Day 308 **B Tier 10-a-day: Model Solutions**

1 Transformations of a point

(a) The point P(8, 2) is enlarged with scale factor ½ and centre the origin. Write down the coordinates of the image.
(b) The point P(4, 1) is rotated 90° anticlockwise about the origin. Write down the coordinates of the image.

(a) Multiply each coordinate by $\frac{1}{2}$: (4, 1)

(b) A 90° anticlockwise turn takes (x, y) to (−y, x): (−1, 4)

Answer: (a) (4, 1) (b) (−1, 4)

2 Probabilities adding to 1

The table shows the probabilities of a spinner landing on each colour.
(a) Work out the value of x.
(b) The spinner is used 100 times. How many times would you expect Red?

(a) Probabilities add up to 1
0.1 + 0.35 + 0.15 + x = 1
x = 1 − 0.6 = 0.4
(b) 0.1 × 100 = 10

Answer: (a) 0.4 (b) 10

3 Volume of a prism

Here is a prism.
Its cross-section is an isosceles triangle.
Work out the volume of the prism.
The diagram is not drawn accurately.

Area of cross-section = ½ × 4 × 6 = 12
Volume of prism = area of cross-section × length
12 × 14 = 168

Answer: 168 cm^3

4 Best buys

Cereal is sold in two sizes.
Small: 500 g for 95p
Large: 750 g for £1.20
Which size is better value for money?
You must show your working.

Compare the cost of 1500 g of each
Large: 2 × £1.20 = £2.40
Small: 3 × 95p = £2.85
The large is cheaper for the same amount

Answer: The large size

5 Wages and overtime

Priya is paid £12.50 per hour for a 35 hour week. (Calculator)
Overtime is paid at double time.
In one week she works 8 hours of overtime.
Work out her total pay for that week.

Normal pay: 35 × £12.50 = £437.50
Overtime rate: £12.50 × 2 = £25 per hour
Overtime pay: 8 × £25 = £200
Total: £437.50 + £200 = £637.50

Answer: £637.50

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6 Expanding double brackets

Expand and simplify $(x - 6)(x - 3)$

Multiply every term in the first bracket by every term in the second:

$x^2 - 3x - 6x + 18$

Collect the x terms: $x^2 - 9x + 18$

Answer: $x^2 - 9x + 18$

7 Volume of a cylinder

A water tank has radius 2 cm and height 18 cm. (Calculator)
Work out its volume.
Give your answer correct to 1 decimal place.

Volume = $\pi \times \text{radius}^2 \times \text{height}$

$\pi \times 2^2 \times 18 = 226.195...$

$= 226.2 \text{ cm}^3$ (1 d.p.)

Answer: 226.2 cm^3

8 Difference of two squares

Factorise $9x^2 - 100$

$9x^2 = (3x)^2$ and $100 = 10^2$

$(3x)^2 - 10^2 = (3x - 10)(3x + 10)$

Answer: $(3x - 10)(3x + 10)$

9 Reverse percentages

In a sale, all prices are reduced by 25%. (Calculator)
A pair of trainers costs £187.50 in the sale.
Work out the original price of the pair of trainers.

The sale price is $100\% - 25\% = 75\%$ of the original price.

$75\% = £187.50$, so $1\% = £187.50 \div 75 = £2.50$

$100\% = £2.50 \times 100 = £250$

Answer: £250

10 Simultaneous equations problem

A theme park sells adult tickets and child tickets.
2 adult tickets and 2 child tickets cost £50.
3 adult tickets and 2 child tickets cost £69.
Work out the cost of one adult ticket and the cost of one child ticket.

Let a = cost of one adult ticket and b = cost of one child ticket

$2a + 2b = 50$ and $3a + 2b = 69$

Subtract: $1a = 69 - 50 = 19$, so $a = 19$

Substitute: $2 \times 19 + 2b = 50$, so $2b = 12$ and $b = 6$

Answer: One adult ticket costs £19 and one child ticket costs £6