Day 363 **B Tier 10-a-day: Model Solutions**

1 Ordering decimals

Write these numbers in order of size.
Start with the smallest number.
5.1, 5.15, 5.29, 5.157

Write each number to 3 decimal places:
5.100, 5.150, 5.290, 5.157
Now put them in order: 5.100, 5.150, 5.157, 5.290
Answer: 5.1, 5.15, 5.157, 5.29

2 Ratio, one part known

The ratio of pencils to pens among the items in a case is 9 : 8.
There are 54 pencils.
How many pens are there?

9 parts = 54 pencils
1 part = 54 ÷ 9 = 6
pens: 8 × 6 = 48
Answer: 48

3 Solving equations

Solve $3x + 8 = -16$

Subtract 8 from both sides: $3x = -24$
Divide both sides by 3
Answer: $x = -8$

4 Multiplying and dividing fractions

Work out
(a) $\frac{1}{2} \times \frac{5}{7}$
(b) $\frac{2}{5} \div \frac{1}{3}$
Give each answer in its simplest form.

(a) Multiply the tops and the bottoms: $\frac{5}{14}$

(b) Turn the second fraction upside down and multiply: $\frac{2}{5} \times 3 = \frac{6}{5} = 1\frac{1}{5}$

Answer: (a) $\frac{5}{14}$ (b) $1\frac{1}{5}$

5 Compound areas

A rectangular pond is 14 m by 12 m.
There is a path of width 1 m all the way round the outside of the pond.
Work out the area of the path.

Outer rectangle: (14 + 2) × (12 + 2) = 16 × 14 = 224
Pond: 14 × 12 = 168
224 − 168 = 56
Answer: 56 m^2

6 Growth and decay

Tom invests £3,000 for 3 years at 2% simple interest per year.
Work out the total interest he earns.

Interest each year = 2% of £3,000 = £60
Over 3 years: 3 × £60 = £180
Answer: £180

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7 Midpoint of a line segment

A is the point (−7, 9) and B is the point (−7, −3).
Find the coordinates of the midpoint of AB.

Add the x-coordinates and halve: (−7 − 7) ÷ 2 = −7
Add the y-coordinates and halve: (9 − 3) ÷ 2 = 3
Answer: (−7, 3)

8 Reverse percentages

The price of a meal including VAT at 20% is £72. (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% = £72, so 1% = £72 ÷ 120 = 60p
100% = 60p × 100 = £60
Answer: £60

9 Bearings with Pythagoras and trigonometry

A boat sails 7 m on a bearing of 090° from P to Q, then 6 m on a bearing of 180° 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
$PR^2 = 7^2 + 6^2 = 85$
$PR = \sqrt{85} = 9.220...$ m
(b) tan (angle QPR) = $\frac{6}{7}$, so angle QPR = 40.601° (to 3 d.p.)

PQ is on a bearing of 090°, and R is a further 40.601° clockwise from PQ
Bearing = 90 + 40.601 = 130.6°
Answer: (a) 9.2 m (b) 130.6°

10 Sample space of two dice

Two fair dice, numbered 1 to 5 and 1 to 6, are rolled.
Work out the probability that the product of the two scores is 12 or more.

There are 5 × 6 = 30 equally likely outcomes
Pairs with product 12 or more: 12 outcomes
P = 12 out of 30
Answer: $\frac{2}{5}$