"Full Coverage": Compound Measures & Rates of Flow

This worksheet is designed to cover one question of each type seen in past papers, for each GCSE Higher Tier topic. This worksheet was automatically generated by the DrFrostMaths Homework Platform: students can practice this set of questions interactively by going to www.drfrostmaths.com/homework, logging on, *Practise* → *Past Papers/Worksheets* (or *Library* → *Past/Past Papers* for teachers), and using the 'Revision' tab.

Question 1

Categorisation: Determine the time taken given some 'rate of work'.

[Edexcel GCSE June2006-2F Q21, June2006-4I Q7]

Bob lays 200 bricks in 1 hour. He always works at the same speed.

Work out how long it will take Bob to lay 960 bricks.
Give your answer in hours and minutes.

..... hours

..... minutes

Question 2

Categorisation: Determine a distance from a speed and time.

[Edexcel IGCSE Nov-2010-4H Q2]

Anya flew from Kuala Lumpur to Singapore.
The average speed for the journey was 248 km/h.
The journey time was 1 hour 15 minutes.

Work out the distance from Kuala Lumpur to Singapore.

..... km

Question 3

Categorisation: Determine an average speed from a distance and time.

[Edexcel IGCSE Jan2017(R)-3H Q4]

A plane flew 8740 km from Nairobi to Hong Kong.
The flight time was 13 hours 15 minutes.

Work out the average speed of the plane.
Give your answer, in kilometres per hour, correct to the nearest whole number.

..... kilometres per hour

Question 4

Categorisation: Determine a time from a speed and distance.

[Edexcel IGCSE Jan2012-4H Q2]

An aeroplane flew from Qatar to Bahrain.
The distance flown was 135 km. The average speed was 180 km/h.

Work out the time taken. Give your answer in minutes.

..... minutes

Question 5

Categorisation: Convert between m/s and km/h or between other compound units.

[Edexcel IGCSE Jan2017-3H Q1b]

Change 750 kilometres per hour to a speed in metres per second.

Give your answer correct to the nearest whole number.

..... m/s

Question 6

Categorisation: Solve speed-distance-time problems that make use of map scales.

[Edexcel GCSE(9-1) Mock Set 2 Spring 2017 3F Q12]

This accurate scale drawing shows two ports, **A** and **B**. *(Note: The distance between* **A** and **B** on the drawing is 7.5cm)

Scale:1 cm represents 10 miles. A boat takes 5 hours to sail directly from A to B.
Calculate the boat's average speed. You must show all your working.

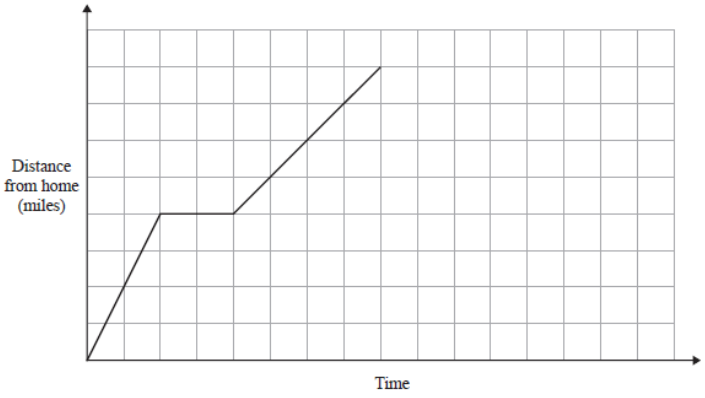
..... mph

Question 7

Categorisation: Solve speed-distance-time problems in the context of travel graphs.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 1F Q22, 1H Q6 Edited]

On Monday Ria delivered a parcel to a hospital.
The travel graph represents Ria's journey to the hospital.



Ria left home at 13 00. She drove for 30 minutes at a constant speed of 40 mph.
She then stopped for a break.

Ria then drove to the hospital at a constant speed.
She was at the hospital for 30 minutes. She then drove home at a constant speed of 32 mph. At what time does she arrive home?

