Day 223 **B Tier 10-a-day: Model Solutions**

1 Simple probability

A bag contains 8 red sweets, 8 green sweets and 8 orange sweets.
One is taken at random. Find the probability that it is green.

Total = 8 + 8 + 8 = 24
P(green) = 8 out of 24
Simplify the fraction

Answer: $\frac{1}{3}$

2 Faces, edges and vertices

Write down the number of faces, edges and vertices of a cube.

Faces: top, bottom and 4 sides = 6
Edges: 4 on the top, 4 on the bottom and 4 joining them = 12
Vertices: 4 on the top and 4 on the bottom = 8
Answer: faces: 6 edges: 12 vertices: 8

3 Adding fractions

Work out
(a) $\frac{5}{9} + \frac{5}{12}$
(b) $\frac{4}{9} - \frac{3}{10}$
Give each answer in its simplest form.

(a) Common denominator 36: $\frac{20}{36} + \frac{15}{36} = \frac{35}{36}$
(b) Common denominator 90: $\frac{40}{90} - \frac{27}{90} = \frac{13}{90}$

Answer: (a) $\frac{35}{36}$ **(b)** $\frac{13}{90}$

4 Forming and solving equations

A rectangle has length (3x + 1) cm and width (x + 2) cm.
The perimeter of the rectangle is 70 cm.
(a) Work out the value of x.
(b) Work out the area of the rectangle.

(a) 2(3x + 1) + 2(x + 2) = 70
8x + 6 = 70
8x = 64, so x = 8
(b) Length = 25 cm and width = 10 cm, so area = 25 × 10 = 250
Answer: (a) x = 8 (b) 250 cm^2

5 Percentage increase and decrease

A jacket costs £250. In a sale the price is reduced by 35%.
(a) Work out the new price.
(b) A car is worth £12,000. Its value goes up by 20% in a year. Work out its new value.

(a) The multiplier is 0.65, so new price = £250 × 0.65 = £162.50
(b) The multiplier is 1.2, so new value = £12,000 × 1.2 = £14,400
Answer: (a) £162.50 (b) £14,400

6 Reading pie charts

The pie chart shows the favourite choices of 360 people.
The angle for Art is not shown.
Work out how many people chose Art.

Angle for Art = 360° − (70° + 90° + 160°) = 360° − 320° = 40°
40 ÷ 360 × 360 = 40
Answer: 40

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7 Arc length and sector area

The diagram shows a sector of a circle with radius 5 cm and angle 72°.
Work out the length of the arc of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Arc length = $\frac{72}{360} \times 2 \times \pi \times 5$

$= \frac{72}{360} \times 10\pi = 2\pi$

Answer: 2π cm

8 Algebraic proof

Show that the sum of two consecutive even numbers is always 2 more than a multiple of 4.

Let the smaller even number be 2n. The next even number is 2n + 2
Sum = 2n + (2n + 2) = 4n + 2
4n is a multiple of 4, so 4n + 2 is 2 more than a multiple of 4
Answer: 4n + 2 is 2 more than a multiple of 4

9 Ratio and changes

In a room, the ratio of cats to dogs is 2 : 5.
There are 20 dogs.
More cats join so that there are equal numbers of cats and dogs.
How many cats join?

5 parts = 20, so 1 part = 4
Originally there are 2 × 4 = 8 cats
To equal 20, add 20 − 8 = 12
Answer: 12

10 Simultaneous equations

Solve the simultaneous equations
$x - 6y = 17$
$2x + 3y = -11$

Multiply the second equation by 2: $4x + 6y = -22$
The y terms have opposite signs, so add the equations: $5x = -5$
$x = -1$
Substitute $x = -1$ into the first equation: $-6y = 17 - (-1) = 18$
$y = -3$
Answer: $x = -1$, $y = -3$