Day 220 **A Tier 10-a-day: Model Solutions**

1 Area of a sector

The diagram shows a sector of a circle of radius 15 cm.
Work out the area of the sector.
Give your answer in terms of π.
The diagram is not drawn accurately.

Area = $\frac{150}{360} \times \pi \times 15^2$

$= \frac{5}{12} \times 225\ \pi$

$= \frac{375}{4}\pi$

Answer: $\mathbf{\frac{375}{4}\pi\ cm^2}$

2 Error intervals

y = 3.13 has been truncated to 2 decimal places.
Write down the error interval for y.

Truncating means cutting off the digits after the second decimal place.
The original value is at least 3.13 and less than 3.13 + 0.01 = 3.14
Answer: $\mathbf{3.13 \leq y < 3.14}$

3 Counting outcomes

A café offers 4 starters, 3 main courses and 5 desserts.
A meal is one starter, one main course and one dessert.
(a) How many different meals are possible?
(b) Hana picks her meal at random. Write down the probability that she picks her favourite meal.

(a) $4 \times 3 \times 5 = 60$
(b) Only 1 of the 60 meals is her favourite

Answer: (a) 60 (b) $\mathbf{\frac{1}{60}}$

4 The quadratic formula

Solve $x^2 - 7x - 4 = 0$
Give your solutions correct to 2 decimal places. (Calculator)

Use $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ with a = 1, b = −7, c = −4

$x = \frac{7 \pm \sqrt{(-7)^2 - 4 \times 1 \times (-4)}}{2}$

$x = \frac{7 \pm \sqrt{65}}{2}$

x = 7.53 or x = −0.53
Answer: $\mathbf{x = 7.53 \text{ or } x = -0.53}$

5 Volume of a prism

The diagram shows a prism.
The cross-section of the prism is a right-angled triangle.
Work out the volume of the prism.
The diagram is not drawn accurately.

Area of cross-section = $\frac{1}{2} \times 8 \times 7 = 28$

Volume = area of cross-section × length
$= 28 \times 17$
$= 476$

Answer: $\mathbf{476\ cm^3}$

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6 Powers and roots in standard form

Work out $(1.5 \times 10^{-6})^3$
Give your answer in standard form.

$(1.5 \times 10^{-6})^3 = 1.5^3 \times (10^{-6})^3$
$= 3.375 \times 10^{-18}$
Answer: 3.375×10^{-18}

7 Inverse functions

$f(x) = \frac{2}{x} - 8$
(a) Find $f^{-1}(x)$
(b) Work out $f^{-1}(7)$

Let $y = \frac{2}{x} - 8$
$y + 8 = \frac{2}{x}$, so $x = \frac{2}{(y + 8)}$
Swap y for x: $f^{-1}(x) = \frac{2}{(x + 8)}$
(b) $f^{-1}(7) = \frac{2}{15}$
Answer: (a) $f^{-1}(x) = \frac{2}{(x + 8)}$ (b) $\frac{2}{15}$

8 Cumulative frequency graphs

The cumulative frequency graph shows information about the length of 40 leaves.
Use the graph to find an estimate for
(a) the median,
(b) the number of leaves with a length greater than 80 cm.

(a) Median at cumulative frequency $40 \div 2 = 20$
Read across from 20 to the graph, then down to the axis
Median = 70 cm
(b) At 80 cm the cumulative frequency is 21
$40 - 21 = 19$
Answer: (a) 70 cm (b) 19

9 The cosine rule: finding an angle

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

$\cos x = \frac{16^2 + 12^2 - 8^2}{2 \times 16 \times 12}$
$\cos x = \frac{336}{384}$
$x = \cos^{-1}(0.8750)$
$x = 29.0°$
Answer: x = 29.0°

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10 Adding algebraic fractions

Write as a single fraction in its simplest form

$$\frac{x+2}{7} + \frac{x-3}{2}$$

Common denominator is 14

$$= \frac{2(x+2) + 7(x-3)}{14}$$

$$= \frac{9x - 17}{14}$$

Answer: $\mathbf{\frac{9x - 17}{14}}$