Day 165 **A Tier 10-a-day: Model Solutions**

1 Surface area of a cuboid

A cuboid has length 14 cm and width 10 cm.
Its total surface area is 424 cm^2.
Work out the height of the cuboid.

$2 \times (14 \times 10 + 14\,h + 10\,h) = 424$
$140 + 24h = 212$
$24h = 72$
$h = 72 \div 24 = 3$
Answer: 3 cm

2 Speed, distance and time

A cyclist rides 75 km at 30 km/h.
Work out the time taken. Give your answer in hours and minutes.

Time = distance ÷ speed = 75 ÷ 30 = 2.5 hours
2.5 hours = 2 hours 30 minutes
Answer: 2 hours 30 minutes

3 Angles in parallel lines

The diagram shows two parallel lines crossed by a straight line.
(a) Work out the value of x.
(b) Work out the size of the angle marked (3x + 10)°.
The diagram is not drawn accurately.

(a) Alternate angles are equal
$3x + 10 = 5x - 46$
$2x = 56$
$x = 28$
(b) $3 \times 28 + 10 = 94$
Answer: (a) x = 28 (b) 94°

4 nth term of a linear sequence

Here are the first four terms of a sequence.
9, 16, 23, 30
(a) Find an expression for the nth term.
(b) Is 262 a term of this sequence? You must show your working.

The terms go up by 7 each time, so the nth term starts with 7n
9 − 7 = 2, so the nth term is 7n + 2
(b) 7n + 2 = 262
$7n = 260$, so $n = \frac{260}{7}$
n is not a positive whole number, so 262 is not a term of the sequence
Answer: (a) 7n + 2 (b) No

5 Tree diagrams

The tree diagram shows probabilities for two events.
(a) Work out the values of p and q.
(b) Work out the probability of rain and late.

(a) Probabilities on pairs of branches add up to 1.
p = 1 − 0.7 = 0.3 and q = 1 − 0.3 = 0.7
(b) $0.3 \times 0.7 = 0.21$
Answer: (a) p = 0.3, q = 0.7 (b) 0.21

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6 Quadratic graph from its roots

The diagram shows the graph of $y = -x^2 + bx + c$.
Find the value of b and the value of c.

The curve crosses the x-axis at $x = -2$ and $x = 3$
So $y = -(x + 2)(x - 3)$
Expand: $y = -x^2 + x + 6$
$b = 1$ and $c = 6$
Answer: b = 1, c = 6

7 Percentage change

The price of a games console changes from £200 to £290.
Work out the percentage increase.

Increase = £290.00 − £200.00 = £90.00

Percentage increase = $\frac{£90.00}{£200.00} \times 100 = 45\%$

Answer: 45%

8 Expanding with surds

Expand and simplify $(6 - 3\sqrt{5})^2$
Give your answer in the form $a + b\sqrt{c}$

$(6 - 3\sqrt{5})(6 - 3\sqrt{5}) = 36 - 18\sqrt{5} - 18\sqrt{5} + 45$
Collect: $81 - 36\sqrt{5}$
Answer: $81 - 36\sqrt{5}$

9 Enlargements and coordinates

Shape A has an area of 8 cm^2.
Shape A is enlarged by scale factor 4 to give shape B.
Work out the area of shape B.

Area scale factor = $(4)^2 = 16$
Area of B = 8 × 16 = 128
Answer: 128 cm^2

10 Finding a rate of compound change

Tom invests £19,500 in a savings account. (Calculator)
Compound interest is paid at a fixed rate each year.
After 2 years the investment is worth £28,080.
Work out the annual rate of interest.

Overall multiplier = £28,080 ÷ £19,500 = 1.44
Take the square root: $\sqrt{1.44} = 1.2$
Rate = (1.2 − 1) × 100 = 20%
Answer: 20%