Day 178 **B Tier 10-a-day: Model Solutions**

1 Number machines

Here is a number machine.
Input → × 4 → − 4 → Output
(a) The input is 6. Work out the output.
(b) The output is 4. Work out the input.

(a) 6 × 4 = 24, then 24 − 4 = 20
(b) Work backwards: undo − 4 to get 8, then undo × 4 to get 2
Answer: (a) 20 (b) 2

2 Angles in parallel lines

In the diagram, KL is parallel to MN.
(a) Work out the size of angle x.
(b) Give a reason for your answer.
The diagram is not drawn accurately.

Angle x and the 123° angle are corresponding angles (F shape)
x = 123°
Corresponding angles are equal
Answer: (a) x = 123° (b) Corresponding angles are equal

3 Multiplying and dividing

Work out 284 × 30

Split 30 into 30 + 0
284 × 30 = 8520
284 × 0 = 0
8520 + 0 = 8520
Answer: 8520

4 Circumference and area of a circle

The diagram shows a circle with radius 7 mm. (Calculator)
Work out the circumference of the circle.
Give your answer correct to 1 decimal place.
The diagram is not drawn accurately.

Circumference = 2 × π × radius
2 × π × 7 = 43.982...
= 44.0 mm (1 d.p.)
Answer: 44.0 mm

5 Negative and zero indices

Work out
(a) 2^{-2}
(b) $2^0 + \sqrt{64}$

(a) A negative power means the reciprocal: $2^{-2} = \frac{1}{2^2} = \frac{1}{4}$

(b) Anything to the power 0 is 1, so $2^0 = 1$
$\sqrt{64} = 8$, so 1 + 8 = 9
Answer: (a) $\frac{1}{4}$ (b) 9

6 Solving double inequalities

(a) Solve $-4 \leq 2x + 4 < 4$
(b) Write down the integer values of x that satisfy this inequality.

(a) Subtract 4 in all three parts: $-8 \leq 2x < 0$
Divide all three parts by 2: $-4 \leq x < 0$
(b) The whole numbers in this range are −4, −3, −2, −1
Answer: (a) $-4 \leq x < 0$ (b) −4, −3, −2, −1

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7 Grouped frequency tables

The table shows the masses of some parcels.
(a) Write down the modal class.
(b) Work out an estimate for the mean.

(a) The highest frequency is 8
(b) Use the midpoint of each class: 22.5, 27.5, 32.5, 37.5
Sum of midpoint × frequency = 22.5 × 8 + 27.5 × 5 + 32.5 × 4 + 37.5 × 3 = 560
Total frequency = 20
Estimate = 560 ÷ 20 = 28
Answer: (a) $20 < m \leq 25$ (b) 28

8 Error intervals

The length of a pencil is 19.7 cm, correct to 1 decimal place.
Write down the error interval for the length.
Use the letter L.

The rounding unit is 0.1, so half of it is 0.05
Lower bound = 19.7 − 0.05 = 19.65
Upper bound = 19.7 + 0.05 = 19.75
Answer: $19.65 \leq L < 19.75$

9 Average speed

A coach travels at 40 km/h for 1.5 hours and then at 36 km/h for 1.5 hours.
Work out its average speed for the whole journey.

Distance: 40 × 1.5 = 60 km and 36 × 1.5 = 54 km
Total distance = 114 km and total time = 3 hours
Average speed = 114 ÷ 3 = 38
Answer: 38 km/h

10 Cumulative frequency

The cumulative frequency graph shows the times taken by 40 students to complete a puzzle.
(a) Use the graph to estimate the median.
(b) Work out an estimate for the interquartile range.

(a) Median is at 40 ÷ 2 = 20: read across from 20 on the vertical axis to the curve, then down: 60
(b) Lower quartile at 10: 32.5. Upper quartile at 30: 90
IQR = 90 − 32.5 = 57.5
Answer: (a) 60 minutes (b) 57.5 minutes