Day 286 **B Tier 10-a-day: Model Solutions**

1 Median and range

Here are the numbers of runs scored by a batter.
51, 55, 44, 63, 64, 43, 49, 56
(a) Find the median.
(b) Work out the range.

(a) Put in order: 43, 44, 49, 51, 55, 56, 63, 64
The middle two values are 51 and 55, so the median is 106 ÷ 2 = 53
(b) Range = largest − smallest = 64 − 43 = 21
Answer: (a) 53 (b) 21

2 Metric units

A jug holds 1.5 litres of juice.
Each glass holds 125 ml.
How many glasses can be filled from the jug?

1.5 litres = 1.5 × 1000 = 1500 ml
1500 ÷ 125 = 12
Answer: 12 glasses

3 Volume of cuboids

A cuboid has volume 120 cm^3.
The length of the cuboid is 8 cm and the width is 3 cm.
Work out the height of the cuboid.

Volume = length × width × height
120 = 8 × 3 × height
120 = 24 × height
Height = 120 ÷ 24 = 5
Answer: 5 cm

4 Compound percentages

A new van costs £20,500. (Calculator)
Its value falls by 4% each year.
Work out its value after 3 years.
Give your answer to the nearest pound.

Multiplier = 100% − 4% = 0.96
Value = 20500×0.96^3
= £18,137.09, which is £18,137 to the nearest pound
Answer: £18,137

5 Simultaneous equations problem

A theme park sells adult tickets and child tickets.
2 adult tickets and 1 child ticket cost £48.
3 adult tickets and 1 child ticket cost £67.
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
2a + 1b = 48 and 3a + 1b = 67
Subtract: 1a = 67 − 48 = 19, so a = 19
Substitute: 2 × 19 + 1b = 48, so 1b = 10 and b = 10
Answer: One adult ticket costs £19 and one child ticket costs £10

Day 286 **B Tier 10-a-day: Model Solutions**

6 Pythagoras in context

A table top is 15 cm long and 8 cm wide.
Work out the length of a diagonal of the table top.

The diagonal is the hypotenuse of a right-angled triangle

$d^2 = 15^2 + 8^2 = 289$

$d = \sqrt{289} = 17$

Answer: 17 cm

7 Stratified sampling

A stratified sample of 30 students is taken from the 300 students in the table.
Work out how many students should be sampled from Year 7.

Sample fraction = 30 ÷ 300
Year 7: 60 ÷ 300 × 30 = 6
Answer: 6

8 Surface area of cuboids

An open box (no lid) is a cuboid measuring 14 cm by 5 cm by 2 cm.
The base is 14 cm by 5 cm.
Work out the total area of card needed to make the box.

Base: 14 × 5 = 70
Two long sides: 2 × 14 × 2 = 56
Two short sides: 2 × 5 × 2 = 20
70 + 56 + 20 = 146
Answer: 146 cm^2

9 Wages and overtime

Sophie is paid £14 per hour for a 35 hour week. (Calculator)
Overtime is paid at time and a half.
In one week she works 4 hours of overtime.
Work out her total pay for that week.

Normal pay: 35 × £14 = £490
Overtime rate: £14 × 1.5 = £21 per hour
Overtime pay: 4 × £21 = £84
Total: £490 + £84 = £574
Answer: £574

10 Algebraic proof

Show that $(2n + 8)^2 - 64$ is a multiple of 4 for any whole number n.

Expand: $(2n + 8)^2 = 4n^2 + 32n + 64$
Subtract 64: $4n^2 + 32n$
Factorise: 4n(n + 8), which is a multiple of 4
Answer: 4n(n + 8) is a multiple of 4