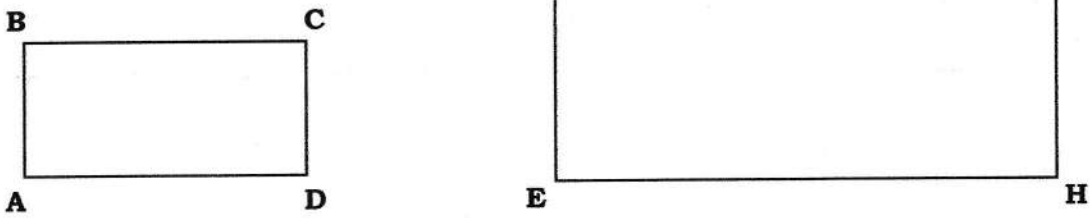
AREA AND VOLUME SCALE FACTORS – PRACTICE QUESTIONS
CALCULATOR ALLOWED

metatutor

1.
ABCD and EFGH are mathematically similar rectangles.
AD = 4 cm and EH = 8 cm.
The area of ABCD is 12 cm².



8 ÷ 4 = 2 = scale factor
2^2 = area scale factor

(a) Find the area of EFGH.

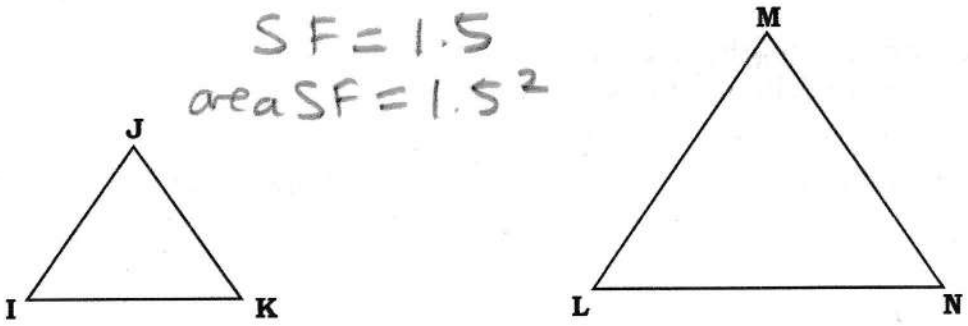
$12 \times 2^2 = 48\ cm^2$

(b) Find CD.

$12 \div 4 = 3\ cm$

2.
IJK and LMN are mathematically similar triangles.
LN = 1.5 × IK.
The area of LMN is 45 cm².

SF = 1.5
area SF = 1.5^2



(a) Find the area of IJK.

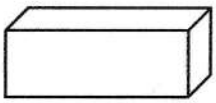
$45 \div 1.5^2 = 20\ cm^2$

(b) The height of triangle IJK is 5 cm.
Find the height of triangle LMN.

$5 \times 1.5 = 7.5\ cm$

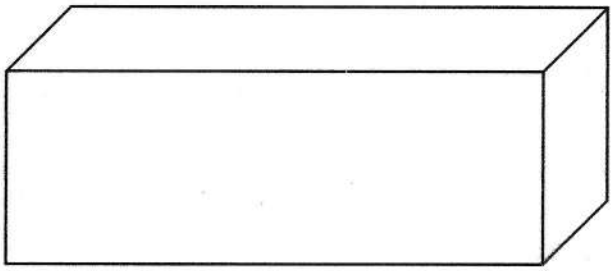
3.
Pictured below are two mathematically similar cuboids – Cuboid A and Cuboid B.
The volume of Cuboid A is 10 cm^3.

Cuboid A



5 cm

Cuboid B



15 cm

(a) Find the volume of Cuboid B.

SF = 15 ÷ 5 = 3
vol SF = 3^3

$10 \times 3^3 = 270 cm^3$

(b) The height of Cuboid B is 7.5 cm.
Find the height of Cuboid A.

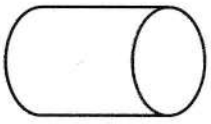
$7.5 \div 3 = 2.5$ cm

(c) The depth of Cuboid A is 2 cm.
Find the depth of Cuboid B.

