Day 29 **A Tier 10-a-day: Model Solutions**

1 Laws of indices

Write $2^6 \times (2^4)^3$ as a single power of 2.

$(2^4)^3 = 2^{12}$

Add the powers: 6 + 12 = 18

$= 2^{18}$

Answer: 2^{18}

2 Surface area of a cuboid

A closed box is a cuboid measuring 9 cm by 4 cm by 3 cm.
Work out the total surface area.

Faces: 9 × 4, 9 × 3 and 4 × 3 each appear twice

2 × (36 + 27 + 12)

= 2 × 75 = 150

Answer: 150 cm^2

3 Solving quadratic equations

Solve $3x^2 - 13x + 12 = 0$

Factorise: $(3x - 4)(x - 3) = 0$

$3x - 4 = 0$ or $x - 3 = 0$

$x = \frac{4}{3}$ or $x = 3$

Answer: $x = \frac{4}{3}$ or $x = 3$

4 Counting outcomes

A café offers 3 starters, 5 main courses and 5 desserts.
A meal is one starter, one main course and one dessert.
(a) How many different meals are possible?
(b) Hana picks her meal at random. Write down the probability that she picks her favourite meal.

(a) 3 × 5 × 5 = 75

(b) Only 1 of the 75 meals is her favourite

Answer: (a) 75 (b) $\frac{1}{75}$

5 Growth and decay

A colony has 17,500 and grows by 6% per day. (Calculator)
Work out the number of bacteria after 3 days.
Give your answer to the nearest whole number.

Multiplier = 1.06

$17{,}500 \times 1.06^3 = 20{,}842.78$

= 20,843 to the nearest whole number

Answer: 20,843

6 Describing transformations

Describe fully the single transformation that maps shape A onto shape B.

The triangle and its image are the same distance from a vertical mirror line
Each point moves to the mirror line and the same distance beyond it
The mirror line is halfway between matching points, at $x = -1$

Answer: Reflection in the line $x = -1$

Day 29 **A Tier 10-a-day: Model Solutions**

7 Combined means

The mean mark of 20 boys in a test is 52.
The mean mark of 20 girls in the same test is 45.
Work out the mean mark of all 40 people.

Total for boys = 20 × 52 = 1040
Total for girls = 20 × 45 = 900
Total = 1940, and number of students = 40
Mean = 1940 ÷ 40 = 48.5
Answer: 48.5

8 Reverse compound change

The value of a house increases by 10% each year. (Calculator)
After 3 years it is worth £25,289.
Work out its value at the start.

Yearly multiplier = 1.1
Overall multiplier = $1.1^3 = 1.331$
Original value = £25,289 ÷ 1.331 = £19,000
Answer: £19,000

9 Angles in parallel lines

The diagram shows two parallel lines crossed by a straight line.
(a) Work out the value of x.
(b) Work out the size of the angle marked $(5x - 10)°$.
The diagram is not drawn accurately.

(a) Co-interior angles add up to 180°
5x − 10 + x + 34 = 180
6x + 24 = 180
6x = 156
x = 26
(b) 5 × 26 − 10 = 120
Answer: (a) x = 26 (b) 120°

10 Equations with algebraic fractions

Solve $\frac{1}{(x-1)} + \frac{3}{(x+3)} = 1$

Multiply every term by (x − 1)(x + 3)
1(x + 3) + 3(x − 1) = (x − 1)(x + 3)
$4x = x^2 + 2x - 3$
$x^2 - 2x - 3 = 0$
(x + 1)(x − 3) = 0
x = −1 or x = 3
Answer: x = −1 or x = 3