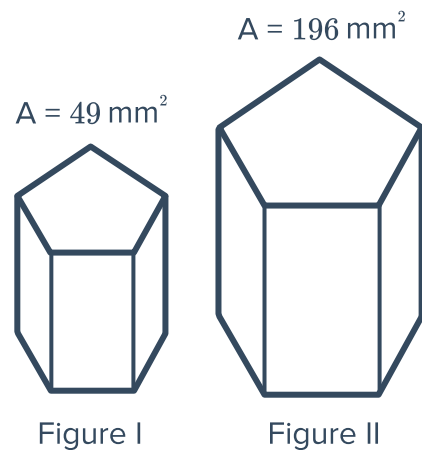
- 16** The bases of two similar rectangular prisms are: 30 cm by 45 cm; and 6 cm by 9 cm.
- a** Find the length scale factor.
 - b** Find the surface area scale factor.
 - c** Find the surface area of the smaller prism, if the surface area of the larger prism is 4425 cm^2 .

- 17** The surface areas of two similar triangular prisms are in the ratio 64 : 49.

- a** Find the scale factor of their sides.
- b** Find the scale factor of their volumes.

- 18** The following pentagonal prisms are similar.
The areas of their cross-sectional faces are given:

- a** Find the surface area scale factor of Figure II from Figure I.
- b** Find the length scale factor of Figure II from Figure I.
- c** Find the height of Figure II, if Figure I has a height of 13 mm.

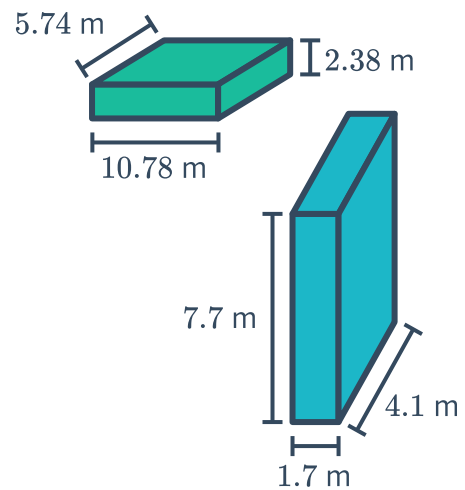


- 19** The volume of two similar crates are in the ratio 1331 : 125.

- a** Find the ratio of their sides.
- b** Find the ratio of their surface areas.

20 Consider the following rectangular prisms:
Going from the left prism to the right prism,
find:

- a The length scale factor.
- b The surface area scale factor.
- c The volume scale factor.



Applications

- 21** A circular oil spill has a radius of 20 m. In a photo taken of the oil spill, the circle is reduced by a factor of 500. Find the radius of the circular oil spill in the photo.
- 22** William recorded a video on his camera. When viewing it on the camera screen, the video appeared in a width to height ratio of 4 : 3 respectively. When he uploaded to his computer, everything stayed in the same ratio. If the width of the video on his computer screen is 20 cm, find the height of the video on the computer screen.
- 23** A rectangular billboard has a length of 1.2 m. The corresponding length on the billboard designer's computer screen is 20 cm.
- a Find the length scale factor.
 - b Find the area scale factor.
 - c Find the area of the computer image, if the area of actual board is 50.4 m^2 .
- 24** A piece of sports tape in the shape of a rectangle measures 6 cm in width and 10 cm in length (when not stretched). When applied to Sophia's shoulder, it is stretched so that it covers a rectangular area measuring 12 cm wide by 20 cm long.
- a When not stretched, what area does the tape cover?
 - b When stretched, what area does the tape cover?
 - c By what scale factor are the sides of the rectangular tape enlarged?
 - d By what scale factor is the area of the rectangular tape enlarged?
- 25** Mae wants to insert a picture into a document. She enlarges it by a factor of 12 but it becomes too blurry, so she reduces the resulting picture by a scale factor of 4. What is the overall scale factor going from the original to the final size?

- 26** Valentina was making a trial birthday cake for her son. The dimensions are 10 cm for the length, 7 cm for the width and 3 cm for the height. The final cake needs to have dimensions of 20 cm for the length, 14 cm for the width and 6 cm for the height.
- a** Find the ratio of the lengths of the final cake to those of the trial cake.
 - b** Hence, find the ratio of the volume of the final cake to that of the trial cake.
 - c** To make the final cake, what should Valentina multiply the quantities of the trial cake by?
- 27** Susana has two teddy bears that have the same shape but are different sizes. The length of the first teddy bear is 15 cm, while the length of the second teddy bear is 75 cm.
- a** Find the length scale factor.
 - b** Find the surface area scale factor.
 - c** If the smaller bear needs 375 cm^2 to be covered with 'fake fur', find the area of 'fake fur' needed for the larger bear.
- 28** The dimensions of a cement slab are l , the length, w , the width, and h , the height. If these dimensions are tripled:
- a** What factor will the surface area of the cement slab increase by?
 - b** What factor will the volume of the cement slab increase by?
- 29** The radii of two spherical balloons are 12cm and 6cm respectively.
- a** Find the ratio of the radii.
 - b** Find the ratio of their surface areas.
 - c** Find the ratio of their volumes.
 - d** Find the ratio of the their volumes, if half the air is released from the smaller balloon.
- 30** Consider two similar ceilings: the first with dimensions 5 m by 4 m, and the second with dimensions 20 m by 16 m .
- a** Find the length scale factor.
 - b** Find the area scale factor.
 - c** The smaller ceiling took 1.5 L of paint to cover it. How many litres of paint would be required to paint the second ceiling?
- 31** The ratio of the length of a model car to a real car is 1 : 20.
- a** Find the ratio of surface area of the model car to the real car.
 - b** Find the ratio of the volume of the model car to the real car.
 - c** Find how many litres of paint are needed to paint the real car, if 18 mL are needed to paint the model car.

d Find the capacity of the model car fuel tank, in mL, if the real car fuel tank holds 48 L.

32 A beehive consists of hexagonal cells with side length 3.2 mm and depth of 3.8 mm. A plastic container is built which is modelled on these hexagonal cells, with a side length of 6.4 cm.

- a** Find the ratio of the side length of the beehive to the side length of the modelled storage unit.
- b** Find the ratio of the surface area of the side of the beehive to the surface area of the side of the modelled storage unit.
- c** Find the ratio of the volume of the beehive to the volume of the modelled storage unit.