Interpreting linear models

6 questions | 16 marks

Equivalent correct methods earn the corresponding marks.

1. A delivery service uses $C = 8 + 2d$ dollars for distance d km. Find C when $d = 7$. [2 marks]

$C = 8 + 2(7) = 22$.

Answer: 22 dollars

2. For $C = 8 + 2d$, explain the intercept and gradient. [2 marks]

At $d = 0$, $C = 8$.

Each increase of 1 km increases the cost by 2.

Answer: Fixed fee of 8 dollars; 2 dollars for each kilometre.

3. A tank follows $V = 150 - 5t$ L. Find when it empties and give a practical time domain. [3 marks]

Set $V = 0$: $0 = 150 - 5t$, so $t = 30$.

The model starts at zero time and stops when empty.

Answer: 30 minutes; $0 \le t \le 30$.

4. A club charges 40 dollars for membership plus 6 dollars per session. Write a cost rule and find the cost of 8 sessions. [3 marks]

Let n be sessions.

Substitute $n = 8$: $40 + 48 = 88$.

Answer: $C = 40 + 6n$; 88 dollars.

5. A plant is 12 cm high at day 0 and 18 cm high at day 3. Assuming linear growth, predict day 5 and state one limitation. [4 marks]

The rate is $\frac{18 - 12}{3} = 2$ cm/day.

$H = 12 + 2t$, so $H(5) = 22$.

Day 5 is beyond the observed range, so this is extrapolation.

Answer: 22 cm; the growth rate may change after the observed period.

6. A bus-hire model is $C = 120 + 5p$, where p is the passenger count and the bus has 24 seats. Explain why $p = 30$ is not allowed. [2 marks]

A passenger count is discrete.

The vehicle's 24-seat limit restricts the input.

Answer: The rule's passenger domain is whole numbers from 0 to 24; 30 exceeds capacity.