

Formulas in Words and Symbols

Maths

Level 2

Exam-style practice · 12 questions · 34 marks · Calculator allowed

Remember

Substitute carefully: write the formula, replace each letter with its number, then calculate using BIDMAS. Cost = $3 + 1.8m$ with $m = 7 \rightarrow 3 + 1.8 \times 7 = 3 + 12.6 = 15.6$.

Formulas in words work the same way: 'Cooking time = 40 minutes per kg plus 20 minutes' $\rightarrow$ for 2.5 kg: $40 \times 2.5 + 20 = 120$ minutes.

Rearranging: do the opposite operation to both sides. If $C = 3 + 1.8m$ and $C = 21$, then $1.8m = 18$, so $m = 10$.

Writing a formula: name the variables, then describe the calculation. Weekly pay $P = 12.50h + 40$ (£12.50 an hour plus a £40 bonus).

Section A – Using formulas

1. A taxi firm charges a £2.80 pick-up fee plus £1.65 per mile. (a) Write a formula for the cost C of a journey of m miles. (b) Find the cost of a 9-mile journey. (3 marks)

2. To roast a chicken: cook for 45 minutes per kg, plus 20 minutes extra. A chicken weighs 1.8 kg. How long does it take? Give your answer in hours and minutes. (3 marks)

3. The formula for the area of a trapezium is $A = \frac{1}{2}(a + b)h$. Find A when $a = 8$, $b = 14$ and $h = 5$. (2 marks)

4. Body Mass Index is given by $BMI = w \div h^2$, where w is mass in kg and h is height in metres. Find the BMI of someone who is 1.75 m tall and weighs 82 kg. Give your answer to 1 decimal place. (3 marks)

5. The formula $P = 2l + 2w$ gives the perimeter of a rectangle. A rectangular garden is 12.5 m long and 7.4 m wide. Fencing costs £9.20 per metre. What will it cost to fence all four sides? (3 marks)

Section B – Rearranging and working backwards

6. Using the taxi formula from Q1, a journey cost £21.61. How many miles was it? (2 marks)

7. A plumber's bill is worked out as $B = 45 + 32h$, where h is hours worked. A customer is charged £189. How many hours did the plumber work? (2 marks)

8. Convert 30 °C to Fahrenheit using $F = 1.8C + 32$. Then find the Celsius temperature that equals 95 °F. (4 marks)

9. A mobile phone tariff costs £12 a month plus 8p per minute of calls. Priya's bill was £26.40. How many minutes did she use? (3 marks)

Section C – Writing formulas

10. A car hire company charges £35 a day plus 12p per mile. Write a formula for the total cost T of hiring a car for d days and driving m miles. Use it to find the cost of 3 days and 260 miles. (3 marks)

11. A tiler charges a fixed £60 plus £22 per square metre. Write a formula in words and in letters for the charge. A bathroom floor is 6.5 m². What is the charge? (3 marks)

12. A rectangular pond is x metres wide and twice as long as it is wide. Write a formula for its perimeter. If the perimeter is 27 m, what is the width? (3 marks)

Formulas in Words and Symbols – Answers

Level 2 · Working shown so you can check your method, not just the final number.

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Section A

1. (a) $C = 2.80 + 1.65m$. (b) $2.80 + 1.65 \times 9 = 2.80 + 14.85 = \text{£17.65}$.
2. $45 \times 1.8 = 81$; $+ 20 = 101$ minutes = **1 hour 41 minutes**.
3. $\frac{1}{2} \times (8 + 14) \times 5 = \frac{1}{2} \times 22 \times 5 = \text{55}$.
4. $1.75^2 = 3.0625$. $82 \div 3.0625 = 26.775\dots = \text{26.8}$.
5. $2 \times 12.5 + 2 \times 7.4 = 25 + 14.8 = 39.8$ m. $39.8 \times 9.20 = \text{£366.16}$.

Section B

6. $21.61 - 2.80 = 18.81$. $18.81 \div 1.65 = \text{11.4 miles}$.
7. $189 - 45 = 144$. $144 \div 32 = \text{4.5 hours}$.
8. $1.8 \times 30 + 32 = \text{86 °F}$. $95 - 32 = 63$; $63 \div 1.8 = \text{35 °C}$.
9. $26.40 - 12 = 14.40 = 1,440\text{p}$. $1,440 \div 8 = \text{180 minutes}$.

Section C

10. $T = 35d + 0.12m$. $35 \times 3 + 0.12 \times 260 = 105 + 31.20 = \text{£136.20}$.
11. Charge = £60 plus £22 for every square metre; $C = 60 + 22A$. $60 + 22 \times 6.5 = \text{£203}$.
12. Length = $2x$. Perimeter = $2x + 2(2x) = 6x$. $6x = 27 \rightarrow x = \text{4.5 m}$.

Where Level 2 students lose marks on this topic

- Squaring the wrong thing in BMI – it is height squared, not weight. 1.75^2 first, then divide.
- Working backwards in the wrong order: subtract the fixed charge *before* dividing by the rate.
- Mixing pence and pounds inside one formula (£12 plus 8p per minute). Convert to one unit before substituting.