Day 74 **B Tier 10-a-day: Model Solutions**

1 Ratio, one part known

The ratio of cats to dogs among the pets at a rescue centre is 8 : 3.
There are 15 dogs.
How many cats are there?

3 parts = 15 dogs
1 part = 15 ÷ 3 = 5
cats: 8 × 5 = 40
Answer: 40

2 Fractions of amounts

Chloe has £240.

They spends $\frac{1}{4}$ of the money on a book.

They then spends $\frac{3}{4}$ of the money left on a drink.

How much money is left?

Book: £240 ÷ 4 × 1 = £60
Left: £240 − £60 = £180
Drink: £180 ÷ 4 × 3 = £135
Money left: £180 − £135 = £45
Answer: £45

3 Enlargement

A rectangle is 9 cm long and 2 cm wide.
It is enlarged by scale factor 2.
(a) Write down the length and width of the enlarged rectangle.
(b) Work out the perimeter of the enlarged rectangle.

(a) 9 × 2 = 18 and 2 × 2 = 4
(b) Perimeter = 2 × (18 + 4) = 44
Answer: (a) 18 cm by 4 cm (b) 44 cm

4 Equations with brackets

Solve $2(x - 6) = -16$

Divide both sides by 2: $x - 6 = -8$
Add 6 to both sides: $1x = -2$
Answer: $x = -2$

5 Wages and overtime

Beth is paid £13 per hour for a 40 hour week. (Calculator)
Overtime is paid at double time.
In one week she works 5 hours of overtime.
Work out her total pay for that week.

Normal pay: 40 × £13 = £520
Overtime rate: £13 × 2 = £26 per hour
Overtime pay: 5 × £26 = £130
Total: £520 + £130 = £650
Answer: £650

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6 Gradient of a line

Work out the gradient of the straight line that passes through the points (1, 0) and (−2, 6).

Gradient = $\frac{\text{change in y}}{\text{change in x}}$

Change in y = 6 − 0 = 6

Change in x = −2 − 1 = −3

Gradient = $\frac{6}{-3} = -2$

Answer: −2

7 LCM problems

Two lights flash at 11:45.
One light flashes every 8 minutes.
The other light flashes every 12 minutes.
At what time do both lights next flash together?

Multiples of 8: 8, 16, 24

Multiples of 12: 12, 24

The first common multiple is 24, so the LCM is 24 minutes

11:45 + 24 minutes = 12:09

Answer: 12:09

8 Simultaneous equations

Solve the simultaneous equations

x + 2y = 4

4x − 2y = 26

The y terms have opposite signs, so add the equations: 5x = 30

x = 6

Substitute x = 6 into the first equation: 2y = 4 − 6 = −2

y = −1

Answer: x = 6, y = −1

9 Frequency trees

There are 120 students.

$\frac{1}{2}$ of them are boys and the rest are girls.

$\frac{2}{5}$ of the boys and $\frac{1}{5}$ of the girls walk to school.

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

boys: $\frac{1}{2} \times 120 = 60$ and girls: 120 − 60 = 60

boys who walk to school: $\frac{2}{5} \times 60 = 24$

girls who walk to school: $\frac{1}{5} \times 60 = 12$

P = (24 + 12) out of 120

Answer: $\frac{3}{10}$

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10 Trigonometry in isosceles triangles

Triangle XYZ is isosceles with XY = XZ = 20 cm. (Calculator)
The base YZ = 12 cm.
Work out the size of angle XYZ.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 12 ÷ 2 = 6

$\cos Y = \frac{6}{20}$

Angle XYZ = $\cos^{-1}(\frac{6}{20})$ = 72.542...

= 72.5° (1 d.p.)

Answer: 72.5°