

Edexcel - Higher

Ratio, proportion and rates of change

2022 GCSE Advance Information

Sparx Topics & Key Questions

We are always looking for ways to support maths teachers and students. In order to help you and your year 11s this year we've pulled together a list of key questions which may be useful to practise with your students based on the exam board topic lists.

These 40 key questions are all taken from our library of over 45,000 high-quality questions in Sparx Maths. If you are a Sparx Maths School then your students can use the Topic Codes provided to search the full content library directly within the independent learning section of Sparx Maths to help target their revision.

Please note this is not an exhaustive topic guide it is simply designed to help you pull together some key questions to use to check for understanding in lessons, starters, or as worksheets with your learners.



Ratio, proportion, and rates of change	Topics	Sparx Topic Codes
<u>Percentages</u>	<u>Percentage of an amount</u>	U554
	<u>Depreciation</u>	U988
	<u>Reverse percentage</u>	U286
<u>Ratio</u>	<u>Use of ratio</u>	U577, U595, U921, U676, U865
	<u>Share in a ratio</u>	U577, U595
<u>Proportion</u>	<u>Direct proportion</u>	U721, U407, U238
	<u>Currency conversion</u>	U610
	<u>Inverse proportion</u>	U357, U138
	<u>Equations of proportion</u>	U407, U138
<u>Compound Measures</u>	<u>Average speed</u>	U151, U462
	<u>Density</u>	U910
	<u>Pressure</u>	U527
<u>Growth and decay</u>	<u>General iterative processes</u>	U988

Percentages - Percentage of an amount

Finding percentages of amounts without a calculator

U554

Maci plays 200 games of noughts and crosses.
She wins 43% of the games, draws 30% of the games and loses the rest.

How many games does Maci lose?

Lilly is downloading a new piece of software. After 24 seconds, 4% of the download is complete.

In **total**, how many seconds should the download take?



Time taken so far: 24 seconds

Total time required: seconds

Not drawn accurately

Percentages - Depreciation

Growth and decay

U988

The number of cases of a disease increases by the same factor each year, as shown in the table below.

Write an expression for the number of cases of the disease after n years.

	Number of cases
Start	1500
End of year 1	2100
End of year 2	2940
End of year 3	4116

In 2010, a total of **2187** of the employees at Zoe's company owned a petrol car.

In 2013, there were **1029** employees with petrol cars.

Assuming this number decreases exponentially, work out how many employees owned a petrol car in 2017.

Give your answer to the nearest integer.

Percentages - Reverse percentage

Finding original values in percentage calculations

U286

A computer costs £968. A tax of 16.5% is then added to the cost of the computer.

Work out the amount of **tax** that is added to the cost of the computer.

Give your answer in pounds (£).

135% of a value is 5265 kg.

What is the original value?

Give your answer in kilograms (kg).

Increase 280 by 132%

The price of a netball dress is **reduced** by 17% in a sale. The sale price is £53.95.

What was the original price of the netball dress?

Give your answer in pounds (£).



Original price = £

Sale price = £53.95

Ratio - Use of ratio

Sharing amounts in a given ratio

U577

A shade of paint, Purple Berry, can be made by mixing red paint and blue paint in the ratio $5 : 2$. Emma has 30 litres of red paint and 10 litres of blue paint.

Work out the **maximum** volume of Purple Berry paint that Emma can make.
Give your answer in litres.

Orla and Rachel split a sum of money between them in the ratio $5 : 9$.

If Rachel has £40 more than Orla, what was the total amount that they split?
Give your answer in pounds (£).

Problem solving: Sharing amounts in a given ratio (Higher)

U595

A fruit bowl contains a mixture of oranges, kiwis and limes. The ratio of oranges to kiwis is $3 : 5$.

Steve picks a piece of fruit at random from the fruit bowl. The probability that it is an **orange** is $\frac{1}{4}$.

What is the probability that it is a **lime**?
Give your answer as a fraction in its simplest form.