..... : .....

Question 8

Categorisation: Solve speed-distance-time problems involving a large amount of information.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 1F Q20, 1H Q4]
On Monday, Tarek travelled by train from Manchester to London.

Tarek's train left Manchester at 08 35. It got to London at 11 05
The train travelled at an average speed of 110 miles per hour.

On Wednesday, Gill travelled by train from Manchester to London.

Gill's train also left at 08 35 but was diverted.
The train had to travel an extra 37 miles. The train got to London at 11 35

Work out the difference between the average speed of Tarek's train and the average speed of Gill's train.

..... mph

Question 9

Categorisation: Calculate an end or start time in the context of speed-distance-time.

[Edexcel GCSE Nov2015-1H Q11b]
The London airport is 200 miles from Manchester airport.
A plane leaves Manchester airport at 10 am to fly to the London airport.
The plane flies at an average speed of 120 mph.
What time does the plane arrive at the London airport?

..... : .....

Question 10

Categorisation: Consider the effect on time given a percentage change in speed.

[Edexcel IGCSE Jan2013-4H Q24]

On Monday, Nalim made a journey. On Tuesday, she made the same journey.
Her average speed on Tuesday was 25% greater than her average speed on Monday.

Calculate the percentage reduction in the time her journey took on Tuesday compared with Monday.

..... %

Question 11

Categorisation: Solve speed-distance-time problems using timetables.

[Edexcel IGCSE May2014(R)-4H Q2]

Here is part of a timetable for the Paris to Montpellier express train service.

Paris	06 07	10 07	12 07	18 07	20 07
Valence	08 22	12 24	14 24	20 24	22 24
Nimes	09 09	13 05	15 05	21 05	23 05
Montpellier	09 37	13 34	15 34	21 34	23 34

The average speed of the 20 07 train from Paris is 224 km/h.
Work out the distance this train travels from Paris to Montpellier.

..... km

Question 12

Categorisation: Solve speed-distance-time problems involving circular motion.

[Edexcel IGCSE Jan2015(R)-4H Q2b Edited]

The wheel of the Singapore Flyer is a circle with a diameter of 150 metres.
The circumference of the wheel is 471 metres, correct to the nearest metre.
The wheel takes 30 minutes to rotate once.

Work out the average speed of a point on the circumference of the wheel as it rotates once. Give your answer in metres per second correct to 3 significant figures.

..... metres per second

Question 13

Categorisation: Solve speed-distance-time problems in the context of bounds.

[Edexcel GCSE Nov2014-2H Q23 Edited]

A road is 4530 m long, correct to the nearest 10 metres.
Kirsty drove along the road in 205 seconds, correct to the nearest 5 seconds.

The average speed limit for the road is 80 km/h.

What is greatest Kirsty's speed could have been?
Give your answer correct to 1 decimal place.

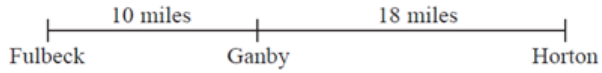
..... km/h

Question 14

Categorisation: Find a combined speed using multiple parts of a journey, or the speed of a part of a journey given the combined speed.

[Edexcel GCSE Jun2015-1H Q14]

The distance from Fulbeck to Ganby is 10 miles.
The distance from Ganby to Horton is 18 miles.



Raksha is going to drive from Fulbeck to Ganby.
Then she will drive from Ganby to Horton.

Raksha leaves Fulbeck at 10 00.
She drives from Fulbeck to Ganby at an average speed of 40mph.

Raksha wants to get to Horton at 10 35.

Work out the average speed Raksha must drive at from Ganby to Horton.

..... mph

Question 15

Categorisation: Solve simple density problems.

[Edexcel GCSE June2006-3I Q14, June2006-5H Q3]

A silver chain has a volume of 5 cm^3 .
The density of silver is 10.5 grams per cm^3 .

Work out the mass of the silver chain.

