Day 281 **A Tier 10-a-day: Model Solutions**

1 Inequalities

Solve $-2x - 8 \leq 2x - 6$

Collect the x terms on the left: $-4x - 8 \leq -6$
Add 8: $-4x \leq 2$
Divide by -4. Dividing by a negative number reverses the inequality sign
$x \geq -\frac{1}{2}$

Answer: $x \geq -\frac{1}{2}$

2 Wages and overtime

Sara is paid £14.50 per hour for a basic week of 40 hours. (Calculator)
Overtime is paid at time and a half.
Last week Sara worked 4 hours of overtime.
Work out Sara's total pay for the week.

Basic pay = 40 × £14.50 = £580.00
Overtime rate = £14.50 × 1.5 = £21.75 per hour
Overtime pay = 4 × £21.75 = £87.00
Total = £580.00 + £87.00 = £667.00
Answer: £667.00

3 Converting units of area and volume

A jug holds 12500 cm^3 of water.
Write this volume in litres.

1 litre = 1000 cm^3
12500 ÷ 1000 = 12.5
Answer: 12.5 litres

4 Fractions of an amount

Oscar spends $\frac{1}{4}$ of the money on a book and $\frac{1}{2}$ of the money that is left on a game.
Oscar has £45 left.
How much money did Oscar have to begin with?

After the second purchase $\frac{1}{2}$ of what was left after the first purchase remains.

£45 = $\frac{1}{2}$ of the amount left, so $\frac{1}{2}$ of it is £45 ÷ 1 = £45
So the amount left after the first purchase is £45 × 2 = £90
This is $\frac{3}{4}$ of the original amount, so the original amount is £90 ÷ 3 × 4 = £120
Answer: £120

5 Combining ratios

p : q = 8 : 1
q : r = 2 : 7
(a) Work out the ratio p : q : r
(b) p, q and r add up to 100. Work out the value of r.

(a) Make the q parts equal: lowest common multiple of 1 and 2 is 2
p : q = 16 : 2 and q : r = 2 : 7
p : q : r = 16 : 2 : 7
(b) 16 + 2 + 7 = 25 parts, so 1 part = 100 ÷ 25 = 4
r = 7 × 4 = 28
Answer: (a) 16 : 2 : 7 (b) 28

Day 281 **A Tier 10-a-day: Model Solutions**

6 Area of a triangle using sine

The area of triangle ABC is 47.7 cm^2. (Calculator)
Angle x is acute.
Work out the size of angle x. Give your answer to 1 decimal place.
The diagram is not drawn accurately.

$\frac{1}{2} \times 7 \times 14 \times \sin x = 47.7$
$49 \sin x = 47.7$
$\sin x = 0.9735$
$x = 76.8°$
Answer: x = 76.8°

7 Reverse percentages

A phone costs £144 including VAT at 20%.
Work out the price of the phone before VAT was added.

120% represents £144
1% = £144 ÷ 120 = £1.2
100% = £1.2 × 100 = £120.00
Answer: £120.00

8 Forming quadratic equations

A rectangle has width x cm and length (x + 8) cm.
The area of the rectangle is 153 cm^2.
(a) Show that $x^2 + 8x - 153 = 0$
(b) Work out the value of x.

(a) Area = length × width, so $x(x + 8) = 153$
$x^2 + 8x = 153$
$x^2 + 8x - 153 = 0$
(b) Factorise: $(x - 9)(x + 17) = 0$
$x = 9$ or $x = -17$
A length cannot be negative, so $x = 9$
Answer: (a) Shown (b) x = 9

9 Mean from a frequency table

The table shows information about 50 days.
(a) Work out the mean.
(b) Write down the mode.

(a) Total = 0 × 15 + 1 × 5 + 2 × 2 + 3 × 12 + 4 × 16 = 109
Mean = 109 ÷ 50 = 2.18
(b) The highest frequency is 16, so the mode is 4
Answer: (a) 2.18 (b) 4

10 Bounds and accuracy

A cyclist travels 270 metres in 16 seconds. The distance is correct to the nearest 10 metres and the time to the nearest 0.1 second.
(a) Work out the upper bound and the lower bound of the speed in m/s.
(b) Write the speed to a suitable degree of accuracy. Give a reason for your answer.

(a) Upper bound = 275 ÷ 15.95 = 17.2414
Lower bound = 265 ÷ 16.05 = 16.5109
(b) Both bounds round to 17 to 2 s.f. but not to the same value to 3 s.f.
So the speed is 17 m/s to 2 significant figures.
Answer: (a) 17.2414, 16.5109 (b) 17 m/s (2 s.f.)