Day 236 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

Write down the number of edges and vertices of a hexagonal prism.

Edges: 6 on each end plus 6 joining them = 18
Vertices: 6 on each end = 12
Answer: edges: 18 vertices: 12

2 Probabilities adding to 1

The table shows the probabilities of a spinner landing on each colour.
(a) Work out the value of x.
(b) The spinner is used 200 times. How many times would you expect Red?

(a) Probabilities add up to 1
0.35 + 0.25 + 0.1 + x = 1
x = 1 − 0.7 = 0.3
(b) 0.35 × 200 = 70
Answer: (a) 0.3 (b) 70

3 Real-life graphs

A company hires out bikes. There is a fixed charge plus a cost for each hour.
The graph shows the total cost.
(a) Write down the fixed charge.
(b) Work out the cost for each hour.

(a) The fixed charge is the cost when nothing has been used, where the line meets the vertical axis
(b) Take two points on the line, for example (0, 2) and (8, 26)
Cost for each hour = (26 − 2) ÷ 8 = 3
Answer: (a) £2 (b) £3

4 Population density

Town A has a population density of 250 people per km^2.
Its area is 5 km^2.
Work out its population.

Population = density × area
250 × 5 = 1,250
Answer: 1,250

5 Equation of a line

A straight line has gradient −4 and passes through the point (−3, 3).
Find the equation of the line.

The equation is $y = -4x + c$
Substitute $x = -3$ and $y = 3$: $3 = -4 \times (-3) + c$
$3 = 12 + c$
$c = 3 - 12 = -9$
Answer: $y = -4x - 9$

6 Surface area of cuboids

An open box (no lid) is a cuboid measuring 5 cm by 9 cm by 4 cm.
The base is 5 cm by 9 cm.
Work out the total area of card needed to make the box.

Base: 5 × 9 = 45
Two long sides: 2 × 5 × 4 = 40
Two short sides: 2 × 9 × 4 = 72
45 + 40 + 72 = 157
Answer: 157 cm^2

Day 236 **B Tier 10-a-day: Model Solutions**

7 Direct proportion

F is directly proportional to m.
When m = 2, F = 1.
Find the value of F when m = 5.

F = km
1 = k × 2, so k = 1 ÷ 2 = 0.5
F = 0.5 × 5 = 2.5
Answer: F = 2.5

8 Simultaneous equations problem

A theme park sells adult tickets and child tickets.
4 adult tickets and 2 child tickets cost £46.
2 adult tickets and 2 child tickets cost £30.
Work out the cost of one adult ticket and the cost of one child ticket.

Let a = cost of one adult ticket and b = cost of one child ticket
4a + 2b = 46 and 2a + 2b = 30
Subtract: 2a = 46 − 30 = 16, so a = 8
Substitute: 4 × 8 + 2b = 46, so 2b = 14 and b = 7
Answer: One adult ticket costs £8 and one child ticket costs £7

9 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 50%. (Calculator)
Two weeks later it is reduced by a further 50% of the new price.
The final price is £12.50.
Work out the original price of the sofa.

Multipliers: 0.5 and 0.5
Overall multiplier = 0.5 × 0.5 = 0.25
Original price = £12.50 ÷ 0.25 = £50
Answer: £50

10 Compound percentages

Owen invests £500 in a savings account. (Calculator)
The account pays 4% compound interest per year.
Work out the amount in the account after 2 years.
Give your answer to the nearest penny.

Multiplier = 1 + 4% = 1.04
Amount = 500×1.04^2
= £540.80
Answer: £540.80