Day 120 **A Tier 10-a-day: Model Solutions**

1 Exchange rates

£1 = $1.6.
(a) Change £40 to dollars.
(b) Change $64 to pounds.

(a) 40 × 1.6 = 64
(b) 64 ÷ 1.6 = 40
Answer: (a) $64 (b) £40

2 Mixed number multiplication and division

Work out $3\frac{1}{3} \times 2\frac{1}{8}$
Give your answer as a mixed number in its simplest form.

Improper fractions: $\frac{10}{3}$ and $\frac{17}{8}$

Multiply: $\frac{10}{3} \times \frac{17}{8} = \frac{170}{24}$

Simplify: $7\frac{1}{12}$

Answer: $7\frac{1}{12}$

3 Bearings

The bearing of B from A is 085°.
Work out the bearing of A from B.
The diagram is not drawn accurately.

The north lines at A and B are parallel
Back bearing = 85° + 180° = 265°
Answer: 265°

4 Ordering numbers

Write these numbers in order of size, starting with the smallest.
$\frac{19}{20}$ 0.21 52% 62%

Change each to a decimal: $\frac{19}{20}$ = 0.95, 0.21 = 0.21, 52% = 0.52, 62% = 0.62
Order the decimals: 0.21 < 0.52 < 0.62 < 0.95
Answer: 0.21, 52%, 62%, $\frac{19}{20}$

5 Interior angles of polygons

The size of each angle of a quadrilateral is shown as an expression:
(x + 30)°, (2x + 10)°, (3x + 55)°, (3x − 41)°
Work out the value of x.

Sum of angles = (4 − 2) × 180 = 360°
x + 30 + 2x + 10 + 3x + 55 + 3x − 41 = 360
9x + 54 = 360
9x = 306
x = 34
Answer: x = 34

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6 Composite functions

f(x) = 2x + 5

g(x) = x^2 + 1

Solve gf(x) = 37

gf(x) = $(2x + 5)^2 + 1$

$(2x + 5)^2 + 1 = 37$, so $(2x + 5)^2 = 36$

$2x + 5 = \pm 6$

$2x + 5 = 6$ or $2x + 5 = -6$

$x = \frac{1}{2}$ or $x = -\frac{11}{2}$

Answer: $x = \frac{1}{2}$ or $x = -\frac{11}{2}$

7 Changing a ratio

A bag contains red counters and blue counters in the ratio 1 : 2.
8 more red counters are added to the bag.
The ratio of red counters to blue counters is now 3 : 2.
How many counters were in the bag at the start?

Let red = 1x and blue = 2x. After adding: (1x + 8) : 2x = 3 : 2

$\frac{1x + 8}{2x} = \frac{3}{2}$, so $2(1x + 8) = 3 \times 2x$

$2x + 16 = 6x$, so $4x = 16$, $x = 4$

Start: $1x + 2x = 3 \times 4 = 12$ counters

Answer: 12

8 Direct and inverse proportion

y is directly proportional to the cube of x.
When x = 2, y = 72.
(a) Find a formula for y in terms of x.
(b) Work out the value of y when x = 5.

(a) $y = kx^3$. Substitute x = 2 and y = 72: $72 = k \times 8$, so k = 9

$y = 9x^3$

(b) $y = 9 \times 5^3 = 9 \times 125 = 1125$

Answer: (a) $y = 9x^3$ (b) 1125

9 Rearranging formulae (subject twice)

Make x the subject of $y = \frac{5x + 4}{x + 6}$

Multiply both sides by (x + 6): $y(x + 6) = 5x + 4$

Expand the bracket: $xy + 6y = 5x + 4$

Collect the x terms on one side: $xy - 5x = -6y + 4$

Factorise: $x(y - 5) = -6y + 4$

Divide by (y − 5): $x = \frac{-6y + 4}{y - 5}$

Answer: $x = \frac{-6y + 4}{y - 5}$

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10 Recurring decimals (mixed)

Write $0.1\dot{5}$ as a fraction in its simplest form.

Let x = 0.155...
Multiply by 10: 10x = 1.55...
Multiply by 100: 100x = 15.55...
Subtract: 90x = 15 − 1 = 14
$x = \frac{14}{90} = \frac{7}{45}$

Answer: $\frac{7}{45}$