Combining ratios

U921

A garden centre has **66** trees that are small, medium or large.

For every small tree there are **6** medium trees.

For every large tree there are **3** small trees.

Calculate the number of small trees in the garden centre.

Calculating with ratios and algebra

U676

Katie's bathroom floor has been decorated with red and purple tiles.

The ratio of red tiles to purple tiles is $(3x + 1) : (4x + 13)$

If $\frac{1}{4}$ of the tiles are red, work out the value of x .

Work out the positive value of x that means that $x : 45$ is equivalent to $20 : x$.

Changing ratios

U865

The day before a show, a theatre had sold adult and child tickets in the ratio **8 : 3**.

On the day of the show, the theatre sold **20** more adult tickets and no more child tickets.

The ratio of adult to child tickets sold became **7 : 2**.

Work out how many adult tickets had been sold the day **before** the show.

Ratio - Share in a ratio

Sharing amounts in a given ratio

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Proportion - Direct proportion

Solving direct proportion word problems

U721

Corey wants to travel 240 miles. How much would the **cheaper** taxi journey cost him?

Give your answer in pounds (£).



Taxi A

Was £35 per 40 miles

Now 15% off!



Taxi B

70p per mile

Constructing direct proportion equations

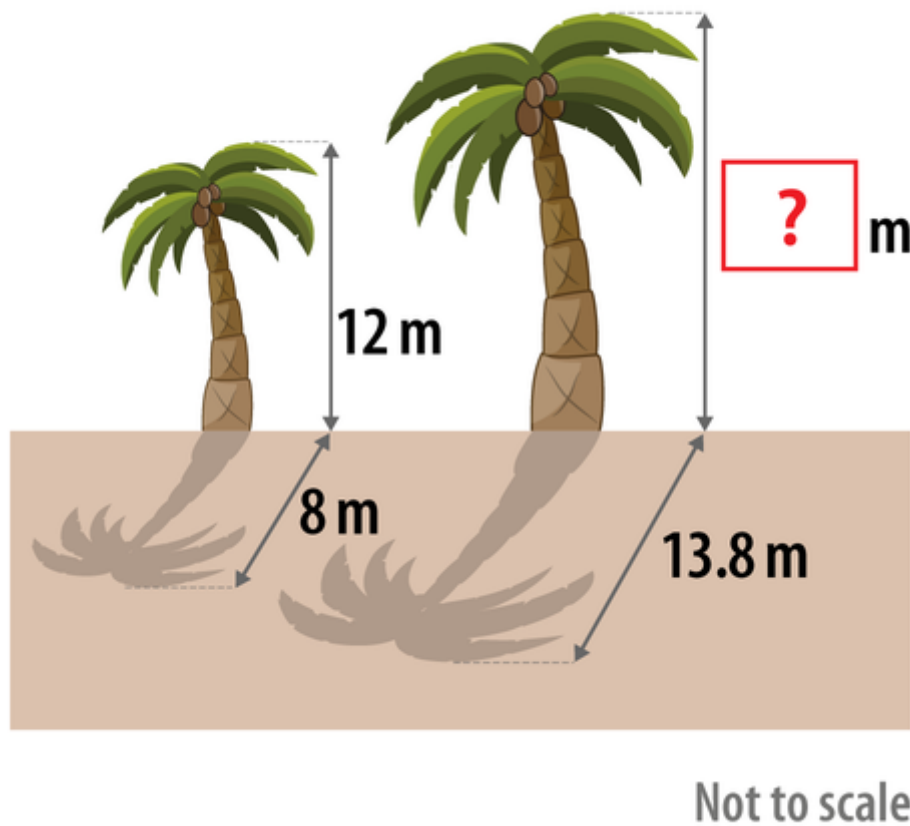
U407

Peter measures the heights of two trees and the lengths of their shadows. He notices that the height of each tree and the length of its shadow are **directly proportional**.