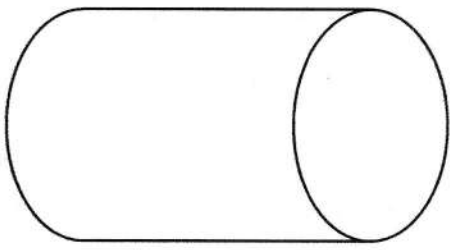
$2 \times 3 = 6$ cm

4.
Pictured below are two mathematically similar cylinders – Cylinder A and Cylinder B.
The width of Cylinder B is 2.5 times the width of Cylinder A.
The volume of Cylinder B is 625 cm^3.

Cylinder A



Cylinder B



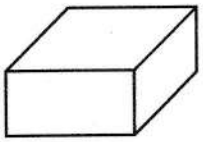
Find the volume of Cylinder A.

SF = 2.5
vol SF = 2.5^3

$625 \div 2.5^3 = 40 cm^3$

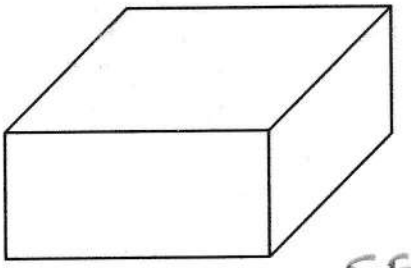
5.
Pictured below are two mathematically similar cuboids – Cuboid C and Cuboid D.

Cuboid C



16 cm

Cuboid D



10.5 cm

28 cm

$SF = 28 \div 16 = \frac{7}{4}$

$\text{area SF} = \left(\frac{7}{4}\right)^2$

The surface area of Cuboid C is 896 cm^2.

(a) Find the surface area of Cuboid D.

$896 \times \left(\frac{7}{4}\right)^2 = 2744 \text{ cm}^2$

(b) Find the height of Cuboid C.

$10.5 \div \frac{7}{4} = 6 \text{ cm}$

6.
Alex and Belinda have two mathematically similar sofas.

Alex's sofa

Belinda's sofa

The height of Alex's sofa is 70 cm.
The height of Belinda's sofa is 98 cm.
The surface area of Belinda's sofa is 78,400 cm^2.

Find the surface area of Alex's sofa.

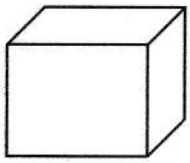
$SF = 98 \div 70 = 1.4$

$\text{area SF} = 1.4^2$

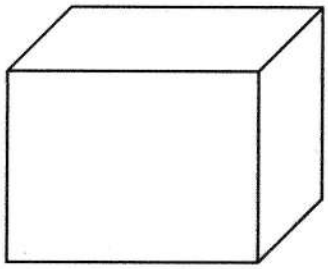
$78400 \div 1.4^2 = 40{,}000 \text{ cm}^2$

7.
Pictured below are two mathematically similar cuboids – Cuboid E and Cuboid F.

Cuboid E



Cuboid F



The surface area of Cuboid E is 200 cm^2.
The surface area of Cuboid F is 512 cm^2.
The volume of Cuboid E is 220 cm^3.

Find the volume of Cuboid F, to the nearest cubic centimetre.

area SF = $512 \div 200 = 2.56$

SF = $\sqrt{2.56} = 1.6$

vol SF = $1.6^3 = 4.096$

$220 \times 4.096 = 901.12 = 901\ cm^3$

8.
Pictured below are two mathematically similar footballs – Football 1 and Football 2.

Football 1

Football 2

The surface area of Football 1 is 260 mm^2.
The surface area of Football 2 is 640 mm^2.
The volume of Football 2 is 1,500 mm^3.

Find the volume of Football 1, to 3 significant figures.

area SF = $640 \div 260 = 2\frac{6}{13}$

SF = $\sqrt{2\frac{6}{13}}$

vol SF = $\sqrt{2\frac{6}{13}}^3$

$1500 \div \sqrt{2\frac{6}{13}}^3 = 388.401\ldots = 388\ mm^3$

9.
Chloe and Dana have mathematically similar toy ducks.

Chloe's duck

Dana's duck

The volume of Chloe's duck is 180 cm^3.
The volume of Dana's duck is 3,125 cm^3.
The surface area of Dana's duck is 1,800 cm^2.

Find the surface area of Chloe's duck, to 3 significant figures.

