Day 196 **A Tier 10-a-day: Model Solutions**

1 Sharing in a ratio

Sam and Noah share £100 in the ratio 1 : 3.
How much more money does Noah get than Sam?

Total number of parts = 1 + 3 = 4
One part = £100 ÷ 4 = £25
Noah gets 3 × £25 = £75 and Sam gets 1 × £25 = £25
Difference = £75 − £25 = £50
Answer: £50

2 Congruent triangles

Triangle UVW: angle V = 90°, UW = 14 cm, UV = 8 cm.
Triangle ABC: angle C = 90°, AB = 14 cm, AC = 8 cm.
Are the two triangles congruent?
Give a reason for your answer.

Both triangles have a right angle
UW and AB are the hypotenuses: both 14 cm
UV = AC = 8 cm
Right angle, hypotenuse and one other side are equal, so the triangles are congruent (RHS)
Answer: Yes, congruent (RHS)

3 Exchange rates

The exchange rate is £1 = $1.25. (Calculator)
Mo changes £750 into US dollars and spends $656.25.
Mo changes the rest back into pounds at the same rate.
How much does Mo get back?

Amount received: £750 × 1.25 = $937.50
Amount left: $937.50 − $656.25 = $281.25
In pounds: 281.25 ÷ 1.25 = £225
Answer: £225

4 Parallel and perpendicular lines

The line L has equation $y = \frac{3}{2}x + 8$

Find the equation of the line that is parallel to L and passes through the point (2, 10).

Parallel lines have the same gradient, so the gradient is $\frac{3}{2}$

$y = \frac{3}{2}x + c$, so $10 = \frac{3}{2} \times 2 + c$

$c = 7$

$y = \frac{3}{2}x + 7$

Answer: $y = \frac{3}{2}x + 7$

5 Probabilities adding to 1

The table shows the probabilities of the outcomes of a biased four-sided dice.
(a) Work out the value of x.
(b) The four-sided dice is rolled 300 times. Estimate the number of times it lands on 2.

(a) Probabilities add to 1: 0.25 + x + x + 0.35 = 1
0.6 + 2x = 1, so 2x = 0.4
x = 0.2
(b) P(2) = 0.2, so expected number = 0.2 × 300 = 60
Answer: (a) x = 0.2 (b) 60

Day 196 **A Tier 10-a-day: Model Solutions**

6 Circle theorems: angle in a semicircle

AB is a diameter of the circle.
Angle BAC = 63°.
Work out the size of angle x.
Give a reason for each step of your working.

The angle in a semicircle is 90°, so angle ACB = 90°
Angles in a triangle add up to 180°
x = 180 − 90 − 63 = 27
Answer: x = 27°

7 Fraction calculations

Work out $(3\frac{1}{4} + 2\frac{3}{5}) \times 3\frac{1}{3}$
Give your answer as a mixed number in its simplest form.

Brackets first, as improper fractions: $\frac{13}{4} + \frac{13}{5} = \frac{117}{20}$

Then multiply: $\frac{117}{20} \times \frac{10}{3} = \frac{39}{2}$

$= 19\frac{1}{2}$

Answer: $19\frac{1}{2}$

8 Probability with three selections

A bag contains 3 mint sweets and 4 toffee sweets.
Three sweets are taken at random without replacement.
Work out the probability that exactly one of the three sweets is toffee.

One order, for example toffee, mint, mint: $\frac{4}{7} \times \frac{3}{6} \times \frac{2}{5} = \frac{4}{35}$

There are 3 possible orders, each with the same probability

$3 \times \frac{4}{35} = \frac{12}{35}$

Answer: $\frac{12}{35}$

9 The cosine rule: finding a side

Work out the value of x. (Calculator)
Give your answer to 3 significant figures.
The diagram is not drawn accurately.

$x^2 = 12^2 + 14^2 - 2 \times 12 \times 14 \times \cos 68°$
$x^2 = 144 + 196 - 336 \cos 68°$
$x^2 = 214.13$
$x = 14.6$
Answer: x = 14.6 cm

10 Simplifying algebraic fractions

Simplify fully

$$\frac{x^2 - x - 6}{x^2 - 2x - 8}$$

Factorise the top: (x + 2)(x − 3)
Factorise the bottom: (x + 2)(x − 4)
Cancel the common factor (x + 2)

Answer: $\frac{x-3}{x-4}$