Day 3 **B Tier 10-a-day: Model Solutions**

1 Metric conversions

(a) Convert 7.5 mm to cm.
(b) Convert 400 mm^2 to cm^2.

(a) mm → cm: divide by 10: 7.5 ÷ 10 = 0.75
(b) 1 cm = 10 mm, so 1 cm^2 = 10 × 10 = 100 mm^2. 400 ÷ 100 = 4
Answer: (a) 0.75 cm (b) 4 cm^2

2 Ratio, one part known

The ratio of apples to oranges among the pieces of fruit in a bowl is 2 : 7.
There are 28 oranges.
How many apples are there?

7 parts = 28 oranges
1 part = 28 ÷ 7 = 4
apples: 2 × 4 = 8
Answer: 8

3 Percentages of amounts

Work out
(a) 20% of £640
(b) 30% of 500

(a) 10% of £640 = £64
20% = 2 × £64 = £128
(b) 10% of 500 = 50
30% = 3 × 50 = 150
Answer: (a) £128 (b) 150

4 Stem and leaf diagrams

The stem and leaf diagram shows 13 values.
(a) Find the median.
(b) Work out the range.

(a) 13 values, so the median is the 7th value
Reading in order: 10, 15, 19, 20, 22, 24, 29, 32, 34, 35, 36, 37, 39
Median = 29
(b) Range = 39 − 10 = 29
Answer: (a) 29 (b) 29

5 Equation of a straight line graph

The diagram shows a straight line.
(a) Work out the gradient of the line.
(b) Find the equation of the line.

(a) The line crosses the y-axis at −1. Pick two points on the line and work out change in y divided by change in x
Gradient = 2
(b) The equation is y = mx + c with m = 2 and c = −1
Answer: (a) 2 (b) $y = 2x - 1$

6 Percentage change

Ella bought a bike for £200 and sold it for £120.
Work out the percentage loss.

Loss = cost − selling price = £80

Percentage loss = $\frac{£80}{£200} \times 100 = 40\%$

Answer: 40% loss

Day 3 **B Tier 10-a-day: Model Solutions**

7 Disproving statements

Jo says, "The sum of two prime numbers is always even."
Give an example to show that Jo is wrong.

Try using the prime number 2, which is even, with an odd prime
2 + 3 = 5, and 5 is odd
Answer: 2 + 3 = 5, which is odd

8 Circle theorems

PA and PB are tangents to a circle, centre O.
Angle APB = 52°.
Work out the size of angle PAB, marked q.
Give a reason for your answer.
The diagram is not drawn accurately.

PA = PB because tangents from a point to a circle are equal in length
Triangle PAB is isosceles
q = (180 − 52) ÷ 2 = 64°
Answer: q = 64°

9 Average speed

A lorry travels at 45 km/h for 1 hour and then at 20 km/h for 1 hour.
Work out its average speed for the whole journey.

Distance: 45 × 1 = 45 km and 20 × 1 = 20 km
Total distance = 65 km and total time = 2 hours
Average speed = 65 ÷ 2 = 32.5
Answer: 32.5 km/h

10 Standard form calculations

Work out $(2.9 \times 10^6) + (5 \times 10^6)$
Give your answer in standard form.

The powers of 10 are the same, so add the numbers: 2.9 + 5 = 7.9
7.9×10^6
Answer: 7.9×10^6