Day 97 **B Tier 10-a-day: Model Solutions**

1 Time

A train leaves at 11:43.
It arrives at 15:38.
How long does the journey take?

From 11:43 to 14:43 is 3 hours.
From 14:43 to 15:38 is 55 minutes.
Total time: 3 hours 55 minutes
Answer: 3 hours 55 minutes

2 Direct proportion

P is directly proportional to n.
When n = 10, P = 5.
Find the value of P when n = 9.

P = kn
5 = k × 10, so k = 5 ÷ 10 = 0.5
P = 0.5 × 9 = 4.5
Answer: P = 4.5

3 Forming equations

I think of a number.
I multiply it by 2 and then subtract 4.
The answer is 10.
Work out my number.

Let the number be n: $2n - 4 = 10$
Add 4: $2n = 14$
Divide by 2
Answer: 7

4 Volume of a cylinder

A tin of beans has radius 9 m and height 14 m. (Calculator)
Work out its volume.
Give your answer correct to 1 decimal place.

Volume = $\pi \times \text{radius}^2 \times \text{height}$
$\pi \times 9^2 \times 14 = 3562.566...$
$= 3562.6\ \text{m}^3$ (1 d.p.)
Answer: 3562.6 m^3

5 Perimeter expressions

A triangle has sides of length (2x + 4) cm, (x − 2) cm and (3x + 3) cm.
Write down an expression, in terms of x, for the perimeter of the triangle.
Give your answer in its simplest form.

Add the three sides: (2x + 4) + (x − 2) + (3x + 3)
x terms: 2x + x + 3x = 6x. Numbers: 4 − 2 + 3 = 5
Answer: 6x + 5 cm

6 Significant figures

Work out the value of this expression. (Calculator)
$\sqrt{8^2 + 3^2}$
Give your answer correct to 3 significant figures.

Use a calculator: the full display is 8.544004...
Round to 3 significant figures: 8.54
Answer: 8.54

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7 Compound shapes with semicircles

A shape is made from a rectangle and a semicircle. (Calculator)
The rectangle is 20 cm wide and 18 cm high.
The diameter of the semicircle is 20 cm.
(a) Work out the area of the shape.
(b) Work out the perimeter of the shape.
Give each answer correct to 1 decimal place.

(a) Rectangle: $20 \times 18 = 360$
Semicircle: $\frac{1}{2} \times \pi \times 10^2 = 157.080...$
Total = 517.1 cm^2
(b) Curved edge: $\frac{1}{2} \times \pi \times 20 = 31.416...$
Straight edges: $20 + 18 + 18 = 56$
Total = 87.4 cm

Answer: (a) 517.1 cm^2 (b) 87.4 cm

8 Venn diagrams

The Venn diagram shows information about 28 pupils in Year 9.
One of them is chosen at random.
Find the probability that the person chose neither French nor Spanish.

Outside both circles = 7
Total = 28
P = 7 out of 28

Answer: $\frac{1}{4}$

9 Surface area of a cylinder

A drum has radius 7 m and height 5 m. (Calculator)
It is closed.
Work out the total outside surface area.
Give your answer correct to 1 decimal place.

Two circles: $2 \times \pi \times 7^2 = 98\pi$
Curved surface: $2 \times \pi \times 7 \times 5 = 70\pi$
Total = $98\pi + 70\pi = 168\pi$
= 527.8 m^2 (1 d.p.)

Answer: 527.8 m^2

10 Expanding double brackets

Expand and simplify $(x - 6)(x + 5)$

Multiply every term in the first bracket by every term in the second:
$x^2 + 5x - 6x - 30$
Collect the x terms: $x^2 - x - 30$

Answer: $x^2 - x - 30$