

GCSE Mathematics

Worksheet: Speed, density, pressure and best buys · Calculator

TIME 35 min	TOTAL 32 marks	CALCULATOR Allowed	DIFFICULTY Easy, Medium
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Topics: Speed, density, pressure and best buys

NAME _____	CLASS _____	DATE _____
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- Use black ink or ball-point pen.
- Answer all questions. Answer the questions in the spaces provided – there may be more space than you need.
- Calculators may be used. If your calculator does not have a π button, take the value of π to be 3.142 unless the question instructs otherwise.
- Diagrams are NOT accurately drawn, unless otherwise indicated.
- You must show all your working.

1

A block of zinc has a mass of 426 g and a volume of 60 cm³.
Work out the density of zinc.

.....

.....

.....

.....

.....

.....

..... g/cm³
(2)

(Total for Question 1 is 2 marks)

.....

2

A block of zinc has a mass of 1725.3 g and a volume of 243 cm³.
Work out the density of zinc.

..... g/cm³

(2)

(Total for Question 2 is 2 marks)

3

Ella runs 5 km in 24 minutes.
Jon runs at an average speed of 12 km/h.
Who runs at the greater average speed?
You must show your working.

(3)

(Total for Question 3 is 3 marks)

4

A car travels 75 km at an average speed of 50 km/h.

How long does the journey take?

Give your answer in hours and minutes.

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.....
(3)

(Total for Question 4 is 3 marks)

5

A force of 14 N acts on an area of 7 cm².

Work out the pressure.

Use **pressure** = $\frac{\text{force}}{\text{area}}$.

.....

.....

.....

.....

.....

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..... N/cm²
(2)

(Total for Question 5 is 2 marks)

6

Shampoo is sold in two sizes.

A small pack contains 400 ml and costs £2.51.

A large pack contains 750 ml and costs £5.03.

Which size of pack is the best value for money?

You must show how you get your answer.

(3)

(Total for Question 6 is 3 marks)

7

A force of 36 newtons acts on an area of 0.4 m^2 .

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

Work out the pressure.

..... N/m^2
(2)

(Total for Question 7 is 2 marks)

8

A force of 22 N acts on a surface. The pressure on the surface is 2 N/cm^2 .

Work out the area of the surface.

..... cm^2
(2)

(Total for Question 8 is 2 marks)

9

(a) Change 126 km/h into m/s.

.....

.....

.....

.....

.....

.....

..... m/s

(2)

(b) Change 25 m/s into km/h.

.....

.....

.....

.....

.....

.....

..... km/h

(2)

(Total for Question 9 is 4 marks)

10

A crate rests on a floor. The base of the crate is a rectangle measuring 0.6 m by 1 m.
The crate exerts a pressure of 1750 N/m^2 on the floor.

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

Work out the force exerted by the crate on the floor.

..... N

(3)

(Total for Question 10 is 3 marks)

11

A car travels 60 km at an average speed of 40 km/h. It then travels a further 60 km at an average speed of 60 km/h.

Ali says, 'The average speed for the whole journey is 50 km/h.'

Show that Ali is wrong.

(3)

(Total for Question 11 is 3 marks)

12

A shop sells cereal in two sizes of box.

Small box: 500 g for £2.40. Offer on small boxes: buy 2, get a third one half price.

Large box: 750 g for £3.10. There is no offer on large boxes.

Kira needs exactly 1.5 kg of cereal.

Should Kira buy small boxes or large boxes to pay the least?

You must show your working.

(3)

(Total for Question 12 is 3 marks)

END OF QUESTIONS

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Mark scheme

GCSE Mathematics · Worksheet: Speed, density, pressure and best buys · 32 marks

Question 1 (2 marks)

[2 marks]

Answer: 7.1 g/cm^3

- **M1** for $426 \div 60$
- **A1** for 7.1 cao

Worked solution: Density = mass $\div$ volume = $426 \div 60 = 7.1 \text{ g/cm}^3$

Question 2 (2 marks)

[2 marks]

Answer: 7.1 g/cm^3

- **M1** for $1725.3 \div 243$
- **A1** for 7.1 cao

Worked solution: Density = mass $\div$ volume = $1725.3 \div 243 = 7.1 \text{ g/cm}^3$

Question 3 (3 marks)

[3 marks]

Answer: Ella: her speed is 12.5 km/h , which is more than 12 km/h .

- **M1** for 24 minutes = 0.4 hours, or $5 \div 24$ km per minute
- **A1** for 12.5 km/h (or Jon runs 4.8 km in 24 minutes, or Jon takes 25 minutes for 5 km)
- **C1** for Ella, from a correct comparison

Worked solution: 24 minutes = $\frac{24}{60} = 0.4$ hours. Ella's speed = $5 \div 0.4 = 12.5 \text{ km/h}$.
 $12.5 \text{ km/h} > 12 \text{ km/h}$, so Ella is faster.

