Day 60 **B Tier 10-a-day: Model Solutions**

1 Bearings

A boat travels on a bearing of 270°.
It then turns right through 50° and continues in a straight line.
Work out the new bearing.

Turning right means adding 50°
270 + 50 = 320
Answer: 320°

2 Forming and solving equations

A triangle has sides of length x cm, (x + 3) cm and (2x − 2) cm.
The perimeter of the triangle is 29 cm.
(a) Work out the value of x.
(b) Work out the length of the longest side.

(a) x + (x + 3) + (2x − 2) = 29
4x + 1 = 29
4x = 28, so x = 7
(b) The sides are 7 cm, 10 cm and 12 cm
Answer: (a) x = 7 (b) 12 cm

3 Column vectors

$\mathbf{a} = \begin{pmatrix} -1 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}$

Work out
(a) $2\mathbf{a} + \mathbf{b}$
(b) $3\mathbf{a} - 2\mathbf{b}$

(a) $\begin{pmatrix} -2 \\ 6 \end{pmatrix} + \begin{pmatrix} -2 \\ 4 \end{pmatrix} = \begin{pmatrix} -4 \\ 10 \end{pmatrix}$

(b) $\begin{pmatrix} -3 \\ 9 \end{pmatrix} - \begin{pmatrix} -4 \\ 8 \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$

Answer: (a) $\begin{pmatrix} \mathbf{-4} \\ \mathbf{10} \end{pmatrix}$ **(b)** $\begin{pmatrix} \mathbf{1} \\ \mathbf{1} \end{pmatrix}$

4 Points on a line

The point (1, k) lies on the line y = 2x − 3
Work out the value of k.

Substitute x = 1: k = 2 × 1 − 3
k = −1
Answer: k = −1

5 Mean from a frequency table

The table shows the shoe sizes of students in a class.
Work out the mean.

Multiply each value by its frequency and add: 5 × 7 + 6 × 2 + 7 × 4 + 8 × 6 + 9 × 5 = 168
Total frequency = 7 + 2 + 4 + 6 + 5 = 24
Mean = 168 ÷ 24 = 7
Answer: 7

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6 Standard form

Write each number as an ordinary number.

(a) 6.6×10^6

(b) 4.8×10^{-4}

(a) Multiply by 10, 6 times: move the decimal point 6 places right

$6.6 \times 10^6 = 6{,}600{,}000$

(b) $10^{-4} = 0.0001$, so move the decimal point 4 places left

$4.8 \times 10^{-4} = 0.00048$

Answer: (a) 6,600,000 (b) 0.00048

7 Surface area of a cylinder

A cylinder has radius 2 cm and height 13 cm.
It is open at one end (no lid).
Work out the total outside surface area.
Give your answer in terms of π.

One circle: $\pi \times 2^2 = 4\pi$

Curved surface: $2 \times \pi \times 2 \times 13 = 52\pi$

Total = $4\pi + 52\pi = 56\pi$

Answer: 56π cm^2

8 Compound interest

£2,500 is invested for 2 years at 5% compound interest per year. (Calculator)
Work out the total interest earned.

Multiplier = 1.05

Value after 2 years = $2{,}500 \times 1.05^2 = £2{,}756.25$

Interest = £2,756.25 − £2,500 = £256.25

Answer: £256.25

9 Adding fractions

Work out

(a) $\frac{1}{10} + \frac{1}{4}$

(b) $\frac{11}{12} - \frac{7}{8}$

Give each answer in its simplest form.

(a) Common denominator 20: $\frac{2}{20} + \frac{5}{20} = \frac{7}{20}$

(b) Common denominator 24: $\frac{22}{24} - \frac{21}{24} = \frac{1}{24}$

Answer: (a) $\frac{7}{20}$ (b) $\frac{1}{24}$

10 Real-life graphs

A plumber charges a call-out fee plus a cost for each hour of work.
The graph shows the total cost.
(a) Write down the fixed charge.
(b) Work out the cost for each hour.

(a) The fixed charge is the cost when nothing has been used, where the line meets the vertical axis

(b) Take two points on the line, for example (0, 7) and (4, 19)

Cost for each hour = (19 − 7) ÷ 4 = 3

Answer: (a) £7 (b) £3