Day 130 **B Tier 10-a-day: Model Solutions**

1 Currency conversion

£1 = 1.3 euros
(a) Change £20 into euros.
(b) Change €52 into pounds.

(a) 20 × 1.3 = 26
(b) Divide by the rate: 52 ÷ 1.3 = 40
Answer: (a) €26 (b) £40

2 Area of 2D shapes

Here is a trapezium.
Calculate the area of this trapezium.
The diagram is not drawn accurately.

Area of a trapezium = ½ × (a + b) × h
½ × (15 + 7) × 11 = ½ × 22 × 11
= 121
Answer: 121 cm^2

3 Simplifying ratios

Write the ratio 9 : 36 in the form 1 : n

Divide both sides by 9
9 ÷ 9 = 1 and 36 ÷ 9 = 4
Answer: 1 : 4

4 Algebraic proof

Show that 3(2n + 1) + 3(2n + 3) is always a multiple of 12, where n is a whole number.

Expand: 6n + 3 + 6n + 9
Collect like terms: 12n + 12
Factorise: 12(n + 1), which is a multiple of 12
Answer: 12(n + 1) is a multiple of 12

5 Simple interest

Ella invests £800 for 3 years.
The account pays 2% simple interest per year.
(a) Work out the interest earned each year.
(b) Work out the total amount in the account after 3 years.

(a) 2% of £800 = 800 ÷ 100 × 2 = £16
(b) Interest over 3 years: 3 × £16 = £48
Total = £800 + £48 = £848
Answer: (a) £16 (b) £848

6 Compound shapes with semicircles

A stage is made from a rectangle and a semicircle. (Calculator)
The rectangle is 10 m wide and 8 m high.
The diameter of the semicircle is 10 m.
(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: 10 × 8 = 80
Semicircle: ½ × π × 5^2 = 39.270...
Total = 119.3 m^2
(b) Curved edge: ½ × π × 10 = 15.708...
Straight edges: 10 + 8 + 8 = 26
Total = 41.7 m
Answer: (a) 119.3 m^2 (b) 41.7 m

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7 Fractions and decimals

(a) Write $\frac{33}{50}$ as a decimal.

(b) Write $\frac{5}{12}$ as a recurring decimal.

For part (b), write down the first 8 decimal places and say which digits repeat.

(a) 33 ÷ 50 = 0.66
(b) 5 ÷ 12: use short division, adding zeros
5 ÷ 12 = 0.41666666...
The digit 6 repeats
Answer: (a) 0.66 (b) 0.41666666... (6 repeats)

8 Pressure

A tank exerts a force of 1200 N and causes a pressure of 30 N/m^2.
Work out the area in contact with the ground.

Area = force ÷ pressure
1200 ÷ 30 = 40
Answer: 40 m^2

9 Repeated percentage change

The price of a laptop is £120.
The price is first reduced by 30%, then the new price is increased by 25%.
(a) Work out the final price.
(b) Work out the overall percentage decrease in the price.

(a) Multipliers: 0.7 and 1.25
120 × 0.7 × 1.25 = £105
(b) Overall multiplier = 0.875
Overall decrease = 12.5%
Answer: (a) £105 (b) 12.5% decrease

10 Simultaneous equations problem

A shop sells pens and pencils. All pens cost the same and all pencils cost the same.
2 pens and 2 pencils cost 320p.
1 pen and 2 pencils cost 185p.
Work out the cost of one pen and the cost of one pencil.

Let a = cost of one pen and b = cost of one pencil
2a + 2b = 320 and 1a + 2b = 185
Subtract: 1a = 320 − 185 = 135, so a = 135
Substitute: 2 × 135 + 2b = 320, so 2b = 50 and b = 25
Answer: One pen costs 135p and one pencil costs 25p