Day 350 **B Tier 10-a-day: Model Solutions**

1 Population density

Island B has a population of 4,500.
Its area is 30 km^2.
Work out the population density.
Give your answer in people per km^2.

Population density = population ÷ area
4,500 ÷ 30 = 150
Answer: 150 people per km^2

2 Factors and multiples

(a) Write down all the factors of 48.
(b) Write down all the multiples of 8 between 41 and 65.

(a) Find pairs that multiply to make 48: 1 × 48, 2 × 24, 3 × 16, 4 × 12, 6 × 8
(b) Count up in 8s: 48, 56, 64
Answer: (a) 1, 2, 3, 4, 6, 8, 12, 16, 24, 48 (b) 48, 56, 64

3 Scale drawings and maps

The scale of a map is 1 : 25 000.
Two villages are 6 cm apart on the map.
Work out the real distance between them.
Give your answer in kilometres.

Real distance = 6 × 25 000 = 150 000 cm
100 000 cm = 1 km, so divide by 100 000: 1.5 km
Answer: 1.5 km

4 Significant figures

Work out the value of this expression. (Calculator)

$$\frac{3.4 + 8.4}{5.1 \times 2.2}$$

Give your answer correct to 2 significant figures.

Use a calculator: the full display is 1.051693...
Round to 2 significant figures: 1.1
Answer: 1.1

5 Surface area of cuboids

A cube has side length 14 cm.
Work out the total surface area of the cube.

A cube has 6 identical square faces
Area of one face = 14 × 14 = 196
6 × 196 = 1176
Answer: 1176 cm^2

6 Gradient and intercept

A straight line has equation y = 3x + 2
(a) Write down the gradient of the line.
(b) Write down the equation of a line that is parallel to this line and passes through the point (0, 6).

(a) The line is in the form y = mx + c, so the gradient m is the number in front of x
(b) Parallel lines have the same gradient, 3
It crosses the y-axis at 6, so c = 6
Answer: (a) 3 (b) y = 3x + 6

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7 Combining ratios

In a bag of counters, the ratio of white to blue is 6 : 7.
The ratio of blue to red is 5 : 2.
Write down the ratio white : blue : red.

Make the blue part the same in both ratios: lowest common multiple of 7 and 5 is 35
white : blue = 30 : 35
blue : red = 35 : 14
white : blue : red = 30 : 35 : 14
Answer: 30 : 35 : 14

8 Simultaneous equations

Solve the simultaneous equations
$3x - 4y = -26$
$3x + 2y = 4$

Multiply the second equation by 2: $6x + 4y = 8$
The y terms have opposite signs, so add the equations: $9x = -18$
$x = -2$
Substitute $x = -2$ into the first equation: $-4y = -26 - (-6) = -20$
$y = 5$
Answer: $x = -2$, $y = 5$

9 HCF and LCM from prime factors

$A = 5 \times 7^2$
$B = 2^3 \times 3 \times 7^2$
Write down, as a product of prime factors,
(a) the HCF of A and B
(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: 7^2
(b) LCM: take the larger power of every prime: $2^3 \times 3 \times 5 \times 7^2$
Answer: (a) 7^2 (b) $2^3 \times 3 \times 5 \times 7^2$

10 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 0 is filled in and the circle at 4 is open
$0 \leq x < 4$
(b) The whole numbers on the shaded part: 0, 1, 2, 3
Answer: (a) $0 \leq x < 4$ (b) 0, 1, 2, 3