Day 59 **B Tier 10-a-day: Model Solutions**

1 Simple probability

A pot contains 4 red counters and 5 blue counters.
One is taken at random. Find the probability that it is not blue.

Total = 4 + 5 = 9
Not blue: 9 − 5 = 4
Simplify the fraction

Answer: $\frac{4}{9}$

2 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 24 and 84.

$24 = 2^3 \times 3$ and $84 = 2^2 \times 3 \times 7$
(a) HCF: multiply the primes in both lists, using the smaller power: $2^2 \times 3 = 12$
(b) LCM: use the larger power of every prime: $2^3 \times 3 \times 7 = 168$
Answer: (a) 12 (b) 168

3 Expanding brackets

Expand
(a) 4(5x + 2)
(b) x(x − 1)

(a) $4 \times 5x = 20x$ and $4 \times 2 = 8$
(b) $x \times x = x^2$ and $x \times (-1) = -x$
Answer: (a) $20x + 8$ (b) $x^2 - x$

4 Simple interest

Amir invests £800 for 5 years.
The account pays 2.5% simple interest per year.
(a) Work out the interest earned each year.
(b) Work out the total amount in the account after 5 years.

(a) 2.5% of £800 = 800 ÷ 100 × 2.5 = £20
(b) Interest over 5 years: 5 × £20 = £100
Total = £800 + £100 = £900
Answer: (a) £20 (b) £900

5 Volume of a cylinder

A tin of beans has radius 10 m and height 19 m.
Work out its volume.
Give your answer in terms of π.

Volume = π × radius^2 × height
$\pi \times 10^2 \times 19 = \pi \times 100 \times 19$
$= 1900\pi$
Answer: 1900π m^3

6 Points on a line

Does the point (1, −1) lie on the line
y = 5x − 4 ?
You must show your working.

Put x = 1 into the equation: $y = 5 \times 1 - 4 = 1$
The y-coordinate of the point is −1, which is not 1
Answer: No, when x = 1 the line has y = 1

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7 Combining ratios

In a bag of counters, the ratio of green to black is 5 : 4.
The ratio of black to blue is 7 : 8.
Write down the ratio green : black : blue.

Make the black part the same in both ratios: lowest common multiple of 4 and 7 is 28
green : black = 35 : 28
black : blue = 28 : 32
green : black : blue = 35 : 28 : 32
Answer: 35 : 28 : 32

8 Trigonometry: finding a side

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

Label the sides: x is the hypotenuse and 21 cm is the opposite
We use sin (opposite and hypotenuse)

$\sin 45° = \frac{21}{x}$

$x = \frac{21}{\sin 45°} = 29.698...$

x = 29.7 cm (1 d.p.)
Answer: x = 29.7 cm

9 Average speed

A cyclist travels at 60 km/h for 1 hour and then at 90 km/h for 1.5 hours.
Work out its average speed for the whole journey.

Distance: 60 × 1 = 60 km and 90 × 1.5 = 135 km
Total distance = 195 km and total time = 2.5 hours
Average speed = 195 ÷ 2.5 = 78
Answer: 78 km/h

10 Pythagoras in context

A field is 9 m long and 5 m wide. (Calculator)
Work out the length of a diagonal of the field. Give your answer correct to 1 decimal place.

The diagonal is the hypotenuse of a right-angled triangle
$d^2 = 9^2 + 5^2 = 106$
$d = \sqrt{106} = 10.296...$
Answer: 10.3 m