Day 180 **B Tier 10-a-day: Model Solutions**

1 Angles in triangles

Triangle XYZ is isosceles with XY = XZ.
Angle XYZ = 47°.
Work out the size of angle YXZ.

Angle XZY is also 47° because the base angles are equal
47 + 47 = 94
180 − 94 = 86
Answer: 86°

2 Money

Leah buys 4 pens at £1.95 each and 2 sandwiches at £1.75 each.
She pays with a £20 note.
Work out how much change she gets.

4 × £1.95 = £7.80
2 × £1.75 = £3.50
Total = £7.80 + £3.50 = £11.30
Change = £20 − £11.30 = £8.70
Answer: £8.70

3 Expanding brackets

Expand
(a) 8(2x − 1)
(b) 3x(x − 6)

(a) 8 × 2x = 16x and 8 × (−1) = −8
(b) 3x × x = $3x^2$ and 3x × (−6) = −18x
Answer: (a) 16x − 8 (b) $3x^2$ − 18x

4 Expected outcomes

The probability that a machine makes a faulty part is 0.3.
Work out how many times you would expect this to happen in 400 parts made.

Expected number = probability × number of trials
0.3 × 400 = 120
Answer: 120

5 Column vectors

$\mathbf{a} = \begin{pmatrix} 7 \\ 1 \end{pmatrix}$ $\mathbf{b} = \begin{pmatrix} -1 \\ -3 \end{pmatrix}$

Work out
(a) 3**a** + **b**
(b) 3**a** − **b**

(a) $\begin{pmatrix} 21 \\ 3 \end{pmatrix} + \begin{pmatrix} -1 \\ -3 \end{pmatrix} = \begin{pmatrix} 20 \\ 0 \end{pmatrix}$

(b) $\begin{pmatrix} 21 \\ 3 \end{pmatrix} - \begin{pmatrix} -1 \\ -3 \end{pmatrix} = \begin{pmatrix} 22 \\ 6 \end{pmatrix}$

Answer: (a) $\begin{pmatrix} \mathbf{20} \\ \mathbf{0} \end{pmatrix}$ **(b)** $\begin{pmatrix} \mathbf{22} \\ \mathbf{6} \end{pmatrix}$

6 Sample space of two dice

Two fair dice, numbered 1 to 6 and 1 to 10, are rolled.
Work out the probability that both dice show the same number.

There are 6 × 10 = 60 equally likely outcomes
Matching pairs: 1-1, 2-2, 3-3, 4-4, 5-5, 6-6
P = 6 out of 60
Answer: $\frac{\mathbf{1}}{\mathbf{10}}$

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7 Multiplying and dividing fractions

Work out

(a) $\frac{3}{4} \times \frac{2}{5}$

(b) $\frac{1}{8} \div \frac{1}{2}$

Give each answer in its simplest form.

(a) Multiply the tops and the bottoms: $\frac{6}{20} = \frac{3}{10}$

(b) Turn the second fraction upside down and multiply: $\frac{1}{8} \times 2 = \frac{2}{8} = \frac{1}{4}$

Answer: (a) $\frac{3}{10}$ (b) $\frac{1}{4}$

8 Trigonometry: finding a side

Work out the length of x. (Calculator)

Give your answer correct to 1 decimal place.

The diagram is not drawn accurately.

Label the sides: x is the hypotenuse and 17 cm is the opposite

We use sin (opposite and hypotenuse)

$\sin 39° = \frac{17}{x}$

$x = \frac{17}{\sin 39°} = 27.013...$

x = 27.0 cm (1 d.p.)

Answer: x = 27.0 cm

9 Iteration

Here is an iteration formula.

$x_{n+1} = 4 + \frac{10}{x_n}$

$x_0 = 2$

(a) Work out x_1

(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = 4 + \frac{10}{2} = 4 + 5 = 9$

(b) $x_2 = 4 + \frac{10}{9} = 5.11111...$

= 5.111

Answer: (a) 9 (b) 5.111

10 Difference of two squares

Factorise $y^2 - 144$

$144 = 12^2$, so this is a difference of two squares

$y^2 - 12^2 = (y - 12)(y + 12)$

Answer: (y − 12)(y + 12)