Day 57 **B Tier 10-a-day: Model Solutions**

1 Compound areas

A rectangular pond is 9 m by 7 m.
There is a path of width 2 m all the way round the outside of the pond.
Work out the area of the path.

Outer rectangle: (9 + 4) × (7 + 4) = 13 × 11 = 143
Pond: 9 × 7 = 63
143 − 63 = 80
Answer: 80 m^2

2 Place value

Here are four digit cards.
3 1 8 6
Use all four cards to make the largest possible even number.

The last digit must be even. Put the biggest remaining digits first.
The largest even number is 8316
Answer: 8316

3 Relative frequency

A coin is thrown 200 times.
It lands on heads 92 times.
(a) Work out the relative frequency of heads.
(b) Is the coin fair? Give a reason.

(a) 92 ÷ 200 = 0.46
(b) A fair coin should give about 0.5
0.46 is close to 0.5
Answer: (a) 0.46 (b) Probably fair, relative frequency close to 0.5

4 Mixed numbers

Work out $3\frac{1}{5} - 1\frac{7}{8}$
Give your answer as a mixed number.

Write as improper fractions: $\frac{16}{5} - \frac{15}{8}$
Common denominator 40: $\frac{128}{40} - \frac{75}{40} = \frac{53}{40}$
As a mixed number: $1\frac{13}{40}$
Answer: $\mathbf{1\frac{13}{40}}$

5 Trigonometry: finding a side

Find the length of x. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: x is the opposite and 14 cm is the adjacent
We use tan (opposite and adjacent)
$\tan 57° = \frac{x}{14}$
x = 14 × tan 57° = 21.558...
x = 21.6 cm (1 d.p.)
Answer: x = 21.6 cm

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6 Venn diagram problems

37 households were asked.
19 of them have a cat and 24 of them have a dog.
10 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they have a cat but do not have a dog.

(a) Union = 19 + 24 − 10 = 33
Neither = 37 − 33 = 4
(b) Only have a cat = 19 − 10 = 9
P = 9 out of 37

Answer: (a) 4 (b) $\frac{9}{37}$

7 Angles and algebra

The angles of a triangle are x°, 2x° and (2x + 25)°.
Work out the size of the largest angle.

Angles in a triangle add up to 180°
5x + 25 = 180
5x = 155, so x = 31
The angles are 31°, 62°, 87°
Answer: 87°

8 Prisms and density

A block of steel is a cuboid measuring 4 cm by 10 cm by 6 cm.
The density of steel is 8 g/cm^3.
Work out the mass of the block.

Volume = 4 × 10 × 6 = 240 cm^3
Mass = density × volume
8 × 240 = 1920 g
Answer: 1920 g

9 Missing value from a mean

The mean of 5 numbers is 14.
Four of the numbers are 10, 18, 13, 15.
Work out the fifth number.

Total = 5 × 14 = 70
Given total = 56
Fifth = 70 − 56 = 14
Answer: 14

10 Iteration

Here is an iteration formula.

$x_{n+1} = 6 + \frac{10}{x_n}$

$x_0 = 5$

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

(a) $x_1 = 6 + \frac{10}{5} = 6 + 2 = 8$

(b) $x_2 = 6 + \frac{10}{8} = 7.25...$

= 7.250
Answer: (a) 8 (b) 7.250