Day 315 **B Tier 10-a-day: Model Solutions**

1 Forming expressions

Jo has x football cards.
Ben has 3 more football cards than Jo.
Cara has 4 times as many football cards as Jo.
(a) Write an expression, in terms of x, for the number of football cards Ben has.
(b) Write an expression, in terms of x, for the total number of football cards the three of them have. Give your answer in its simplest form.

(a) Ben has 3 more than Jo: x + 3
(b) Cara has 4x
Total = x + (x + 3) + 4x
Collect like terms: 6x + 3
Answer: (a) x + 3 (b) 6x + 3

2 Metric conversions

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

(a) mm → cm: divide by 10: 7.5 ÷ 10 = 0.75
(b) 1 m = 100 cm, so 1 m^2 = 100 × 100 = 10 000 cm^2. 2 × 10 000 = 20 000
Answer: (a) 0.75 cm (b) 20 000 cm^2

3 Mode and median from a table

The table shows the numbers of brothers and sisters of some students.
(a) Write down the mode.
(b) Work out the median.

(a) The highest frequency is 8, for 5
(b) Total frequency = 25, so the median is the number 13 value
Running totals of frequency: 2, 8, 10, 17, 25
The median is 4
Answer: (a) 5 (b) 4

4 Comparing fractions and percentages

Zara has $\frac{1}{4}$ of £128.

Ravi has 60% of £140.
Who has more money? You must show your working.

Zara: 128 ÷ 8 × 2 = £32
Ravi: 140 ÷ 100 × 60 = £84
£84 is more than £32, so Ravi has more
Answer: Ravi

5 Mean from a frequency table

The table shows the numbers of brothers and sisters of some students.
Work out the mean.

Multiply each value by its frequency and add: 3 × 3 + 4 × 2 + 5 × 3 + 6 × 4 + 7 × 8 = 112
Total frequency = 3 + 2 + 3 + 4 + 8 = 20
Mean = 112 ÷ 20 = 5.6
Answer: 5.6

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6 Radius from area or circumference

The area of a circle is 133 cm^2. (Calculator)
Work out the radius of the circle.
Give your answer correct to 1 decimal place.

Area = πr^2, so $r^2 = 133 \div \pi = 42.335...$
$r = \sqrt{42.335} = 6.507...$
r = 6.5 cm (1 d.p.)
Answer: 6.5 cm

7 Solving double inequalities

(a) Solve $6 < 4x + 6 < 18$
(b) Write down the integer values of x that satisfy this inequality.

(a) Subtract 6 in all three parts: $0 < 4x < 12$
Divide all three parts by 4: $0 < x < 3$
(b) The whole numbers in this range are 1, 2
Answer: (a) $0 < x < 3$ (b) 1, 2

8 Average speed

A coach travels at 50 km/h for 2 hours and then at 48 km/h for 2 hours.
Work out its average speed for the whole journey.

Distance: 50 × 2 = 100 km and 48 × 2 = 96 km
Total distance = 196 km and total time = 4 hours
Average speed = 196 ÷ 4 = 49
Answer: 49 km/h

9 Algebraic proof

Show that $(n + 4)(n + 3) - n(n + 7)$ has the same value for every whole number n.

Expand the first part: $n^2 + 3n + 4n + 12 = n^2 + 7n + 12$
Expand the second part: $n^2 + 7n$
Subtract: the n^2 terms and the n terms cancel, leaving 12
Answer: The value is always 12

10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 20%. (Calculator)
Two weeks later it is reduced by a further 25% of the new price.
The final price is £90.
Work out the original price of the sofa.

Multipliers: 0.8 and 0.75
Overall multiplier = 0.8 × 0.75 = 0.6
Original price = £90 ÷ 0.6 = £150
Answer: £150