

# COMPOUND MEASURES

## Task 1

- 1) A cyclist travels 45 km in 1 hour 30 minutes. What is their average speed in km/h?
- 2) A train travels 120 miles in 2 hours 30 minutes. What is its average speed in mph?
- 3) A swimmer covers 400 m in 5 minutes. What is their average speed in m/s?
- 4) A lorry driver travels 275 km in 5 hours. What is their average speed in km/h?
- 5) A sprinter completes 200 m in 20 seconds. What is their speed in m/s?
- 6) A car travels at 65 mph for 2 hours 15 minutes. How far does the car travel?
- 7) A ship sails at 25 km/h for 3.6 hours. How far does the ship travel?
- 8) A bus travels 156 miles at a speed of 52 mph. How long does the journey take?
- 9) A cheetah runs 420 m at a speed of 21 m/s. How long does it take?
- 10) Convert 90 km/h into m/s.

## Task 2

- 11) A block has a mass of 250 g and a volume of 50 cm<sup>3</sup>. Calculate its density.
- 12) A stone has a density of 3 g/cm<sup>3</sup> and a volume of 400 cm<sup>3</sup>. Work out its mass in kg.
- 13) A liquid has a mass of 5.4 kg and a volume of 3 litres. Find its density in g/ml.
- 14) A box has a density of 0.8 g/cm<sup>3</sup> and a mass of 640 g. Work out the volume of the box.
- 15) A machine exerts a force of 1200 N on the ground with an area of 0.25 m<sup>2</sup>. Calculate the pressure.
- 16) The pressure on the ground from a suitcase is 4000 N/m<sup>2</sup>. The suitcase's weight has a force of 320 N. Work out the area of contact the suitcase has with the ground.
- 17) A person exerts a force of 600 N on a floor, while standing on two feet. Given, each foot has an area of 0.03 m<sup>2</sup>, calculate the pressure on the floor.
- 18) A force of 600 N acts over an area of 300 cm<sup>2</sup>. Work out the pressure in N/m<sup>2</sup>.
- 19) A block of metal has a mass of 2.4 kg and a density of 8 g/cm<sup>3</sup>. Work out the volume in cm<sup>3</sup>.
- 20) A tank holds 2500 ml of liquid with a density of 1.2 g/ml. Find the mass of the liquid in kilograms.

### Task 3

- 21) A train travels 225 km in 3 hours and 45 minutes. Work out the speed of the train in m/s.
- 22) A cube with a side length of 5 cm has a mass of 2.7 kg. Work out its density in  $\text{g/cm}^3$ .
- 23) A rectangular block measures  $20 \text{ cm} \times 15 \text{ cm} \times 10 \text{ cm}$ . Its mass is 12 kg. Find its density in  $\text{g/cm}^3$ .
- 24) A car tyre has a surface area of  $0.04 \text{ m}^2$  in contact with the road. If the car has a total weight of 12,000 N spread equally across 4 tyres, calculate the pressure each tyre exerts on the road.
- 25) A diver weighs 800 N. He wears flippers with a total area of  $0.12 \text{ m}^2$ . Calculate the pressure he exerts on the seabed to the nearest unit. Compare this with the pressure if he stood barefoot with an area of  $0.025 \text{ m}^2$ .
- 26) Sophie cycles 72 km from Oxford to Cambridge. She cycles the first 45 km at an average speed of 18 km/h. The remainder of the journey takes her 1 hour and 10 minutes. Work out Sophie's average speed for the whole journey. Give your answer to 3 significant figures.
- 27) Daniel swims 1,500 m in 22 minutes and 18 seconds.
- Work out how long it would take Daniel to swim 3,000 m at the same speed. Give your answer in minutes and seconds.
  - Daniel tires quickly after 2,000 m. How would this affect your answer to part a?

### Challenge

- 28) 250 ml of cranberry juice and 350 ml of apple juice are mixed to make a fruit drink. The cranberry juice has a density of 0.9 g/ml. The apple juice has a density of 1.15 g/ml. Work out the density of the fruit drink. Give your answer to 3 decimal places.
- 29) Emma drives a total of  $d$  miles. She drives the first half of the journey at  $x$  mph. She drives the second half of the journey at  $2x$  mph. Write a fully simplified expression, in terms of  $d$  and  $x$ , for Emma's average speed for the whole journey.
- 30) A mixture is made by combining:  
 $a$  ml of a liquid with density  $p$  g/ml, and  
 $b$  ml of a liquid with density  $q$  g/ml.  
Write a fully simplified expression for the density of the mixture in terms of  $a$ ,  $b$ ,  $p$ , and  $q$ .