Area & Volume of Similar Shapes

Question Paper

Course	Edexcel IGCSE Maths
Section	4. Geometry & Trigonometry
Topic	Area & Volume of Similar Shapes
Difficulty	Hard

Time allowed: 60

Score: /50

Percentage: /100

Question 1

Fred is making two rectangular flower beds.

The dimensions of the larger rectangle will be three times the dimensions of the smaller rectangle.

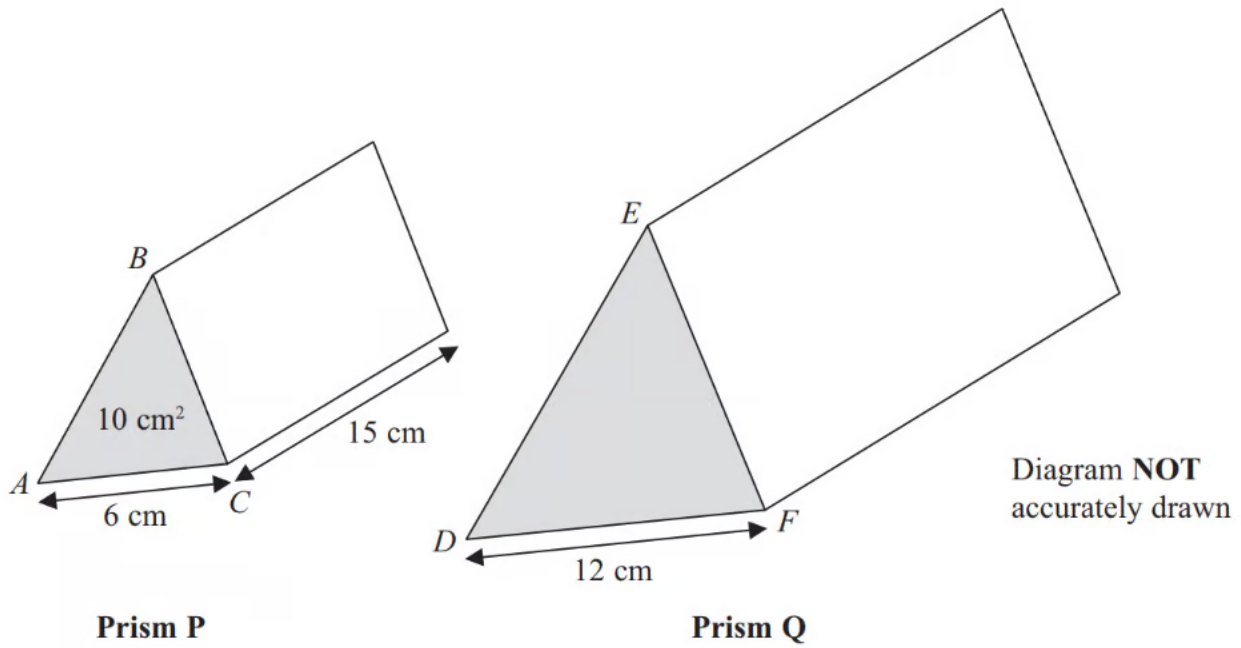There is going to be the same depth of soil in each flower bed.
Fred needs 180 kg of soil for the smaller flower bed.

Work out how much soil Fred needs for the larger flower bed.

[2 marks]

Question 2

P and **Q** are two triangular prisms that are mathematically similar.

E

B

$10\ cm^2$

$15\ cm$

A

$6\ cm$ C

D

$12\ cm$ F

Diagram **NOT** accurately drawn

Prism P   **Prism Q**

Prism **P** has triangle ABC as its cross section.
Prism **Q** has triangle DEF as its cross section.

$AC = 6\ cm$
$DF = 12\ cm$

The area of the cross section of prism **P** is 10 cm^2.
The length of prism **P** is 15 cm.

Work out the volume of prism **Q**.
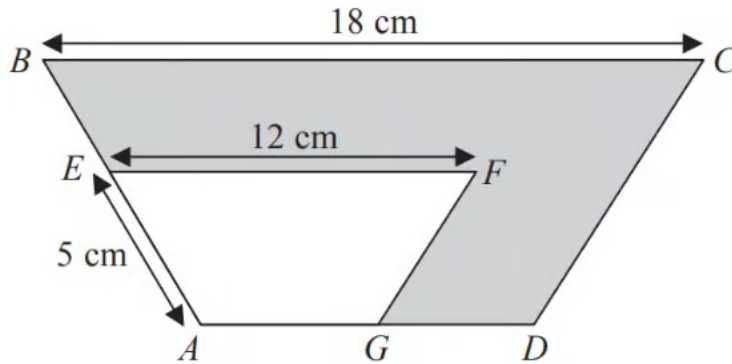
[4 marks]

Question 3a

18 cm

B — C

12 cm

E — F

5 cm

A   G   D

Diagram **NOT** accurately drawn

$ABCD$ and $AEFG$ are mathematically similar trapeziums.
AE = 5 cm
EF = 12 cm
BC = 18 cm

Work out the length of AB.

[2 marks]

Question 3b

Trapezium $AEFG$ has an area of 36 cm^2.

