Day 285 **B Tier 10-a-day: Model Solutions**

1 Solving equations

Solve $a + 4 = 15$

Subtract 4 from both sides

Answer: $a = 11$

2 Rounding

Write 2116.8251

(a) correct to 1 decimal place,

(b) correct to 2 significant figures.

(a) Look at the next digit after the first decimal place: 2

So 2116.8251 rounds to 2116.8

(b) The first significant figure is the first non-zero digit. Count 2 figures and look at the next digit.

2116.8251 rounds to 2100

Answer: (a) 2116.8 (b) 2100

3 Column vectors

$\mathbf{a} = \begin{pmatrix} -5 \\ 3 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} 3 \\ 5 \end{pmatrix}$

Work out

(a) $\mathbf{a} - \mathbf{b}$

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

(a) $\begin{pmatrix} -5 \\ 3 \end{pmatrix} - \begin{pmatrix} 3 \\ 5 \end{pmatrix} = \begin{pmatrix} -8 \\ -2 \end{pmatrix}$

(b) $\begin{pmatrix} -15 \\ 9 \end{pmatrix} + \begin{pmatrix} 6 \\ 10 \end{pmatrix} = \begin{pmatrix} -9 \\ 19 \end{pmatrix}$

Answer: (a) $\begin{pmatrix} \mathbf{-8} \\ \mathbf{-2} \end{pmatrix}$ (b) $\begin{pmatrix} \mathbf{-9} \\ \mathbf{19} \end{pmatrix}$

4 Percentage as a fraction of

(a) Priya scores 10 out of 25 in a test. Write this as a percentage.

(b) Write 80p as a percentage of £4.

(a) $\frac{10}{25} \times 100 = 40\%$

(b) Change both to pence: 80p and 400p

$\frac{80}{400} \times 100 = 20\%$

Answer: (a) 40% (b) 20%

5 Surface area of cuboids

A cube has side length 3 cm.

Work out the total surface area of the cube.

A cube has 6 identical square faces

Area of one face = $3 \times 3 = 9$

$6 \times 9 = 54$

Answer: 54 $\mathbf{cm^2}$

6 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 (6, 19)

Cost for each hour = $(19 - 7) \div 6 = 2$

Answer: (a) £7 (b) £2

Day 285 **B Tier 10-a-day: Model Solutions**

7 Density

A bar of lead has a density of 11.3 g/cm^3 and a mass of 678 g.
Work out its volume.

Volume = mass ÷ density
678 ÷ 11.3 = 60
Answer: 60 cm^3

8 Laws of indices

Write each answer as a single power of 2.
(a) $(2^2)^3$
(b) $2^6 \times 2^3 \div 2^3$

(a) Multiply the powers: 2 × 3 = 6
(b) Add then subtract: 6 + 3 − 3 = 6
Answer: (a) 2^6 (b) 2^6

9 Trial and improvement

The equation $x^3 + 2x = 113$ has a solution between 4 and 5. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 4.5: $4.5^3 + 2 \times 4.5 = 100.125$ (too small)
x = 4.7: $4.7^3 + 2 \times 4.7 = 113.223$ (too big)
x = 4.6: $4.6^3 + 2 \times 4.6 = 106.536$ (too small)
x = 4.65: value = 109.845 (too small), so the solution is above 4.65
So x = 4.7 to 1 decimal place
Answer: x = 4.7

10 Tree diagrams

A bag contains 7 green beads and 3 yellow beads.
Gita takes one at random, replaces it, then takes a second.
Work out the probability that the two are the same colour.

P(both green) = $\frac{49}{100}$

P(both yellow) = $\frac{9}{100}$

Add: $\frac{49}{100} + \frac{9}{100} = \frac{29}{50}$

Answer: $\frac{29}{50}$