Day 241 **B Tier 10-a-day: Model Solutions**

1 Negative numbers

The temperature in a freezer is −8°C.
(a) The temperature rises by 5°C. Work out the new temperature.
(b) The highest temperature one day was 12°C and the lowest was −7°C. Work out the difference.

(a) −8 + 5 = −3
(b) Difference = 12 − (−7) = 12 + 7 = 19
Answer: (a) −3°C (b) 19°C

2 Metric conversions

(a) Convert 12 litres to ml.
(b) Convert 1.5 cm^2 to mm^2.

(a) litres → ml: multiply by 1000: 12 × 1000 = 12 000
(b) 1 cm = 10 mm, so 1 cm^2 = 10 × 10 = 100 mm^2. 1.5 × 100 = 150
Answer: (a) 12 000 ml (b) 150 mm^2

3 Powers and roots

Write down
(a) the square root of 36
(b) the cube root of 8

(a) 6 × 6 = 36, so the square root is 6
(b) 2 × 2 × 2 = 8, so the cube root is 2
Answer: (a) 6 (b) 2

4 Stem and leaf diagrams

The stem and leaf diagram shows 11 values.
(a) Find the median.
(b) Work out the range.

(a) 11 values, so the median is the 6th value
Reading in order: 22, 28, 29, 32, 34, 41, 43, 44, 45, 46, 47
Median = 41
(b) Range = 47 − 22 = 25
Answer: (a) 41 (b) 25

5 Points on a line

Does the point (2, 14) lie on the line
y = 3x + 8 ?
You must show your working.

Put x = 2 into the equation: y = 3 × 2 + 8 = 14
The y-coordinate of the point is 14, which is 14
Answer: Yes, when x = 2 the line has y = 14

6 Trigonometry: finding a side

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

Label the sides: b is the opposite and 7 m is the adjacent
We use tan (opposite and adjacent)

$\tan 30° = \frac{b}{7}$

b = 7 × tan 30° = 4.041...
b = 4.0 m (1 d.p.)
Answer: b = 4.0 m

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7 Inverse proportion

6 painters take 4 hours to paint a fence.
All the painters work at the same rate.
How long would it take 8 painters?

The total work stays the same: 6 × 4 = 24 painters-hours
With 8 painters: 24 ÷ 8 = 3 hours
Answer: 3 hours

8 Algebraic fractions

Simplify fully $\frac{x^2 - 7x}{x}$

Factorise the top: x(x − 7)
Cancel the x on the top and bottom
Answer: x − 7

9 Average speed

A lorry travels at 30 km/h for 0.5 hours and then at 60 km/h for 2.5 hours.
Work out its average speed for the whole journey.

Distance: 30 × 0.5 = 15 km and 60 × 2.5 = 150 km
Total distance = 165 km and total time = 3 hours
Average speed = 165 ÷ 3 = 55
Answer: 55 km/h

10 Trigonometry in isosceles triangles

Triangle PQR is isosceles with PQ = PR = 18 m. (Calculator)
The base QR = 14 m.
Work out the size of angle PQR.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 14 ÷ 2 = 7

cos Q = $\frac{7}{18}$

Angle PQR = $\cos^{-1}(\frac{7}{18})$ = 67.115...

= 67.1° (1 d.p.)
Answer: 67.1°