Day 85 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of faces and edges of a hexagonal-based pyramid.

Faces: a 6-sided base and 6 triangles = 7
Edges: 6 on the base plus 6 up to the point = 12
Answer: faces: 7 edges: 12

2 Fuel use

A car travels 10 km on each litre of petrol. (Calculator)
Petrol costs £1.30 per litre.
Work out the cost of the petrol for a journey of 120 km.

Litres needed = 120 ÷ 10 = 12
Cost = 12 × £1.30 = £15.60
Answer: £15.60

3 Perimeter with algebra

A rectangle has length (3x + 1) cm and width (2x − 1) cm.
The perimeter of the rectangle is 40 cm.
(a) Work out the value of x.
(b) Work out the area of the rectangle.

(a) 2(3x + 1) + 2(2x − 1) = 40
10x = 40
10x = 40
x = 4
(b) Length = 13, width = 7, area = 13 × 7 = 91
Answer: (a) x = 4 (b) 91 cm^2

4 Forming and solving equations

A rectangle has length (3x + 3) cm and width (x + 4) cm.
The perimeter of the rectangle is 54 cm.
(a) Work out the value of x.
(b) Work out the area of the rectangle.

(a) 2(3x + 3) + 2(x + 4) = 54
8x + 14 = 54
8x = 40, so x = 5
(b) Length = 18 cm and width = 9 cm, so area = 18 × 9 = 162
Answer: (a) x = 5 (b) 162 cm^2

5 Volume of a prism

The diagram shows a prism.
Its cross-section is an isosceles triangle.
Find the volume of this prism.
The diagram is not drawn accurately.

Area of cross-section = ½ × 14 × 7 = 49
Volume of prism = area of cross-section × length
49 × 10 = 490
Answer: 490 m^3

6 Laws of indices

Write each answer as a single power of 5.
(a) $5^7 \times 5^6$
(b) $5^{13} \div 5^6$

(a) Add the powers: 7 + 6 = 13
(b) Subtract the powers: 13 − 6 = 7
Answer: (a) 5^{13} (b) 5^7

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7 Ratio with a difference

Chloe and Jack share some money in the ratio 8 : 1.
Chloe gets £70 more than Jack.
How much money does Jack get?

Difference in parts: 8 − 1 = 7
7 parts = £70, so 1 part = £10
Jack gets 1 × £10 = £10
Answer: £10

8 Quadratic equation problem

A rectangle has length (x + 4) cm and width (x − 1) cm.
The area of the rectangle is 50 cm^2.
(a) Show that $x^2 + 3x - 54 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: $(x + 4)(x - 1) = 50$
Expand: $x^2 + 3x - 4 = 50$
Subtract 50 from both sides: $x^2 + 3x - 54 = 0$
(b) Factorise: $(x - 6)(x + 9) = 0$, so $x = 6$ or $x = -9$
A length cannot be negative, so x = 6. Length = 6 + 4 = 10
Answer: (b) 10 cm

9 Reverse percentages

The price of a meal including VAT at 20% is £144. (Calculator)
Work out the price of the meal before VAT was added.

The price including VAT is 100% + 20% = 120% of the price before VAT.
120% = £144, so 1% = £144 ÷ 120 = £1.20
100% = £1.20 × 100 = £120
Answer: £120

10 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 80
(b) Lower quartile at 10: 55. Upper quartile at 30: 85
IQR = 85 − 55 = 30
Answer: (a) 80 minutes (b) 30 minutes