Day 256 **A Tier 10-a-day: Model Solutions**

1 Rounding

(a) Write 0.0077657 correct to 3 significant figures.
(b) Write 52.345 correct to 2 decimal places.

(a) Count 3 significant figures and look at the next digit: 0.0077657 rounds to 0.00777
(b) Look at the digit after decimal place 2: 52.345 rounds to 52.35
Answer: (a) 0.00777 (b) 52.35

2 Converting units of area and volume

Convert 1200 mm^2 into cm^2.

1 cm = 10 mm, so 1 cm^2 = 10 × 10 = 100 mm^2
1200 ÷ 100 = 12
Answer: 12 cm^2

3 Pressure

A machine exerts a force of 120 N on the floor.
The area in contact with the floor is 2 m^2.
Work out the pressure on the floor in N/m^2.

Pressure = force ÷ area
= 120 ÷ 2 = 60
Answer: 60 N/m^2

4 Difference of two squares

(a) Factorise $x^2 - 9$
(b) Use the same idea to work out $66^2 - 34^2$ without a calculator.

(a) Difference of two squares: $x^2 - 9 = x^2 - 3^2$
$(x - 3)(x + 3)$
(b) $a^2 - b^2 = (a + b)(a - b)$, so $66^2 - 34^2 = (66 + 34)(66 - 34)$
= 100 × 32 = 3200
Answer: (a) $(x - 3)(x + 3)$ (b) 3200

5 Pythagoras' theorem

Work out the length of x. (Calculator)
Give your answer to 3 significant figures.
The diagram is not drawn accurately.

$17^2 = x^2 + 5^2$
$x^2 = 289 - 25 = 264$
$x = \sqrt{264} = 16.2$
Answer: x = 16.2 mm

6 Successive percentage changes

The price of a games console is increased by 50%.
The new price is then increased by 25%.
Work out the overall percentage change.

First change: multiplier 1.5. Second change: multiplier 1.25
Overall multiplier = 1.5 × 1.25 = 1.875
1.875 − 1 = 0.875, so the overall change is 87.5%
Answer: 87.5% increase

Day 256 **A Tier 10-a-day: Model Solutions**

7 Area of a segment

The diagram shows a circle with centre O and radius 12 cm.
Angle AOB = 80°. (Calculator)
Work out the area of the shaded segment.
Give your answer to 3 significant figures.

Area of sector = $\frac{80}{360} \times \pi \times 12^2 = 100.53$

Area of triangle OAB = $\frac{1}{2} \times 12 \times 12 \times \sin 80° = 70.906$

Segment = 100.53 − 70.906 = 29.6

Answer: 29.6 cm^2

8 Equations with algebraic fractions

Solve $\frac{6}{(x+3)} + \frac{2}{(x-5)} = 1$

Multiply every term by $(x + 3)(x - 5)$
$6(x - 5) + 2(x + 3) = (x + 3)(x - 5)$
$8x - 24 = x^2 - 2x - 15$
$x^2 - 10x + 9 = 0$
$(x - 1)(x - 9) = 0$
$x = 1$ or $x = 9$
Answer: x = 1 or x = 9

9 Adding and subtracting in standard form

Work out $(5.6 \times 10^6) + (9.1 \times 10^3)$
Give your answer in standard form.

Write both numbers using 10^3: $5.6 \times 10^6 = 5600 \times 10^3$
$(5600 + 9.1) \times 10^3 = 5609.1 \times 10^3$
In standard form: 5.6091×10^6
Answer: 5.6091×10^6

10 Rearranging formulae (subject twice)

Make x the subject of $y = \frac{4x + 5}{3x - 4}$

Multiply both sides by $(3x - 4)$: $y(3x - 4) = 4x + 5$
Expand the bracket: $3xy - 4y = 4x + 5$
Collect the x terms on one side: $3xy - 4x = 4y + 5$
Factorise: $x(3y - 4) = 4y + 5$
Divide by $(3y - 4)$: $x = \frac{4y + 5}{3y - 4}$

Answer: $x = \frac{4y + 5}{3y - 4}$