Day 135 **A Tier 10-a-day: Model Solutions**

1 Two-way tables

The table shows information about 66 people.
One person is chosen at random.
(a) Find the probability that the person is a girl and studies Spanish.
(b) The person studies French. Find the probability that they are a boy.

(a) Girls who studies Spanish: 29 out of 66 = $\frac{29}{66}$

(b) French total = 19, of whom 8 are in the Boys row: $\frac{8}{19}$

Answer: (a) $\frac{29}{66}$ (b) $\frac{8}{19}$

2 Circle area and circumference

A circular pond has diameter 12 m.
Work out, in terms of π,
(a) the circumference,
(b) the area.

(a) Circumference = $\pi d = \pi \times 12 = 12\pi$

(b) Area = $\pi r^2 = \pi \times 6^2 = 36\pi$

Answer: (a) 12π m (b) 36π m^2

3 Mixed number multiplication and division

Work out $3\frac{3}{5} \div 4\frac{1}{2}$

Give your answer as a mixed number in its simplest form.

Improper fractions: $\frac{18}{5}$ and $\frac{9}{2}$

Turn the second fraction upside down and multiply: $\frac{18}{5} \times \frac{2}{9} = \frac{36}{45}$

Simplify: $\frac{4}{5}$

Answer: $\frac{4}{5}$

4 Stratified sampling

A company has 325 employees in Sales, 225 in Admin and 250 in Production.
A stratified sample of 32 employees is to be taken.
Work out how many employees should be chosen from Admin.

Total = 325 + 225 + 250 = 800

Number from Admin = $\frac{225}{800} \times 32$

= 9

Answer: 9

5 Compound interest

Jack invests £4,500 in a bank account. (Calculator)
The account pays compound interest at 3% per year.
Work out the value of the investment after 3 years.

Multiplier = 1 + 3 ÷ 100 = 1.03

£4,500 × 1.03^3 = £4,917.27

Answer: £4,917.27

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6 Similar shapes: area and volume

Two similar models are 6 cm and 8 cm tall.
The surface area of the smaller model is 180 cm^2.
Work out the surface area of the larger model.

Length scale factor = $8 \div 6 = \frac{4}{3}$

Area scale factor = $(\frac{4}{3})^2 = \frac{16}{9}$

Area = $180 \times \frac{16}{9} = 320$

Answer: 320 cm^2

7 Rationalising the denominator

Rationalise the denominator of $\frac{2}{2\sqrt{5}}$
Give your answer in its simplest form.

Multiply top and bottom by $\sqrt{5}$: $\frac{2\sqrt{5}}{2 \times 5}$

$= \frac{2\sqrt{5}}{10} = \frac{\sqrt{5}}{5}$

Answer: $\frac{\sqrt{5}}{5}$

8 Expanding three brackets

Expand and simplify
$(x - 4)(x - 5)(x - 3)$

Expand the first two brackets: $(x - 4)(x - 5) = x^2 - 9x + 20$
Multiply by the third bracket: $(x^2 - 9x + 20)(x - 3)$
$= x^3 - 9x^2 + 20x - 3x^2 + 27x - 60$
$= x^3 - 12x^2 + 47x - 60$
Answer: $x^3 - 12x^2 + 47x - 60$

9 Adding algebraic fractions

Write as a single fraction
$\frac{-5}{(x - 1)} - \frac{5}{(x + 5)}$

Common denominator is $(x - 1)(x + 5)$
$= \frac{-5(x + 5) - 5(x - 1)}{(x - 1)(x + 5)}$
$= \frac{-10x - 20}{(x - 1)(x + 5)}$
Answer: $\frac{-10x - 20}{(x - 1)(x + 5)}$

10 Circle theorems: tangents

PA is a tangent to a circle with centre O. A is on the circle.
The radius is 24 cm and OP = 25 cm.
Work out the length of PA.
The diagram is not drawn accurately.

The tangent is perpendicular to the radius, so angle OAP = 90°
$PA^2 = 25^2 - 24^2 = 625 - 576 = 49$
$PA = \sqrt{49} = 7$
Answer: 7 cm