Day 332 **B Tier 10-a-day: Model Solutions**

1 Area of 2D shapes

Work out the area of the parallelogram.
The diagram is not drawn accurately.

Area of a parallelogram = base × perpendicular height
The slanting side is not needed
15 × 8 = 120
Answer: 120 cm^2

2 Median and range

Here are the temperatures at noon in a town.
9, 9, 16, 18, 26, 22, 12, 7, 29
(a) Find the median.
(b) Work out the range.

(a) Put in order: 7, 9, 9, 12, 16, 18, 22, 26, 29
The middle value is number 5: 16
(b) Range = largest − smallest = 29 − 7 = 22
Answer: (a) 16 (b) 22

3 Volume of cuboids

A box is a cuboid measuring 18 cm by 15 cm by 12 cm.
Small cubes of side 3 cm are packed into the box.
How many small cubes fit in the box with no gaps?

Along the length: 18 ÷ 3 = 6
Along the width: 15 ÷ 3 = 5
Along the height: 12 ÷ 3 = 4
6 × 5 × 4 = 120
Answer: 120 cubes

4 Using the nth term

The nth term of a sequence is 6n − 2
(a) Work out the 9th term.
(b) Is 103 a term in the sequence? You must show how you get your answer.

(a) Replace n with 9: 6 × 9 − 2 = 52
(b) Solve 6n − 2 = 103: 6n = 105
n = 105 ÷ 6 = 17.5, which is not a whole number, so 103 is not in the sequence
Answer: (a) 52 (b) No, n is not a whole number

5 Mixed numbers

Work out $2\frac{3}{8} - 1\frac{1}{2}$

Give your answer as a fraction in its simplest form.

Write as improper fractions: $\frac{19}{8} - \frac{3}{2}$

Common denominator 8: $\frac{19}{8} - \frac{12}{8} = \frac{7}{8}$

As a mixed number: $\frac{7}{8}$

Answer: $\frac{7}{8}$

6 Midpoint of a line segment

A is the point (3, 9) and B is the point (7, −1).
Find the coordinates of the midpoint of AB.

Add the x-coordinates and halve: (3 + 7) ÷ 2 = 5
Add the y-coordinates and halve: (9 − 1) ÷ 2 = 4
Answer: (5, 4)

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7 Combining ratios

In a bag of counters, the ratio of green to white is 1 : 4.
The ratio of white to blue is 1 : 8.
Write down the ratio green : white : blue.

Make the white part the same in both ratios: lowest common multiple of 4 and 1 is 4
green : white = 1 : 4
white : blue = 4 : 32
green : white : blue = 1 : 4 : 32
Answer: 1 : 4 : 32

8 Fraction problems

A water tank is $\frac{2}{5}$ full.

38 litres of water are added.

The water tank is now $\frac{3}{5}$ full.

Work out the capacity of the water tank.

Fraction added = $\frac{3}{5} - \frac{2}{5} = \frac{1}{5}$

$\frac{1}{5}$ of the capacity = 38 litres
Whole capacity = 38 × 5 = 190 litres
Answer: 190 litres

9 Midpoint and length of a line

A is the point (4, 1) and B is the point (0, −2).
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB.

(a) Midpoint = (4 ÷ 2, −1 ÷ 2) = (2, −0.5)
(b) Horizontal distance = 4, vertical distance = 3
$AB^2 = 4^2 + 3^2 = 16 + 9 = 25$
$AB = \sqrt{25} = 5$
Answer: (a) (2, −0.5) (b) 5

10 Quadratic equation problem

A rectangle has length (x + 5) cm and width (x − 1) cm.
The area of the rectangle is 91 cm^2.
(a) Show that $x^2 + 4x - 96 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: (x + 5)(x − 1) = 91
Expand: $x^2 + 4x - 5 = 91$
Subtract 91 from both sides: $x^2 + 4x - 96 = 0$
(b) Factorise: (x − 8)(x + 12) = 0, so x = 8 or x = −12
A length cannot be negative, so x = 8. Length = 8 + 5 = 13
Answer: (b) 13 cm