Day 139 **A Tier 10-a-day: Model Solutions**

1 Rounding

(a) Write 0.026614 correct to 2 significant figures.
(b) Write 8.293 correct to 1 decimal place.

(a) Count 2 significant figures and look at the next digit: 0.026614 rounds to 0.027
(b) Look at the digit after decimal place 1: 8.293 rounds to 8.3
Answer: (a) 0.027 (b) 8.3

2 Is it a right-angled triangle?

A triangle has sides of length 11 cm, 8 cm and 6 cm.
Is the triangle right-angled?
You must show your working.

Longest side^2 = 11^2 = 121
Sum of the squares of the other two sides = $6^2 + 8^2 = 36 + 64 = 100$
$121 \neq 100$, so the triangle is not right-angled
Answer: No, it is not right-angled

3 Best buys

A shop sells flour in 2 different sizes.
Small bag: 250 g for 95p
Large bag: 1000 g for £3.70
Which bag is the best value for money? You must show your working.

Small bag: 95p ÷ 2.5 = 38p per 100 g
Large bag: 370p ÷ 10 = 37p per 100 g
The large bag has the lowest price per 100 g, so it is the best value
Answer: The large bag

4 Adding algebraic fractions

Write as a single fraction in its simplest form

$$\frac{x+2}{2} + \frac{x+6}{5}$$

Common denominator is 10

$$= \frac{5(x+2) + 2(x+6)}{10}$$

$$= \frac{7x + 22}{10}$$

Answer: $\mathbf{\frac{7x + 22}{10}}$

5 Index equations

Solve $3^{3x-3} = 729$

$729 = 3^6$, so $3x - 3 = 6$
$3x = 6 + 3 = 9$
$x = 3$
Answer: x = 3

6 Average speed

Tom cycles 100 km at 25 km/h and then a further 100 km at 100 km/h.
Work out the average speed for the whole journey.

Time for first part = 100 ÷ 25 = 4 hours
Time for second part = 100 ÷ 100 = 1 hours
Total distance = 200 km, total time = 5 hours
Average speed = 200 ÷ 5 = 40 km/h
Answer: 40 km/h

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7 LCM in context

On a stage, a red light flashes every 6 seconds.
A green light flashes every 8 seconds.
They flash together at the start.
After how many seconds will they next flash together?

Find the LCM of 6 and 8.
$6 = 2 \times 3$ and $8 = 2^3$
LCM = 24
They flash together again after 24 seconds.
Answer: 24 seconds

8 Direct proportion formulae

y is directly proportional to the square root of x.
When x = 64, y = 40.
(a) Find a formula for y in terms of x.
(b) Work out the positive value of x when y = 15.

(a) $y = k\sqrt{x}$. Substitute: $40 = k \times 8$, so $k = 5$
$y = 5\sqrt{x}$
(b) $15 = 5\sqrt{x}$, so $\sqrt{x} = 15 \div 5 = 3$, so $x = 3^2 = 9$
Answer: (a) $y = 5\sqrt{x}$ (b) $x = 9$

9 Equations with algebraic fractions

Solve $\frac{6}{(x-4)} + \frac{2}{(x+3)} = 1$

Multiply every term by $(x - 4)(x + 3)$
$6(x + 3) + 2(x - 4) = (x - 4)(x + 3)$
$8x + 10 = x^2 - x - 12$
$x^2 - 9x - 22 = 0$
$(x + 2)(x - 11) = 0$
$x = -2$ or $x = 11$
Answer: $x = -2$ or $x = 11$

10 Pythagoras in three dimensions

The diagram shows a cuboid.
Work out the length of the diagonal AG.
The diagram is not drawn accurately.

$AG^2 = 11^2 + 10^2 + 2^2$
$= 121 + 100 + 4 = 225$
$AG = \sqrt{225} = 15$
Answer: 15 cm