Day 114 **A Tier 10-a-day: Model Solutions**

1 Factorising quadratics

Factorise $x^2 - 11x + 28$

Find two numbers that multiply to 28 and add to -11
The numbers are -4 and -7
$(x - 4)(x - 7)$
Answer: $(x - 4)(x - 7)$

2 Best buys

A shop sells coffee in 2 different sizes.
Small bag: 500 g for £4.10
Large bag: 1000 g for £7.30
Which bag is the best value for money? You must show your working.

Small bag: 410p ÷ 5 = 82p per 100 g
Large bag: 730p ÷ 10 = 73p per 100 g
The large bag has the lowest price per 100 g, so it is the best value
Answer: The large bag

3 Isosceles triangles and exterior angles

XYZ is an isosceles triangle with XY = XZ.
YZW is a straight line.
Angle XZW = 124°.
Work out the size of angle x.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
Angle XZY = 180 − 124 = 56°
Base angles are equal, so angle XYZ = 56°
x = 180 − 56 − 56 = 68
Answer: x = 68°

4 Forming and solving equations

The sum of 4 consecutive whole numbers is 118.
Work out the largest of the numbers.

Let the smallest number be n. The numbers are n, n + 1, n + 2, n + 3
Sum = 4n + 6 = 118
4n = 112
n = 28
The numbers are 28, 29, 30, 31
Answer: 31

5 Counting

A shop sells 5 different shirts, 3 different pairs of trousers and 3 different hats.
How many different outfits, made of one shirt, one pair of trousers and one hat, are possible?

Multiply the number of choices: 5 × 3 × 3 = 45
Answer: 45

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6 Circle theorems: isosceles triangles with radii

A, B and C are points on a circle with centre O.
Angle OAB = 47°.
(a) Work out angle AOB.
(b) Work out the size of angle x.
Give reasons for your answers.

(a) OA = OB (radii), so triangle OAB is isosceles and angle OBA = 47°
Angle AOB = 180 − 47 − 47 = 86°
(b) The angle at the centre is twice the angle at the circumference
x = 86 ÷ 2 = 43
Answer: (a) 86° (b) x = 43°

7 Recurring decimals (mixed)

Write $0.6\dot{7}\dot{3}$ as a fraction in its simplest form.

Let x = 0.67373...
Multiply by 10: 10x = 6.7373...
Multiply by 1000: 1000x = 673.7373...
Subtract: 990x = 673 − 6 = 667
$x = \frac{667}{990}$
Answer: $\frac{667}{990}$

8 Probabilities adding to 1

The table shows the probabilities of the outcomes of a biased spinner.
(a) Work out the value of x.
(b) The spinner is spun 100 times. Estimate the number of times it lands on white.

(a) Probabilities add to 1: 0.3 + x + 2x + 0.4 = 1
0.7 + 3x = 1, so 3x = 0.3
x = 0.1
(b) P(white) = 0.1, so expected number = 0.1 × 100 = 10
Answer: (a) x = 0.1 (b) 10

9 Finding an interest rate

Amy invests £2500 in a savings account. (Calculator)
The account pays compound interest at a fixed rate each year.
After 2 years there is £2809 in the account.
Work out the annual rate of interest.

Let the yearly multiplier be m. Then $2500 \times m^2 = 2809$
$m^2 = 2809 \div 2500 = 1.1236$
$m = \sqrt{1.1236} = 1.06$
Rate = (1.06 − 1) × 100 = 6%
Answer: 6%

10 Bounds and accuracy

A cyclist travels 520 metres in 18.5 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 = 525 ÷ 18.45 = 28.4553
Lower bound = 515 ÷ 18.55 = 27.7628
(b) Both bounds round to 28 to 2 s.f. but not to the same value to 3 s.f.
So the speed is 28 m/s to 2 significant figures.
Answer: (a) 28.4553, 27.7628 (b) 28 m/s (2 s.f.)