Day 296 **B Tier 10-a-day: Model Solutions**

1 Order of operations

Work out
(a) $(7 + 12) \times 3 - 9$
(b) $12 + 3 \times 2^2$

(a) Brackets first: $7 + 12 = 19$
Multiply: $19 \times 3 = 57$
Subtract: $57 - 9 = 48$
(b) Powers first: $2^2 = 4$
Then multiply: $3 \times 4 = 12$
Then add: $12 + 12 = 24$
Answer: (a) 48 (b) 24

2 Substitution with negative numbers

Work out the value of $5a + 6b$
when $a = -6$ and $b = 6$

Substitute: $5 \times (-6) + 6 \times 6$
$-30 + 36 = 6$
Answer: 6

3 Percentage increase and decrease

A bike costs £300. In a sale the price is reduced by 35%.
(a) Work out the new price.
(b) A car is worth £6000. Its value goes down by 12% in a year. Work out its new value.

(a) The multiplier is 0.65, so new price = £300 × 0.65 = £195
(b) The multiplier is 0.88, so new value = £6000 × 0.88 = £5280
Answer: (a) £195 (b) £5280

4 Inequalities on a number line

(a) Write down the inequality shown on the number line.
(b) Write down all the integers that satisfy the inequality.

(a) The circle at -2 is filled in and the circle at 0 is filled in
$-2 \leq x \leq 0$
(b) The whole numbers on the shaded part: -2, -1, 0
Answer: (a) $-2 \leq x \leq 0$ (b) -2, -1, 0

5 Factors and multiples

Write down all the common factors of 9 and 15.

Factors of 9: 1, 3, 9
Factors of 15: 1, 3, 5, 15
The common factors are the numbers in both lists
Answer: 1, 3

6 Surface area of cuboids

A cube has side length 2 cm.
Work out the total surface area of the cube.

A cube has 6 identical square faces
Area of one face = $2 \times 2 = 4$
$6 \times 4 = 24$
Answer: 24 cm^2

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7 Mode and median from a table

The table shows the pets owned by each student in a class.
(a) Write down the mode.
(b) Work out the median.

(a) The highest frequency is 10, for 3
(b) Total frequency = 27, so the median is the number 14 value
Running totals of frequency: 6, 16, 21, 27
The median is 3
Answer: (a) 3 (b) 3

8 Simultaneous equations

Solve the simultaneous equations
$x + 3y = -6$
$4x - 6y = 30$

Multiply the first equation by 2: $2x + 6y = -12$
The y terms have opposite signs, so add the equations: $6x = 18$
$x = 3$
Substitute $x = 3$ into the first equation: $3y = -6 - 3 = -9$
$y = -3$
Answer: $x = 3$, $y = -3$

9 Speed unit conversion

A kite flies at 40 metres per second.
Work out this speed in kilometres per hour.

In 1 hour (3600 s) it travels $40 \times 3600 = 144{,}000$ m
144,000 m = 144 km
Answer: 144 km/h

10 Enlargement

A rectangle is 4 cm long and 8 cm wide.
It is enlarged by scale factor 2.5.
(a) Write down the length and width of the enlarged rectangle.
(b) Work out the perimeter of the enlarged rectangle.

(a) $4 \times 2.5 = 10$ and $8 \times 2.5 = 20$
(b) Perimeter $= 2 \times (10 + 20) = 60$
Answer: (a) 10 cm by 20 cm (b) 60 cm