**Day 175** **B Tier 10-a-day: Model Solutions**

## 1 Simplifying expressions

Simplify fully

(a) $8a^2 \div 4a$

(b) $3x \times 5y$

(a) $8 \div 4 = 2$ and $a^2 \div a = a$

(b) Multiply the numbers: $3 \times 5 = 15$, then the letters: $x \times y = xy$

**Answer: (a) 2a (b) 15xy**

## 2 Currency conversion

£1 = 1.25 dollars

A holiday costs $25.

Work out the cost in pounds.

Divide by the rate: $25 \div 1.25$

= £20

**Answer: £20**

## 3 Percentage change

The number of members of a club goes from 400 to 420.

Work out the percentage increase.

Increase = $420 - 400 = 20$

Percentage increase = $\frac{20}{400} \times 100 = 5\%$

**Answer: 5% increase**

## 4 The nth term

Here are the first four terms of a sequence.

33, 29, 25, 21

Find an expression, in terms of n, for the nth term of this sequence.

The terms go down by 4 each time, so the nth term starts with $-4n$

When n = 1: $-4$ and the first term is 33, so we need to add 37

nth term = $-4n + 37$

**Answer: $-4n + 37$**

## 5 Reflection

The diagram shows triangle ABC on a grid.

(a) Write down the coordinates of the image of B after a reflection in the y-axis.

(b) Write down the coordinates of the image of C after a reflection in the line x = 1.

(a) B is at (4, 3). Reflect in the y-axis: $(-4, 3)$

(b) C is at (2, 1). Reflect in the line x = 1: (0, 1)

**Answer: (a) $(-4, 3)$ (b) (0, 1)**

## 6 Frequency trees

There are 150 students.

$\frac{1}{5}$ of them are boys and the rest are girls.

$\frac{1}{5}$ of the boys and $\frac{3}{5}$ of the girls walk to school.

One person is chosen at random. Work out the probability that they walk to school.

boys: $\frac{1}{5} \times 150 = 30$ and girls: $150 - 30 = 120$

boys who walk to school: $\frac{1}{5} \times 30 = 6$

girls who walk to school: $\frac{3}{5} \times 120 = 72$

P = (6 + 72) out of 150

**Answer: $\frac{13}{25}$**

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## 7 Solving inequalities

Solve $\frac{y}{2} + 1 > 3$

Subtract 1 from both sides: $\frac{y}{2} > 2$

Multiply both sides by 2

**Answer: y > 4**

## 8 Area of an isosceles trapezium

An isosceles trapezium has parallel sides of length 14 cm and 4 cm.
Each sloping side is 13 cm long.
(a) Work out the perpendicular height of the trapezium.
(b) Work out the area of the trapezium.

(a) The difference in the parallel sides is 14 − 4 = 10, so each end sticks out 5
$h^2 = 13^2 - 5^2 = 169 - 25 = 144$, so h = 12
(b) Area = ½ × (14 + 4) × 12 = 108

**Answer: (a) 12 cm (b) 108 $cm^2$**

## 9 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 50
(b) Lower quartile at 10: 25. Upper quartile at 30: 55
IQR = 55 − 25 = 30

**Answer: (a) 50 minutes (b) 30 minutes**

## 10 Reverse repeated percentages

In a sale, the price of a sofa is reduced by 10%. (Calculator)
Two weeks later it is reduced by a further 20% of the new price.
The final price is £72.
Work out the original price of the sofa.

Multipliers: 0.9 and 0.8
Overall multiplier = 0.9 × 0.8 = 0.72
Original price = £72 ÷ 0.72 = £100

**Answer: £100**