..... grams

Question 16

Categorisation: Solve density problems where the volume of a prism must be calculated.

[Edexcel GCSE June2016-2H Q14 Edited]

The diagram shows a metal bar in the shape of a prism.

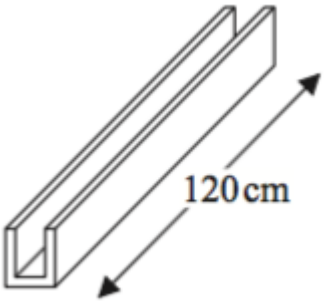


Diagram **NOT** accurately drawn

The length of the metal bar is 120 cm.
The cross section of the metal bar is shown below.

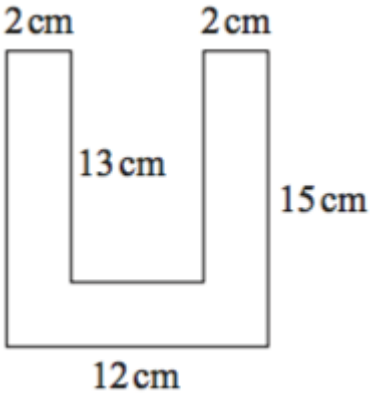


Diagram **NOT** accurately drawn

All corners are right angles. The metal bar is made from steel with density 8 g/ cm^3 .

Sean has a trolley. The trolley can carry a maximum mass of 250 kg.

How many metal bars can the trolley carry at the same time?

..... metal bars

Question 17

Categorisation: As above, but with cylinders.

[Edexcel GCSE June2008-4H Q13b]

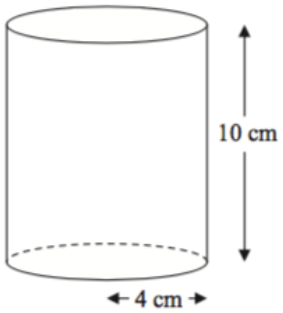


Diagram **NOT** accurately drawn

A solid cylinder has a radius of 4 cm and a height of 10 cm.
The cylinder is made from wood. The density of the wood is 0.6 grams per cm^3 .

(b) Given that the volume of the cylinder is $503cm^3$, work out the mass of the cylinder.
Give your answer correct to 3 significant figures.

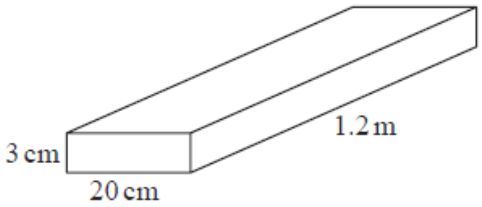
..... grams

Question 18

Categorisation: As above, but involving a mixture of units.

[Edexcel GCSE(9-1) Mock Set 1 Autumn 2016 3H Q12 Edited]

The diagram shows a piece of wood in the shape of a cuboid.



The piece of wood is 3 cm by 20 cm by 1.2 m. The mass of the piece of wood is 8 kg.
The piece of wood will float in sea water if the density of the wood is less than the density of the sea water. In a large pool, 1 litre of sea water has a mass of 1030 g.

Will the piece of wood float in this pool? Determine the densities of the water and the wood (to 3 significant figures) that would enable you to make this conclusion.

Density of wood: ..... g/cm ^{3}

Density of water: ..... g/cm ^{3}

Question 19

Categorisation: Determine the combined density of a mixture of solids/liquids.

[Edexcel GCSE Jun2015-2H Q16]

Liquid A has a density of 0.7 g/cm^3.
Liquid B has a density of 1.6 g/cm^3.

140 g of liquid A and 128 g of liquid B are mixed to make liquid C.

Work out the density of liquid C.

..... g/cm^3

Question 20

Categorisation: As above, but finding the density of a component of a mixture when the combined density is known.

[Edexcel GCSE(9-1) Mock Set 3 Autumn 2017 3H Q7]

Liquid **A** has a density of 1.42 g/cm^3

7 cm^3 of liquid **A** is mixed with 125 cm^3 of liquid **B** to make liquid **C**.