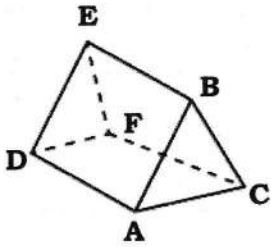
vol SF = $3125 \div 180 = 17.361$

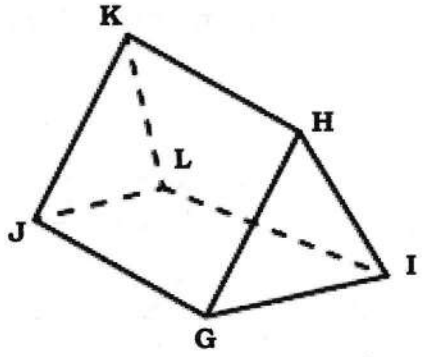
SF = $\sqrt[3]{17.361}$

area SF = $\left(\sqrt[3]{17.361}\right)^2$

$1800 \div \left(\sqrt[3]{17.361}\right)^2 = 268.46... = 268\ cm^2$

10.
ABCDEF and GHIJKL are mathematically similar prisms.





The surface area of ABCDEF is 312 cm^2.
The surface are of GHIJKL is 955.5 cm^2.
The volume of ABCDEF is 288 cm^3.
JG = 21 cm.

area SF = $\frac{955.5}{312} = 3.0625$

SF = $\sqrt{3.0625} = 1.75$

vol SF = $1.75^3 = 5.35937$

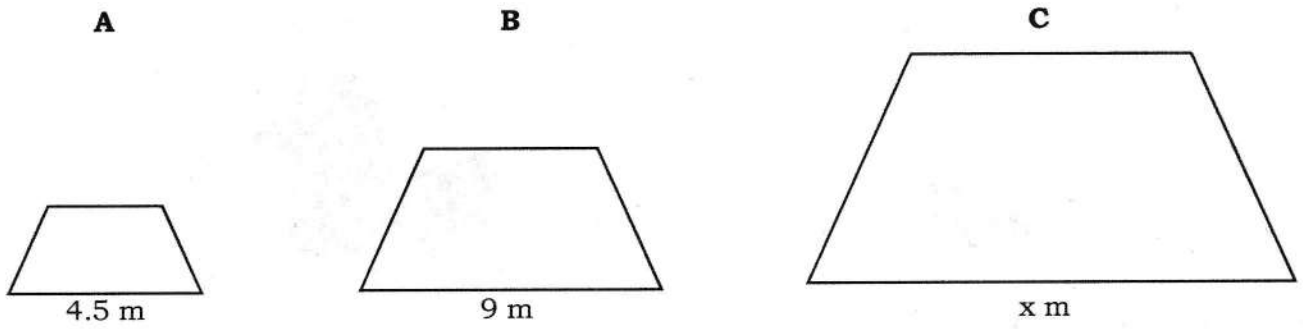
(a) Find the volume of GHIJKL.

$288 \times 5.359375 = 1543.5\ cm^3$

(b) Find DA, to the nearest centimetre.

$21 \div 1.75 = 12\ cm$

11.
Pictured below are three mathematically similar trapeziums – A, B and C.



The area of B is 63 m^2.
The area of C is 343 m^2.

(a) Find the area of Shape A.

$9 \div 4.5 = 2$

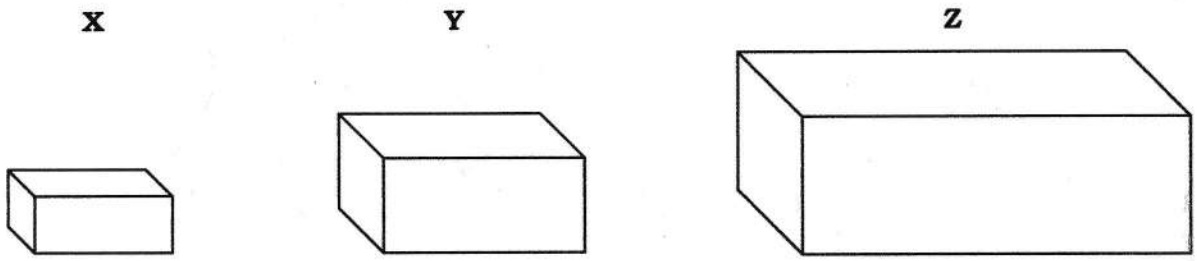
$63 \div 2^2 = 15.75\ m^2$

(b) Find x.