Work out the area of the shaded region.

[3 marks]

Question 4

Here are two similar solid shapes.

surface area of shape **A** : surface area of shape **B** = 3:4

The volume of shape **B** is 10 cm^3

Work out the volume of shape **A**.
Give your answer correct to 3 significant figures.

[3 marks]

Question 5

Solid **A** and solid **B** are mathematically similar.
The ratio of the surface area of solid **A** to the surface area of solid **B** is 4 : 9

The volume of solid **B** is 405 cm^3.

Show that the volume of solid **A** is 120cm^3.

[3 marks]

Question 6

Mark has made a clay model.
He will now make a clay statue that is mathematically similar to the clay model.

The model has a base area of 6cm^2
The statue will have a base area of 253.5 cm^2

Mark used 2kg of clay to make the model.

Clay is sold in 10kg bags.
Mark has to buy all the clay he needs to make the statue.

How many bags of clay will Mark need to buy?

[3 marks]

Question 7

Cone **A** and cone **B** are mathematically similar.
The ratio of the volume of cone **A** to the volume of cone **B** is 27:8

The surface area of cone **A** is 297 cm^2

Show that the surface area of cone **B** is 132 cm^2

[3 marks]

Question 8a

The circumference of circle **B** is 90% of the circumference of circle **A**.

Find the ratio of the area of circle **A** to the area of circle **B**.

[2 marks]

Question 8b

Square **E** has sides of length e cm.
Square **F** has sides of length f cm.

The area of square **E** is 44% greater than the area of square **F**.

Work out the ratio $e : f$

[2 marks]

Question 9

The three solids $\mathbf{A, B}$ and C are similar such that

the surface area of $\mathbf{A}$: the surface area of $\mathbf{B} = 4 : 9$

and

the volume of $\mathbf{B}$: the volume of $\mathbf{C} = 125 : 343$

Work out the ratio

the height of $\mathbf{A}$: the height of $\mathbf{C}$

Give your ratio in its simplest form.

[4 marks]

Question 10

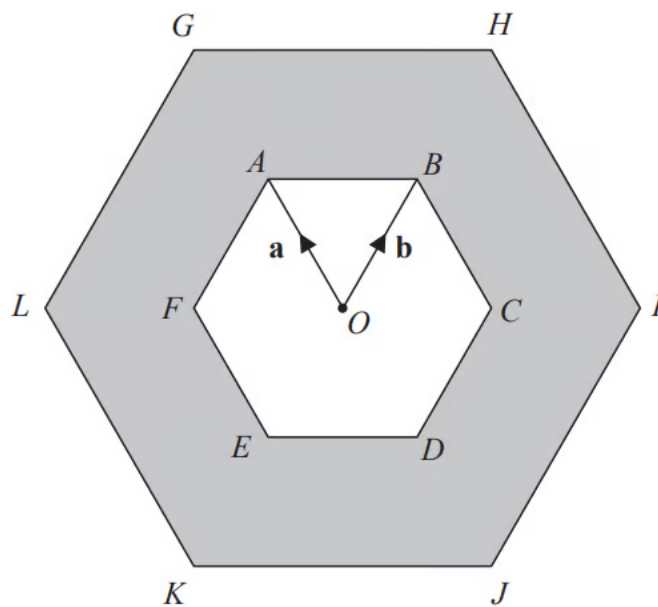$ABCDEF$ and $GHIJKL$ are regular hexagons each with centre O.

Diagram **NOT** accurately drawn

$GHIJKL$ is an enlargement of $ABCDEF$, with centre O and scale factor 2

The triangle OAB has an area of 5 cm^2

Calculate the area of the shaded region.

.... cm^2

[3 marks]
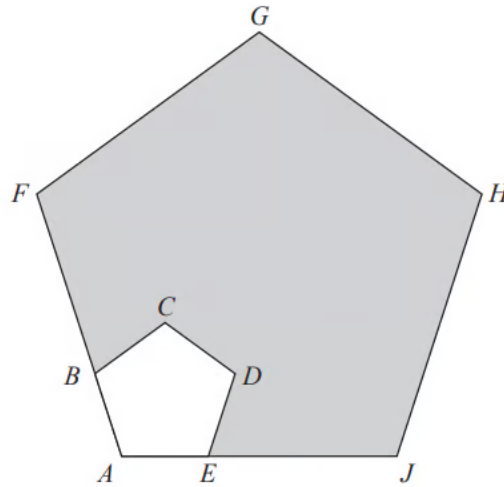
Question 11

ABCDE and *AFGHJ* are regular pentagons.

Diagram **NOT** accurately drawn

AEJ and *ABF* are straight lines.