Liquid **C** has a density of 1.05 g/cm^3

Find the density of liquid **B**.
Give your answer correct to 2 decimal places.

..... g/cm^3

Question 21

Categorisation: Solve problems involving pressure-force-area.

[Edexcel Specimen Papers Set 1, Paper 1H Q21, Paper 1H Q2]

Key Formula: $P = \frac{F}{A}$, *where* $P =$ *pressure*, $F =$ *force*, $A =$*area.*

A box exerts a force of 140 newtons on a table.
The pressure on the table is 35 newtons/m ^{2} .

Calculate the area of the box that is in contact with the table.

..... m ^{2}

Question 22

Categorisation: Solve density problems in the context of ratio.

[Edexcel GCSE(9-1) Mock Set 2 Spring 2017 3H Q9]

The densities of three metal alloys, A , B and C , are in the ratio

$$13 : 15 : 21$$

1 m ^{3} of alloy B has a mass of 8600 kg.

Work out the difference between the mass of 5 m ^{3} of alloy A and 3 m ^{3} of alloy C.
Give your answer correct to 3 significant figures.

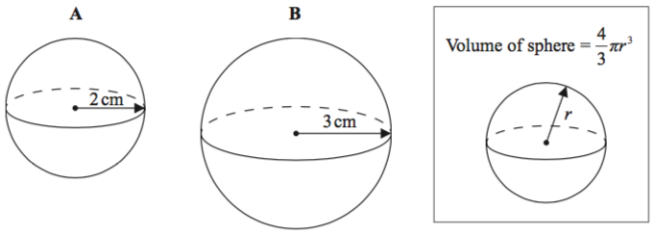
..... kg

Question 23

Categorisation: Solve density problems involving estimation.

[Edexcel GCSE(9-1) Mock Set 3 Autumn 2017 1H Q16 Edited]

Here are two solid spheres, **A** and **B**.



Sphere **A** is made of gold. Sphere **B** is made of silver.
Sphere **A** has radius 2 cm. Sphere **B** has radius 3 cm.

Gold has a density of 19 000 kg/m^3
Silver has a density of 10 000 kg/m^3

Which sphere has the greater mass?

[ ] Sphere A [ ] Sphere B

Question 24

Categorisation: Consider the rate of change of depth as a container fills.

[Edexcel GCSE Nov2014-2H Q13b]
The diagram shows a swimming pool in the shape of a prism.

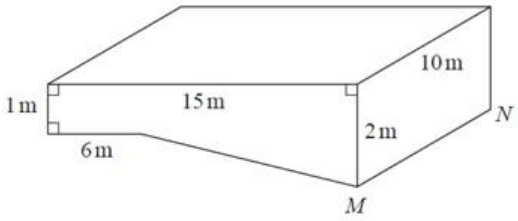
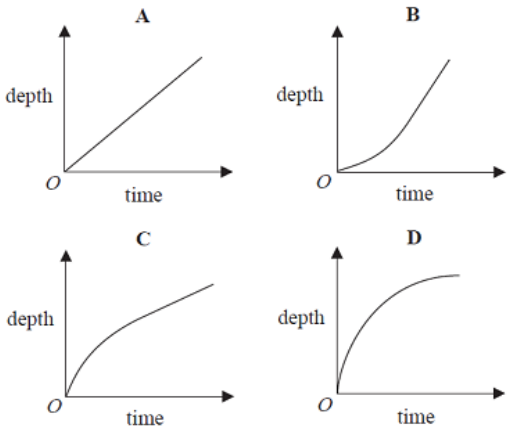


Diagram **NOT** accurately drawn

The swimming pool is empty. Here are four graphs.



Write down the letter of the graph that best shows how the depth of the water in the pool above the line MN changes with time as the pool is filled.

[ ] A [ ] B [ ] C [ ] D

Question 25

Categorisation: Solve 'rates of flow' problems.

