Day 70 **A Tier 10-a-day: Model Solutions**

1 Simple and compound interest

Isla and Ben each invest £2000 for 3 years. (Calculator)
Isla's account pays 4% simple interest per year.
Ben's account pays 4% compound interest per year.
Work out how much more interest Ben earns than Isla.

Simple interest = £2000 × 4% × 3 = £240

Compound: £2000 × 1.04^3 = £2249.728, so interest = £249.728

Difference = 249.728 − 240 = £9.73 (to the nearest penny)

Answer: £9.73

2 Rationalising the denominator

Rationalise the denominator of $\frac{8}{\sqrt{2}}$

Give your answer in its simplest form.

Multiply top and bottom by $\sqrt{2}$: $\frac{8}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}} = \frac{8\sqrt{2}}{2}$

$= 4\sqrt{2}$

Answer: $4\sqrt{2}$

3 Perpendicular bisector

A is the point (8, 4) and B is the point (2, 2).
Find the equation of the perpendicular bisector of AB.

Midpoint of AB = $(\frac{8+2}{2}, \frac{4+2}{2}) = (5, 3)$

Gradient of AB = $\frac{-2}{-6} = \frac{1}{3}$

Perpendicular gradient = $-1 \div \frac{1}{3} = -3$

$y = -3x + c$ through (5, 3): $3 = -3 \times 5 + c$, so $c = 18$

$y = -3x + 18$

Answer: $y = -3x + 18$

4 Area of a trapezium

The area of this trapezium is 152 cm^2.
Work out the value of x.
The diagram is not drawn accurately.

$\frac{1}{2} \times (13 + 25) \times x = 152$

$19x = 152$

$x = 152 \div 19 = 8$

Answer: $x = 8$

5 HCF and LCM in index form

$A = 3^2 \times 5^4 \times 7^3$

$B = 3 \times 5^4 \times 7^4$

Find the highest common factor (HCF) and the lowest common multiple (LCM) of A and B.
Give your answers as products of prime factors.

HCF: for each prime take the lower power (a missing prime has power 0): $3 \times 5^4 \times 7^3$

LCM: for each prime take the higher power: $3^2 \times 5^4 \times 7^4$

Answer: HCF = $3 \times 5^4 \times 7^3$, LCM = $3^2 \times 5^4 \times 7^4$

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6 Addition and multiplication rules

A spinner can land on red, blue or green.
P(red) = 0.2 and P(blue) = 0.3.
(a) Work out the probability that it lands on red or blue.
(b) Work out the probability that it lands on green.

(a) Mutually exclusive, so add: 0.2 + 0.3 = 0.5
(b) 1 − 0.5 = 0.5
Answer: (a) 0.5 (b) 0.5

7 Perimeter and area with algebra

An isosceles triangle has two equal sides of length (4x + 2) cm and (2x + 22) cm.
The third side is 17 cm.
Work out the perimeter of the triangle.

The two equal sides give an equation
4x + 2 = 2x + 22
2x = 20
x = 10
Equal sides = 4 × 10 + 2 = 42 cm
Perimeter = 42 + 42 + 17 = 101
Answer: 101 cm

8 Reading a histogram

The histogram shows information about the length of some items.
(a) Work out the number of items with a length in the class 30 to 40 mm.
(b) Work out an estimate for the number with a length greater than 35 mm.

(a) Frequency = frequency density × class width
2.8 × 10 = 28
(b) 35 to 40: 2.8 × 5 = 14
Class 40 to 50: 2.6 × 10 = 26
Total = 14 + 26 = 40
Answer: (a) 28 (b) 40

9 Substitution

$E = \frac{1}{2}mv^2$

Work out the value of E when m = 2 and v = 8

$E = \frac{1}{2} \times 2 \times (8)^2$
$= 1 \times 64$
$= 64$
Answer: 64

10 Ordering numbers

Write these numbers in order of size, starting with the smallest.

0.52 $\frac{1}{10}$ 93% 84%

Change each to a decimal: 0.52 = 0.52, $\frac{1}{10}$ = 0.1, 93% = 0.93, 84% = 0.84
Order the decimals: 0.1 < 0.52 < 0.84 < 0.93
Answer: $\frac{1}{10}$, 0.52, 84%, 93%