

Variation using a maths GCSE question

Year 11 (Higher)

HIAS Maths Team (secondary)
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Final version

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Overview

This document contains...

A set of connected questions that link to a past GCSE question

Points to consider when using this resource

Each variation of the exam question should be considered as part of a learning journey. Teachers may wish to consider models and images to support students to access the problems.



Year 11 H: variation: Edexcel 2018 P3 Q13

Similar shapes



Prior knowledge to review

- Multiplication strategies
- Surds
- Length , area and volume scale factors
- Surface area
- Volume





A



B

Here are two similar solid shapes

height of shape **A** : height of shape **B** = 2 : 1

The surface area of shape **B** is 20 cm²

Work out the surface area of shape **A**



Solution



A



B

Here are two similar solid shapes

height of shape **A** : height of shape **B** = 2 : 1

The surface area of shape **B** is 20 cm²

Work out the surface area of shape **A**

Linear scale factor = 2 : 1

Area scale factor = 2² : 1² = 4 : 1

Surface area A:B = 80 : 20

The surface area of shape **A** is 80 cm²





A



B

Here are two similar solid shapes

surface area of shape **A** : surface area of shape **B** = 1 : 16

The height of shape **B** is 20 cm

Work out the height of shape **A**



Solution



A



B

Here are two similar solid shapes

surface area of shape **A** : surface area of shape **B** = 1 : 16

The height of shape **B** is 20 cm

Work out the height of shape **A**

$$\text{Area scale factor} = 1 : 16 = 1^2 : 4^2$$

$$\text{Linear scale factor} = 1 : 4$$

$$\text{Height A:B} = 5 : 20$$

The height of shape **A** is 5 cm





A



B

Here are two similar solid shapes

width of shape **A** : width of shape **B** = 3: 4

The volume of shape **B** is 32 cm³

Work out the volume of shape **A**



Solution



A



B

Here are two similar solid shapes

width of shape **A** : width of shape **B** = 3: 4

The volume of shape **B** is 32 cm³

Work out the volume of shape **A**

Linear scale factor = 3 : 4

Volume scale factor = 3³ : 4³ = 27 : 64

Volume A : Volume B = 13.5 : 32

The volume of shape **A** is 13.5 cm³





A



B

Here are two similar solid shapes

surface area of shape **A** : surface of shape **B** = 16 : 9

The volume of shape **B** is 5.4 cm^3

Work out the volume of shape **A**



Solution



A



B

Here are two similar solid shapes

surface area of shape **A** : surface of shape **B** = 16 : 9

The volume of shape **B** is 5.4 cm³

Work out the volume of shape **A**

Area scale factor A : B = 16 : 9

Linear scale factor A : B = $\sqrt{16} : \sqrt{9} = 4 : 3$

Volume scale factor A : B = $4^3 : 3^3 = 64 : 27$

$27 \div 5.4 = 5$

So volume of **A** is $64 \div 5 = 12.8 \text{ cm}^3$





A



B

Here are two similar solid shapes

surface area of shape **A** : surface of shape **B** = 7 : 1

The volume of shape **B** is 15 cm³

Work out the volume of shape **A**

Give your answer to 3 significant figures



Solution



A



B

Here are two similar solid shapes

surface area of shape **A** : surface of shape **B** = 7 : 1

The volume of shape **B** is 15 cm³

Work out the volume of shape **A**

Give your answer to 3 significant figures

Area scale factor A : B = 7 : 1

Linear scale factor A : B = $\sqrt{7}$: $\sqrt{1}$

Volume scale factor A : B = $(\sqrt{7})^3$: $(\sqrt{1})^3$ = $7\sqrt{7}$: 1

(Vol) A : (Vol) B = $7\sqrt{7}$: 1 = $(15 \times 7\sqrt{7})$: (15×1)

So $7\sqrt{7} \times 15 = 277.80388\dots = 278 \text{ cm}^3$ to 3 sig figs



Edexcel : H : 2018: P3: Q13
(3 marks)

Here are two similar solid shapes.

A



B



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.



Area scale factor $A : B = 3 : 4$

Linear scale factor $A : B = \sqrt{3} : \sqrt{4}$

Volume scale factor $A : B = (\sqrt{3})^3 : (\sqrt{4})^3 = 3\sqrt{3} : 8$

Since $8 \times 1.25 = 10$ (volume of B is 10cm^3)

Then $3\sqrt{3} \times 1.25 = 6.49519\dots = 6.50\text{ cm}^3$ to 3 sig figs

Here are two similar solid shapes.

A



B



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.



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