Day 131 **B Tier 10-a-day: Model Solutions**

1 Powers and roots

Work out

(a) $3^2 + 3^3$

(b) $\sqrt{16} - 4^2$

(a) $3^2 = 9$ and $3^3 = 27$, so $9 + 27 = 36$

(b) $\sqrt{16} = 4$ and $4^2 = 16$, so $4 - 16 = -12$

Answer: (a) 36 (b) −12

2 Simplifying ratios

Write the ratio 48 : 40 in its simplest form.

The highest common factor of 48 and 40 is 8

$48 \div 8 = 6$ and $40 \div 8 = 5$

Answer: 6 : 5

3 Trigonometry: finding a side

Work out 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 15 cm is the adjacent

We use cos (adjacent and hypotenuse)

$\cos 46° = \frac{15}{x}$

$x = \frac{15}{\cos 46°} = 21.593...$

x = 21.6 cm (1 d.p.)

Answer: x = 21.6 cm

4 Sharing in a ratio

Isla and Sam share 84 stickers in the ratio 1 : 6.

Work out how many Isla gets.

1 + 6 = 7 parts

1 part = 84 ÷ 7 = 12

Isla gets 1 × 12 = 12

Answer: 12

5 Difference of two squares

Factorise $36 - y^2$

$36 = 6^2$, so this is a difference of two squares

$6^2 - y^2 = (6 - y)(6 + y)$

Answer: (6 − y)(6 + y)

6 Compound interest

£400 is invested for 2 years at 5% compound interest per year. (Calculator)

Work out the total interest earned.

Multiplier = 1.05

Value after 2 years = 400×1.05^2 = £441

Interest = £441 − £400 = £41

Answer: £41

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7 Circle theorems

A, B and C are points on a circle, centre O.
Angle AOB = 66°.
Work out the size of angle ACB, marked x.
Give a reason for your answer.
The diagram is not drawn accurately.

The angle at the centre is twice the angle at the circumference
x = 66 ÷ 2 = 33°
Answer: x = 33°

8 Standard form calculations

Work out $(4.8 \times 10^5) + (4.8 \times 10^5)$
Give your answer in standard form.

The powers of 10 are the same, so add the numbers: 4.8 + 4.8 = 9.6
9.6×10^5
Answer: 9.6×10^5

9 Trigonometry: finding an angle

Work out the size of angle x. (Calculator)
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

We know the opposite (12 cm) and the adjacent (11 cm), so use tan
$\tan x = \frac{12}{11}$
$x = \tan^{-1}(\frac{12}{11}) = 47.490...$
x = 47.5° (1 d.p.)
Answer: x = 47.5°

10 Disproving statements

Hannah says, "3n + 4 is a prime number for every positive whole number n."
Show that Hannah is wrong.

Try values of n until the answer is not prime
When n = 2: 3 × 2 + 4 = 10
10 is not prime, because it has factors other than 1 and itself
Answer: n = 2 gives 10, which is not prime