Day 27 **A Tier 10-a-day: Model Solutions**

1 Estimation

Estimate the value of $\sqrt{48.7} \times 6.7$, by rounding 48.7 to the nearest square number and 6.7 to 1 significant figure.

Round to values we can work with: $48.7 \approx 49$ and $6.7 \approx 7$

$\sqrt{49} \times 7 = 7 \times 7 = 49$

Answer: 49

2 Algebraic formulae in context

A plumber charges a call-out fee of £40 plus £35 for each hour of work.
(a) Write a formula for the total cost, £C, after h hours.
(b) Chloe pays £250 in total. Work out the number of hours.

(a) $C = 40 + 35h$
(b) $40 + 35h = 250$
$35h = 210$
$h = 6$
Answer: (a) C = 40 + 35h (b) 6

3 LCM in context

Bus A leaves a bus station every 20 minutes.
Bus B leaves the same station every 15 minutes.
Both buses leave together at 7:10 am.
At what time will they next leave together?

We need the LCM of 20 and 15.
Multiples of 20: 20, 40, 60
Multiples of 15: 15, 30, 45, 60
LCM = 60, so they leave together again 60 minutes later, at 8:10 am
Answer: 8:10 am

4 Best buys

A shop sells rice in 3 different sizes.
Small bag: 250 g for £2.10
Medium bag: 400 g for £3.20
Large bag: 1000 g for £8.65
Which bag is the best value for money? You must show your working.

Small bag: 210p ÷ 2.5 = 84p per 100 g
Medium bag: 320p ÷ 4 = 80p per 100 g
Large bag: 865p ÷ 10 = 86.5p per 100 g
The medium bag has the lowest price per 100 g, so it is the best value
Answer: The medium bag

5 Similar shapes: finding a length

The two triangles are similar.
Work out the value of x.
The diagrams are not drawn accurately.

Scale factor from the small triangle to the large triangle = $18 \div 12 = \frac{3}{2}$

$x = 10 \times \frac{3}{2} = 15$

Answer: x = 15 cm

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6 nth term of a linear sequence

Here are the first four terms of a sequence.
1, 4, 7, 10
(a) Find an expression for the nth term.
(b) Work out the 30th term.

The terms go up by 3 each time, so the nth term starts with 3n
1 − 3 = −2, so the nth term is 3n − 2
(b) 30 × 3 − 2 = 88
Answer: (a) 3n − 2 (b) 88

7 Percentages of percentages

There are 200 passengers on a plane.
60% of the passengers are children.
20% of the children are under 5 years old.
How many passengers are children under 5?

Children = 60% of 200 = 120
Under 5 = 20% of 120 = 24
Answer: 24

8 Combined means

The mean mark of 10 adults in a test is 79.
The mean mark of 14 children in the same test is 67.
Work out the mean mark of all 24 people.

Total for adults = 10 × 79 = 790
Total for children = 14 × 67 = 938
Total = 1728, and number of students = 24
Mean = 1728 ÷ 24 = 72
Answer: 72

9 Exact trigonometric values

Without using a calculator, work out the exact value of
6 cos 60° + 3 tan 45°
Give your answer in its simplest form.

$\cos 60° = \frac{1}{2}$ and tan 45° = 1

$6 \times \frac{1}{2} + 3 \times 1 = 6$

Answer: 6

10 Simultaneous equations (one quadratic)

Solve the simultaneous equations
$x^2 + y^2 = 25$
$y = x + 7$

Substitute $y = x + 7$ into $x^2 + y^2 = 25$
$x^2 + (x + 7)^2 = 25$
$2x^2 + 14x + 24 = 0$
Divide by 2: $x^2 + 7x + 12 = 0$
$(x + 4)(x + 3) = 0$
$x = -4$ or $x = -3$
Use $y = x + 7$ to find y: when $x = -4$, $y = 3$; when $x = -3$, $y = 4$
Answer: x = −4, y = 3 and x = −3, y = 4