Day 31 **B Tier 10-a-day: Model Solutions**

1 Rounding

Write 27.4291
(a) correct to 2 decimal places,
(b) correct to 3 significant figures.

(a) Look at the next digit after the second decimal place: 9
So 27.4291 rounds to 27.43
(b) The first significant figure is the first non-zero digit. Count 3 figures and look at the next digit.
27.4291 rounds to 27.4
Answer: (a) 27.43 (b) 27.4

2 Circumference and area of a circle

The diagram shows a circle with diameter 18 mm.
Work out the circumference of the circle.
Give your answer in terms of π.
The diagram is not drawn accurately.

Circumference = $\pi \times$ diameter
$\pi \times 18 = 18\pi$
Answer: 18π mm

3 Laws of indices

Simplify fully
(a) $4t^9 \div 2t^5$
(b) $(a^2)^3$

(a) Divide the numbers: $4 \div 2 = 2$. Subtract the powers: $9 - 5 = 4$
(b) Multiply the powers: $2 \times 3 = 6$
Answer: (a) $2t^4$ (b) a^6

4 Map scales

The scale of a map is 1 : 25,000.
Two towns are 3 cm apart on the map.
Work out the real distance between the towns.
Give your answer in kilometres.

3 × 25,000 = 75,000 cm
100 000 cm = 1 km, so divide by 100 000
= 0.75 km
Answer: 0.75 km

5 Repeated percentage change

The price of a laptop is £60.
The price is first increased by 40%, then the new price is reduced by 10%.
(a) Work out the final price.
(b) Work out the overall percentage increase in the price.

(a) Multipliers: 1.4 and 0.9
60 × 1.4 × 0.9 = £75.60
(b) Overall multiplier = 1.26
Overall increase = 26%
Answer: (a) £75.60 (b) 26% increase

6 Inverse proportion

3 workers take 40 days to dig a trench.
All the workers work at the same rate.
How long would it take 8 workers?

The total work stays the same: 3 × 40 = 120 workers-days
With 8 workers: 120 ÷ 8 = 15 days
Answer: 15 days

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7 Similar shapes

The two triangles are similar.
(a) Write down the scale factor of the enlargement from the smaller triangle to the larger triangle.
(b) Work out the value of p.
The diagram is not drawn accurately.

(a) Scale factor = 16 ÷ 8 = 2
(b) p is on the smaller triangle, so divide: 18 ÷ 2 = 9
Answer: (a) 2 (b) p = 9 cm

8 Growth in standard form

There are 7.9×10^5 cells in a sample.
The number doubles every day.
How many are there after 3 days?
Give your answer in standard form.

Each day multiply by 2, so multiply by $2^3 = 8$
$7.9 \times 10^5 \times 8 = 63.2 \times 10^5$
In standard form: 6.32×10^6
Answer: 6.32×10^6

9 Iteration

Here is an iteration formula.
$x_{n+1} = \sqrt{5x_n + 1}$
$x_0 = 3$
(a) Work out x_1
(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = \sqrt{5 \times 3 + 1} = \sqrt{16} = 4$
(b) $x_2 = \sqrt{5 \times 4 + 1} = \sqrt{21} = 4.58258...$
= 4.583
Answer: (a) 4 (b) 4.583

10 Trigonometry: finding a side

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

Label the sides: a is the adjacent and 20 cm is the hypotenuse
We use cos (adjacent and hypotenuse)

$\cos 26° = \frac{a}{20}$

$a = 20 \times \cos 26° = 17.976...$
a = 18.0 cm (1 d.p.)
Answer: a = 18.0 cm