**Day 304** **B Tier 10-a-day: Model Solutions**

## 1 Factors and multiples

Write down all the common factors of 6 and 18.

Factors of 6: 1, 2, 3, 6
Factors of 18: 1, 2, 3, 6, 9, 18
The common factors are the numbers in both lists
**Answer: 1, 2, 3, 6**

## 2 Interior angles of regular polygons

Work out the sum of the interior angles of a polygon with 20 sides.

Sum = (n − 2) × 180°
(20 − 2) × 180 = 18 × 180 = 3240°
**Answer: 3240°**

## 3 Exchange rates

The exchange rate is £1 = $1.35. (Calculator)
(a) Change £80 to dollars.
(b) Change $162 to pounds (£).

(a) Multiply by 1.35: 80 × 1.35 = $108
(b) Divide by 1.35: 162 ÷ 1.35 = £120
**Answer: (a) $108 (b) £120**

## 4 Loci

A point P is always exactly 3 m from a sprinkler, L.
Describe the locus of the point P.

The points are all the same distance from L
This forms a circle
**Answer: A circle with centre L and radius 3 m**

## 5 Laws of indices

Write each answer as a single power of 5.
(a) $5^9 \times 5^7$
(b) $5^{16} \div 5^7$

(a) Add the powers: 9 + 7 = 16
(b) Subtract the powers: 16 − 7 = 9
**Answer: (a) $5^{16}$ (b) $5^9$**

## 6 Distance-time graphs

The graph shows Ella's journey.
(a) For how many minutes did Ella stop?
(b) Work out Ella's speed in the first 30 minutes. Give your answer in km/h.

(a) The horizontal section runs from 30 to 45 minutes: 15 minutes
(b) 4 km in 30 minutes = 0.5 hours
Speed = 4 ÷ 0.5 = 8 km/h
**Answer: (a) 15 minutes (b) 8 km/h**

## 7 Disproving statements

Ali says, "The value of $n^2 + n + 11$ is a prime number for every positive whole number n."
Show that Ali is wrong.

Try n = 1, 2, 3, ... and check each answer
When n = 10: $10^2 + 1 \times 10 + 11 = 121$
121 is not prime because it has other factors
**Answer: n = 10 gives 121, which is not prime**

**Day 304** **B Tier 10-a-day: Model Solutions**

## 8 Inverse proportion

6 gardeners take 8 days to clear a field.
All the gardeners work at the same rate.
How long would it take 3 gardeners?

The total work stays the same: 6 × 8 = 48 gardeners-days
With 3 gardeners: 48 ÷ 3 = 16 days
**Answer: 16 days**

## 9 Trial and improvement

The equation $x^3 + 3x = 17$ has a solution between 2 and 3. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 2.5: $2.5^3 + 3 \times 2.5 = 23.125$ (too big)
x = 2.2: $2.2^3 + 3 \times 2.2 = 17.248$ (too big)
x = 2.1: $2.1^3 + 3 \times 2.1 = 15.561$ (too small)
x = 2.15: value = 16.388 (too small), so the solution is above 2.15
So x = 2.2 to 1 decimal place
**Answer: x = 2.2**

## 10 Volume of cones and pyramids

A cone has base radius 9 cm and vertical height 6 cm.

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Work out the volume of the cone.
Give your answer in terms of $\pi$.

Volume = $\frac{1}{3} \times \pi \times 9^2 \times 6$

$= \frac{1}{3} \times \pi \times 81 \times 6 = 162\pi$

**Answer: $162\pi$ cm$^3$**