Day 66 **B Tier 10-a-day: Model Solutions**

1 Time

(a) Write 10:45 pm using the 24-hour clock.
(b) Write 16:05 using am or pm.

(a) Add 12 to the hour: 10 + 12 = 22, so 22:45
(b) 16 − 12 = 4, so 4:05 pm
Answer: (a) 22:45 (b) 4:05 pm

2 Scale drawings and maps

A road is 0.8 km long.
It is drawn on a map with scale 1 : 20 000.
Work out the length of the road on the map, in cm.

0.8 km = 80 000 cm
80 000 ÷ 20 000 = 4 cm
Answer: 4 cm

3 Tables of values

Complete the table of values for $y = 4x - 2$

x = 0: y = 4 × 0 − 2 = −2
x = 3: y = 4 × 3 − 2 = 10
x = 4: y = 4 × 4 − 2 = 14
Answer: x = 0: −2, x = 3: 10, x = 4: 14

4 Mode and median from a table

The table shows the pets owned by each student in a class.
(a) Write down the mode.
(b) Work out the median.

(a) The highest frequency is 9, for 3
(b) Total frequency = 41, so the median is the number 21 value
Running totals of frequency: 7, 16, 24, 29, 33, 41
The median is 4
Answer: (a) 3 (b) 4

5 HCF and LCM from prime factors

A = $2^2 \times 5^2 \times 7$
B = $2^3 \times 3^3$
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: $2^3 \times 3^3 \times 5^2 \times 7$
Answer: (a) 2^2 (b) $2^3 \times 3^3 \times 5^2 \times 7$

6 Combined mean

In a test, the mean mark of 6 boys is 63.
The mean mark of 4 girls is 78.
Work out the mean mark of all 10 students.

Total for boys = 6 × 63 = 378
Total for girls = 4 × 78 = 312
Overall mean = (378 + 312) ÷ 10 = 690 ÷ 10 = 69
Answer: 69

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7 Volume of a cylinder

A cylinder has radius 7 m and height 5 m.
Work out its volume.
Give your answer in terms of π.

Volume = π × radius^2 × height
π × 7^2 × 5 = π × 49 × 5
= 245π
Answer: 245π m^3

8 Trial and improvement

The equation $x^3 + 2x = 54$ has a solution between 3 and 4. (Calculator)
Use trial and improvement to find this solution.
Give your answer correct to 1 decimal place.

x = 3.5: $3.5^3 + 2 \times 3.5 = 49.875$ (too small)
x = 3.7: $3.7^3 + 2 \times 3.7 = 58.053$ (too big)
x = 3.6: $3.6^3 + 2 \times 3.6 = 53.856$ (too small)
x = 3.65: value = 55.927 (too big), so the solution is below 3.65
So x = 3.6 to 1 decimal place
Answer: x = 3.6

9 Bounds

The length of a rectangle is 8 cm and its width is 14 cm.
Both measurements are correct to the nearest cm.
Work out the upper bound for the perimeter of the rectangle.

Upper bound of each side = value + 0.5: 8.5 cm and 14.5 cm
Perimeter = 2 × (8.5 + 14.5) = 46 cm
Answer: 46 cm

10 Quadratic equation problem

A rectangle has length (x + 2) cm and width (x − 5) cm.
The area of the rectangle is 44 cm^2.
(a) Show that $x^2 - 3x - 54 = 0$
(b) Hence work out the length of the rectangle.

(a) Area = length × width: (x + 2)(x − 5) = 44
Expand: $x^2 - 3x - 10 = 44$
Subtract 44 from both sides: $x^2 - 3x - 54 = 0$
(b) Factorise: (x − 9)(x + 6) = 0, so x = 9 or x = −6
A length cannot be negative, so x = 9. Length = 9 + 2 = 11
Answer: (b) 11 cm