Day 134 **B Tier 10-a-day: Model Solutions**

1 Negative numbers

At night, the temperature in Moscow is −8°C.
(a) The temperature rises by 7°C. Work out the new temperature.
(b) The highest temperature one day was 13°C and the lowest was −5°C. Work out the difference.

(a) −8 + 7 = −1
(b) Difference = 13 − (−5) = 13 + 5 = 18
Answer: (a) −1°C (b) 18°C

2 Mean

Here are the heights of some plants.
17, 26, 27, 13, 23, 20, 20, 28, 16, 28
Work out the mean.

Add the values: 17 + 26 + 27 + 13 + 23 + 20 + 20 + 28 + 16 + 28 = 218
Divide by the number of values: 218 ÷ 10 = 21.8
Answer: 21.8 cm

3 Similar shapes

The two triangles are similar.
(a) Write down the scale factor of the enlargement from the smaller triangle to the larger triangle.
(b) Work out the value of q.
The diagram is not drawn accurately.

(a) Scale factor = 16 ÷ 8 = 2
(b) q is on the smaller triangle, so divide: 20 ÷ 2 = 10
Answer: (a) 2 (b) q = 10 m

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

5 Density

A steel bar has a density of 7.8 g/cm^3 and a mass of 390 g.
Work out its volume.

Volume = mass ÷ density
390 ÷ 7.8 = 50
Answer: 50 cm^3

6 Compound shapes with semicircles

A garden bed is made from a rectangle and a semicircle. (Calculator)
The rectangle is 10 m wide and 3 m high.
The diameter of the semicircle is 10 m.
(a) Work out the area of the shape.
(b) Work out the perimeter of the shape.
Give each answer correct to 1 decimal place.

(a) Rectangle: 10 × 3 = 30
Semicircle: ½ × π × 5^2 = 39.270...
Total = 69.3 m^2
(b) Curved edge: ½ × π × 10 = 15.708...
Straight edges: 10 + 3 + 3 = 16
Total = 31.7 m
Answer: (a) 69.3 m^2 (b) 31.7 m

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7 Percentage change

Chloe bought a bike for £2000 and sold it for £3200.
Work out the percentage profit.

Profit = selling price − cost = £1200

Percentage profit = $\frac{£1200}{£2000} \times 100 = 60\%$

Answer: 60% profit

8 Radius from area or circumference

The circumference of a circle is 20π cm.
Work out the radius of the circle.

Circumference = $2\pi r$, so $2r = 20$
$r = 20 \div 2 = 10$
Answer: 10 cm

9 Number machines

Here is a number machine.
Input → × 5 → − 10 → Output
(a) The input is 8. Work out the output.
(b) The output is 25. Work out the input.

(a) $8 \times 5 = 40$, then $40 - 10 = 30$
(b) Work backwards: undo − 10 to get 35, then undo × 5 to get 7
Answer: (a) 30 (b) 7

10 Quadratic equation problem

A rectangle has length $(x + 6)$ cm and width $(x - 5)$ cm.
The area of the rectangle is 42 cm^2.
(a) Show that $x^2 + x - 72 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: $(x + 6)(x - 5) = 42$
Expand: $x^2 + x - 30 = 42$
Subtract 42 from both sides: $x^2 + x - 72 = 0$
(b) Factorise: $(x - 8)(x + 9) = 0$, so $x = 8$ or $x = -9$
A length cannot be negative, so $x = 8$. Length = 8 + 6 = 14
Answer: (b) 14 cm