Day 191 **A Tier 10-a-day: Model Solutions**

1 Best buys

A shop sells flour in 3 different sizes.
Small bag: 250 g for £1.60
Medium bag: 400 g for £2.60
Large bag: 500 g for £3.40
Which bag is the best value for money? You must show your working.

Small bag: 160p ÷ 2.5 = 64p per 100 g
Medium bag: 260p ÷ 4 = 65p per 100 g
Large bag: 340p ÷ 5 = 68p per 100 g
The small bag has the lowest price per 100 g, so it is the best value
Answer: The small bag

2 Equations with brackets

Solve $-6(x - 2) = -2(x + 7) - 2$

Expand the brackets: $-6x + 12 = -2x - 14 - 2$
Simplify: $-6x + 12 = -2x - 16$
Collect x terms on one side and numbers on the other: $-4x = -28$
$x = 7$
Answer: x = 7

3 Bearings

The bearing of B from A is 235°.
Work out the bearing of A from B.
The diagram is not drawn accurately.

The north lines at A and B are parallel
Back bearing = 235° − 180° = 55°
Answer: 055°

4 Speed, distance and time

A cyclist rides 78 km at 24 km/h.
Work out the time taken. Give your answer in hours and minutes.

Time = distance ÷ speed = 78 ÷ 24 = 3.25 hours
3.25 hours = 3 hours 15 minutes
Answer: 3 hours 15 minutes

5 Dividing fractions in context

A jug holds $10\frac{1}{5}$ litres of juice. Glasses hold $\frac{3}{5}$ litre each.

How many glasses can be filled completely?

Divide: $10\frac{1}{5} \div \frac{3}{5}$

As improper fractions and multiplying by the reciprocal: $\frac{51}{5} \times \frac{5}{3}$

$= 17$
Answer: 17

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6 Iteration

$x_{n+1} = 5 + \frac{2}{x_n}$

$x_0 = 3$

Work out the values of x_1, x_2 and x_3.

Give your answers correct to 3 decimal places. (Calculator)

Substitute $x_0 = 3$ into the formula, then use each answer in the next step (keep the full calculator display)

$x_1 = 5.66667$

$x_2 = 5.35294$

$x_3 = 5.37363$

Answer: $x_1 = 5.667$, $x_2 = 5.353$, $x_3 = 5.374$

7 Frequency density

The table gives information about 80 measurements.

A histogram is drawn using this information.

(a) Work out the missing frequency.

(b) Work out the height of the bar for the class $30 < l \leq 40$.

(a) Missing frequency = $80 - (27 + 18 + 22) = 13$

(b) Class width = $40 - 30 = 10$

Frequency density = $18 \div 10 = 1.8$

Answer: (a) 13 (b) 1.8

8 The sine rule

Work out the value of x. (Calculator)

Give your answer to 3 significant figures.

The diagram is not drawn accurately.

$\frac{x}{\sin 58°} = \frac{5}{\sin 73°}$

$x = \frac{5 \times \sin 58°}{\sin 73°}$

$x = 4.43$

Answer: x = 4.43 cm

9 Equations with algebraic fractions

Solve $\frac{3}{(x-2)} + \frac{2}{(x-4)} = 1$

Multiply every term by $(x - 2)(x - 4)$

$3(x - 4) + 2(x - 2) = (x - 2)(x - 4)$

$5x - 16 = x^2 - 6x + 8$

$x^2 - 11x + 24 = 0$

$(x - 3)(x - 8) = 0$

$x = 3$ or $x = 8$

Answer: x = 3 or x = 8

10 Standard form in context

One grain of sand has a mass of 1.2×10^{-6} kg.

A sample contains 5×10^9 grains of sand.

Work out the total mass of the sample.

Give your answer in standard form.

Total mass = $(1.2 \times 10^{-6}) \times (5 \times 10^9)$

$1.2 \times 5 = 6$ and $10^{-6} \times 10^9 = 10^3$

Answer: 6×10^3 kg