$EJ = 4AE$

The area of *ABCDE* is 8 cm^2

Calculate the area of the shaded region.
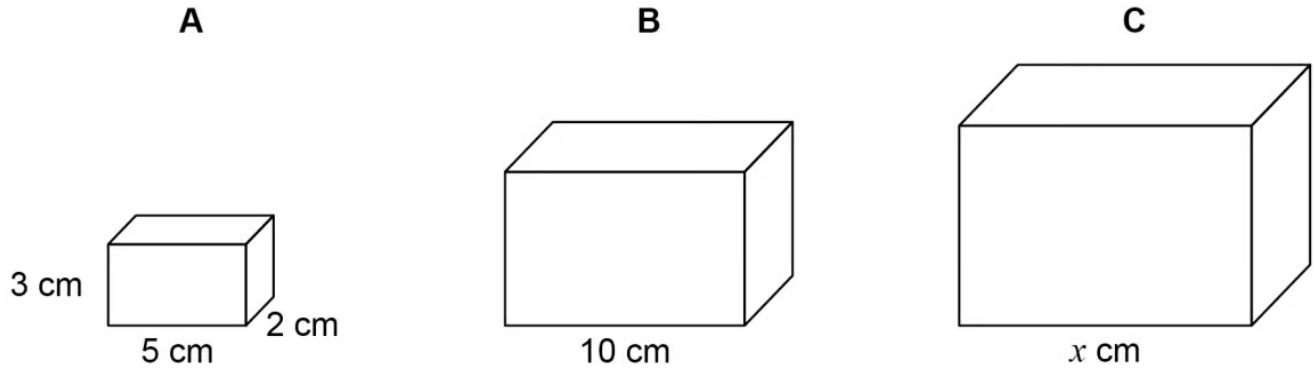
..............................cm^2

[3 marks]

Question 12a

Here are three similar cuboids, A, B and C.

A has length 5 cm, width 2 cm and height 3 cm
B has length 10 cm
C has length x cm

The total surface area of A is 62 cm^2

Tim wants to work out the total surface area of B.

Here is his working.

$$10 \div 5 = 2$$
$$62 \times 2 = 124$$
$$\text{Total surface area of B} = 124 \text{ cm}^2$$

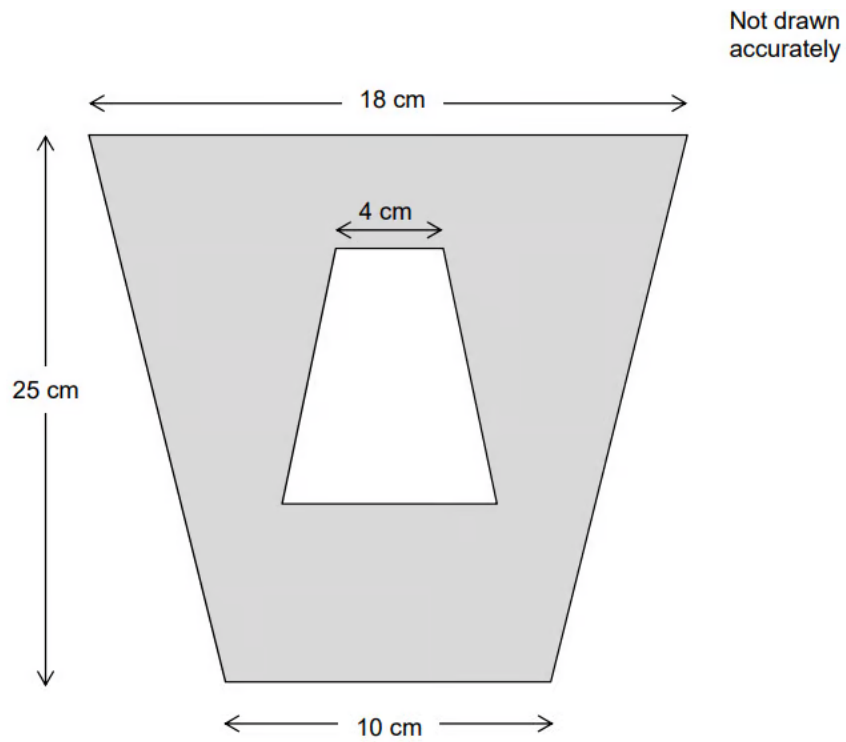Make one criticism of Tim's method.

[1 mark]

Question 12b

Volume of $A \times \dfrac{125}{8} =$ Volume of C

Work out the value of x.

[3 marks]

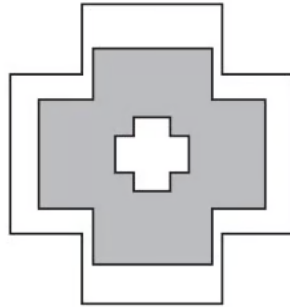## Question 13

A pattern is made from two **similar** trapeziums.

Not drawn
accurately

Show that the shaded area is 294 cm^2

[1 mark]

Question 14

The diagram consists of three mathematically similar shapes.
The heights of the shapes are in the ratio 1 : 4 : 5.

Not to scale

Find the ratio

total shaded area : total unshaded area.

Give your answer in its simplest form.

total shaded area : total unshaded area .... : ....

[4 marks]

Question 15

Prism P and prism Q are similar.
The ratio of the surface area of prism P to the surface area of prism Q is 1 : 3.

i)
Jay says

The height of prism P is one third of the height of prism Q.

Explain why he is wrong.

[1]

ii)
The volume of prism Q is $86\,cm^3$.

Calculate the volume of prism P.

.... cm^3 [3]

[4 marks]