Day 27 **B Tier 10-a-day: Model Solutions**

1 Forming expressions

A pencil costs p pence.
A pen costs 20 pence more than a pencil.
(a) Write an expression, in terms of p, for the cost of a pen.
(b) Write an expression, in terms of p, for the total cost of 2 pencils and 4 pens. Give your answer in its simplest form.

(a) A pen costs 20p more than a pencil: p + 20
(b) 2 pencils cost 2p and 4 pens cost 4(p + 20)
2p + 4p + 80
Collect like terms: 6p + 80
Answer: (a) p + 20 (b) 6p + 80 pence

2 Factors and multiples

(a) Write down all the factors of 30.
(b) Write down all the multiples of 6 between 35 and 53.

(a) Find pairs that multiply to make 30: 1 × 30, 2 × 15, 3 × 10, 5 × 6
(b) Count up in 6s: 36, 42, 48
Answer: (a) 1, 2, 3, 5, 6, 10, 15, 30 (b) 36, 42, 48

3 Tables of values

Complete the table of values for y = x + 1

x = −1: y = 1 × (−1) + 1 = 0
x = 1: y = 1 × 1 + 1 = 2
x = 2: y = 1 × 2 + 1 = 3
Answer: x = −1: 0, x = 1: 2, x = 2: 3

4 Multiplying and dividing fractions

Work out
(a) $\frac{3}{10} \times \frac{3}{5}$
(b) $\frac{1}{2} \div \frac{1}{5}$
Give each answer in its simplest form.

(a) Multiply the tops and the bottoms: $\frac{9}{50}$

(b) Turn the second fraction upside down and multiply: $\frac{1}{2} \times 5 = \frac{5}{2} = 2\frac{1}{2}$

Answer: (a) $\frac{9}{50}$ (b) $2\frac{1}{2}$

5 Currency conversion

£1 = 1.25 Swiss francs
A holiday costs 125 francs.
Work out the cost in pounds.

Divide by the rate: 125 ÷ 1.25
= £100
Answer: £100

6 Pythagoras in context

A ladder 25 m long leans against a vertical wall.
The foot of the ladder is 15 m from the wall.
Work out how high up the wall the ladder reaches.

Draw a right-angled triangle. The ladder is the hypotenuse
$25^2 = 15^2 + h^2$
$h^2 = 625 - 225 = 400$
$h = \sqrt{400} = 20$
Answer: 20 m

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7 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 0. Pick two points on the line and work out change in y divided by change in x

Gradient = $-\frac{1}{2}$

(b) The equation is y = mx + c with m = $-\frac{1}{2}$ and c = 0

Answer: (a) $-\frac{1}{2}$ (b) y = $-\frac{1}{2}$x

8 Repeated percentage change

The price of a laptop is £160.
The price is first reduced by 40%, then the new price is increased by 5%.
(a) Work out the final price.
(b) Work out the overall percentage decrease in the price.

(a) Multipliers: 0.6 and 1.05
160 × 0.6 × 1.05 = £100.80
(b) Overall multiplier = 0.63
Overall decrease = 37%
Answer: (a) £100.80 (b) 37% decrease

9 Compound interest

£4,000 is invested for 2 years at 4% compound interest per year. (Calculator)
Work out the total interest earned.

Multiplier = 1.04
Value after 2 years = $4{,}000 \times 1.04^2$ = £4,326.40
Interest = £4,326.40 − £4,000 = £326.40
Answer: £326.40

10 Bearings with Pythagoras and trigonometry

A boat sails 7 km on a bearing of 270° from P to Q, then 24 km on a bearing of 000° 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 km

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

PQ is on a bearing of 270°, and R is a further 73.740° clockwise from PQ
Bearing = 270 + 73.740 = 343.7°
Answer: (a) 25 km (b) 343.7°