**Day 333** **B Tier 10-a-day: Model Solutions**

## 1 Place value

Here are four digit cards.
4 5 9 7
Use all four cards to make the largest possible number.
Work out the difference between the largest and smallest possible numbers.

Largest: put the digits in order, biggest first: 9754
Smallest: put the digits in order, smallest first: 4579
9754 − 4579 = 5175
**Answer: 5175**

## 2 Counting outcomes

A hotel menu has 2 starters, 5 main courses and 4 desserts.
A customer chooses one starter, one main course and one dessert.
How many different meals are possible?

Multiply: 2 × 5 × 4 = 40
**Answer: 40**

## 3 Number machines

Here is a number machine.
Input → − 4 → + 2 → Output
(a) The input is 10. Work out the output.
(b) The output is 8. Work out the input.

(a) 10 − 4 = 6, then 6 + 2 = 8
(b) Work backwards: undo + 2 to get 6, then undo − 4 to get 10
**Answer: (a) 8 (b) 10**

## 4 Transformations of a point

(a) The point P(6, 1) is enlarged with scale factor −2 and centre the origin. Write down the coordinates of the image.
(b) The point P(6, 1) is rotated 90° clockwise about the origin. Write down the coordinates of the image.

(a) Multiply each coordinate by −2: (−12, −2)
(b) A 90° clockwise turn takes (x, y) to (y, −x): (1, −6)
**Answer: (a) (−12, −2) (b) (1, −6)**

## 5 LCM problems

Two lights flash at 10:00.
One light flashes every 9 minutes.
The other light flashes every 24 minutes.
At what time do both lights next flash together?

Multiples of 9: 9, 18, 27, 36, 45, 54, 63, 72
Multiples of 24: 24, 48, 72
The first common multiple is 72, so the LCM is 72 minutes
10:00 + 72 minutes = 11:12
**Answer: 11:12**

## 6 Metric conversions

(a) Convert 12.5 litres to ml.
(b) Convert 2.5 litres to $cm^3$.

(a) litres → ml: multiply by 1000: 12.5 × 1000 = 12 500
(b) 1 litre = 1000 $cm^3$. 2.5 × 1000 = 2500
**Answer: (a) 12 500 ml (b) 2500 $cm^3$**

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## 7 Grouped frequency tables

The table shows the lengths of some leaves.
(a) Write down the modal class.
(b) Work out an estimate for the mean.

(a) The highest frequency is 11
(b) Use the midpoint of each class: 20, 40, 60, 80, 100
Sum of midpoint × frequency = 20 × 6 + 40 × 8 + 60 × 8 + 80 × 7 + 100 × 11 = 2580
Total frequency = 40
Estimate = 2580 ÷ 40 = 64.5
**Answer: (a) $90 < l \leq 110$ (b) 64.5**

## 8 Iteration

Here is an iteration formula.

$x_{n+1} = 3 + \frac{10}{x_n}$

$x_0 = 2$

(a) Work out $x_1$
(b) Work out $x_2$. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = 3 + \frac{10}{2} = 3 + 5 = 8$

(b) $x_2 = 3 + \frac{10}{8} = 4.25...$

= 4.250
**Answer: (a) 8 (b) 4.250**

## 9 Area of shaded regions

The diagram shows a rectangle 20 m by 11 m with a circle of radius 2 m cut out.
The circle is in the centre of the rectangle.
Work out the area of the shaded region.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area of rectangle = 20 × 11 = 220
Area of circle = $\pi \times 2^2 = 4\pi$
Shaded area = $220 - 4\pi$
**Answer: $220 - 4\pi$ m$^2$**

## 10 Average speed

A lorry travels at 40 km/h for 2 hours and then at 72 km/h for 2 hours.
Work out its average speed for the whole journey.

Distance: 40 × 2 = 80 km and 72 × 2 = 144 km
Total distance = 224 km and total time = 4 hours
Average speed = 224 ÷ 4 = 56
**Answer: 56 km/h**