Day 266 **B Tier 10-a-day: Model Solutions**

1 Unitary method

8 pens cost £3.60.
(a) Work out the cost of 3 pens.
(b) How many pens can be bought for £3.15?

(a) 1 pen costs £3.60 ÷ 8 = 45p
3 × 45p = £1.35
(b) £3.15 ÷ 45p = 7
Answer: (a) £1.35 (b) 7

2 Multiplying and dividing

A school has 1102 students. They are put into equal groups of 29.
How many are in each group?

1102 ÷ 29
29 × 38 = 1102
So 1102 ÷ 29 = 38
Answer: 38

3 Currency conversion

£1 = 1.3 dollars
A holiday costs $78.
Work out the cost in pounds.

Divide by the rate: 78 ÷ 1.3
= £60
Answer: £60

4 Trigonometry: finding a side

Find the length of x. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Label the sides: x is the hypotenuse and 16 cm is the adjacent
We use cos (adjacent and hypotenuse)

$\cos 30° = \frac{16}{x}$

$x = \frac{16}{\cos 30°} = 18.475...$

x = 18.5 cm (1 d.p.)
Answer: x = 18.5 cm

5 Stratified sampling

A stratified sample of 20 students is taken from the 1000 students in the table.
Work out how many students should be sampled from Year 9.

Sample fraction = 20 ÷ 1000
Year 9: 400 ÷ 1000 × 20 = 8
Answer: 8

6 Changing the subject

Make q the subject of the formula

$p = \frac{q + 11}{2}$

Multiply both sides by 2: 2p = q + 11
Subtract 11 from both sides
Answer: q = 2p − 11

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7 Circle theorems

A, B and C are points on a circle, centre O.
Angle ACB = 21°.
Work out the size of angle AOB, marked y.
Give a reason for your answer.
The diagram is not drawn accurately.

The angle at the centre is twice the angle at the circumference
y = 2 × 21 = 42°
Answer: y = 42°

8 Reverse percentages

In a sale, all prices are reduced by 20%. (Calculator)
A jacket costs £192 in the sale.
Work out the original price of the jacket.

The sale price is 100% − 20% = 80% of the original price.
80% = £192, so 1% = £192 ÷ 80 = £2.40
100% = £2.40 × 100 = £240
Answer: £240

9 Algebraic proof

Show that 6(2n + 1) + 6(2n + 7) is always a multiple of 24, where n is a whole number.

Expand: 12n + 6 + 12n + 42
Collect like terms: 24n + 48
Factorise: 24(n + 2), which is a multiple of 24
Answer: 24(n + 2) is a multiple of 24

10 Function notation

$g(x) = 3x^2 + 8$
(a) Work out g(5)
(b) Work out g(−3)

(a) $g(5) = 3 \times 5^2 + 8 = 83$
(b) $g(-3) = 3 \times (-3)^2 + 8 = 35$
Answer: (a) 83 (b) 35