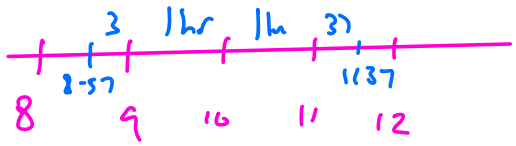
Compound Measures - Exercise 22.1 A

1 A train leaves Euston at 8:57 am and arrives at Preston at 11:37 am.
If the distance is 238 miles find the average speed of the train.



$= 2\text{hr } 40\text{ min}$

$2\frac{2}{3}$ hrs

$\text{Speed} = \frac{\text{Dist}}{\text{Time}} = \frac{238}{2\frac{2}{3}}$

$= 89.25$ mph

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3 A metal cuboid has a length of 9 cm, a width of 5 cm and a height of 4 cm.
It has a mass of 1.53 kg.
Find its density in g/cm^3.

$\text{Vol} = 9 \times 5 \times 4 = 180\text{ cm}^3$

$\text{Density} = \frac{\text{Mass}}{\text{Vol}} = \frac{1530\text{ g}}{180\text{ cm}^3} = 8.5\text{ g/cm}^3$

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7 A solid block has a length and width of 22.50 mm, and a height of 3.15 mm. It has a mass of 9.50 g.

a Find the density of the metal from which the block is made.
Give your answer in g/cm^3.

b How many blocks can be made from 1 kg of the material?

a) Vol = 2.25 cm × 2.25 cm × 0.315 cm

= 1.5946875 cm^3

Density = $\frac{\text{Mass}}{\text{Vol}}$ = $\frac{9.5 \text{ g}}{1.5946875 \text{ cm}^3}$ = 5.95728

5.96 g/cm^3

b) 1000 g blocks 9.5 g

so number of blocks = $\frac{1000}{9.5}$ = 105.263

so 105 blocks

Classwork Q2, 4, 6, 8

2 Sand falls from the back of a lorry at a rate of 0.2 kg/s.
It took 25 minutes for all the sand to fall from the lorry.
How much sand was the lorry carrying?

Total sand = 0.2 × 60 × 25 = 300 kg

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4 A car travels 24 miles in 45 minutes. Find the average speed of the car in miles per hour (mph).

In 1 hr travels $24 \div 45 \times 60 = 32$ miles

Speed 32 mph

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6 A cube of side 2 cm weighs 40 grams.

a Find the density of the material from which the cube is made. Give your answer in g/cm³.

Volume of cube = length³.

b A cube of side length 2.6 cm is made from the same material. Find the mass of this cube, in grams.

a) $\text{Vol} = 2 \times 2 \times 2 = 8 \text{ cm}^3$

$\text{Density} = \frac{\text{Mass}}{\text{Vol}} = \frac{40}{8} = 5 \text{ g/cm}^3$

b) $\text{Vol} = 2.6 \times 2.6 \times 2.6 = 17.576 \text{ cm}^3$

$\text{Mass} = \text{Vol} \times \text{Density}$

$= 17.576 \times 5$

$= 87.88 \text{ g}$

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8 In this question, give your answers in kg/m³.

a The volume of 31.5 g of silver is 3 cm³.

Work out the density of silver.

b The volume of 18 g of titanium is 4 cm³.

Work out the density of titanium.

c A sheet of aluminium foil has volume 0.4 cm³ and mass 1.08 g. Work out the density of aluminium foil.

a) $\text{Density} = \frac{\text{Mass}}{\text{Vol}}$

$= \frac{31.5}{3} = 10.5 \text{ g/cm}^3$

$= 10.5 \times 1000000 \text{ g/m}^3$

$= \frac{10.5 \times 1000000}{1000} \text{ kg/m}^3$

$= 10500 \text{ kg/m}^3$

b) $\text{Density} = \frac{18}{4} \times 1000 \text{ kg/m}^3$

$= 4500 \text{ kg/m}^3$

c) $\text{Density} = \frac{1.08}{0.4} \times 1000 \text{ kg/m}^3$

$= 2700 \text{ kg/m}^3$

11 A yacht race has three legs of 8 km, 6 km and 10 km.
The average speed for the winning yacht was 6.2 km/h.
The second yacht finished 8 minutes after the winner.
How long did it take the second place yacht to finish the race?

Race length = 8 + 6 + 10 = 24 km

Speed = 6.2 km/h

$$\text{Time} = \frac{\text{Dist}}{\text{Speed}} = \frac{24}{6.2} = 3.870967742 \text{ hrs}$$

$$= 3 \text{ hrs } 52.258 \text{ mins}$$

$$= 3 \text{ hrs } 52 \text{ min}$$

2nd yacht takes 3 hr 52 min + 8 min

= 4 hrs

Exercise 22.1A

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How much sand was the lorry carrying?

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Find the average speed of the car in miles per hour (mph).

5 Copy and complete the table to show speeds, distances and times for five different journeys.

Speed (kmph)	Distance (km)	Time
105		5 hours
48	106	
	84	2 hours 15 minutes
86		2 hours 30 minutes
	65	1 hours 45 minutes

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9 Grace earns £340 per week for 40 hours work.
If Grace works overtime, she is paid 1.5 times her standard hourly rate.

a How much is Grace paid for 7 hours of overtime work?

b Grace earned £531.25 last week. How many hours of overtime did she work?

10 The toll charged for a car travelling on a motorway was £33.60 for a journey of 420 km.
Cars with trailers are charged double.
How much would it cost for a car with a trailer to travel 264 km?

11 A yacht race has three legs of 8 km, 6 km and 10 km.
The average speed for the winning yacht was 6.2 km/h.
The second yacht finished 8 minutes after the winner.
How long did it take the second place yacht to finish the race?

12 **a** Julia is wearing high-heeled shoes.
Each heel has an area of 1 cm^2. Julia weighs 55 kg.
How much pressure does Julia's heel exert when she has one heel on the ground?

b An elephant's foot is 45 cm across is approximately circular.
An elephant walks with two feet on the ground at a time.
An elephant weighs 5500 kg.
How much pressure does an elephant's foot exert when the elephant has two feet on the ground?