Day 297 **A Tier 10-a-day: Model Solutions**

1 Rounding

(a) Write 39029 correct to 3 significant figures.
(b) Write 4.1084 correct to 1 decimal place.

(a) Count 3 significant figures and look at the next digit: 39029 rounds to 39000
(b) Look at the digit after decimal place 1: 4.1084 rounds to 4.1
Answer: (a) 39000 (b) 4.1

2 Direct proportion

Here are the ingredients for 10 flapjacks.
Sugar: 300 g
Water: 750 ml
Oats: 250 g
(a) Work out how much sugar is needed for 36 flapjacks.
(b) Hannah has 2602 ml of water. What is the greatest number of flapjacks she can make?

(a) sugar for one: 300 ÷ 10 = 30 g
For 36: 30 × 36 = 1080 g
(b) water for one: 750 ÷ 10 = 75 ml
2602 ÷ 75 = 34 remainder 52, so she can make 34
Answer: (a) 1080 g (b) 34

3 Wages and overtime

Chloe is paid £9.60 per hour for a basic week of 35 hours. (Calculator)
Overtime is paid at time and a half.
Last week Chloe worked 7 hours of overtime.
Work out Chloe's total pay for the week.

Basic pay = 35 × £9.60 = £336.00
Overtime rate = £9.60 × 1.5 = £14.40 per hour
Overtime pay = 7 × £14.40 = £100.80
Total = £336.00 + £100.80 = £436.80
Answer: £436.80

4 Simultaneous equations

Solve the simultaneous equations
$-2x + 4y = 14$
$3x + 2y = 11$

Multiply (2) by 2 to make the y coefficients match
$-2x + 4y = 14$ (1)
$6x + 4y = 22$ (2)
The y terms have the same sign, so subtract equation (1) from equation (2)
$8x = 8$, so $x = 1$
Substitute $x = 1$ into equation (1) to find $y = 4$
Answer: $x = 1$, $y = 4$

5 Area of a trapezium

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

Area $= \frac{1}{2} \times (7 + 10) \times 10$

$= \frac{1}{2} \times 17 \times 10$
$= 85$
Answer: 85 cm^2

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6 Index equations

Solve $2^{x+10} = 8^x$

$8 = 2^3$, so $8^x = (2^3)^x = 2^{3x}$
$x + 10 = 3x$
$10 = 3x - x = 2x$
$x = 5$
Answer: x = 5

7 Finding an interest rate

Maya invests £5000 in a savings account. (Calculator)
The account pays compound interest at a fixed rate each year.
After 2 years there is £5512.50 in the account.
Work out the annual rate of interest.

Let the yearly multiplier be m. Then $5000 \times m^2 = 5512.5$
$m^2 = 5512.5 \div 5000 = 1.1025$
$m = \sqrt{1.1025} = 1.05$
Rate $= (1.05 - 1) \times 100 = 5\%$
Answer: 5%

8 Perpendicular bisector

A is the point (7, 6) and B is the point (3, 0).
Find the equation of the perpendicular bisector of AB.

Midpoint of AB $= (\frac{7+3}{2}, \frac{6+0}{2}) = (5, 3)$

Gradient of AB $= \frac{-6}{-4} = \frac{3}{2}$

Perpendicular gradient $= -1 \div \frac{3}{2} = -\frac{2}{3}$

$y = -\frac{2}{3}x + c$ through (5, 3): $3 = -\frac{2}{3} \times 5 + c$, so $c = \frac{19}{3}$

$y = -\frac{2}{3}x + \frac{19}{3}$

Answer: $y = -\frac{2}{3}x + \frac{19}{3}$

9 Area of a triangle using sine

Work out the area of triangle ABC. (Calculator)
Give your answer to 3 significant figures.
The diagram is not drawn accurately.

Area $= \frac{1}{2} \times a \times b \times \sin C$

$= \frac{1}{2} \times 10 \times 20 \times \sin 29°$
$= 48.5$
Answer: 48.5 cm^2

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10 Cumulative frequency graphs

The cumulative frequency graph shows information about the age of 80 visitors.
Use the graph to find an estimate for
(a) the median,
(b) the number of visitors with a age greater than 30 years.

(a) Median at cumulative frequency 80 ÷ 2 = 40
Read across from 40 to the graph, then down to the axis
Median = 20 years
(b) At 30 years the cumulative frequency is 48
80 − 48 = 32
Answer: (a) 20 years (b) 32