Day 204 **B Tier 10-a-day: Model Solutions**

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

2 Powers and roots

Work out
(a) $8^2 + 3^3$
(b) $\sqrt{81} - 4^2$

(a) $8^2 = 64$ and $3^3 = 27$, so $64 + 27 = 91$
(b) $\sqrt{81} = 9$ and $4^2 = 16$, so $9 - 16 = -7$
Answer: (a) 91 (b) -7

3 Mean from a frequency table

The table shows the books read by each member of a club in a month.
Work out the mean.

Multiply each value by its frequency and add: $0 \times 7 + 1 \times 2 + 2 \times 1 + 3 \times 8 + 4 \times 2 = 36$
Total frequency = $7 + 2 + 1 + 8 + 2 = 20$
Mean = $36 \div 20 = 1.8$
Answer: 1.8

4 Gradient and intercept

A straight line has equation $y = 4x + 6$
(a) Write down the gradient of the line.
(b) Write down the equation of a line that is parallel to this line and passes through the point (0, 7).

(a) The line is in the form $y = mx + c$, so the gradient m is the number in front of x
(b) Parallel lines have the same gradient, 4
It crosses the y-axis at 7, so c = 7
Answer: (a) 4 (b) $y = 4x + 7$

5 Surface area of cuboids

An open box (no lid) is a cuboid measuring 10 cm by 9 cm by 5 cm.
The base is 10 cm by 9 cm.
Work out the total area of card needed to make the box.

Base: $10 \times 9 = 90$
Two long sides: $2 \times 10 \times 5 = 100$
Two short sides: $2 \times 9 \times 5 = 90$
$90 + 100 + 90 = 280$
Answer: 280 cm^2

6 Changing the subject

Make m the subject of the formula
$T = 6m + 4$

Subtract 4 from both sides: $T - 4 = 6m$
Divide both sides by 6
Answer: $m = \frac{T - 4}{6}$

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7 Population density

City E has a population density of 40 people per km^2.
Its area is 25 km^2.
Work out its population.

Population = density × area
40 × 25 = 1,000
Answer: 1,000

8 Fraction problems

A storage tank is $\frac{1}{4}$ full.
112 litres of oil are added.
The storage tank is now $\frac{3}{5}$ full.
Work out the capacity of the storage tank.

Fraction added = $\frac{3}{5} - \frac{1}{4} = \frac{7}{20}$

$\frac{7}{20}$ of the capacity = 112 litres

$\frac{1}{20}$ of the capacity = 112 ÷ 7 = 16 litres
Whole capacity = 16 × 20 = 320 litres
Answer: 320 litres

9 Area of a triangle using sine

In triangle PQR, PQ = 8 cm, QR = 19 cm and angle PQR = 75°. (Calculator)
Work out the area of the triangle.
Give your answer correct to 1 decimal place.

Area = ½ab sin C
Area = ½ × 8 × 19 × sin 75°
= 73.410...
= 73.4 cm^2 (1 d.p.)
Answer: 73.4 cm^2

10 Trigonometry: finding a side

Calculate the length of t. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: t is the hypotenuse and 20 cm is the adjacent
We use cos (adjacent and hypotenuse)

$\cos 35° = \frac{20}{t}$

$t = \frac{20}{\cos 35°} = 24.415...$

t = 24.4 cm (1 d.p.)
Answer: t = 24.4 cm