Day 136 **B Tier 10-a-day: Model Solutions**

1 Sharing in a ratio

Leo, Jack and Ben share 54 stamps in the ratio 2 : 5 : 2.
Work out how many Ben gets.

2 + 5 + 2 = 9 parts
1 part = 54 ÷ 9 = 6
Ben gets 2 × 6 = 12
Answer: 12

2 Inequalities on a number line

(a) Write down the inequality shown on the number line.
(b) Write down all the integers that satisfy the inequality.

(a) The circle at −2 is open and the circle at 1 is open
$-2 < x < 1$
(b) The whole numbers on the shaded part: −1, 0
Answer: (a) $-2 < x < 1$ (b) −1, 0

3 Trigonometry: finding an angle

Calculate the size of angle q. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

We know the adjacent (3 m) and the hypotenuse (5 m), so use cos

$\cos q = \frac{3}{5}$

$q = \cos^{-1}(\frac{3}{5}) = 53.130...$

q = 53.1° (1 d.p.)
Answer: q = 53.1°

4 Prime factors

Write 100 as a product of its prime factors.
Give your answer in index form.

Divide by prime numbers, smallest first:
100 ÷ 2 = 50, 50 ÷ 2 = 25, 25 ÷ 5 = 5, 5 is prime
100 = 2 × 2 × 5 × 5
In index form: $100 = 2^2 \times 5^2$
Answer: $2^2 \times 5^2$

5 Speed unit conversion

A bus travels at 72 km/h.
Work out its speed in metres per second.

72 km = 72,000 m
1 hour = 3600 seconds
72,000 ÷ 3600 = 20 m/s
Answer: 20 m/s

Day 136 **B Tier 10-a-day: Model Solutions**

6 Area of shaded regions

The diagram shows two circles with the same centre.
The radius of the larger circle is 12 cm.
The radius of the smaller circle is 9 cm.
Work out the area of the shaded region.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area of large circle = $\pi \times 12^2 = 144\pi$
Area of small circle = $\pi \times 9^2 = 81\pi$
$144\pi - 81\pi = 63\pi$
Answer: 63π cm^2

7 Venn diagram problems

34 adults were asked.
20 of them like tea and 17 of them like coffee.
9 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they like tea but do not like coffee.

(a) Union = 20 + 17 − 9 = 28
Neither = 34 − 28 = 6
(b) Only like tea = 20 − 9 = 11
P = 11 out of 34
Answer: (a) 6 (b) $\frac{11}{34}$

8 Solving quadratic equations

Solve $x^2 - 100 = 0$

Factorise as a difference of two squares: $(x - 10)(x + 10) = 0$
Either $x - 10 = 0$ or $x + 10 = 0$
Answer: $x = -10$ or $x = 10$

9 Repeated percentage change

The price of a laptop is £80.
The price is first increased by 20%, then the new price is increased by 30%.
(a) Work out the final price.
(b) Work out the overall percentage increase in the price.

(a) Multipliers: 1.2 and 1.3
$80 \times 1.2 \times 1.3 = £124.80$
(b) Overall multiplier = 1.56
Overall increase = 56%
Answer: (a) £124.80 (b) 56% increase

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 20%. (Calculator)
Two weeks later it is reduced by a further 25% of the new price.
The final price is £240.
Work out the original price of the sofa.

Multipliers: 0.8 and 0.75
Overall multiplier = $0.8 \times 0.75 = 0.6$
Original price = £240 ÷ 0.6 = £400
Answer: £400