Day 364 **B Tier 10-a-day: Model Solutions**

1 Rates

Nia types at 35 words per minute.
(a) How many words does Nia type in 10 minutes?
(b) How long does Nia take to type 1050 words?

(a) 35 × 10 = 350
(b) 1050 ÷ 35 = 30 minutes
Answer: (a) 350 words (b) 30 minutes

2 Volume of cuboids

A cuboid has volume 168 cm^3.
The length of the cuboid is 4 cm and the width is 7 cm.
Work out the height of the cuboid.

Volume = length × width × height
168 = 4 × 7 × height
168 = 28 × height
Height = 168 ÷ 28 = 6
Answer: 6 cm

3 Fractions in simplest form

What fraction of 1 hour is 20 minutes?
Give your answer in its simplest form.

1 hour = 60 minutes
$\frac{20}{60} = \frac{1}{3}$
Answer: $\frac{1}{3}$

4 Angles and algebra

The angles of a triangle are x°, 2x° and (2x + 35)°.
Work out the size of the largest angle.

Angles in a triangle add up to 180°
5x + 35 = 180
5x = 145, so x = 29
The angles are 29°, 58°, 93°
Answer: 93°

5 LCM problems

Two buses leave a bus station at 07:30.
One bus leaves every 30 minutes.
The other bus leaves every 10 minutes.
At what time do both buses next leave together?

Multiples of 30: 30
Multiples of 10: 10, 20, 30
The first common multiple is 30, so the LCM is 30 minutes
07:30 + 30 minutes = 08:00
Answer: 08:00

6 Capture-recapture

80 deer in a lake are caught, tagged and returned to the lake.
Later, a sample of 30 deer is caught and 8 of them are tagged.
Estimate the total number of deer in the lake.

Proportion tagged in the sample = 8 ÷ 30
This is the same proportion as 80 out of the whole population
Population ≈ 80 × 30 ÷ 8 = 300
Answer: 300

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7 HCF and LCM from prime factors

$A = 2^3 \times 3^2$
$B = 2^2 \times 7^2$
Write down, as a product of prime factors,
(a) the HCF of A and B
(b) the LCM of A and B

(a) HCF: take the smaller power of each prime that is in both: 2^2
(b) LCM: take the larger power of every prime: $2^3 \times 3^2 \times 7^2$
Answer: (a) 2^2 (b) $2^3 \times 3^2 \times 7^2$

8 Venn diagram problems

28 viewers were asked.
17 of them watch drama and 10 of them watch comedy.
6 of them did both.
(a) How many did neither?
(b) One is chosen at random. Find the probability that they watch drama but do not watch comedy.

(a) Union = 17 + 10 − 6 = 21
Neither = 28 − 21 = 7
(b) Only watch drama = 17 − 6 = 11
P = 11 out of 28
Answer: (a) 7 (b) $\frac{11}{28}$

9 Trigonometry in isosceles triangles

Triangle ABC is isosceles with AB = AC = 13 m. (Calculator)
The base BC = 22 m.
Work out the size of angle ABC.
Give your answer correct to 1 decimal place.

Split the triangle into two right-angled triangles. Half the base = 22 ÷ 2 = 11

$\cos B = \frac{11}{13}$

Angle ABC = $\cos^{-1}(\frac{11}{13}) = 32.204...$

= 32.2° (1 d.p.)
Answer: 32.2°

10 Iteration

Here is an iteration formula.

$x_{n+1} = 5 + \frac{4}{x_n}$

$x_0 = 2$
(a) Work out x_1
(b) Work out x_2. Give your answer correct to 3 decimal places. (Calculator)

(a) $x_1 = 5 + \frac{4}{2} = 5 + 2 = 7$

(b) $x_2 = 5 + \frac{4}{7} = 5.57143...$

= 5.571
Answer: (a) 7 (b) 5.571