Day 63 **B Tier 10-a-day: Model Solutions**

1 Pythagoras' theorem

Calculate the length of x.
The diagram is not drawn accurately.

Use Pythagoras: $a^2 + b^2 = c^2$
$x^2 = 12^2 + 16^2 = 144 + 256 = 400$
$x = \sqrt{400} = 20$
Answer: x = 20 mm

2 Simplifying expressions

Simplify fully
(a) $3x \times 4x$
(b) $20mn \div 4m$

(a) $3 \times 4 = 12$ and $x \times x = x^2$
(b) Divide the numbers: $20 \div 4 = 5$. The m cancels, leaving 5n
Answer: (a) $12x^2$ (b) 5n

3 Symmetry

(a) Write down the number of lines of symmetry of a regular nonagon.
(b) Write down the order of rotational symmetry of a regular nonagon.

A regular nonagon has 9 lines of symmetry
A regular nonagon looks the same 9 times in a full turn, so the order of rotational symmetry is 9
Answer: (a) 9 (b) 9

4 Scatter graphs

The scatter graph shows information about hours revising and test mark.
A line of best fit is drawn.
(a) Describe the correlation.
(b) Use the line of best fit to estimate the test mark when hours revising is 4.

(a) As one variable goes up, the other goes up
This is positive correlation
(b) Go up from 4 on the horizontal axis to the line, then across to the vertical axis
The reading is about 58
Answer: (a) Positive correlation (b) about 58

5 Substitution into formulae

$y = 3x^2 + 5x - 8$
Work out the value of y when $x = -2$

$y = 3 \times (-2)^2 + 5 \times (-2) + (-8)$
$y = 12 + (-10) + (-8) = -6$
Answer: y = −6

6 Distance, speed and time

A bus travels 168 km at an average speed of 48 km/h.
How long does the journey take?
Give your answer in hours and minutes.

Time = distance ÷ speed
168 ÷ 48 = 3.5 hours
3.5 hours = 3 hours 30 minutes
Answer: 3 hours 30 minutes

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7 Reverse percentages

In a sale, all prices are reduced by 30%. (Calculator)
A jacket costs £210 in the sale.
Work out the original price of the jacket.

The sale price is 100% − 30% = 70% of the original price.
70% = £210, so 1% = £210 ÷ 70 = £3
100% = £3 × 100 = £300
Answer: £300

8 Simultaneous equations problem

A theme park sells adult tickets and child tickets.
1 adult ticket and 3 child tickets cost £22.
2 adult tickets and 3 child tickets cost £32.
Work out the cost of one adult ticket and the cost of one child ticket.

Let a = cost of one adult ticket and b = cost of one child ticket
1a + 3b = 22 and 2a + 3b = 32
Subtract: 1a = 32 − 22 = 10, so a = 10
Substitute: 1 × 10 + 3b = 22, so 3b = 12 and b = 4
Answer: One adult ticket costs £10 and one child ticket costs £4

9 Circumference and area of a circle

The diagram shows a circle with diameter 16 m. (Calculator)
Work out the area of the circle.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Area = $\pi \times \text{radius}^2$
Radius = 16 ÷ 2 = 8
$\pi \times 8^2 = 201.062...$
= 201.1 m^2 (1 d.p.)
Answer: 201.1 m^2

10 Bounds

The length of a rectangle is 19 cm and its width is 30 cm.
Both measurements are correct to the nearest cm.
Work out the lower bound for the area of the rectangle.

Lower bound of each side = value − 0.5: 18.5 cm and 29.5 cm
Area = 18.5 × 29.5 = 545.75 cm^2
Answer: 545.75 cm^2