Day 298 **B Tier 10-a-day: Model Solutions**

1 Using a given calculation

Use the fact that 38 × 17 = 646
to work out
(a) 3800 × 170
(b) 64,600 ÷ 38

(a) 3800 = 38 × 100 and 170 = 17 × 10
So the answer is 646 × 1000 = 646,000
(b) 64,600 = 646 × 100 and 38 is unchanged
646 ÷ 38 = 17, so the answer is 17 × 100 = 1700
Answer: (a) 646,000 (b) 1700

2 Forming expressions

Jo has x marbles.
Ben has 4 more marbles than Jo.
Cara has 2 times as many marbles as Jo.
(a) Write an expression, in terms of x, for the number of marbles Ben has.
(b) Write an expression, in terms of x, for the total number of marbles the three of them have. Give your answer in its simplest form.

(a) Ben has 4 more than Jo: x + 4
(b) Cara has 2x
Total = x + (x + 4) + 2x
Collect like terms: 4x + 4
Answer: (a) x + 4 (b) 4x + 4

3 Simplifying ratios

Write the ratio £1 : 50p in its simplest form.

Change to pence: £1 = 100p
100 : 50
Divide both by 50 to get 2 : 1
Answer: 2 : 1

4 Expanding and simplifying

Expand and simplify 4(x + 6) + 3(x + 5)

Expand each bracket: 4x + 24 + 3x + 15
Collect like terms: 7x + 39
Answer: 7x + 39

5 Exchange rates

The exchange rate is £1 = €1.16. (Calculator)
(a) Change £60 to euros.
(b) Change €185.6 to pounds (£).

(a) Multiply by 1.16: 60 × 1.16 = €69.6
(b) Divide by 1.16: 185.6 ÷ 1.16 = £160
Answer: (a) €69.6 (b) £160

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6 Compound shapes with semicircles

A shape is made from a rectangle and a semicircle. (Calculator)
The rectangle is 28 cm wide and 7 cm high.
The diameter of the semicircle is 28 cm.
(a) Work out the area of the shape.
(b) Work out the perimeter of the shape.
Give each answer correct to 1 decimal place.

(a) Rectangle: $28 \times 7 = 196$
Semicircle: $\frac{1}{2} \times \pi \times 14^2 = 307.876...$
Total = 503.9 cm^2
(b) Curved edge: $\frac{1}{2} \times \pi \times 28 = 43.982...$
Straight edges: $28 + 7 + 7 = 42$
Total = 86.0 cm
Answer: (a) 503.9 cm^2 (b) 86.0 cm

7 Standard form calculations

Work out $(2.5 \times 10^7) \times (7 \times 10^4)$
Give your answer in standard form.

Multiply the numbers: $2.5 \times 7 = 17.5$
Add the powers: $10^7 \times 10^4 = 10^{11}$
$17.5 \times 10^{11} = 1.75 \times 10^{12}$ in standard form
Answer: 1.75×10^{12}

8 Speed

A car travels 90 km in 2 hours 15 minutes.
Work out its average speed in km per hour.

Speed = distance ÷ time
Time = 2.25 hours
$90 \div 2.25 = 40$
Answer: 40 km per hour

9 Area of shaded regions

The diagram shows a square of side 16 m with a circle of radius 8 m cut out.
The circle is in the centre of the square.
Work out the area of the shaded region.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area of square = $16 \times 16 = 256$
Area of circle = $\pi \times 8^2 = 64\pi$
Shaded area = $256 - 64\pi$
Answer: $256 - 64\pi$ m^2

10 Laws of indices

Simplify fully
(a) $12y^8 \div 4y^4$
(b) $p^5 \times p^8$

(a) Divide the numbers: $12 \div 4 = 3$. Subtract the powers: $8 - 4 = 4$
(b) Add the powers: $5 + 8 = 13$
Answer: (a) $3y^4$ (b) p^{13}