Day 38 **A Tier 10-a-day: Model Solutions**

1 Algebraic formulae in context

A taxi company charges £4 plus £2 for each mile.
(a) Write a formula for the total cost, £C, after m miles.
(b) Aisha pays £34 in total. Work out the number of miles.

(a) C = 4 + 2m
(b) 4 + 2m = 34
2m = 30
m = 15
Answer: (a) C = 4 + 2m (b) 15

2 Wages and overtime

Jack is paid £11.20 per hour for a basic week of 35 hours. (Calculator)
Overtime is paid at double time.
Last week Jack worked 5 hours of overtime.
Work out Jack's total pay for the week.

Basic pay = 35 × £11.20 = £392.00
Overtime rate = £11.20 × 2 = £22.40 per hour
Overtime pay = 5 × £22.40 = £112.00
Total = £392.00 + £112.00 = £504.00
Answer: £504.00

3 Surface area of a cuboid

A cuboid has length 10 cm and width 12 cm.
Its total surface area is 372 cm^2.
Work out the height of the cuboid.

2 × (10 × 12 + 10 h + 12 h) = 372
120 + 22h = 186
22h = 66
h = 66 ÷ 22 = 3
Answer: 3 cm

4 Mean from a frequency table

Here is some information about 25 students.
(a) Work out the mean.
(b) Write down the mode.

(a) Total = 0 × 7 + 1 × 9 + 2 × 2 + 3 × 6 + 4 × 1 = 35
Mean = 35 ÷ 25 = 1.4
(b) The highest frequency is 9, so the mode is 1
Answer: (a) 1.4 (b) 1

5 Pythagoras in context

A ladder reaches 24 m up a vertical wall.
The ladder is 25 m long.
Work out how far the foot of the ladder is from the wall.

$d^2 + 24^2 = 25^2$
$d^2 = 625 - 576 = 49$
d = 7
Answer: 7 m

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6 Bounds

A triangle has base 16.3 m and perpendicular height 7.3 m. (Calculator)
Each measurement is correct to the nearest 0.1 m.
Work out the upper bound for the area of the triangle.

Upper bounds: base = 16.35 m, height = 7.35 m

Area = ½ × 16.35 × 7.35 = 60.08625 m^2

Answer: 60.08625 m^2

7 Adding algebraic fractions

Write as a single fraction in its simplest form

$\frac{x-2}{5} + \frac{x+6}{4}$

Common denominator is 20

$= \frac{4(x-2) + 5(x+6)}{20}$

$= \frac{9x+22}{20}$

Answer: $\frac{9x+22}{20}$

8 Reverse compound change

The value of an investment grows by 4% each year. (Calculator)
After 2 years it is worth £32,448.
Work out its value at the start.

Yearly multiplier = 1.04

Overall multiplier = 1.04^2 = 1.0816

Original value = £32,448 ÷ 1.0816 = £30,000

Answer: £30,000

9 Equations with fractions

Solve $\frac{x-4}{2} + \frac{x+1}{4} = 2$

Multiply every term by 4 (the lowest common multiple of 2 and 4)

$2(x-4) + (x+1) = 4 \times 2$

$3x - 7 = 8$

$3x = 15$

$x = 5$

Answer: x = 5

10 Direct proportion formulae

y is directly proportional to the square of x.
When x = 8, y = 256.
(a) Find a formula for y in terms of x.
(b) Work out the positive value of x when y = 64.

(a) $y = kx^2$. Substitute: $256 = k \times 64$, so $k = 4$

$y = 4x^2$

(b) $64 = 4x^2$, so $x^2 = 64 \div 4 = 16$, so $x = 4$

Answer: (a) $y = 4x^2$ (b) x = 4