Day 80 **A Tier 10-a-day: Model Solutions**

1 Recurring decimals to fractions

Write the recurring decimal $0.\dot{3}\dot{0}$ as a fraction in its simplest form.

Let x = 0.303030...
Multiply by 100: 100x = 30.3030...
Subtract: 99x = 30
$x = \frac{30}{99} = \frac{10}{33}$

Answer: $\mathbf{\frac{10}{33}}$

2 Congruent triangles

Triangle PQR: angle P = 40°, angle Q = 60°, PQ = 4 cm.
Triangle STU: angle S = 40°, angle T = 60°, ST = 8 cm.
Are the two triangles congruent?
Give a reason for your answer.

The angles are the same, so the triangles are similar
But PQ = 4 cm and ST = 8 cm, so the matching sides are different
The triangles are not congruent
Answer: No, not congruent

3 Two-way tables

The table shows information about 84 people.
One person is chosen at random.
(a) Find the probability that the person is a child and chose coffee.
(b) The person chose tea. Find the probability that they are an adult.

(a) Children who chose coffee: 7 out of 84 = $\frac{1}{12}$

(b) Tea total = 48, of whom 27 are in the Adults row: $\frac{9}{16}$

Answer: (a) $\mathbf{\frac{1}{12}}$ **(b)** $\mathbf{\frac{9}{16}}$

4 Equations with fractions

Solve $\frac{3x - 3}{2} = \frac{3x - 3}{5}$

Multiply both sides by 10
5(3x − 3) = 2(3x − 3)
15x − 15 = 6x − 6
9x = 9
x = 1
Answer: x = 1

5 Mixed number addition and subtraction

Work out $3\frac{1}{6} - 2\frac{1}{4}$

Give your answer as a mixed number in its simplest form.

Write as improper fractions: $3\frac{1}{6} = \frac{19}{6}$ and $2\frac{1}{4} = \frac{9}{4}$

Common denominator 12: $\frac{38}{12} - \frac{27}{12}$

$= \frac{11}{12}$

Answer: $\mathbf{\frac{11}{12}}$

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6 Cumulative frequency graphs

The cumulative frequency graph shows information about the age of 100 visitors.
Use the graph to find an estimate for
(a) the median,
(b) the number of visitors with a age greater than 20 years.

(a) Median at cumulative frequency $100 \div 2 = 50$
Read across from 50 to the graph, then down to the axis
Median = 25 years
(b) At 20 years the cumulative frequency is 36
$100 - 36 = 64$
Answer: (a) 25 years (b) 64

7 Area of shaded regions with circles

A circle of radius 8 cm fits exactly inside a square.
The circle touches all four sides of the square. (Calculator)
Work out the area of the shaded region.
Give your answer to 3 significant figures.

Side of square $= 2 \times 8 = 16$ cm
Square: $16 \times 16 = 256$
Circle: $\pi \times 8^2 = 64\pi$
Shaded area $= 256 - 64\pi = 54.9$
Answer: 54.9 cm^2

8 Rates of flow

A tank is in the shape of a cuboid measuring 50 cm by 60 cm by 100 cm.
It already contains 100 litres of water.
Water flows in at 25 litres per minute until the tank is full.
Work out how long this takes. Give your answer in minutes.

Volume $= 50 \times 60 \times 100 = 300000$ cm^3 = 300 litres
Water needed $= 300 - 100 = 200$ litres
Time $= 200 \div 25 = 8$ minutes
Answer: 8 minutes

9 Equations with algebraic fractions

Solve $\frac{6}{(x+3)} + \frac{4}{(x-4)} = 1$

Multiply every term by $(x + 3)(x - 4)$
$6(x - 4) + 4(x + 3) = (x + 3)(x - 4)$
$10x - 12 = x^2 - x - 12$
$x^2 - 11x = 0$
$x(x - 11) = 0$
$x = 0$ or $x = 11$
Answer: x = 0 or x = 11

10 Perimeter and area with algebra

An isosceles triangle has two equal sides of length $(5x - 1)$ cm and $(4x + 2)$ cm.
The third side is 13 cm.
Work out the perimeter of the triangle.

The two equal sides give an equation
$5x - 1 = 4x + 2$
$x = 3$
$x = 3$
Equal sides $= 5 \times 3 - 1 = 14$ cm
Perimeter $= 14 + 14 + 13 = 41$
Answer: 41 cm