Day 236 **A Tier 10-a-day: Model Solutions**

1 Best buys

A shop sells cereal in 3 different sizes.
Small bag: 250 g for 60p
Medium bag: 400 g for 85p
Large bag: 500 g for 95p
Which bag is the best value for money? You must show your working.

Small bag: 60p ÷ 2.5 = 24p per 100 g
Medium bag: 85p ÷ 4 = 21.25p per 100 g
Large bag: 95p ÷ 5 = 19p per 100 g
The large bag has the lowest price per 100 g, so it is the best value
Answer: The large bag

2 Forming and solving equations

Priya is x years old.
Her aunt is 4 times as old as Priya, plus 6 years.
The sum of their ages is 56 years.
Work out how old her aunt is.

Let Priya's age be x, so her aunt's age is 4x + 6
x + (4x + 6) = 56
5x = 50
x = 10
Her aunt's age = 4 × 10 + 6 = 46
Answer: 46 years

3 Median and interquartile range

Here are the scores of 11 students in a test.
68 35 9 57 66 41 54 42 26 28 76
(a) Work out the median.
(b) Work out the interquartile range.

Put in order: 9, 26, 28, 35, 41, 42, 54, 57, 66, 68, 76
(a) The middle value is number 6, so the median is 42
(b) Lower half: 9, 26, 28, 35, 41, so LQ = 28
Upper half: 54, 57, 66, 68, 76, so UQ = 66
IQR = 66 − 28 = 38
Answer: (a) 42 (b) 38

4 Functions

f(x) = 3x + 4
g(x) = $x^2 - 2$
Find fg(−1)

g(−1) = $(-1)^2 - 2 = -1$
f(−1) = 3 × (−1) + 4 = 1
Answer: 1

5 Compound shapes with circles

The diagram shows a shape made from a rectangle and a semicircle.
Work out the area of the shape.
Give your answer in terms of π.
The diagram is not drawn accurately.

Rectangle: 8 × 12 = 96

Semicircle: $\frac{1}{2} \times \pi \times 4^2 = 8\pi$

Total = 96 + 8π

Answer: 96 + 8π cm^2

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6 Percentages in context

A washing machine costs £200 plus VAT at 20%.
In a sale, the price including VAT is reduced by 20%.
Work out the sale price of the washing machine.

VAT = 20% of £200 = £40, so the price with VAT is £240
Reduction = 20% of £240 = £48
Sale price = £240 − £48 = £192
Answer: £192

7 Composite functions

f(x) = 4x − 7
g(x) = x^2 + 1
Solve gf(x) = 26

gf(x) = $(4x - 7)^2 + 1$
$(4x - 7)^2 + 1 = 26$, so $(4x - 7)^2 = 25$
$4x - 7 = \pm 5$
$4x - 7 = 5$ or $4x - 7 = -5$
$x = 3$ or $x = \frac{1}{2}$
Answer: $x = 3$ or $x = \frac{1}{2}$

8 Recurring decimals to fractions

Write the recurring decimal $0.\dot{1}2\dot{4}$ as a fraction in its simplest form.

Let x = 0.124124124...
Multiply by 1000: 1000x = 124.124124...
Subtract: 999x = 124
$x = \frac{124}{999}$
Answer: $\frac{124}{999}$

9 Bounds and accuracy

A cyclist travels 380 metres in 18.2 seconds. The distance is correct to the nearest 10 metres and the time to the nearest 0.1 second.
(a) Work out the upper bound and the lower bound of the speed in m/s.
(b) Write the speed to a suitable degree of accuracy. Give a reason for your answer.

(a) Upper bound = 385 ÷ 18.15 = 21.2121
Lower bound = 375 ÷ 18.25 = 20.5479
(b) Both bounds round to 21 to 2 s.f. but not to the same value to 3 s.f.
So the speed is 21 m/s to 2 significant figures.
Answer: (a) 21.2121, 20.5479 (b) 21 m/s (2 s.f.)

10 Area of a trapezium

The diagram shows a trapezium.
Work out the area of the trapezium.
The diagram is not drawn accurately.

Area = $\frac{1}{2} \times (7 + 15) \times 8$
$= \frac{1}{2} \times 22 \times 8$
= 88
Answer: 88 cm^2