

# Worksheet 24: Compound measures

Metric units, speed-distance-time, density and pressure

## Gateway skills: time and metric units

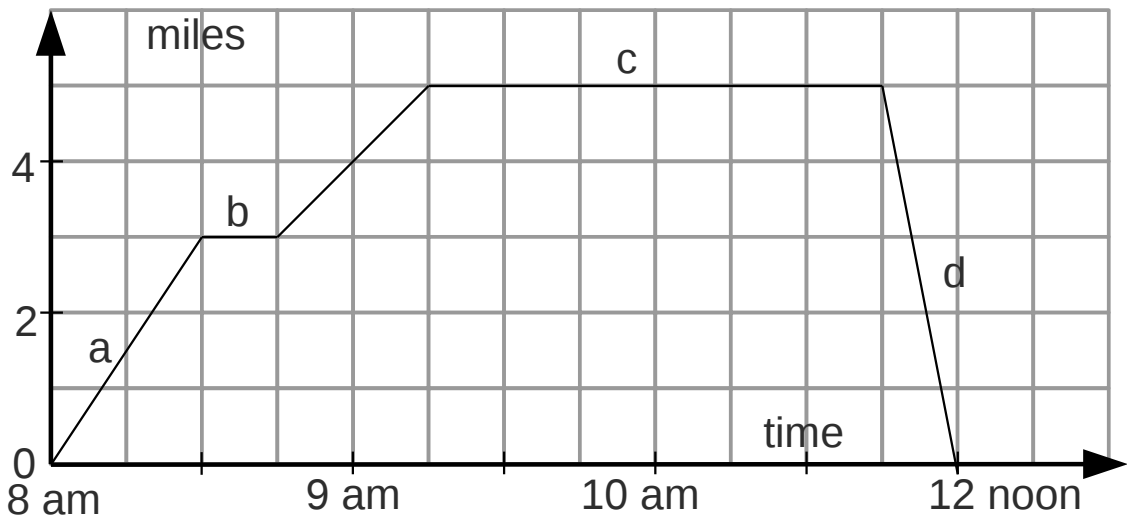
Complete this table

Qu	Time	Time in decimal hours
1	15 minutes	
2		0.5
3	2h 30	
4		2.1
5	1h 45	
6		1.9
7	4h 24	

- 8) A television programme starts at 21:07 and ends at 23:01  
How long did the programme last in decimal hours?
- 9) Convert 810g into kilogrammes
- 10) What is 1.5 litres in millilitres?
- 11) A 70cl bottle of wine costs £6.30  
How much should a 1 litre bottle of the same wine cost?
- 12) How many full cups of 240ml of orange juice can you take from a 2.7 litre bottle?
- 13) Convert 0.43Kg to grams
- 14) A car advert claims an mpg figure of 35.  
The car has 5 gallons of petrol in the tank. How far should the car be able to travel without refilling?
- 15) A 750ml bottle of olive oil costs £3.60.  
Work out the cost per 100ml of the oil.

## Speed Distance and Time

- 1) A car travels at 30 mph for 3 hours. How far did it travel?
- 2) Fred leaves home at 0745 and arrives at work at 0830  
He lives 15 miles from where he works  
Calculate Fred's average speed for the journey
- 3) Look at the distance-time diagram below



Write a detailed description of the journey shown including the speed for each of the sections labelled a to d.

- 4) Amjad travels at 60 mph for 2h 15 minutes, then slows down to 30mph for the last 1h 30 minutes of his journey.  
Calculate the average speed for the whole journey.
- 5) Angela walks at 5 mph for 45 minutes and then slows down to 3mph for the last 15 minutes.  
How far has she walked in total?
- 6) A plane travels at 600 mph over the Atlantic, a distance of 3 600 miles. How many hours will it take?
- 7) Usain Bolt once ran 100 metres in 9.58 seconds.
  - a) Calculate his speed in metres per second
  - b) Convert this to kilometres per hour

## Density

You will need the *Density of Common Materials* table for this section.

