Day 246 **B Tier 10-a-day: Model Solutions**

1 Negative numbers

The temperature in a freezer is −5°C.
(a) The temperature rises by 10°C. Work out the new temperature.
(b) The highest temperature one day was 9°C and the lowest was −4°C. Work out the difference.

(a) −5 + 10 = 5
(b) Difference = 9 − (−4) = 9 + 4 = 13
Answer: (a) 5°C (b) 13°C

2 Simplifying ratios

Write the ratio 4 : 24 in the form 1 : n

Divide both sides by 4
4 ÷ 4 = 1 and 24 ÷ 4 = 6
Answer: 1 : 6

3 Changing the subject

Make b the subject of the formula
P = 4a + 2b

Subtract 4a from both sides: P − 4a = 2b
Divide both sides by 2
Answer: $\mathbf{b = \frac{P - 4a}{2}}$

4 Bearings

A plane travels on a bearing of 050°.
It then turns left through 120° and continues in a straight line.
Work out the new bearing.

Turning left means subtracting 120°
50 − 120 = −70
Bearings are between 0° and 360°, so −70 + 360 = 290
Answer: 290°

5 Prime factors

Write 700 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
700 ÷ 2 = 350, 350 ÷ 2 = 175, 175 ÷ 5 = 35, 35 ÷ 5 = 7, 7 is prime
700 = 2 × 2 × 5 × 5 × 7
In index form: $700 = 2^2 \times 5^2 \times 7$
Answer: $\mathbf{2^2 \times 5^2 \times 7}$

6 Prisms and density

A prism has volume 310 cm^3.
The area of its cross-section is 31 cm^2.
Work out the length of the prism.

Volume = area of cross-section × length
Length = 310 ÷ 31 = 10
Answer: 10 cm

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7 Reverse percentages

Will's rent goes up by 30%. (Calculator)
The new rent is £1040 a month.
Work out the rent before the increase.

The new rent is 100% + 30% = 130% of the old rent.
130% = £1040, so 1% = £1040 ÷ 130 = £8
100% = £8 × 100 = £800
Answer: £800

8 Compound interest

£1,500 is invested for 2 years at 6% compound interest per year. (Calculator)
Work out the total interest earned.

Multiplier = 1.06
Value after 2 years = $1{,}500 \times 1.06^2 = £1{,}685.40$
Interest = £1,685.40 − £1,500 = £185.40
Answer: £185.40

9 Circle theorems

A, B, C and D are points on a circle.
Angle ACB = 48°.
Work out the size of angle ADB, marked p.
Give a reason for your answer.
The diagram is not drawn accurately.

Angles in the same segment are equal
p = 48°
Answer: p = 48°

10 Algebraic proof

Show that (n + 8)(n + 2) − n(n + 10) has the same value for every whole number n.

Expand the first part: $n^2 + 2n + 8n + 16 = n^2 + 10n + 16$
Expand the second part: $n^2 + 10n$
Subtract: the n^2 terms and the n terms cancel, leaving 16
Answer: The value is always 16