Day 185 **B Tier 10-a-day: Model Solutions**

1 Faces, edges and vertices

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

Faces: a 4-sided base and 4 triangles = 5
Edges: 4 on the base plus 4 up to the point = 8
Answer: faces: 5 edges: 8

2 Multiplying and dividing

Work out
(a) 821 × 7
(b) 1288 ÷ 23

(a) 800 × 7 = 5600 and 21 × 7 = 147, so the total is 5747
(b) 23 × 50 = 1150 and 1288 − 1150 = 138, then 138 ÷ 23 = 6, so 50 + 6 = 56
Answer: (a) 5747 (b) 56

3 Integer inequalities

n is an integer.
Write down all the values of n for which
$-1 \leq n \leq 5$

Both end values are included because of the ≤ signs
Answer: −1, 0, 1, 2, 3, 4, 5

4 Pie charts

In a survey, 48 people chose hockey.
There were 120 people in the survey altogether.
The results are shown in a pie chart. Work out the angle for hockey.

Fraction = 48 out of 120
Angle = 48 ÷ 120 × 360° = 144°
Answer: 144°

5 Proving a triangle is right-angled

A triangle has sides of length 12 m, 9 m and 14 m.
Is the triangle right-angled?
You must show your working.

The longest side is 14. Check whether $a^2 + b^2 = c^2$
$9^2 + 12^2 = 81 + 144 = 225$
$14^2 = 196$
These are not equal, so the triangle is not right-angled
Answer: No, $9^2 + 12^2 = 225$ but $14^2 = 196$

6 Expected outcomes

The probability that a football team wins a match is $\frac{1}{4}$.

Work out how many times you would expect this to happen in 100 matches.

Expected number = probability × number of trials
$\frac{1}{4} \times 100 = 25$
Answer: 25

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7 Repeated percentage change

The price of a laptop is £200.
The price is first increased by 30%, then the new price is reduced by 5%.
(a) Work out the final price.
(b) Work out the overall percentage increase in the price.

(a) Multipliers: 1.3 and 0.95
200 × 1.3 × 0.95 = £247
(b) Overall multiplier = 1.235
Overall increase = 23.5%
Answer: (a) £247 (b) 23.5% increase

8 Trial and improvement

The equation $x^3 - 2x = 61$ has a solution between 4 and 5. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 4.5: $4.5^3 - 2 \times 4.5 = 82.125$ (too big)
x = 4.2: $4.2^3 - 2 \times 4.2 = 65.688$ (too big)
x = 4.1: $4.1^3 - 2 \times 4.1 = 60.721$ (too small)
x = 4.15: value = 63.173 (too big), so the solution is below 4.15
So x = 4.1 to 1 decimal place
Answer: x = 4.1

9 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: 43.5
(b) Lower quartile at 10: 27.5. Upper quartile at 30: 48.5
IQR = 48.5 − 27.5 = 21
Answer: (a) 43.5 minutes (b) 21 minutes

10 The nth term

Here are the first four terms of a sequence.
2, 5, 8, 11
Find an expression, in terms of n, for the nth term of this sequence.

The terms go up by 3 each time, so the nth term starts with 3n
When n = 1: 3 and the first term is 2, so we need to subtract 1
nth term = 3n − 1
Answer: 3n − 1