- 1) 100 cm<sup>3</sup> of ice has a weight/mass of 83g.  
Calculate the density of the ice in gcm<sup>-3</sup>
  
- 2) Hassan has a sample of a bright silver metal in the form of a cuboid measuring 4cm by 5cm by 6cm.  
He weighs the metal cuboid and finds the mass to be 325g
  - a) Calculate the density of the cuboid
  - b) What metal could the cuboid be made of?
  
- 3) A cylinder of polystyrene measures 1m long and 30cm in diameter.  
What is the largest mass it could have consistent with the densities shown in the density sheet?
  
- 4) A block of wood measures 20cm by 20cm by 10cm.  
It weighs 2.9 kg
  - a) Calculate the density of the block of wood
  - b) Compare the density with values in the table of densities and identify the type of wood the block could be
  
- 5) A sawmill sells timber from sustainable fir forests at £130 per cubic metre.  
Stanislaw needs to buy 2.6 m<sup>3</sup> for his new timber house.
  - a) Calculate the cost of the timber
  - b) Estimate the weight in kg of the consignment.
  
- 6) A cylinder of lead measures 3cm long and 1cm diameter.  
Calculate the weight of the cylinder.

## Pressure and flow rates

Force (N) = mass (kg)  $\times$  g. Take g as 9.98 in the questions below

- 1) An oil tank is a cuboid, measuring 2m by 3m by 4m long.  
A tanker fills the tank at the rate of 1 500 litres per minute.  
How long would it take to fill the tank at that rate?  
Give your answer in minutes
  
- 2) A mass of 3kg is spread over an area of 100cm<sup>2</sup>  
Calculate the pressure exerted in Nm<sup>-2</sup>
  
- 3) A large water tank is in the shape of a cylinder with diameter 10m  
and height 5m.  
A small village uses about 100 litres of water per person per day.  
The population of the village is 50.  
Does the water tank hold enough water to supply the village for a  
month if fully filled?  
Show calculations to support your answer
  
- 4) A high-heel shoe has a heel with an area of 1cm<sup>2</sup>  
The wearer has a body weight of 50Kg  
Assume the wearer is leaning back on one heel
  - a) Calculate the force exerted by the 50Kg mass
  - b) Calculate the pressure exerted on the dance floor
  
- 5) Algernon leaves his cold water tap on full one weekend and goes  
away. The tap runs at the rate of 0.2li per second.  
Agernon was away for 48 hours  
How many cubic metres of water awaited him in the basement?

Table 1. Densities of Common Materials

Material	Density (g/cm <sup>3</sup> )	Material	Density (g/cm <sup>3</sup> )	Material	Density (g/cm <sup>3</sup> )
Aluminum (Al)	2.71	Iron (Fe)	7.87	Steel	7.85
Aluminum Alloy	2.64 - 2.8	Iron - Cast	7.0 - 7.4	Stone - Granite	2.6
Brass	8.4 - 8.75	Iron - Wrought	7.4 - 7.8	Stone - Limestone	2.0 - 2.9
Brass - Noval	8.4	Lead (Pb)	11.3	Stone - Marble	2.6 - 2.9
Brass - Red	8.75	Magnesium (Mg)	1.74	Stone - Quartz	2.6
Brick	1.8 - 2.4	Magnesium Alloy	1.77	Tin (Sn)	7.3
Bronze - Reg.	7.8 - 8.8	Monel (67% Ni, 30% Cu)	8.84	Titanium (Ti)	4.54
Bronze - Managanese	8.3	Neoprene Rubber	1.23	Titanium Alloy	4.51
Carbon	2.25	Nickel (Ni)	8.89	Tungsten (W)	19.3
Ceramic	2.0 - 3.0	Nylon	1.15	Wood - Ash	0.56 - 0.64
Concrete	2.3 - 2.4	Parafin	0.8	Wood - Balsa	0.16
Copper (Cu)	8.94	Platinum (Pt)	21.4	Wood - Douglas Fir	0.48 - 0.56
Copper Alloy	8.23	Polystyrene	0.027 - 0.064	Wood - Oak	0.64 - 0.72
Cork	0.15 - 0.2	Rubber	0.96 - 1.3	Wood - South. Pine	0.55 - 0.64
Glass	2.4 - 2.8	Silicon (Si)	2.33	Zinc (Zn)	7.14
Gold (Au)	19.32	Silver (Ag)	10.49		