

Variation using a maths GCSE question

Year 11 (Higher)

HIAS Maths Team (secondary)
March 2021
Final version

© Hampshire County Council





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











Here are two similar solid shapes

height of shape \mathbf{A} : height of shape $\mathbf{B} = 2:1$

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

Work out the surface area of shape A

A B





Solution







В

Here are two similar solid shapes

height of shape \mathbf{A} : height of shape $\mathbf{B} = 2:1$

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 = 2^2 : 1^2 = 4:1

Surface area A:B = 80:20

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



Α







Here are two similar solid shapes

surface area of shape \mathbf{A} : surface area of shape $\mathbf{B} = 1$: 16

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

Work out the height of shape A











Solution





Here are two similar solid shapes

surface area of shape \mathbf{A} : surface area of shape $\mathbf{B} = 1:16$

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

Work out the height of shape A



Α

В

Area scale factor = $1:16 = 1^2:4^2$

Linear scale factor = 1:4

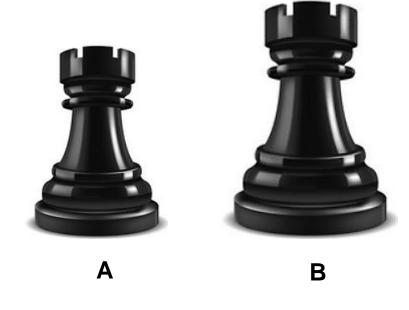
Height A:B = 5:20

The height of shape A is 5 cm









Here are two similar solid shapes

width of shape \mathbf{A} : width of shape $\mathbf{B} = 3$: 4

The volume of shape **B** is 32 cm³

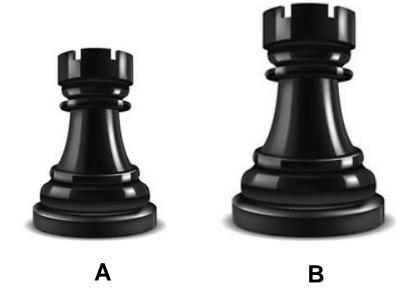
Work out the volume of shape **A**





Solution





Here are two similar solid shapes

width of shape \mathbf{A} : width of shape $\mathbf{B} = 3$: 4

The volume of shape **B** is 32 cm³

Work out the volume of shape A

Linear scale factor = 3:4

Volume scale factor = 3^3 : 4^3 = 27: 64

Volume A : Volume B = 13.5 : 32

The volume of shape **A** is 13.5 cm³









В

Here are two similar solid shapes

surface area of shape \mathbf{A} : surface of shape $\mathbf{B} = 16:9$

The volume of shape **B** is 5.4 cm³

Work out the volume of shape A





Hampshire Services HIAS SCHOOL IMPROVEMENT

Solution



Α



Here are two similar solid shapes

surface area of shape \mathbf{A} : surface of shape $\mathbf{B} = 16:9$

The volume of shape **B** is 5.4 cm³

Work out the volume of shape A

В

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 $64 \div 5 = 12.8 \text{ cm}^3$











Here are two similar solid shapes

surface area of shape \mathbf{A} : surface of shape $\mathbf{B} = 7:1$

The volume of shape **B** is 15 cm³

Work out the volume of shape A

Give your answer to 3 significant figures







Solution

Here are two similar solid shapes







В

surface area of shape \mathbf{A} : surface of shape $\mathbf{B} = 7:1$

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

(VoI) A: (VoI) B = $7\sqrt{7}$: 1 = (15 x $7\sqrt{7}$): (15 x 1)

So $7\sqrt{7}$ x 15 = 277.80388.... = 278 cm³ to 3 sig figs



Edexcel: H: 2018: P3: Q13

(3 marks)



Here are two similar solid shapes.

A



1



surface area of shape \mathbf{A} : surface area of shape $\mathbf{B} = 3:4$

The volume of shape B is 10 cm³

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





Edexcel: H: 2018: P3: Q13 Solution



Here are two similar solid shapes.

A



B



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 x 1.25 = 10 (volume of B is $10cm^{3}$)

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

surface area of shape \mathbf{A} : surface area of shape $\mathbf{B} = 3:4$

The volume of shape B is 10 cm³

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







IS SCHOOL IMPROVEMENT

HIAS Maths Team (secondary)

Contact details

Jo.Lees@hants.gov.uk

Jenny.Burn@hants.gov.uk

Tessa.Ingrey@hants.gov.uk

For further details on the full range of services available please contact us using the following details:

Tel: 01962 874820 or email: hias.enquiries@hants.gov.uk







IS SCHOOL IMPROVEMENT

Upcoming Courses

Keep up-to-date with our learning opportunities for each subject through our Upcoming Course pages linked below. To browse the full catalogue of learning offers, visit our new Learning Zone. Full details of how to access the site to make a booking are provided <a href="https://example.com/here/bears/bases

- English
- Maths
- Science
- Geography
- RE
- History
- Leadership
- <u>Computing</u>
- Art
- D&T
- Assessment
- Support Staff
- SEN







Terms and Conditions

Terms of licence

Moodle+ subscribers are licenced to access and use this resource and have agreed to pay the annual subscription fee. This authority starts when the fee is paid and ends when the subscription period expired unless it is renewed. This file is for personal or classroom use only. By using it, you agree that you will not copy or reproduce this file except for your own personal, non-commercial use. HIAS have the right to modify the terms of this agreement at any time; the modification will be effective immediately and shall replace all prior agreements.

You are welcome to:

- download this resource
- save this resource on your computer
- print as many copies as you would like to use in your school
- amend this electronic resource so long as you acknowledge its source and do not share as your own work.

You may not:

- · claim this resource as your own
- sell or in any way profit from this resource
- store or distribute this resource on any other website or another location where others are able to electronically retrieve it
- email this resource to anyone outside your school or transmit it in any other fashion.



