Practice test 4 - Explain and correct

Name: _____ Date: _____

10 questions | 56 marks | 75 minutes

Find errors in algebra and modelling, support corrections and evaluate claims.

A scientific calculator may be used.

1. A student solves $5 - 2x = 17$ and reports x = 6. [4 marks]

(a) Find the correct solution. [2 marks]

(b) Check both values and explain why the reported answer fails. [2 marks]

2. A line passes through $(2, 12)$ and $(5, 24)$. A student writes $y = 4x + 12$. [4 marks]

(a) Check the gradient and find the correct rule. [2 marks]

(b) Explain why 12 is not its y-intercept. [2 marks]

3. Consider the lines $y = 7$ and $x = 7$. [6 marks]

(a) State each gradient. [2 marks]

(b) Find their intersection. [2 marks]

(c) Explain why neither is written as $y = mx + b$ with a finite nonzero m. [2 marks]

4. Classify the solution sets of two systems. [6 marks]

(a) System A: $y = 3x - 4$ and $2y = 6x - 8$. [2 marks]

(b) System B: $y = 3x - 4$ and $y = 3x + 1$. [2 marks]

(c) Explain how the graph would confirm each conclusion. [2 marks]

5. A service charges 12 dollars for up to 3 h, then 2 dollars per extra hour, proportionally. Someone uses $C = 12 + 2t$ for t > 3. [6 marks]

(a) Write the correct later rule. [2 marks]

(b) Compare the correct and proposed costs at t = 5. [2 marks]

(c) Explain the discrepancy. [2 marks]

6. A report says a multiplying factor of 1.2 means 120% annual growth and two years therefore means 40% total growth. [6 marks]

(a) Correct the annual growth claim. [2 marks]

(b) Find the true two-year overall percentage increase. [2 marks]

(c) An amount is 720 after those two years. Find its initial value. [2 marks]

7. A quantity falls from 1200 to 972 over two equal intervals. Assume fixed-percentage decay. [6 marks]

(a) Find its positive step factor and rate of decrease. [2 marks]

(b) Find the first whole interval below 700. [2 marks]

(c) Why is subtracting 120 each interval not the same model? [2 marks]

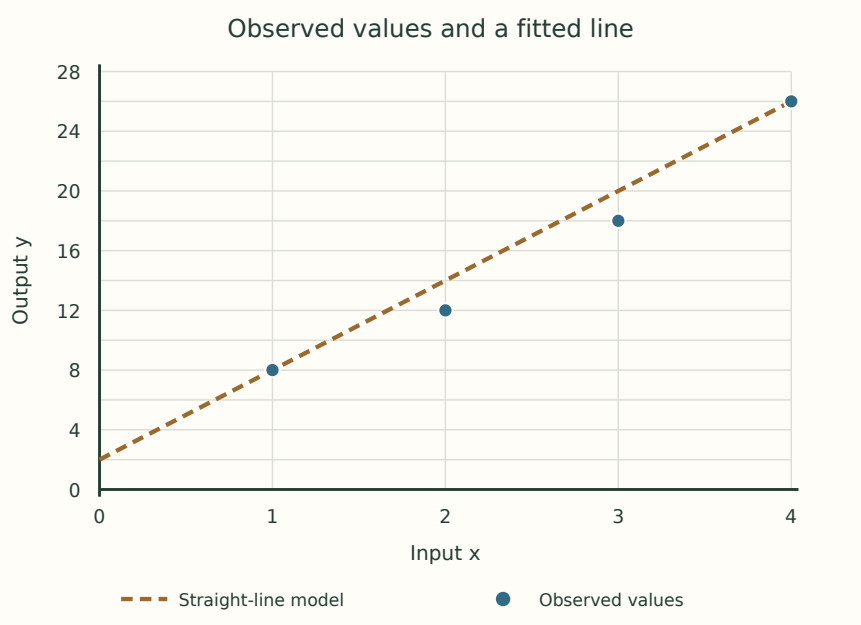
8. Values at n = 0,1,2 are 50,55,60.5. Someone says they cannot be exponential because they do not double. [6 marks]

(a) Find a constant-factor model. [2 marks]

(b) Compare the n = 2 value with the linear rule $L = 50 + 5n$. [2 marks]

(c) Correct the claim about doubling. [2 marks]

9. Use the graph below. Circles are observations; the dashed line is fitted through the first and last observations. Each small vertical grid step is 2 units. [6 marks]



(a) Read the first and last observations and find the fitted line's equation. [2 marks]

(b) Read all four observed outputs from the graph and find their residuals at x = 1,2,3,4. [2 marks]

(c) Does joining the endpoints establish an exact linear model for these data? [2 marks]

10. A fitted electricity bill rule is $C = 30 + 0.25u$ dollars for observations between 100 and 600 kWh, all on the same tariff. [6 marks]

(a) Predict the bill at 400 kWh and classify it. [2 marks]

(b) Evaluate the rule at 5000 kWh. [2 marks]

(c) Explain why the second value needs caution. [2 marks]