Day 14 **B Tier 10-a-day: Model Solutions**

1 Negative numbers

The temperature in a freezer is −8°C.
(a) The temperature rises by 9°C. Work out the new temperature.
(b) The highest temperature one day was 6°C and the lowest was −3°C. Work out the difference.

(a) −8 + 9 = 1
(b) Difference = 6 − (−3) = 6 + 3 = 9
Answer: (a) 1°C (b) 9°C

2 Pie charts

In a survey, 20 people chose rugby.
There were 180 people in the survey altogether.
The results are shown in a pie chart. Work out the angle for rugby.

Fraction = 20 out of 180
Angle = 20 ÷ 180 × 360° = 40°
Answer: 40°

3 Area of 2D shapes

This is a triangle.
Find the area of the triangle.
The diagram is not drawn accurately.

Area of a triangle = ½ × base × height
½ × 8 × 10 = 40
Answer: 40 cm^2

4 Solving double inequalities

(a) Solve $-1 < 4x + 3 \leq 11$
(b) Write down the integer values of x that satisfy this inequality.

(a) Subtract 3 in all three parts: $-4 < 4x \leq 8$
Divide all three parts by 4: $-1 < x \leq 2$
(b) The whole numbers in this range are 0, 1, 2
Answer: (a) $-1 < x \leq 2$ (b) 0, 1, 2

5 Pythagoras' theorem

Find the length of x. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Use Pythagoras: $a^2 + b^2 = c^2$, where c is the longest side
$x^2 + 5^2 = 10^2$
$x^2 = 100 - 25 = 75$
$x = \sqrt{75} = 8.660...$
x = 8.7 cm (1 d.p.)
Answer: x = 8.7 cm

6 Ordering standard form

Write these numbers in order of size.
Start with the smallest.
4.2×10^0, 8700, 8.8×10^5, 700

Write each in standard form: 4.2×10^0, 8.7×10^3, 8.8×10^5, 7×10^2
Compare the powers of 10 first (the bigger the power, the bigger the number)
Order: 4.2×10^0, 700, 8700, 8.8×10^5
Answer: 4.2×10^0, 700, 8700, 8.8×10^5

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7 Algebraic proof

Show that the sum of 9 consecutive whole numbers is always a multiple of 9.

Let the middle number be n. The numbers are $n - 4$, $n - 3$, $n - 2$, $n - 1$, n, $n + 1$, $n + 2$, $n + 3$, $n + 4$
Add them: the extra parts cancel, giving $9n$
$9n$ is a multiple of 9 because n is a whole number
Answer: 9n is a multiple of 9

8 Compound interest

Maya invests £200 in an account paying 10% compound interest per year. (Calculator)
Work out the value of her investment after 2 years.

Multiplier = $1 + 10 \div 100 = 1.1$
Value = 200×1.1^2
= £242
Answer: £242

9 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 10%. (Calculator)
Two weeks later it is reduced by a further 20% of the new price.
The final price is £90.
Work out the original price of the sofa.

Multipliers: 0.9 and 0.8
Overall multiplier = $0.9 \times 0.8 = 0.72$
Original price = £90 ÷ 0.72 = £125
Answer: £125

10 Simultaneous equations problem

A theme park sells adult tickets and child tickets.
2 adult tickets and 3 child tickets cost £50.
3 adult tickets and 3 child tickets cost £60.
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
$2a + 3b = 50$ and $3a + 3b = 60$
Subtract: $1a = 60 - 50 = 10$, so $a = 10$
Substitute: $2 \times 10 + 3b = 50$, so $3b = 30$ and $b = 10$
Answer: One adult ticket costs £10 and one child ticket costs £10