Day 146 **B Tier 10-a-day: Model Solutions**

1 Enlargement

A rectangle is 2 cm long and 8 cm wide.
It is enlarged by scale factor 2.5.
(a) Write down the length and width of the enlarged rectangle.
(b) Work out the perimeter of the enlarged rectangle.

(a) 2 × 2.5 = 5 and 8 × 2.5 = 20
(b) Perimeter = 2 × (5 + 20) = 50
Answer: (a) 5 cm by 20 cm (b) 50 cm

2 Median and range

Here are the number of books read by some students.
22, 22, 36, 35, 21, 10, 31, 28, 11
(a) Find the median.
(b) Work out the range.

(a) Put in order: 10, 11, 21, 22, 22, 28, 31, 35, 36
The middle value is number 5: 22
(b) Range = largest − smallest = 36 − 10 = 26
Answer: (a) 22 (b) 26

3 Angles in quadrilaterals

PQRS is a kite with PQ = PS and RQ = RS.
Angle SPQ = 124° and angle QRS = 98°.
Work out the size of angle PQR.

Angles in a quadrilateral add up to 360°
Angles PQR and PSR are equal in a kite
360 − 124 − 98 = 138
138 ÷ 2 = 69
Answer: 69°

4 Standard form calculations

Work out $(6 \times 10^5) + (5.9 \times 10^5)$
Give your answer in standard form.

The powers of 10 are the same, so add the numbers: 6 + 5.9 = 11.9
$11.9 \times 10^5 = 1.19 \times 10^6$ in standard form
Answer: 1.19×10^6

5 Density

A piece of wood has a mass of 24 g and a volume of 40 cm^3.
Work out its density.
Give your answer in g/cm^3.

Density = mass ÷ volume
24 ÷ 40 = 0.6
Answer: 0.6 g/cm^3

6 Equations with fractional answers

Solve 3x − 4 = 4
Give your answer as a fraction in its simplest form.

Add 4 to both sides: 3x = 8
Divide both sides by 3: $x = \frac{8}{3}$
Answer: $x = \frac{8}{3}$

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7 Radius from area or circumference

The area of a circle is 25π m^2.
Work out the radius of the circle.

Area = πr^2, so $r^2 = 25$
$r = \sqrt{25} = 5$
Answer: 5 m

8 Trial and improvement

The equation $x^3 - x = 11$ has a solution between 2 and 3. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

$x = 2.5$: $2.5^3 - 2.5 = 13.125$ (too big)
$x = 2.2$: $2.2^3 - 2.2 = 8.448$ (too small)
$x = 2.3$: $2.3^3 - 2.3 = 9.867$ (too small)
$x = 2.4$: $2.4^3 - 2.4 = 11.424$ (too big)
$x = 2.35$: value = 10.628 (too small), so the solution is above 2.35
So x = 2.4 to 1 decimal place
Answer: x = 2.4

9 Rates

A tap fills a tank at a rate of 6 litres per minute.
The tank holds 120 litres.
How long does it take to fill the empty tank?

Time = 120 ÷ 6 = 20 minutes
Answer: 20 minutes

10 Error intervals

The time of a race is 11.9 seconds, correct to 1 decimal place.
Write down the error interval for the time.
Use the letter t.

The rounding unit is 0.1, so half of it is 0.05
Lower bound = 11.9 − 0.05 = 11.85
Upper bound = 11.9 + 0.05 = 11.95
Answer: $11.85 \leq t < 11.95$