Day 106 **B Tier 10-a-day: Model Solutions**

1 Money

Chloe buys 2 sandwiches at 55p each and 4 notebooks at £1.95 each.
She pays with a £20 note.
Work out how much change she gets.

2 × 55p = £1.10
4 × £1.95 = £7.80
Total = £1.10 + £7.80 = £8.90
Change = £20 − £8.90 = £11.10
Answer: £11.10

2 Simple probability

A bag contains 3 black pens and 4 blue pens.
One is taken at random. Find the probability that it is not black.

Total = 3 + 4 = 7
Not black: 7 − 3 = 4
Simplify the fraction
Answer: $\frac{4}{7}$

3 Perimeter and area of compound shapes

The diagram shows the shape of a garden.
All the corners are right angles. All lengths are in m.
(a) Find the perimeter.
(b) Find the area.

(a) Missing lengths: 18 − 13 = 5 and 14 − 5 = 9
Perimeter = 18 + 5 + 5 + 9 + 13 + 14 = 64
(b) Split into two rectangles: 18 × 5 = 90 and 13 × 9 = 117
90 + 117 = 207
Answer: (a) 64 m (b) 207 m^2

4 Mixed numbers

Work out $2\frac{1}{2} + 2\frac{5}{8}$
Give your answer as a mixed number.

Whole numbers: 2 + 2 = 4
Fractions: $\frac{1}{2} + \frac{5}{8} = \frac{9}{8} = 1\frac{1}{8}$
Total = $5\frac{1}{8}$
Answer: $\mathbf{5\frac{1}{8}}$

5 Transformations of a point

(a) The point P(5, −6) is enlarged with scale factor 3 and centre the origin. Write down the coordinates of the image.
(b) The point P(5, −6) is reflected in the line y = x. Write down the coordinates of the image.

(a) Multiply each coordinate by 3: (15, −18)
(b) Reflecting in y = x swaps x and y: (−6, 5)
Answer: (a) (15, −18) (b) (−6, 5)

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6 Standard form

Write each number as an ordinary number.

(a) 9×10^4

(b) 5.8×10^{-3}

(a) Multiply by 10, 4 times: move the decimal point 4 places right

$9 \times 10^4 = 90{,}000$

(b) $10^{-3} = 0.001$, so move the decimal point 3 places left

$5.8 \times 10^{-3} = 0.0058$

Answer: (a) 90,000 (b) 0.0058

7 Inverse proportion

8 machines take 3 hours to make a batch of parts.
All the machines work at the same rate.
How long would it take 6 machines?

The total work stays the same: $8 \times 3 = 24$ machines-hours
With 6 machines: $24 \div 6 = 4$ hours

Answer: 4 hours

8 Solving quadratic equations

Solve $x^2 - 10x + 21 = 0$

Factorise: $(x - 7)(x - 3) = 0$
Either $x - 7 = 0$ or $x - 3 = 0$

Answer: x = 3 or x = 7

9 Bearings with Pythagoras and trigonometry

A boat sails 12 m on a bearing of 090° from P to Q, then 5 m on a bearing of 180° to R. (Calculator)
(a) Work out the distance PR.
(b) Work out the bearing of R from P.
Give your answers correct to 1 decimal place.

(a) Triangle PQR has a right angle at Q

$PR^2 = 12^2 + 5^2 = 169$

$PR = \sqrt{169} = 13$ m

(b) tan (angle QPR) = $\frac{5}{12}$, so angle QPR = 22.620° (to 3 d.p.)

PQ is on a bearing of 090°, and R is a further 22.620° clockwise from PQ
Bearing = 90 + 22.620 = 112.6°

Answer: (a) 13 m (b) 112.6°

10 Number machines

Here is a number machine.
Input → × 6 → + 10 → Output
(a) The input is 4. Work out the output.
(b) The output is 28. Work out the input.

(a) $4 \times 6 = 24$, then $24 + 10 = 34$

(b) Work backwards: undo + 10 to get 18, then undo × 6 to get 3

Answer: (a) 34 (b) 3