Day 170 **B Tier 10-a-day: Model Solutions**

1 Money

Sophie buys 3 pens at 60p each and 3 notebooks at £1.85 each.
She pays with a £50 note.
Work out how much change she gets.

3 × 60p = £1.80
3 × £1.85 = £5.55
Total = £1.80 + £5.55 = £7.35
Change = £50 − £7.35 = £42.65
Answer: £42.65

2 Simplifying expressions

Simplify fully
(a) 4c × 4d
(b) 9m × 9m

(a) Multiply the numbers: 4 × 4 = 16, then the letters: c × d = cd
(b) 9 × 9 = 81 and m × m = m^2
Answer: (a) 16cd (b) 81m^2

3 Compound areas

A sheet of card measures 19 cm by 7 cm.
A rectangle measuring 6 cm by 2 cm is cut out.
Work out the area that is left.

Whole area = 19 × 7 = 133
Area cut out = 6 × 2 = 12
133 − 12 = 121
Answer: 121 cm^2

4 Currency conversion

£1 = 1.4 euros
(a) Change £100 into euros.
(b) Change €56 into pounds.

(a) 100 × 1.4 = 140
(b) Divide by the rate: 56 ÷ 1.4 = 40
Answer: (a) €140 (b) £40

5 Loci

A goat is tied to a post in the middle of a large flat field by a rope 5 m long. (Calculator)
Work out the area of grass the goat can reach.
Give your answer correct to 1 decimal place.

The goat can reach a circle of radius 5 m
Area = $\pi \times 5^2$ = 78.540...
= 78.5 m^2 (1 d.p.)
Answer: 78.5 m^2

6 Equation of a straight line graph

The diagram shows a straight line.
(a) Work out the gradient of the line.
(b) Find the equation of the line.

(a) The line crosses the y-axis at −1. Pick two points on the line and work out change in y divided by change in x
Gradient = −2
(b) The equation is y = mx + c with m = −2 and c = −1
Answer: (a) −2 (b) y = −2x − 1

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7 Combining ratios

In a bag of counters, the ratio of green to red is 1 : 4.
The ratio of red to white is 1 : 2.
Write down the ratio green : red : white.

Make the red part the same in both ratios: lowest common multiple of 4 and 1 is 4
green : red = 1 : 4
red : white = 4 : 8
green : red : white = 1 : 4 : 8
Answer: 1 : 4 : 8

8 Substitution into formulae

$s = ut + \frac{1}{2}at^2$

Work out the value of s when u = 2, a = 5 and t = 2

$s = 2 \times 2 + \frac{1}{2} \times 5 \times 2^2$

$s = 4 + \frac{1}{2} \times 5 \times 4$

$s = 4 + 10 = 14$
Answer: s = 14

9 Negative and zero indices

Work out
(a) 3^{-2}
(b) $11^0 + \sqrt{4}$

(a) A negative power means the reciprocal: $3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

(b) Anything to the power 0 is 1, so $11^0 = 1$
$\sqrt{4} = 2$, so 1 + 2 = 3
Answer: (a) $\frac{1}{9}$ (b) 3

10 Bearings with Pythagoras and trigonometry

A boat sails 7 m on a bearing of 180° from P to Q, then 24 m on a bearing of 270° 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
$PR^2 = 7^2 + 24^2 = 625$
$PR = \sqrt{625} = 25$ m

(b) tan (angle QPR) = $\frac{24}{7}$, so angle QPR = 73.740° (to 3 d.p.)

PQ is on a bearing of 180°, and R is a further 73.740° clockwise from PQ
Bearing = 180 + 73.740 = 253.7°
Answer: (a) 25 m (b) 253.7°