Day 168 **B Tier 10-a-day: Model Solutions**

1 Comparing fractions and percentages

Uma has $\frac{3}{5}$ of £85.

Ivan has 30% of £240.

Who has more money? You must show your working.

Uma: 85 ÷ 5 × 3 = £51

Ivan: 240 ÷ 100 × 30 = £72

£72 is more than £51, so Ivan has more

Answer: Ivan

2 Substitution into formulae

Here is a formula.

P = 2l + 2w

Work out the value of P when l = 6 and w = 7

P = 2 × 6 + 2 × 7

P = 26

Answer: P = 26

3 Angles in parallel lines

In the diagram, PQ is parallel to RS.

(a) Work out the size of angle d.

(b) Give a reason for your answer.

The diagram is not drawn accurately.

Angle d and the 48° angle are corresponding angles (F shape)

d = 48°

Corresponding angles are equal

Answer: (a) d = 48° (b) Corresponding angles are equal

4 Probabilities adding to 1

The table shows the probabilities of a biased dice landing on each colour.

(a) Work out the value of x.

(b) The biased dice is used 100 times. How many times would you expect White?

(a) Probabilities add up to 1

0.1 + 0.25 + 0.2 + x = 1

x = 1 − 0.55 = 0.45

(b) 0.25 × 100 = 25

Answer: (a) 0.45 (b) 25

5 Wages and overtime

Jasmine is paid £8.50 per hour for a 30 hour week. (Calculator)

Overtime is paid at time and a half.

In one week she works 9 hours of overtime.

Work out her total pay for that week.

Normal pay: 30 × £8.50 = £255

Overtime rate: £8.50 × 1.5 = £12.75 per hour

Overtime pay: 9 × £12.75 = £114.75

Total: £255 + £114.75 = £369.75

Answer: £369.75

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6 Midpoint and length of a line

A is the point (−4, 3) and B is the point (−13, −9).
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB.

(a) Midpoint = (−17 ÷ 2, −6 ÷ 2) = (−8.5, −3)
(b) Horizontal distance = 9, vertical distance = 12
$AB^2 = 9^2 + 12^2 = 81 + 144 = 225$
$AB = \sqrt{225} = 15$
Answer: (a) (−8.5, −3) (b) 15

7 Expanding squared brackets

Expand and simplify $(x + 3)^2$

Write as a product of two brackets: (x + 3)(x + 3)
$x^2 + 3x + 3x + 9$
$x^2 + 6x + 9$
Answer: $x^2 + 6x + 9$

8 Area of shaded regions

The diagram shows a square of side 8 m with a circle of radius 4 m cut out.
The circle is in the centre of the square.
Work out the area of the shaded region.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area of square = 8 × 8 = 64
Area of circle = $\pi \times 4^2 = 16\pi$
Shaded area = $64 - 16\pi$
Answer: $64 - 16\pi$ m^2

9 Algebraic proof

Show that $(n + 4)^2 - (n - 4)^2$ is a multiple of 16 for any whole number n.

Expand: $(n + 4)^2 = n^2 + 8n + 16$ and $(n - 4)^2 = n^2 - 8n + 16$
Subtract: the n^2 terms and the 16s cancel, leaving 16n
16n is a multiple of 16
Answer: 16n is a multiple of 16

10 Average speed

A lorry travels at 50 km/h for 1.5 hours and then at 20 km/h for 1.5 hours.
Work out its average speed for the whole journey.

Distance: 50 × 1.5 = 75 km and 20 × 1.5 = 30 km
Total distance = 105 km and total time = 3 hours
Average speed = 105 ÷ 3 = 35
Answer: 35 km/h