Day 305 **B Tier 10-a-day: Model Solutions**

1 Fuel use

A car uses 50 litres of petrol to travel 500 km.
Work out how many kilometres it travels on each litre of petrol.

500 ÷ 50 = 10
Answer: 10 km per litre

2 Angles in triangles

The angles in a triangle are x°, 3x° and (x + 30)°.
(a) Work out the value of x.
(b) Work out the size of the largest angle.

(a) x + 3x + x + 30 = 180
5x + 30 = 180
5x = 150, so x = 30
(b) The angles are 30°, 90° and 60°
Answer: (a) x = 30 (b) 90°

3 Integer inequalities

x is an integer.
Write down the smallest value of x for which x > 2.1

The integers above 2.1 are 3, 4 ...
Answer: 3

4 HCF and LCM

Find the (a) highest common factor (HCF), (b) lowest common multiple (LCM) of 36 and 28.

$36 = 2^2 \times 3^2$ and $28 = 2^2 \times 7$
(a) HCF: multiply the primes in both lists, using the smaller power: $2^2 = 4$
(b) LCM: use the larger power of every prime: $2^2 \times 3^2 \times 7 = 252$
Answer: (a) 4 (b) 252

5 Trigonometry in context

Sam stands 30 m from the base of a church spire on level ground. (Calculator)
The angle of elevation of the top of the church spire is 25°.
Work out the height of the church spire.
Give your answer correct to 1 decimal place.

The distance is the adjacent side and the height is the opposite side
$\tan 25° = \frac{h}{30}$
h = 30 × tan 25° = 13.989...
h = 14.0 m (1 d.p.)
Answer: 14.0 m

6 Equation of a straight line graph

The diagram shows a straight line.
(a) Work out the gradient of the line.
(b) Find the equation of the line.

(a) The line crosses the y-axis at −1. Pick two points on the line and work out change in y divided by change in x
Gradient = −3
(b) The equation is y = mx + c with m = −3 and c = −1
Answer: (a) −3 (b) y = −3x − 1

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7 Circle theorems

A and B are points on a circle, centre O.
Angle AOB = 106°.
Work out the size of angle b.
Give a reason for your answer.
The diagram is not drawn accurately.

OA = OB because they are radii, so triangle OAB is isosceles
b = (180 − 106) ÷ 2 = 37
The base angles of an isosceles triangle are equal
Answer: b = 37°

8 Ordering fractions

Write these in order of size.
Start with the smallest.
$\frac{3}{8}$, 0.3, $\frac{1}{2}$, 65%

Write each as a decimal:
$\frac{3}{8}$ = 0.375, 0.3 = 0.3, $\frac{1}{2}$ = 0.5, 65% = 0.65

Order: 0.3, $\frac{3}{8}$, $\frac{1}{2}$, 65%

Answer: 0.3, $\frac{3}{8}$, $\frac{1}{2}$, 65%

9 Average speed

A cyclist travels at 40 km/h for 2 hours and then at 90 km/h for 3 hours.
Work out its average speed for the whole journey.

Distance: 40 × 2 = 80 km and 90 × 3 = 270 km
Total distance = 350 km and total time = 5 hours
Average speed = 350 ÷ 5 = 70
Answer: 70 km/h

10 Iteration

Here is an iteration formula.
$x_{n+1} = \sqrt{3x_n + 7}$
$x_0 = 6$
(a) Work out x_1
(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = \sqrt{3 \times 6 + 7} = \sqrt{25} = 5$
(b) $x_2 = \sqrt{3 \times 5 + 7} = \sqrt{22} = 4.69042...$
= 4.690
Answer: (a) 5 (b) 4.690