[Edexcel GCSE Nov2014-2H Q13a]

The diagram shows a swimming pool in the shape of a prism.

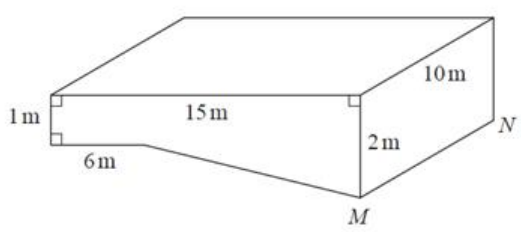


Diagram **NOT** accurately drawn

The swimming pool is empty. The swimming pool is filled with water at a constant rate of 50 litres per minute. Work out how long it will take for the swimming pool to be completely full of water. Give your answer in hours. (1 m^3 = 1000 litres)

..... hours

Question 26

Categorisation: As above.

[Edexcel GCSE June2013-1H Q17]

Sumeet has a pond in the shape of a prism.

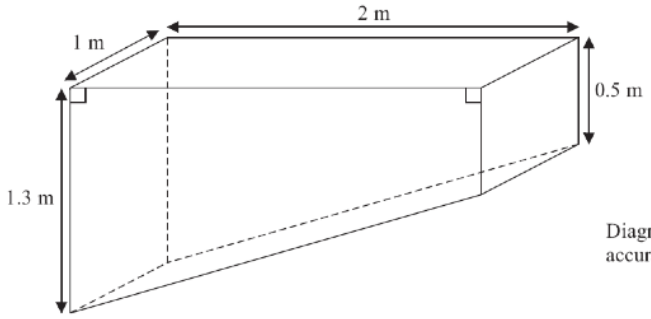


Diagram **NOT** accurately drawn

The pond is completely full of water. Sumeet wants to empty the pond so he can clean it. Sumeet uses a pump to empty the pond. The volume of water in the pond decreases at a constant rate. The level of the water in the pond goes down by 20 cm in the first 30 minutes. Work out how much more time Sumeet has to wait for the pump to empty the pond completely.

..... hour(s)

and ..... minute(s)

Question 27

Categorisation: As above, but using compound solids.

[Edexcel GCSE Jun2015-1H Q23]

The diagram shows a container for grain.

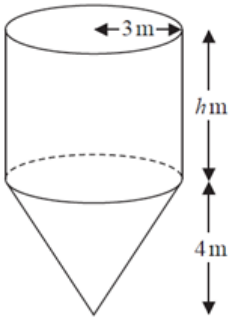


Diagram **NOT** accurately drawn

The container is a cylinder on top of a cone.
The cylinder has a radius of 3 m and a height of h m.
The cone has a base radius of 3 m and a vertical height of 4 m.

The container is empty.
The container is then filled with grain at a constant rate.

After 5 hours the depth of the grain is 6 metres above the vertex of the cone.
After 9 hours the container is full of grain.

Work out the value of h .
Give your answer as a fraction in its simplest form.
You must show all your working.

.....

Answers

Question 1

4 hours and 48 minutes

Question 2

310 km

Question 3

660 kilometres per hour

Question 4

45 minutes

Question 5

208 m/s

Question 6

15 mph

Question 7

16: 45

Question 8

6 mph

Question 9

11: 40

Question 10

20 %

Question 11

772.8 km

Question 12

0.262 metres per second

Question 13

80.6 km/h

Question 14

54 mph

Question 15

52.5 grams

Question 16

3 metal bars

Question 17

any value in the range 300 grams to 302 grams

Question 18

Density of wood: 1.11 g/cm ^{3} and Density of water: 1.03 g/cm ^{3}

Question 19

any value in the range 0.957 gcm^3 to 0.96 gcm^3

Question 20

1.03 g/cm^3

Question 21

4 m ^{2}

Question 22

any value in the range 1146 kg to 1150 kg

Question 23

Sphere B

Question 24

C

Question 25

65 hours

Question 26

1 hour(s) and and 45 minute(s)

Question 27

$\frac{14}{3}$