Day 101 **B Tier 10-a-day: Model Solutions**

1 Bar charts

The bar chart shows some information.
(a) How many more were there for Pear than for Apple?
(b) Work out the total of all five bars.

(a) Pear: 6, Apple: 4
$6 - 4 = 2$
(b) $4 + 10 + 2 + 12 + 6 = 34$
Answer: (a) 2 (b) 34

2 Rounding

Write 3.2442
(a) correct to 2 decimal places,
(b) correct to 3 significant figures.

(a) Look at the next digit after the second decimal place: 4
So 3.2442 rounds to 3.24
(b) The first significant figure is the first non-zero digit. Count 3 figures and look at the next digit.
3.2442 rounds to 3.24
Answer: (a) 3.24 (b) 3.24

3 Symmetry

What is the order of rotational symmetry of a regular nonagon?

A regular nonagon looks the same 9 times in a full turn, so the order of rotational symmetry is 9
Answer: 9

4 Solving inequalities

Solve $7p + 10 \geq -11$

Subtract 10 from both sides: $7p \geq -21$
Divide both sides by 7 (a positive number, so the inequality sign stays the same)
Answer: $p \geq -3$

5 Scatter graphs

The scatter graph shows information about speed and stopping distance.
A line of best fit is drawn.
(a) Describe the correlation.
(b) Use the line of best fit to estimate the stopping distance when speed is 44.

(a) As one variable goes up, the other goes up
This is positive correlation
(b) Go up from 44 on the horizontal axis to the line, then across to the vertical axis
The reading is about 38 m
Answer: (a) Positive correlation (b) about 38 m

6 Disproving statements

Ali says, "The value of $n^2 - 3n + 13$ is a prime number for every positive whole number n."
Show that Ali is wrong.

Try n = 1, 2, 3, ... and check each answer
When n = 12: $12^2 + (-3) \times 12 + 13 = 121$
121 is not prime because it has other factors
Answer: n = 12 gives 121, which is not prime

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7 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 12
(b) Use the midpoint of each class: 2.5, 7.5, 12.5, 17.5, 22.5
Sum of midpoint × frequency = 2.5 × 10 + 7.5 × 7 + 12.5 × 12 + 17.5 × 5 + 22.5 × 2 = 360
Total frequency = 36
Estimate = 360 ÷ 36 = 10
Answer: (a) 10 < t ≤ 15 (b) 10

8 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
3 pens and 2 pencils cost 365p.
4 pens and 2 pencils cost 480p.
Work out the cost of one pen and the cost of one pencil.

Let a = cost of one pen and b = cost of one pencil
3a + 2b = 365 and 4a + 2b = 480
Subtract: 1a = 480 − 365 = 115, so a = 115
Substitute: 3 × 115 + 2b = 365, so 2b = 20 and b = 10
Answer: One pen costs 115p and one pencil costs 10p

9 Fraction problems

A fuel tank is $\frac{2}{5}$ full.

64 litres of fuel are added.

The fuel tank is now $\frac{2}{3}$ full.

Work out the capacity of the fuel tank.

Fraction added = $\frac{2}{3} - \frac{2}{5} = \frac{4}{15}$

$\frac{4}{15}$ of the capacity = 64 litres

$\frac{1}{15}$ of the capacity = 64 ÷ 4 = 16 litres

Whole capacity = 16 × 15 = 240 litres
Answer: 240 litres

10 Bearings with Pythagoras and trigonometry

A boat sails 13 km on a bearing of 270° from P to Q, then 6 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
$PR^2 = 13^2 + 6^2 = 205$
$PR = \sqrt{205} = 14.318...$ km
(b) tan (angle QPR) = $\frac{6}{13}$, so angle QPR = 24.775° (to 3 d.p.)
PQ is on a bearing of 270°, and R is a further 24.775° clockwise from PQ
Bearing = 270 + 24.775 = 294.8°
Answer: (a) 14.3 km (b) 294.8°