Day 218 **B Tier 10-a-day: Model Solutions**

1 Ratio, one part known

The ratio of adults to children among the people on a bus is 3 : 2.
There are 18 adults.
How many children are there?

3 parts = 18 adults
1 part = 18 ÷ 3 = 6
children: 2 × 6 = 12
Answer: 12

2 Exterior angles of polygons

Each exterior angle of a regular polygon is 36°.
Work out the number of sides of the polygon.

Exterior angles add up to 360°
Number of sides = 360 ÷ 36 = 10
Answer: 10 sides

3 Substitution into formulae

Here is a formula.
$y = mx + c$
Work out the value of y when m = 2, x = 4 and c = 1

$y = 2 \times 4 + 1$
$y = 9$
Answer: y = 9

4 Angles in parallel lines

In the diagram, PQ is parallel to RS.
(a) Work out the size of angle a.
(b) Give a reason for your answer.
The diagram is not drawn accurately.

Angle a and the 70° angle are corresponding angles (F shape)
a = 70°
Corresponding angles are equal
Answer: (a) a = 70° (b) Corresponding angles are equal

5 Sample space of two dice

Two fair six-sided spinners are spun.
Work out the probability that the product of the two scores is 12 or more.

There are 6 × 6 = 36 equally likely outcomes
Pairs with product 12 or more: 17 outcomes
P = 17 out of 36
Answer: $\frac{17}{36}$

6 Trigonometry in context

A church spire is 14 m tall. (Calculator)
Mia stands 60 m from the base of the church spire on level ground.
Work out the angle of elevation of the top of the church spire from Mia.
Give your answer correct to 1 decimal place.

The height is the opposite side and the distance is the adjacent side

$\tan\theta = \frac{14}{60}$

$\theta = \tan^{-1}(\frac{14}{60}) = 13.134...$

$\theta = 13.1°$ (1 d.p.)
Answer: 13.1°

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7 Percentage as a fraction of

(a) George scores 21 out of 40 in a test. Write this as a percentage.
(b) Write £1.30 as a percentage of £10.

(a) $\frac{21}{40} \times 100 = 52.5\%$

(b) Change both to pence: 130p and 1000p

$\frac{130}{1000} \times 100 = 13\%$

Answer: (a) 52.5% (b) 13%

8 Simultaneous equations

Solve the simultaneous equations
$3x + y = 12$
$5x - y = 4$

The y terms have opposite signs, so add the equations: $8x = 16$
$x = 2$
Substitute $x = 2$ into the first equation: $y = 12 - 6 = 6$
$y = 6$
Answer: x = 2, y = 6

9 Growth in standard form

There are 4.3×10^6 bacteria in a dish.
The number doubles every day.
How many are there after 4 days?
Give your answer in standard form.

Each day multiply by 2, so multiply by $2^4 = 16$
$4.3 \times 10^6 \times 16 = 68.8 \times 10^6$
In standard form: 6.88×10^7
Answer: 6.88×10^7

10 Reverse percentages

The price of a meal including VAT at 20% is £600. (Calculator)
Work out the price of the meal before VAT was added.

The price including VAT is 100% + 20% = 120% of the price before VAT.
120% = £600, so 1% = £600 ÷ 120 = £5
100% = £5 × 100 = £500
Answer: £500