One of the trees has a height of 12 m and an 8 m long shadow.

The other tree has a 13.8 m long shadow. Calculate its height, in metres (m).

Give any decimal answers to 1 d.p.



$$f \propto p^2$$

Given that $f = 90$ when $p = 5$, work out the value of f when $p = 3$

Give any decimal answers to 1 d.p.

Graphs of direct and inverse proportion

U238

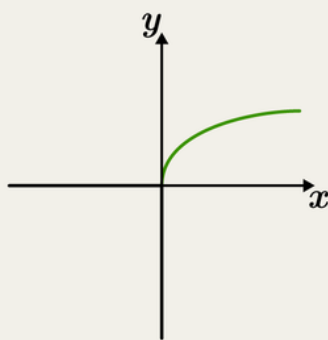
Select the graph that shows each of the following statements.

a) y is directly proportional to x^2

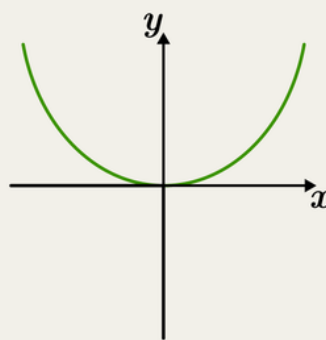
b) y is directly proportional to x^3

c) y is directly proportional to \sqrt{x}

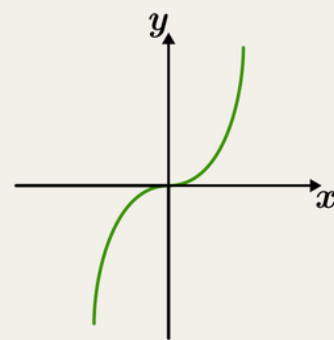
Graph 1



Graph 2

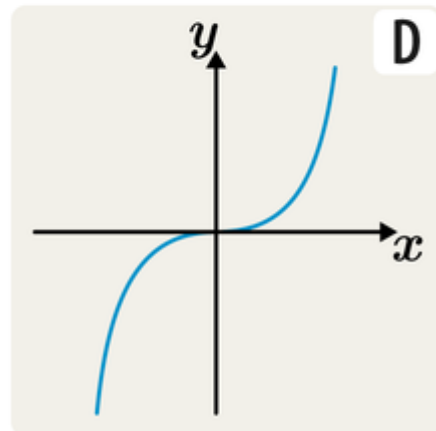
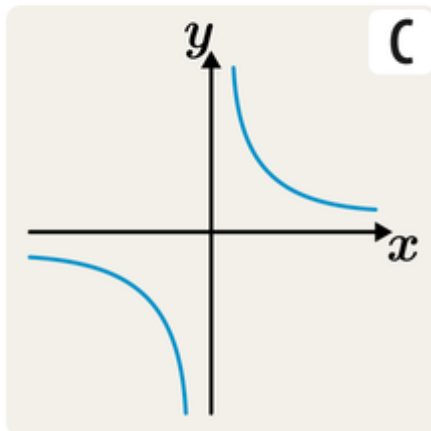
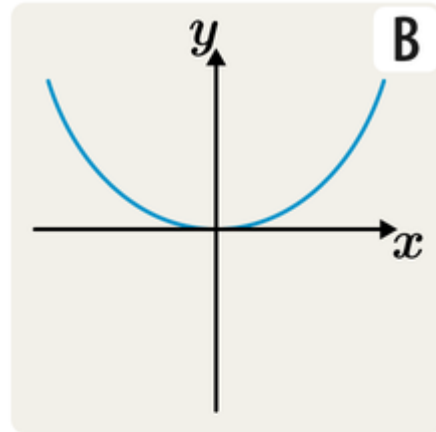
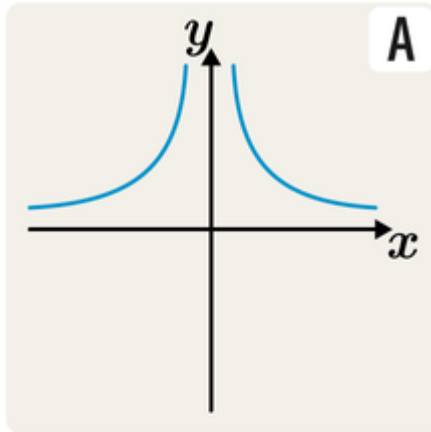


Graph 3



y is inversely proportional to x^2 .