Question 4 (3 marks)

[3 marks]

Answer: 1 hour 30 minutes

- **M1** for $75 \div 50 (= 1.5 \text{ hours})$
- **M1** for converting the decimal part of the hour to minutes, e.g. $0.5 \times 60 = 30$
- **A1** for 1 hour 30 minutes cao

Notes: An answer of 1.5 hours scores M1 M0 A0.

Worked solution: Time = $75 \div 50 = 1.5$ hours. $0.5 \times 60 = 30$ minutes, so the journey takes 1 hour 30 minutes.

Question 5 (2 marks)

[2 marks]

Answer: 2 N/cm²

- **M1** for $14 \div 7$
- **A1** for 2 cao

Worked solution: Pressure = $14 \div 7 = 2$ N/cm².

Question 6 (3 marks)

[3 marks]

Answer: The small pack (cost per 100 ml: small 62.7p, large 67.1p)

- **M1** for a correct method to find a comparable value for one pack, e.g. $2.51 \div 4$ (cost per 100 ml) or $400 \div 251$ (ml per penny)
- **M1** for a correct method to find comparable values for both packs
- **C1** for the small pack, supported by correct figures, e.g. 62.7p, 67.1p per 100 ml

Notes: Any complete, correct comparison can be used, e.g. cost per 100 ml, cost per litre, amount per £1, or the cost of the same total amount. Values rounded to the nearest penny are acceptable if they still show which pack is best.

Worked solution: Small: $2.51 \div 4 = 0.6275$ pounds per 100 ml

Large: $5.03 \div 7.5 = 0.6707 \dots$ pounds per 100 ml

The small pack has the lowest cost per 100 ml, so it is the best value.

Question 7 (2 marks)

[2 marks]

Answer: 90 N/m²

- **M1** for $36 \div 0.4$
- **A1** for 90 cao

Worked solution: $36 \div 0.4 = 90 \text{ N/m}^2$

Question 8 (2 marks)

[2 marks]

Answer: 11 cm²

- **M1** for $22 \div 2$
- **A1** for 11 cao

Notes: An answer of 44 (force $\times$ pressure) scores 0.

Worked solution: Area = $\frac{\text{force}}{\text{pressure}} = 22 \div 2 = 11 \text{ cm}^2$.

Question 9 (4 marks)

(a) [2 marks]

Answer: 35 m/s

- **M1** for 126×1000 or $\div 3600$ seen
- **A1** for 35 cao

Worked solution: $126 \text{ km/h} = 126,000 \text{ m per hour}$, and $126,000 \div 3600 = 35 \text{ m/s}$

(b) [2 marks]

Answer: 90 km/h

- **M1** for 25×3600 or $\div 1000$ seen
- **A1** for 90 cao

Worked solution: $25 \times 3600 = 90,000 \text{ m per hour} = 90 \text{ km/h}$

Question 10 (3 marks)

[3 marks]

Answer: 1050 N

- **M1** for the area, $0.6 \times 1 = 0.6 \text{ m}^2$
- **M1** for 1750×0.6
- **A1** for 1050 cao

Worked solution: Area = 0.6 m^2 . Force = pressure $\times$ area = $1750 \times 0.6 = 1050 \text{ N}$

Question 11 (3 marks)

[3 marks]

Answer: Times: 1.5 h and 1 h. Average speed = $\frac{120}{2.5} = 48 \text{ km/h}$, not 50 km/h.

- **M1** for the time of one section: $60 \div 40 = 1.5 \text{ h}$ or $60 \div 60 = 1 \text{ h}$
- **M1** for total distance $\div$ total time: $120 \div 2.5$
- **C1** for 48 km/h with the conclusion that Ali is wrong

Worked solution: First part: $60 \div 40 = 1.5 \text{ h}$. Second part: $60 \div 60 = 1 \text{ h}$.

Average speed = $\frac{120}{2.5} = 48 \text{ km/h}$. The car spends longer at the slower speed, so the average is less than 50 km/h.

Question 12 (3 marks)

[3 marks]

Answer: Small boxes: 3 small boxes cost £6.00 and 2 large boxes cost £6.20.

- **M1** for 3 small boxes: $2 \times 2.40 + 1.20$ (= £6.00)
- **M1** for 2 large boxes: 2×3.10 (= £6.20)
- **C1** for small boxes, supported by £6.00 and £6.20

Notes: Comparing prices per 100 g without using the offer (48p and 41.3p) scores 0.

Worked solution: 1.5 kg = 3 small boxes or 2 large boxes.

Small: $2.40 + 2.40 + 1.20 = 6.00$. Large: $2 \times 3.10 = 6.20$.

Small boxes are cheaper by 20p.
