Day 5 **B Tier 10-a-day: Model Solutions**

1 Rounding

Write 1102.8035
(a) correct to 2 decimal places,
(b) correct to 3 significant figures.

(a) Look at the next digit after the second decimal place: 3
So 1102.8035 rounds to 1102.80
(b) The first significant figure is the first non-zero digit. Count 3 figures and look at the next digit.
1102.8035 rounds to 1100
Answer: (a) 1102.80 (b) 1100

2 Speed

A car travels 108 km in 2 hours 15 minutes.
Work out its average speed in km per hour.

Speed = distance ÷ time
Time = 2.25 hours
108 ÷ 2.25 = 48
Answer: 48 km per hour

3 Solving inequalities

Solve $7n + 8 \leq 29$

Subtract 8 from both sides: $7n \leq 21$
Divide both sides by 7 (a positive number, so the inequality sign stays the same)
Answer: $n \leq 3$

4 Faces, edges and vertices

Write down the number of faces, edges and vertices of a triangular-based pyramid.

Faces: a 3-sided base and 3 triangles = 4
Edges: 3 on the base plus 3 up to the point = 6
Vertices: 3 on the base plus the top point = 4
Answer: faces: 4 edges: 6 vertices: 4

5 Powers and roots

Work out
(a) $\sqrt[3]{8} \times 7$
(b) the square root of 49

(a) $\sqrt[3]{8} = 2$ because $2 \times 2 \times 2 = 8$, so $2 \times 7 = 14$
(b) $7 \times 7 = 49$, so the square root is 7
Answer: (a) 14 (b) 7

6 Proving a triangle is right-angled

A triangle has sides of length 17 cm, 8 cm and 15 cm.
Is the triangle right-angled?
You must show your working.

The longest side is 17. Check whether $a^2 + b^2 = c^2$
$8^2 + 15^2 = 64 + 225 = 289$
$17^2 = 289$
These are equal, so the triangle is right-angled
Answer: Yes, $8^2 + 15^2 = 17^2$

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7 Venn diagram problems

30 adults were asked.
10 of them like tea and 17 of them like coffee.
4 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they like tea but do not like coffee.

(a) Union = 10 + 17 − 4 = 23
Neither = 30 − 23 = 7
(b) Only like tea = 10 − 4 = 6
P = 6 out of 30

Answer: (a) 7 (b) $\frac{1}{5}$

8 Percentages of amounts

Work out
(a) 75% of £300
(b) 20% of 40

(a) 10% of £300 = £30
5% of £300 = £15
75% = 7 × £30 + £15 = £225
(b) 10% of 40 = 4
20% = 2 × 4 = 8
Answer: (a) £225 (b) 8

9 Volume of cones and pyramids

A cone has base radius 2 cm and vertical height 8 cm. (Calculator)

Volume of a cone = $\frac{1}{3}\pi r^2 h$

Work out the volume of the cone.
Give your answer correct to 1 decimal place.

Volume = $\frac{1}{3} \times \pi \times 2^2 \times 8$
= 33.510...
= 33.5 cm^3 (1 d.p.)
Answer: 33.5 cm^3

10 Algebraic proof

Show that $(n + 2)^2 - (n - 2)^2$ is a multiple of 8 for any whole number n.

Expand: $(n + 2)^2 = n^2 + 4n + 4$ and $(n - 2)^2 = n^2 - 4n + 4$
Subtract: the n^2 terms and the 4s cancel, leaving 8n
8n is a multiple of 8
Answer: 8n is a multiple of 8