Which of the graphs below shows this relationship?



Proportion - Currency conversion

Currency conversion

U610

Amelia wants to buy 100 g of spice mix from a British or Italian website. The prices on each website are shown below.

The conversion rate is $\text{€}1 = \text{£}0.95$

What is the price, including delivery costs, that Amelia would pay for the spice mix from the **cheaper** website?

Give your answer in **pounds** (£).

British website



£0.80 for 25 g
Free delivery!

Italian website



€1.10 for 50 g
€0.60 delivery per order

Proportion - Inverse proportion

Solving inverse proportion word problems

U357

A greengrocer normally sells 20 carrots for £2.80.

In a sale, the cost of the carrots is reduced by 30%. Work out how much 180 carrots cost in the sale.

Give your answer in pounds (£).

20 builders working 8 hours a day can finish a building in 30 days.

a) How many builders would have to work to finish the building in 20 days if they worked for 10 hours a day?

b) State one assumption you made to answer part a).

Constructing inverse proportion equations

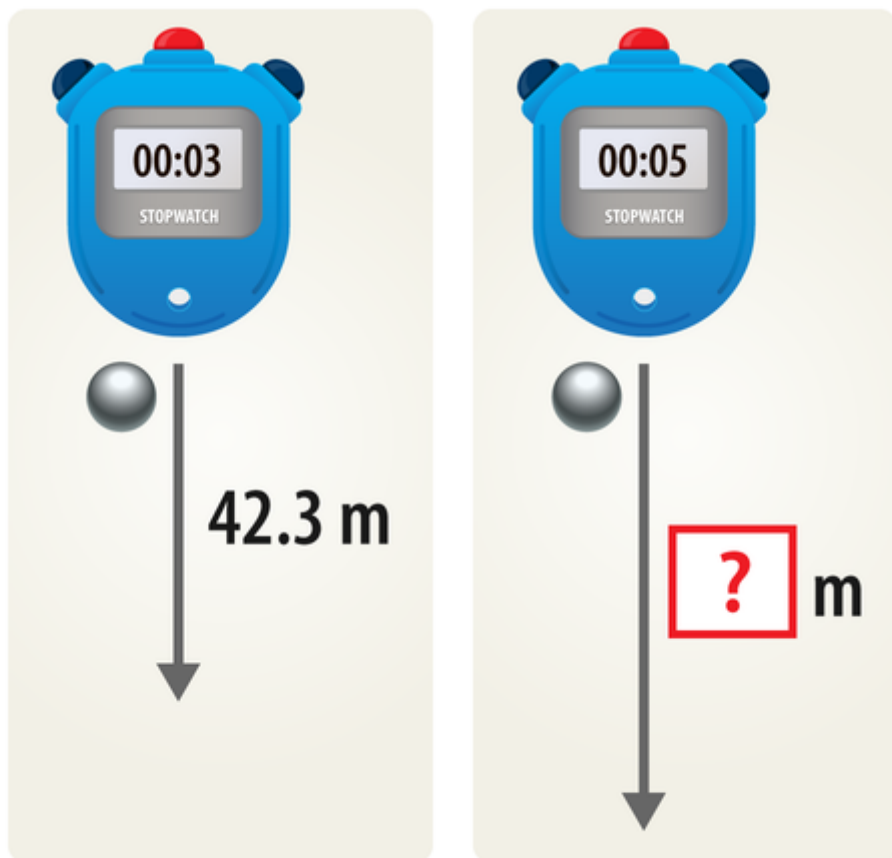
U138

When a marble is dropped it falls d metres in t seconds.

d is **directly proportional** to t^2

It takes 3 seconds for the marble to fall 42.3 metres. How far, in metres, would it fall in 5 seconds?

