Day 227 **B Tier 10-a-day: Model Solutions**

1 Angles on a line and round a point

The diagram shows 2 angles on a straight line.
Work out the value of c.
The diagram is not drawn accurately.

Angles on a straight line add up to 180°
(2c + 35) + (4c + 1) = 180
6c + 36 = 180
6c = 144
c = 144 ÷ 6 = 24
Answer: c = 24°

2 Place value

Here are four digit cards.
8 6 5 2
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 8652
Answer: 8652

3 Substitution into formulae

Here is a formula.
v = u + at
Work out the value of v when u = 4, a = 5 and t = 4

v = 4 + 5 × 4
v = 24
Answer: v = 24

4 Rates

Electricity costs 20p per unit.
There is also a standing charge of £12.
Work out the total bill for 200 units.

Cost of units: 200 × 20p = 4000p = £40
Add the standing charge: £40 + £12 = £52
Answer: £52

5 Angles in parallel lines

In the diagram, PQ is parallel to RS.
(a) Work out the size of angle x.
(b) Give a reason for your answer.
The diagram is not drawn accurately.

Angle x and the 107° angle are alternate angles (Z shape)
x = 107°
Alternate angles are equal
Answer: (a) x = 107° (b) Alternate angles are equal

6 HCF and LCM from prime factors

A = $2 \times 3^3 \times 5$
B = $2 \times 3^2 \times 7^2$
Write down, as a product of prime factors,
(a) the HCF of A and B
(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: 2×3^2
(b) LCM: take the larger power of every prime: $2 \times 3^3 \times 5 \times 7^2$
Answer: (a) 2×3^2 (b) $2 \times 3^3 \times 5 \times 7^2$

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7 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 hypotenuse and 19 cm is the adjacent
We use cos (adjacent and hypotenuse)

$\cos 68° = \frac{19}{x}$

$x = \frac{19}{\cos 68°} = 50.720...$

x = 50.7 cm (1 d.p.)

Answer: x = 50.7 cm

8 Capture-recapture

100 deer in a lake are caught, tagged and returned to the lake.
Later, a sample of 30 deer is caught and 3 of them are tagged.
Estimate the total number of deer in the lake.

Proportion tagged in the sample = 3 ÷ 30
This is the same proportion as 100 out of the whole population
Population ≈ 100 × 30 ÷ 3 = 1000

Answer: 1000

9 Equation of a line

Line L has equation y = 4x + 1
Line M is parallel to line L and passes through the point (4, −5).
Find the equation of line M.

Parallel lines have the same gradient, so line M is y = 4x + c
Substitute x = 4 and y = −5: −5 = 4 × 4 + c
c = −5 − 16 = −21

Answer: y = 4x − 21

10 LCM problems

Two lights flash at 09:00.
One light flashes every 15 minutes.
The other light flashes every 18 minutes.
At what time do both lights next flash together?

Multiples of 15: 15, 30, 45, 60, 75, 90
Multiples of 18: 18, 36, 54, 72, 90
The first common multiple is 90, so the LCM is 90 minutes
09:00 + 90 minutes = 10:30

Answer: 10:30