Day 358 **B Tier 10-a-day: Model Solutions**

1 Metric conversions

(a) Convert 2 m to mm.
(b) Convert 500 mm^2 to cm^2.

(a) m → mm: multiply by 1000: 2 × 1000 = 2000
(b) 1 cm = 10 mm, so 1 cm^2 = 10 × 10 = 100 mm^2. 500 ÷ 100 = 5
Answer: (a) 2000 mm (b) 5 cm^2

2 Continuing sequences

Here are the first four terms of a sequence.
3, 6, 12, 21
(a) Write down the next two terms.
(b) Describe the rule for continuing the sequence.

The differences are 3, 6, 9, going up by 3 each time
Next differences: 12 then 15
21 + 12 = 33 and 33 + 15 = 48
Answer: (a) 33, 48 (b) The differences go up by 3 each time

3 Median and range

Here are the number of customers at a shop each day.
35, 40, 45, 22, 31, 25
(a) Find the median.
(b) Work out the range.

(a) Put in order: 22, 25, 31, 35, 40, 45
The middle two values are 31 and 35, so the median is 66 ÷ 2 = 33
(b) Range = largest − smallest = 45 − 22 = 23
Answer: (a) 33 (b) 23

4 Term-to-term rules

The first term of a sequence is 2.
The term-to-term rule is: double the term, then add 1.
Work out the 5th term.

2nd term: 2 × 2 + 1 = 5
3rd term: 2 × 5 + 1 = 11
4th term: 2 × 11 + 1 = 23
5th term: 2 × 23 + 1 = 47
Answer: 47

5 Midpoint and length of a line

A is the point (4, 3) and B is the point (1, 7).
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB.

(a) Midpoint = (5 ÷ 2, 10 ÷ 2) = (2.5, 5)
(b) Horizontal distance = 3, vertical distance = 4
$AB^2 = 3^2 + 4^2 = 9 + 16 = 25$
$AB = \sqrt{25} = 5$
Answer: (a) (2.5, 5) (b) 5

6 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 60 and 36.

$60 = 2^2 \times 3 \times 5$ and $36 = 2^2 \times 3^2$
(a) HCF: multiply the primes in both lists, using the smaller power: $2^2 \times 3 = 12$
(b) LCM: use the larger power of every prime: $2^2 \times 3^2 \times 5 = 180$
Answer: (a) 12 (b) 180

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7 Compound shapes with semicircles

A shape is made from a rectangle and a semicircle. (Calculator)
The rectangle is 6 cm wide and 6 cm high.
The diameter of the semicircle is 6 cm.
(a) Work out the area of the shape.
(b) Work out the perimeter of the shape.
Give each answer correct to 1 decimal place.

(a) Rectangle: $6 \times 6 = 36$
Semicircle: $\frac{1}{2} \times \pi \times 3^2 = 14.137...$
Total = 50.1 cm^2
(b) Curved edge: $\frac{1}{2} \times \pi \times 6 = 9.425...$
Straight edges: $6 + 6 + 6 = 18$
Total = 27.4 cm

Answer: (a) 50.1 cm^2 (b) 27.4 cm

8 Venn diagrams

The Venn diagram shows information about 35 workers in an office.
One of them is chosen at random.
Find the probability that the person chose Bike or Bus or both.

Inside the circles = $9 + 6 + 13 = 28$
Total = 35
P = 28 out of 35

Answer: $\frac{4}{5}$

9 Bounds

The length of a rectangle is 23 cm and its width is 14 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 22.5 cm and 13.5 cm
Area = $22.5 \times 13.5 = 303.75$ cm^2

Answer: 303.75 cm^2

10 Where a line crosses the axes

A straight line has equation $y = -x + 3$
(a) Write down the coordinates of the point where the line crosses the y-axis.
(b) Work out the coordinates of the point where the line crosses the x-axis.

(a) When x = 0, y = 3
(b) The line crosses the x-axis when y = 0: $-x + 3 = 0$
$-1x = -3$
$x = 3$

Answer: (a) (0, 3) (b) (3, 0)