Give any decimal answers to 1 d.p.



Not to scale

A radiation counter records n counts when it is placed d metres from a radiation source.

n is **inversely proportional** to d^2

$$n = 5 \text{ when } d = 12$$

What is the value of n when $d = 3$?

Give any decimal answers to 1 d.p.

Proportion - Equations of proportion

Constructing direct proportion equations

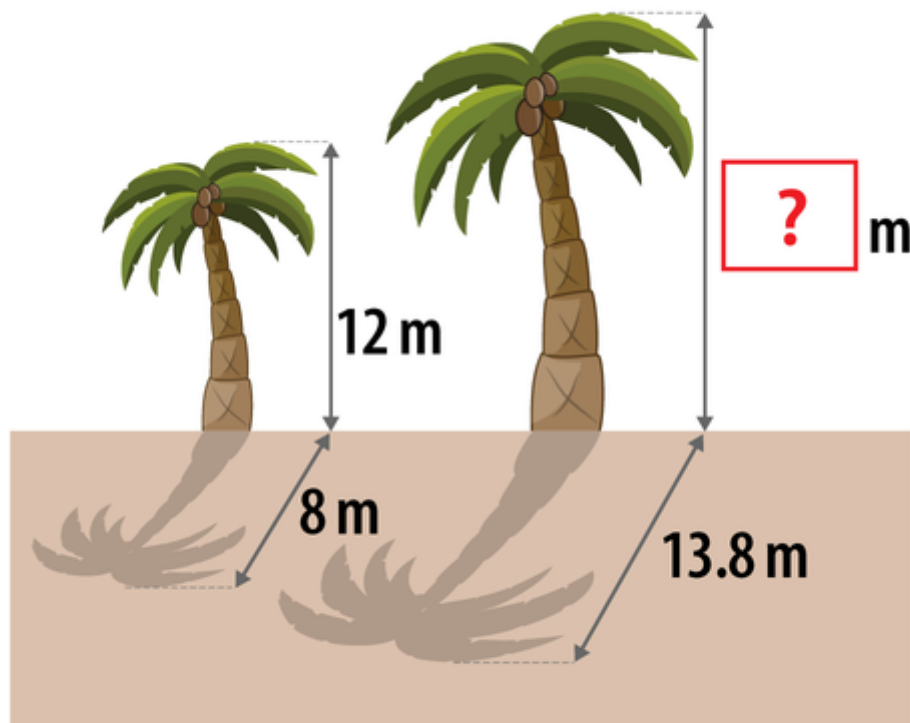
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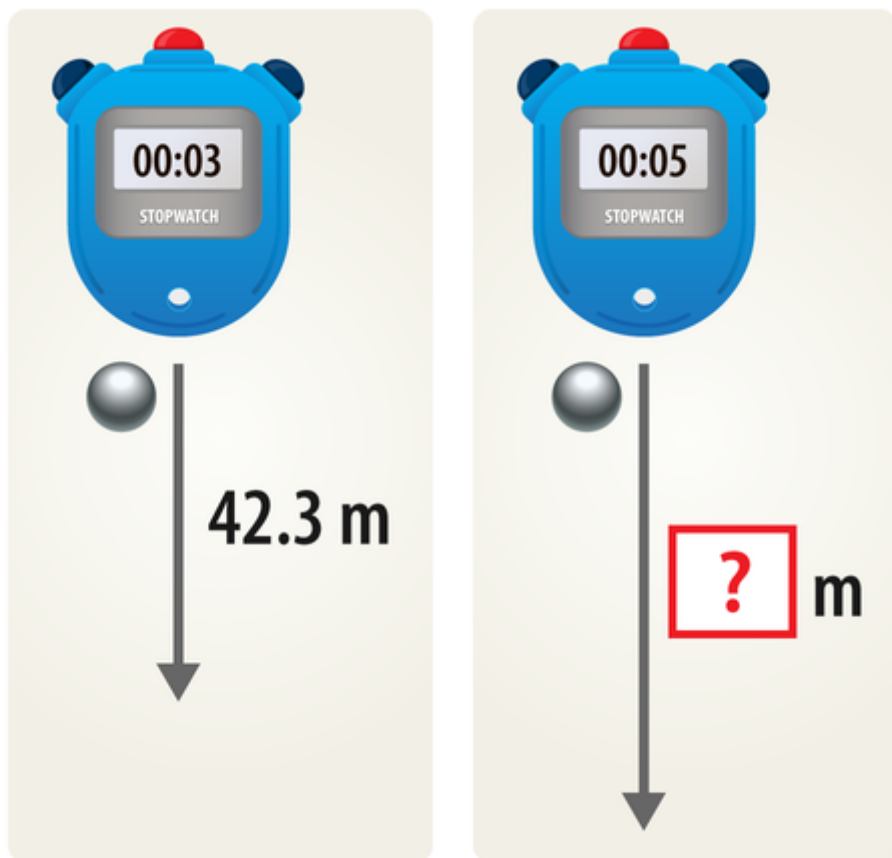
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Compound Measures - Average speed

