Day 128 **A Tier 10-a-day: Model Solutions**

1 Equations with brackets

Solve $-2(x + 6) = 6(x + 3) - 6$

Expand the brackets: $-2x - 12 = 6x + 18 - 6$
Simplify: $-2x - 12 = 6x + 12$
Collect x terms on one side and numbers on the other: $-8x = 24$
$x = -3$
Answer: $x = -3$

2 Isosceles triangles and exterior angles

ABC is an isosceles triangle with AB = AC.
BCD is a straight line.
Angle BAC = 102°.
Work out the size of angle x.
The diagram is not drawn accurately.

Base angles of an isosceles triangle are equal
Angle ABC = (180 − 102) ÷ 2 = 39°
Exterior angle of a triangle = sum of the two opposite interior angles
x = 102 + 39 = 141
Answer: x = 141°

3 Mixed number addition and subtraction

Work out $3\frac{1}{2} + 4\frac{3}{5}$

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

Write as improper fractions: $3\frac{1}{2} = \frac{7}{2}$ and $4\frac{3}{5} = \frac{23}{5}$

Common denominator 10: $\frac{35}{10} + \frac{46}{10}$

$= \frac{81}{10}$

$= 8\frac{1}{10}$

Answer: $8\frac{1}{10}$

4 Factorising

Factorise fully $5x^2 - 25x + 30$

Take out the common factor 5: $5x^2 - 25x + 30 = 5(x^2 - 5x + 6)$
Factorise the bracket: $5(x - 3)(x - 2)$
Answer: $5(x - 3)(x - 2)$

5 Describing transformations

Describe fully the single transformation that maps shape A onto shape B.

The triangle and its image are the same distance from a horizontal mirror line
The mirror line is halfway between matching points, at $y = -2$
Answer: Reflection in the line $y = -2$

6 Stratified sampling

A club has 240 members in junior, 280 in intermediate and 240 in senior.
A stratified sample of 38 members is to be taken.
Work out how many members should be chosen from intermediate.

Total = 240 + 280 + 240 = 760

Number from intermediate = $\frac{280}{760} \times 38$

= 14
Answer: 14

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7 Recurring decimals, show that

(a) Show that $0.\dot{6}\dot{7} = \frac{67}{99}$

(b) Hence write $2.\dot{6}\dot{7}$ as a mixed number in its simplest form.

(a) Let x = 0.676767..., so 100x = 67.6767...

$100x - x = 67$, so $99x = 67$ and $x = \frac{67}{99}$

(b) $2.\dot{6}\dot{7} = 2 + \frac{67}{99} = 2\frac{67}{99}$

Answer: (b) $2\frac{67}{99}$

8 The quadratic formula

Solve $2x^2 - 9x - 6 = 0$

Give your solutions correct to 2 decimal places. (Calculator)

Use $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ with a = 2, b = −9, c = −6

$x = \frac{9 \pm \sqrt{(-9)^2 - 4 \times 2 \times (-6)}}{4}$

$x = \frac{9 \pm \sqrt{129}}{4}$

x = 5.09 or x = −0.59

Answer: x = 5.09 or x = −0.59

9 The cosine rule: finding a side

Work out the value of x. (Calculator)

Give your answer to 3 significant figures.

The diagram is not drawn accurately.

$x^2 = 6^2 + 9^2 - 2 \times 6 \times 9 \times \cos 123°$

$x^2 = 36 + 81 - 108 \cos 123°$

$x^2 = 175.82$

x = 13.3

Answer: x = 13.3 cm

10 Direct proportion formulae

y is directly proportional to the cube of x.

When x = 5, y = 875.

(a) Find a formula for y in terms of x.

(b) Work out the positive value of x when y = 448.

(a) $y = kx^3$. Substitute: $875 = k \times 125$, so k = 7

$y = 7x^3$

(b) $448 = 7x^3$, so $x^3 = 448 \div 7 = 64$, so x = 4

Answer: (a) $y = 7x^3$ (b) x = 4