Day 348 **B Tier 10-a-day: Model Solutions**

1 Symmetry

(a) Write down the number of lines of symmetry of a regular decagon.
(b) Write down the order of rotational symmetry of a regular decagon.

A regular decagon has 10 lines of symmetry
A regular decagon looks the same 10 times in a full turn, so the order of rotational symmetry is 10
Answer: (a) 10 (b) 10

2 Mean

Here are the ages of players in a team.
22, 15, 17, 21, 22, 18, 20, 21
Work out the mean.

Add the values: 22 + 15 + 17 + 21 + 22 + 18 + 20 + 21 = 156
Divide by the number of values: 156 ÷ 8 = 19.5
Answer: 19.5 years

3 Ordering fractions

Write these in order of size.
Start with the smallest.
$\frac{3}{10}$, $\frac{1}{5}$, $\frac{1}{2}$, 25%

Write each as a decimal:
$\frac{3}{10}$ = 0.3, $\frac{1}{5}$ = 0.2, $\frac{1}{2}$ = 0.5, 25% = 0.25
Order: $\frac{1}{5}$, 25%, $\frac{3}{10}$, $\frac{1}{2}$
Answer: $\frac{1}{5}$, 25%, $\frac{3}{10}$, $\frac{1}{2}$

4 Pythagoras' theorem

Find the length of x.
The diagram is not drawn accurately.

Use Pythagoras: $a^2 + b^2 = c^2$
$x^2 = 35^2 + 12^2 = 1225 + 144 = 1369$
$x = \sqrt{1369} = 37$
Answer: x = 37 m

5 Multiplying and dividing fractions

Work out
(a) $\frac{1}{5} \times \frac{4}{7}$
(b) $\frac{1}{3} \div \frac{3}{5}$
Give each answer in its simplest form.

(a) Multiply the tops and the bottoms: $\frac{4}{35}$
(b) Turn the second fraction upside down and multiply: $\frac{1}{3} \times \frac{5}{3} = \frac{5}{9} = \frac{5}{9}$
Answer: (a) $\frac{4}{35}$ (b) $\frac{5}{9}$

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6 Sample space of two dice

Two fair dice, numbered 1 to 6 and 1 to 8, are rolled.
Work out the probability that the product of the two scores is 12 or more.

There are 6 × 8 = 48 equally likely outcomes
Pairs with product 12 or more: 27 outcomes
P = 27 out of 48

Answer: $\frac{9}{16}$

7 Solving quadratic equations

Solve $x^2 + 8x + 16 = 0$

Factorise: (x + 4)(x + 4) = 0
Either x + 4 = 0 or x + 4 = 0
Answer: x = −4

8 Grouped frequency tables

The table shows the times taken by some students to complete a task.
(a) Write down the modal class.
(b) Work out an estimate for the mean.

(a) The highest frequency is 9
(b) Use the midpoint of each class: 5, 15, 25, 35, 45
Sum of midpoint × frequency = 5 × 7 + 15 × 9 + 25 × 6 + 35 × 2 + 45 × 6 = 660
Total frequency = 30
Estimate = 660 ÷ 30 = 22
Answer: (a) 10 < t ≤ 20 (b) 22

9 Solving inequalities

Solve 7y − 9 ≤ 19

Add 9 to both sides: 7y ≤ 28
Divide both sides by 7 (a positive number, so the inequality sign stays the same)
Answer: y ≤ 4

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 5% of the new price.
The final price is £427.50.
Work out the original price of the sofa.

Multipliers: 0.9 and 0.95
Overall multiplier = 0.9 × 0.95 = 0.855
Original price = £427.50 ÷ 0.855 = £500
Answer: £500