**Day 65** **A Tier 10-a-day: Model Solutions**

## 1 Rearranging formulae

Make w the subject of $z = 8(w + 6)$

Divide both sides by 8: $\frac{z}{8} = w + 6$

Subtract 6 from both sides

$w = \frac{z}{8} - 6$

**Answer: $w = \frac{z}{8} - 6$**

## 2 Fractions of an amount

Chloe spends $\frac{3}{4}$ of the money on a phone case and $\frac{3}{5}$ of the money that is left on headphones.
Chloe has £42 left.
How much money did Chloe have to begin with?

After the second purchase $\frac{2}{5}$ of what was left after the first purchase remains.

£42 = $\frac{2}{5}$ of the amount left, so $\frac{1}{5}$ of it is £42 ÷ 2 = £21

So the amount left after the first purchase is £21 × 5 = £105

This is $\frac{1}{4}$ of the original amount, so the original amount is £105 × 4 = £420

**Answer: £420**

## 3 Area of parallelograms and kites

The area of this parallelogram is 144 $cm^2$.
Work out the value of h.
The diagram is not drawn accurately.

12 × h = 144
h = 144 ÷ 12 = 12
**Answer: h = 12**

## 4 Estimating the mean from grouped data

The table shows the masses, in kg, of 40 parcels.
(a) Write down the class that contains the median.
(b) Work out an estimate for the mean. Give your answer to 1 decimal place.

(a) The median is in position (40 + 1) ÷ 2 = 20.5. Cumulative frequencies: 8, 17, 36, 40
The median is in the class $20 < m \leq 25$
(b) Midpoints: 12.5, 17.5, 22.5, 27.5
12.5 × 8 + 17.5 × 9 + 22.5 × 19 + 27.5 × 4 = 795
Estimate = 795 ÷ 40 = 19.9
**Answer: (a) $20 < m \leq 25$ (b) 19.9**

## 5 Simplifying algebraic fractions

Simplify fully

$$\frac{x^2 - 49}{x^2 - 7x}$$

Top: $x^2 - 49 = (x - 7)(x + 7)$
Bottom: $x^2 - 7x = x(x - 7)$
Cancel $(x - 7)$
**Answer: $\frac{x + 7}{x}$**

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## 6 Compound interest

Lena invests £1500 in a savings account. (Calculator)
The account pays 8% compound interest per year.
Work out the interest earned in 2 years.

Multiplier = 100% + 8% = 1.08
£1500 × $1.08^2$ = £1749.600
Interest = £1749.60 − £1500 = £249.60
**Answer: £249.60**

## 7 Functions

f(x) = 4x − 4
g(x) = $x^2$ − 6
Find fg(5)

g(5) = $5^2$ − 6 = 19
f(19) = 4 × 19 − 4 = 72
**Answer: 72**

## 8 Recurring decimals (mixed)

Write $0.8\dot{2}$ as a fraction in its simplest form.

Let x = 0.822...
Multiply by 10: 10x = 8.22...
Multiply by 100: 100x = 82.22...
Subtract: 90x = 82 − 8 = 74
$x = \frac{74}{90} = \frac{37}{45}$
**Answer:** $\frac{37}{45}$

## 9 Frequency density

The table gives information about 102 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 $0 < m \leq 10$.

(a) Missing frequency = 102 − (26 + 40 + 24) = 12
(b) Class width = 10 − 0 = 10
Frequency density = 26 ÷ 10 = 2.6
**Answer: (a) 12 (b) 2.6**

## 10 Volume of cones and spheres

A cone has base radius 3 cm and perpendicular height 12 cm.
Work out the volume of the cone. Give your answer in terms of π.

Volume = $\frac{1}{3} \times \pi \times r^2 \times h$
= $\frac{1}{3} \times \pi \times 3^2 \times 12$
= 36π
**Answer: 36π $cm^3$**