Calculating with speed

U151

A plane flew **232 miles** from Edinburgh airport to Liverpool airport. It had an average speed of **174 mph** and arrived at 20:15.

Work out what time the plane left Edinburgh airport.
Give your answer using the 24 hour clock.

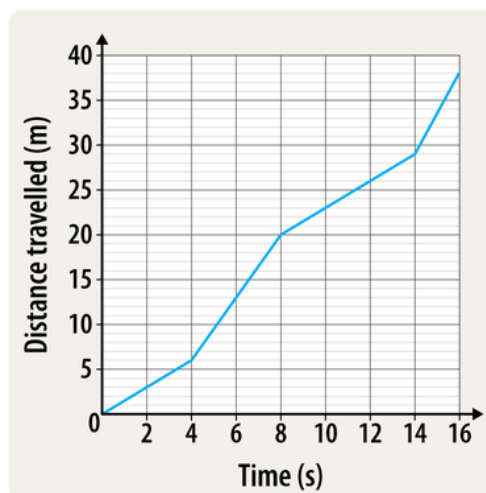
Use the conversion $8 \text{ km/h} = 5 \text{ mph}$ to convert 24 m/s into **mph**.
If your answer is a decimal, give it to 1 d.p.

Calculating speed from distance-time graphs

U462

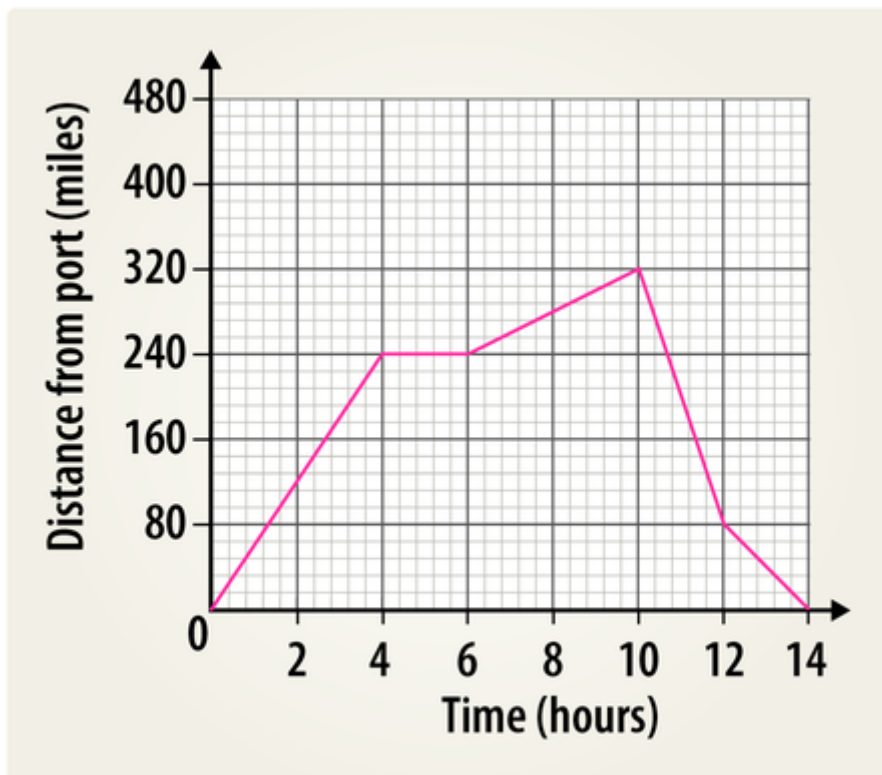
This distance-time graph shows the journey of a blackbird.

Calculate the average speed of the blackbird between 4 and 14 seconds.
If your answer is a decimal, give it to 1 d.p.



This distance-time graph shows the journey a boat made when it travelled away from a port and then returned.

What was the **fastest** speed that the boat reached during the journey?
Give your answer in miles per hour and give any decimal answers to 2 d.p.



Compound Measures - Density