$343 \div 63 = 5\frac{4}{9}$

$9 \times \sqrt{5\frac{4}{9}} = 21\ m$

12.
Pictured below are three mathematically similar wooden blocks – X, Y and Z.



X has a surface area of 126 m^2 and a volume of 81 m^3.
Y has a surface area of 350 m^2.
Z has a volume of 5,184 m^3.

(a) Find the surface area of Z.

$5184 \div 81 = 64$

$126 \times \sqrt[3]{64^2} = 2016\ m^2$

(b) Find the volume of Y.

$350 \div 126 = 2\frac{7}{9}$

$81 \times \sqrt{2\frac{7}{9}}^3 = 375\ m^3$

13.
Caroline has two mathematically similar watering cans.

The smaller watering can has a height of 20 cm and a capacity of 8 litres.
The larger watering can has a height of 24 cm.

Caroline is going to use the larger watering can to water her plants.
She needs 50 litres of water to water all of her plants.

How many times does she need to refill the larger watering can in order to water all of her plants?

SF = $24 \div 20 = 1.2$

vol SF = 1.2^3

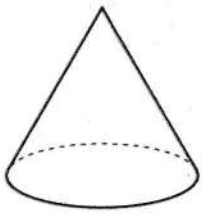
Larger volume = $8 \times 1.2^3 = 13.824 cm^3$

$50 \div 13.824 = 3.616...$

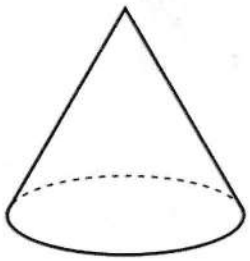
4 times

14.
Pictured below are two mathematically similar cones – Cone A and Cone B.

Cone A



Cone B



The ratio of the height of Cone A to the height of Cone B is 4:5.

(a) Find the ratio of the volume of Cone A to the volume of Cone B.

$4^3 : 5^3$

64 : 125

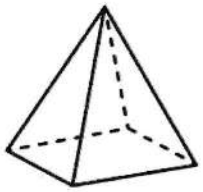
(b) Find the ratio of the surface area of Cone A to the surface area of Cone B.

$4^2 : 5^2$

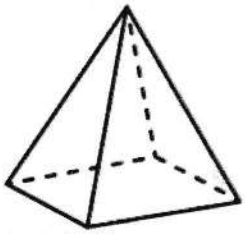
16 : 25

15.
Pictured below are two pyramids – Pyramid A and Pyramid B.

Pyramid A



Pyramid B



The ratio of the surface area of Pyramid A to the surface area of Pyramid B is 49:81.
The height of Pyramid B is 180 cm.
The volume of Pyramid A is 6,860 cm^3.

(a) Find the height of Pyramid A.

Height ratio = $\sqrt{49} : \sqrt{81} = 7 : 9$

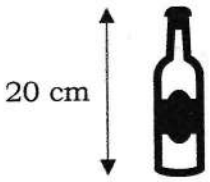
$180 \div 9 = 20 \times 7 = 140$ cm

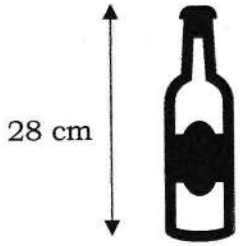
(b) Find the volume of Pyramid B.

volume ratio = $7^3 : 9^3 = 343 : 729$

$6860 \div 343 = 20 \times 729 = 14,580\ cm^3$

16.
Chris brews beer.
He sells his beer in two mathematically similar bottles – small and large.





Chris has brewed a barrel of beer. The barrel contains 75 litres of beer.
Chris can fill 200 small bottles with the contents of the barrel.

How many large bottles can be filled with the contents of the barrel?

capacity of small bottle = $75000 \div 200 = 375$ ml

SF = $28 \div 20 = 1.4$

vol SF = 1.4^3

$375 \times 1.4^3 = 1029$ ml = capacity of large bottle

$75000 \div 1029 = 72.886...$

72 Large bottle