Day 359 **B Tier 10-a-day: Model Solutions**

1 Mean

Here are the prices of some sandwiches in pence.
166, 323, 202, 198, 357, 191
Work out the mean.

Add the values: 166 + 323 + 202 + 198 + 357 + 191 = 1437
Divide by the number of values: 1437 ÷ 6 = 239.5
Answer: 239.5p

2 Compound areas

A rectangular wall measures 13 m by 12 m.
A rectangle measuring 5 m by 6 m is cut out.
Work out the area that is left.

Whole area = 13 × 12 = 156
Area cut out = 5 × 6 = 30
156 − 30 = 126
Answer: 126 m^2

3 Integer inequalities

x is an integer.
Write down the greatest value of x for which $x < 2.5$

The integers below 2.5 are ... 1, 2
Answer: 2

4 Ratio to fraction and percentage

The ratio of adults to children at a concert is 2 : 7.
What fraction of them are adults?

Total parts = 2 + 7 = 9
adults are 2 out of 9 parts
Answer: $\frac{2}{9}$

5 Harder linear equations

Solve 6(x + 2) = 3(x + 12)

Expand the brackets: 6x + 12 = 3x + 36
Subtract 3x from both sides: 3x + 12 = 36
Subtract 12 from both sides: 3x = 24
Divide both sides by 3
Answer: x = 8

6 Midpoint and length of a line

A is the point (1, 3) and B is the point (−14, 23).
(a) Work out the coordinates of the midpoint of AB.
(b) Work out the length of AB.

(a) Midpoint = (−13 ÷ 2, 26 ÷ 2) = (−6.5, 13)
(b) Horizontal distance = 15, vertical distance = 20
$AB^2 = 15^2 + 20^2 = 225 + 400 = 625$
$AB = \sqrt{625} = 25$
Answer: (a) (−6.5, 13) (b) 25

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7 Fractions and decimals

(a) Write $\frac{3}{5}$ as a decimal.

(b) Write $\frac{4}{15}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 3 ÷ 5 = 0.6
(b) 4 ÷ 15: use short division, adding zeros
4 ÷ 15 = 0.26666666...
The digit 6 repeats
Answer: (a) 0.6 (b) 0.26666666... (6 repeats)

8 Solving quadratic equations

Solve $x^2 + x - 30 = 0$

Factorise: $(x - 5)(x + 6) = 0$
Either $x - 5 = 0$ or $x + 6 = 0$
Answer: $x = -6$ or $x = 5$

9 LCM problems

Two buses leave a bus station at 08:45.
One bus leaves every 24 minutes.
The other bus leaves every 8 minutes.
At what time do both buses next leave together?

Multiples of 24: 24
Multiples of 8: 8, 16, 24
The first common multiple is 24, so the LCM is 24 minutes
08:45 + 24 minutes = 09:09
Answer: 09:09

10 Bearings with Pythagoras and trigonometry

A boat sails 12 m on a bearing of 270° from P to Q, then 5 m 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
$PR^2 = 12^2 + 5^2 = 169$
$PR = \sqrt{169} = 13$ m
(b) tan (angle QPR) = $\frac{5}{12}$, so angle QPR = 22.620° (to 3 d.p.)
PQ is on a bearing of 270°, and R is a further 22.620° clockwise from PQ
Bearing = 270 + 22.620 = 292.6°
Answer: (a) 13 m (b) 292.6°