Day 326 **B Tier 10-a-day: Model Solutions**

1 Simple probability

A bag contains 4 pink beads, 8 blue beads and 5 gold beads.
One is taken at random. Find the probability that it is pink or blue.

Total = 4 + 8 + 5 = 17
pink or blue: 4 + 8 = 12
Simplify the fraction

Answer: $\frac{12}{17}$

2 Compound areas

A rectangular lawn measures 18 m by 9 m.
A rectangle measuring 8 m by 3 m is cut out.
Work out the area that is left.

Whole area = 18 × 9 = 162
Area cut out = 8 × 3 = 24
162 − 24 = 138

Answer: 138 m^2

3 Multiplying and dividing

Work out 124 × 27

Split 27 into 20 + 7
124 × 20 = 2480
124 × 7 = 868
2480 + 868 = 3348

Answer: 3348

4 Scale drawings and maps

A railway line is 3 km long.
It is drawn on a map with scale 1 : 50 000.
Work out the length of the railway line on the map, in cm.

3 km = 300 000 cm
300 000 ÷ 50 000 = 6 cm

Answer: 6 cm

5 Laws of indices

Write each answer as a single power of 4.
(a) $4^6 \times 4^2$
(b) $4^8 \div 4^2$

(a) Add the powers: 6 + 2 = 8
(b) Subtract the powers: 8 − 2 = 6

Answer: (a) 4^8 (b) 4^6

6 Ratio and changes

In a room, the ratio of red counters to blue counters is 4 : 7.
There are 56 blue counters.
More red counters join so that there are equal numbers of red counters and blue counters.
How many red counters join?

7 parts = 56, so 1 part = 8
Originally there are 4 × 8 = 32 red counters
To equal 56, add 56 − 32 = 24

Answer: 24

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7 Midpoint of a line segment

A is the point (−8, −2) and B is the point (8, 6).
Find the coordinates of the midpoint of AB.

Add the x-coordinates and halve: (−8 + 8) ÷ 2 = 0
Add the y-coordinates and halve: (−2 + 6) ÷ 2 = 2
Answer: (0, 2)

8 Area of a triangle using sine

In triangle ABC, AB = 5 m, BC = 6 m and angle ABC = 55°. (Calculator)
Work out the area of the triangle.
Give your answer correct to 1 decimal place.

Area = ½ab sin C
Area = ½ × 5 × 6 × sin 55°
= 12.287...
= 12.3 m^2 (1 d.p.)
Answer: 12.3 m^2

9 Trial and improvement

The equation $x^3 + x = 25$ has a solution between 2 and 3. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 2.5: $2.5^3 + 2.5 = 18.125$ (too small)
x = 2.7: $2.7^3 + 2.7 = 22.383$ (too small)
x = 2.8: $2.8^3 + 2.8 = 24.752$ (too small)
x = 2.9: $2.9^3 + 2.9 = 27.289$ (too big)
x = 2.85: value = 25.999 (too big), so the solution is below 2.85
So x = 2.8 to 1 decimal place
Answer: x = 2.8

10 Algebraic proof

Show that $(2n + 7)^2 - 49$ is a multiple of 4 for any whole number n.

Expand: $(2n + 7)^2 = 4n^2 + 28n + 49$
Subtract 49: $4n^2 + 28n$
Factorise: 4n(n + 7), which is a multiple of 4
Answer: 4n(n + 7) is a multiple of 4