Day 297 **B Tier 10-a-day: Model Solutions**

1 Map scales

The scale of a map is 1 : 50,000.
Two towns are 12.5 cm apart on the map.
Work out the real distance between the towns.
Give your answer in kilometres.

12.5 × 50,000 = 625,000 cm
100 000 cm = 1 km, so divide by 100 000
= 6.25 km
Answer: 6.25 km

2 Rounding

Write 1544.9289
(a) correct to 2 decimal places,
(b) correct to 3 significant figures.

(a) Look at the next digit after the second decimal place: 8
So 1544.9289 rounds to 1544.93
(b) The first significant figure is the first non-zero digit. Count 3 figures and look at the next digit.
1544.9289 rounds to 1540
Answer: (a) 1544.93 (b) 1540

3 Fuel use

A car travels 18 km on each litre of petrol. (Calculator)
Petrol costs £1.60 per litre.
Work out the cost of the petrol for a journey of 360 km.

Litres needed = 360 ÷ 18 = 20
Cost = 20 × £1.60 = £32
Answer: £32

4 Types of number

Here is a list of numbers.
52, 9, 12, 63, 83, 97, 87, 21
From the list, write down
(a) a square number
(b) a factor of 60

(a) 9 (3 × 3) is a whole number multiplied by itself
(b) 12 (60 ÷ 12 = 5) divides exactly into 60
Answer: (a) 9 (b) 12

5 Difference of two squares

Factorise $n^2 - 81$

$81 = 9^2$, so this is a difference of two squares
$n^2 - 9^2 = (n - 9)(n + 9)$
Answer: $(n - 9)(n + 9)$

6 Trigonometry: finding an angle

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

We know the opposite (16 cm) and the hypotenuse (20 cm), so use sin

$\sin x = \frac{16}{20}$

$x = \sin^{-1}(\frac{16}{20}) = 53.130...$

x = 53.1° (1 d.p.)
Answer: x = 53.1°

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7 Compound percentages

The population of a town is 4500. (Calculator)
It increases by 2% each year.
Work out the population after 2 years.
Give your answer to the nearest whole number.

Multiplier = 1.02

Population = 4500×1.02^2
= 4681.80, which is 4682 to the nearest whole number
Answer: 4682

8 Combining ratios

In a bag of counters, the ratio of white to green is 5 : 7.
The ratio of green to blue is 1 : 4.
Write down the ratio white : green : blue.

Make the green part the same in both ratios: lowest common multiple of 7 and 1 is 7
white : green = 5 : 7
green : blue = 7 : 28
white : green : blue = 5 : 7 : 28
Answer: 5 : 7 : 28

9 Equations with fractions

Solve $\frac{x - 3}{2} = 2$

Multiply both sides by 2: $x - 3 = 4$
Add 3 to both sides
Answer: x = 7

10 Arc length and sector area

The diagram shows a sector of a circle with radius 8 cm and angle 270°. (Calculator)
Work out the area of the sector.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Sector area = $\frac{270}{360} \times \pi \times 8^2$

= 150.796... = 150.8 cm^2 (1 d.p.)
Answer: 150.8 cm^2