Calculating with density

U910

A glass contains 320 cm^3 of milk. The mass of the milk is 330 g .

Calculate the density of the milk in kilograms per cubic metre (kg/m^3).
Give your answer to the nearest integer.

Compound Measures - Pressure

Calculating with pressure

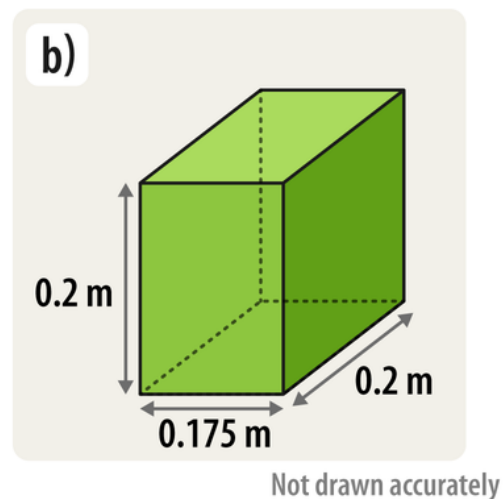
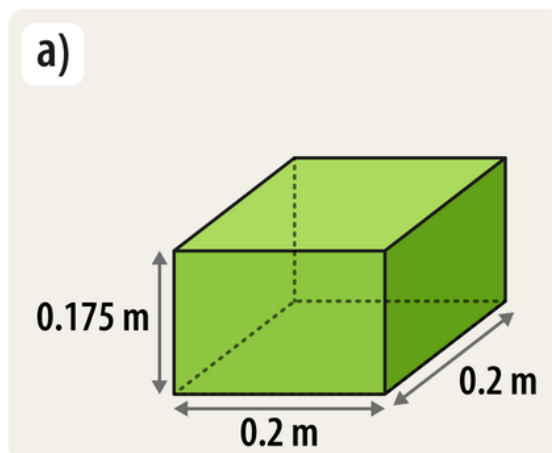
U527

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

A cuboid-shaped block is shown below in two different orientations. The block exerts a force of 7 N on the ground.

Calculate the pressure the block exerts on the ground, in N/m^2 , when it is

- a) flat against the ground, so that one of the square faces is the base.
- b) standing up on its side, so that one of the rectangular faces is the base.



Growth and decay - General iterative processes

Growth and decay

U988

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Write an expression for the number of cases of the disease after n years.

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