**Day 344** **B Tier 10-a-day: Model Solutions**

## 1 Types of number

Here is a list of numbers.
71, 93, 14, 80, 50, 41, 62, 24
From the list, write down
(a) a multiple of 7
(b) an odd number that is not prime

(a) 14 (7 × 2) is in the 7 times table
(b) 93 is odd but has more than two factors
**Answer: (a) 14 (b) 93**

## 2 Ratio, one part known

The ratio of cats to dogs among the pets at a rescue centre is 9 : 7.
There are 36 cats.
How many dogs are there?

9 parts = 36 cats
1 part = 36 ÷ 9 = 4
dogs: 7 × 4 = 28
**Answer: 28**

## 3 Angles in quadrilaterals

PQRS is a parallelogram.
Angle SPQ = 50°.
(a) Write down the size of angle QRS.
(b) Work out the size of angle PQR.

(a) Opposite angles are equal, so angle QRS = 50°
(b) Angles next to each other add up to 180°
180 − 50 = 130
**Answer: (a) 50° (b) 130°**

## 4 Decimal calculations

Work out
(a) 0.095 ÷ 0.05
(b) 19 ÷ 0.5

(a) Multiply both numbers by 100: 9.5 ÷ 5
9.5 ÷ 5 = 1.9
(b) Dividing by 0.5 is the same as multiplying by 2: 19 × 2 = 38
**Answer: (a) 1.9 (b) 38**

## 5 Density

A bar of lead has a mass of 904 g and a volume of 80 $cm^3$.
Work out its density.
Give your answer in $g/cm^3$.

Density = mass ÷ volume
904 ÷ 80 = 11.3
**Answer: 11.3 $g/cm^3$**

## 6 Function notation

$g(x) = 3x^2 + 1$
(a) Work out g(3)
(b) Work out g(−1)

(a) $g(3) = 3 \times 3^2 + 1 = 28$
(b) $g(-1) = 3 \times (-1)^2 + 1 = 4$
**Answer: (a) 28 (b) 4**

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## 7 Trigonometry in context

A tower is 17 m tall. (Calculator)
Mia stands 29 m from the base of the tower on level ground.
Work out the angle of elevation of the top of the tower from Mia.
Give your answer correct to 1 decimal place.

The height is the opposite side and the distance is the adjacent side

$\tan\theta = \frac{17}{29}$

$\theta = \tan^{-1}(\frac{17}{29}) = 30.379...$

$\theta = 30.4°$ (1 d.p.)

**Answer: 30.4°**

## 8 Population density

Village C has a population density of 150 people per $km^2$.
Its area is 10 $km^2$.
Work out its population.

Population = density × area
150 × 10 = 1,500
**Answer: 1,500**

## 9 Gradient of a line

Work out the gradient of the straight line that passes through the points $(-4, 4)$ and $(-1, 3)$.

$\text{Gradient} = \frac{\text{change in y}}{\text{change in x}}$

Change in y = $3 - 4 = -1$
Change in x = $-1 - (-4) = 3$

$\text{Gradient} = \frac{-1}{3} = -\frac{1}{3}$

**Answer:** $\mathbf{-\frac{1}{3}}$

## 10 Quadratic equation problem

A rectangle has length (x + 4) cm and width (x − 1) cm.
The area of the rectangle is 14 $cm^2$.
(a) Show that $x^2 + 3x - 18 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: $(x + 4)(x - 1) = 14$
Expand: $x^2 + 3x - 4 = 14$
Subtract 14 from both sides: $x^2 + 3x - 18 = 0$
(b) Factorise: $(x - 3)(x + 6) = 0$, so $x = 3$ or $x = -6$
A length cannot be negative, so x = 3. Length = 3 + 4 = 7
**Answer: (b) 7 cm**