Day 254 **B Tier 10-a-day: Model Solutions**

1 Negative numbers

At night, the temperature in Moscow is −8°C.
(a) The temperature rises by 8°C. Work out the new temperature.
(b) The highest temperature one day was 15°C and the lowest was −5°C. Work out the difference.

(a) −8 + 8 = 0
(b) Difference = 15 − (−5) = 15 + 5 = 20
Answer: (a) 0°C (b) 20°C

2 Equations with fractions

Solve $\frac{5x + 7}{4} = 3$

Multiply both sides by 4: 5x + 7 = 12
Subtract 7 from both sides: 5x = 5
Divide both sides by 5
Answer: x = 1

3 Median and range

Here are the numbers of runs scored by a batter.
25, 25, 27, 11, 13, 23, 12
(a) Find the median.
(b) Work out the range.

(a) Put in order: 11, 12, 13, 23, 25, 25, 27
The middle value is number 4: 23
(b) Range = largest − smallest = 27 − 11 = 16
Answer: (a) 23 (b) 16

4 Where a line crosses the axes

A straight line has equation y = −4x − 4
(a) Write down the coordinates of the point where the line crosses the y-axis.
(b) Work out the coordinates of the point where the line crosses the x-axis.

(a) When x = 0, y = −4
(b) The line crosses the x-axis when y = 0: −4x − 4 = 0
−4x = 4
x = −1
Answer: (a) (0, −4) (b) (−1, 0)

5 Volume of cuboids

A box is a cuboid measuring 25 cm by 15 cm by 25 cm.
Small cubes of side 5 cm are packed into the box.
How many small cubes fit in the box with no gaps?

Along the length: 25 ÷ 5 = 5
Along the width: 15 ÷ 5 = 3
Along the height: 25 ÷ 5 = 5
5 × 3 × 5 = 75
Answer: 75 cubes

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6 Ordering fractions

Write these in order of size.
Start with the smallest.

35%, $\frac{1}{4}$, 80%, 85%

Write each as a decimal:

35% = 0.35, $\frac{1}{4}$ = 0.25, 80% = 0.8, 85% = 0.85

Order: $\frac{1}{4}$, 35%, 80%, 85%

Answer: $\frac{1}{4}$, 35%, 80%, 85%

7 Pay and overtime

Maya earns £8 per hour for the first 32 hours worked each week.
Any extra hours are paid at time and a half.
Last week Maya worked 34 hours.
Work out Maya's total pay for last week.

Normal pay: 32 × £8 = £256
Overtime rate: 1.5 × £8 = £12 per hour
Overtime pay: 2 × £12 = £24
Total = £256 + £24 = £280
Answer: £280

8 Equation of a straight line graph

The diagram shows a straight line.
(a) Work out the gradient of the line.
(b) Find the equation of the line.

(a) The line crosses the y-axis at −2. Pick two points on the line and work out change in y divided by change in x
Gradient = 1
(b) The equation is y = mx + c with m = 1 and c = −2
Answer: (a) 1 (b) y = x − 2

9 Tree diagrams

A bag contains 6 green beads and 3 yellow beads.
Amy takes one at random, replaces it, then takes a second.
Work out the probability that both are green.

P(first green) = $\frac{2}{3}$

P(second green) = $\frac{2}{3}$

P(both green) = $\frac{2}{3} \times \frac{2}{3} = \frac{4}{9}$

Answer: $\frac{4}{9}$

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10 Trigonometry in isosceles triangles

Triangle ABC is isosceles with AB = AC = 10 cm. (Calculator)
The base BC = 14 cm.
Work out the size of angle ABC.
Give your answer correct to 1 decimal place.

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

$\cos B = \frac{7}{10}$

Angle ABC = $\cos^{-1}(\frac{7}{10})$ = 45.573...

= 45.6° (1 d.p.)

Answer: 45.6°