Day 228 **B Tier 10-a-day: Model Solutions**

1 Simplifying expressions

Simplify fully
(a) $5c \times 3c$
(b) $8p \times 2q$

(a) $5 \times 3 = 15$ and $c \times c = c^2$
(b) Multiply the numbers: $8 \times 2 = 16$, then the letters: $p \times q = pq$
Answer: (a) $15c^2$ (b) $16pq$

2 Counting outcomes

A fair coin is thrown 3 times.
Each throw lands on heads or tails.
How many different sequences of heads and tails are possible?

Each throw has 2 outcomes
$2 \times 2 \times 2 = 8$
Answer: 8

3 Standard form

Write each number as an ordinary number.
(a) 4.5×10^3
(b) 9×10^{-5}

(a) Multiply by 10, 3 times: move the decimal point 3 places right
$4.5 \times 10^3 = 4500$
(b) $10^{-5} = 0.00001$, so move the decimal point 5 places left
$9 \times 10^{-5} = 0.00009$
Answer: (a) 4500 (b) 0.00009

4 Tables of values

Complete the table of values for $y = 3x - 1$

$x = -2$: $y = 3 \times (-2) - 1 = -7$
$x = -1$: $y = 3 \times (-1) - 1 = -4$
$x = 2$: $y = 3 \times 2 - 1 = 5$
Answer: $x = -2$: -7, $x = -1$: -4, $x = 2$: 5

5 Simple interest

Farah invests £400 for 4 years.
The account pays 4% simple interest per year.
(a) Work out the interest earned each year.
(b) Work out the total amount in the account after 4 years.

(a) 4% of £400 = $400 \div 100 \times 4$ = £16
(b) Interest over 4 years: $4 \times$ £16 = £64
Total = £400 + £64 = £464
Answer: (a) £16 (b) £464

6 Volume of a cylinder

A water tank has radius 5 m and height 3 m.
Work out its volume.
Give your answer in terms of π.

Volume = $\pi \times \text{radius}^2 \times \text{height}$
$\pi \times 5^2 \times 3 = \pi \times 25 \times 3$
$= 75\pi$
Answer: 75π m^3

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7 Equation of a straight line graph

The diagram shows a straight line.
(a) Work out the gradient of the line.
(b) Find the equation of the line.

(a) The line crosses the y-axis at −1. Pick two points on the line and work out change in y divided by change in x
Gradient = 1
(b) The equation is y = mx + c with m = 1 and c = −1
Answer: (a) 1 (b) y = x − 1

8 Frequency trees

There are 100 visitors.
$\frac{1}{5}$ of them are men and the rest are women.
$\frac{1}{5}$ of the men and $\frac{3}{5}$ of the women buy a drink.
One person is chosen at random. Work out the probability that they buy a drink.

men: $\frac{1}{5} \times 100 = 20$ and women: $100 - 20 = 80$

men who buy a drink: $\frac{1}{5} \times 20 = 4$

women who buy a drink: $\frac{3}{5} \times 80 = 48$

P = (4 + 48) out of 100

Answer: $\frac{13}{25}$

9 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 10%. (Calculator)
Two weeks later it is reduced by a further 25% of the new price.
The final price is £33.75.
Work out the original price of the sofa.

Multipliers: 0.9 and 0.75
Overall multiplier = 0.9 × 0.75 = 0.675
Original price = £33.75 ÷ 0.675 = £50
Answer: £50

10 Trigonometry in isosceles triangles

Triangle XYZ is isosceles with XY = XZ = 14 m. (Calculator)
The base YZ = 10 m.
Work out the size of angle XYZ.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 10 ÷ 2 = 5

$\cos Y = \frac{5}{14}$

Angle XYZ = $\cos^{-1}(\frac{5}{14})$ = 69.075...

= 69.1° (1 d.p.)
Answer: 69.1°