Day 244 **B Tier 10-a-day: Model Solutions**

1 Number machines

Here is a number machine.
Input → − 2 → × 5 → Output
(a) The input is 5. Work out the output.
(b) The output is 45. Work out the input.

(a) 5 − 2 = 3, then 3 × 5 = 15
(b) Work backwards: undo × 5 to get 9, then undo − 2 to get 11
Answer: (a) 15 (b) 11

2 Fractions of amounts

Jasmine has £240.

They spends $\frac{3}{8}$ of the money on a book.

They then spends $\frac{1}{2}$ of the money left on a drink.

How much money is left?

Book: £240 ÷ 8 × 3 = £90
Left: £240 − £90 = £150
Drink: £150 ÷ 2 × 1 = £75
Money left: £150 − £75 = £75
Answer: £75

3 Unitary method

3 apples cost £2.25.
Work out the cost of 11 apples.

1 apple costs £2.25 ÷ 3 = 75p
11 apples cost 11 × 75p = £8.25
Answer: £8.25

4 Volume of cuboids

A water tank is a cuboid 25 cm long, 50 cm wide and 20 cm deep.
(a) Work out the volume of the water tank.
(b) How many litres of water does it hold when full?
1 litre = 1000 cm^3

(a) Volume = length × width × depth
25 × 50 × 20 = 25000 cm^3
(b) 25000 ÷ 1000 = 25 litres
Answer: (a) 25000 cm^3 (b) 25 litres

5 Stem and leaf diagrams

The stem and leaf diagram shows 13 values.
(a) Find the median.
(b) Work out the range.

(a) 13 values, so the median is the 7th value
Reading in order: 33, 34, 35, 43, 44, 47, 48, 52, 53, 55, 56, 57, 59
Median = 48
(b) Range = 59 − 33 = 26
Answer: (a) 48 (b) 26

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6 Quadratic graphs

The diagram shows the graph of

$y = x^2 - 2x - 3$

(a) Write down the solutions of $x^2 - 2x - 3 = 0$

(b) Write down the coordinates of the minimum point of the graph.

(a) The solutions are where the graph crosses the x-axis

(b) The lowest point of the curve is halfway between the two solutions, at x = 1

Answer: (a) x = −1 and x = 3 (b) (1, −4)

7 Arc length and sector area

The diagram shows a sector of a circle with radius 4 m and angle 45°. (Calculator)

Work out the length of the arc of the sector.

Give your answer correct to 1 decimal place.

The diagram is not drawn accurately.

Arc length = $\frac{45}{360} \times 2 \times \pi \times 4$

= 3.142... = 3.1 m (1 d.p.)

Answer: 3.1 m

8 Equations with brackets

Solve $3(3x - 5) = 12$

Divide both sides by 3: $3x - 5 = 4$

Add 5 to both sides: $3x = 9$

Divide both sides by 3

Answer: x = 3

9 Radius from area or circumference

The area of a circle is 70 cm^2. (Calculator)

Work out the radius of the circle.

Give your answer correct to 1 decimal place.

Area = πr^2, so $r^2 = 70 \div \pi = 22.282...$

$r = \sqrt{22.282} = 4.720...$

r = 4.7 cm (1 d.p.)

Answer: 4.7 cm

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 40%. (Calculator)

Two weeks later it is reduced by a further 10% of the new price.

The final price is £270.

Work out the original price of the sofa.

Multipliers: 0.6 and 0.9

Overall multiplier = 0.6 × 0.9 = 0.54

Original price = £270 ÷ 0.54 = £500

Answer: £500