Statistics and regression - Practice test 3

Name: _____ Date: _____

10 questions | 51 marks | 70 minutes

Choose and assess exponential models alongside linear summaries and normal calculations.

Use a graphics calculator or appropriate digital tool for labelled tasks.

1. A population count is 120,180,270,405 at times 0,1,2,3 days. [5 marks]

Paired measurements

Days	Count
0	120
1	180
2	270
3	405

(a) Explain why an exponential model is suggested. [2 marks]

(b) Write the model and predict at day 4. [3 marks]

2. A decreasing model is $y = 800(0.85)^t$. [5 marks]

(a) State the percentage decrease per time unit. [2 marks]

(b) Calculate the decrease over four time units as a percentage. [3 marks]

3. Technology gives $\ln(\hat{y}) = 4.1 - 0.12t$. [5 marks]

(a) Express the result in original response units. [3 marks]

(b) Predict y at $t = 5$. [2 marks]

4. A class fits a log model only after removing responses 0 and -2 from the original table. [5 marks]

(a) Why do these responses prevent direct real-log fitting? [2 marks]

(b) Why is silently deleting them not a satisfactory solution? [3 marks]

5. For a straight-line fit to $\ln(y), r = -0.96$. [5 marks]

(a) Find the coefficient of determination. [2 marks]

(b) Give its correct scale-specific interpretation. [3 marks]

6. At $x = 1, 2, 3, 4$, residuals from a proposed linear model are $3, -2, -3, 2$. [5 marks]

Paired measurements

x	Residual
1	3
2	-2
3	-3
4	2

(a) Sketch the residual plot and describe its pattern. [3 marks]

(b) What follow-up is appropriate? [2 marks]

7. A regression of cost C on output q has slope 4.8 dollars per item and passes through $(50, 310)$. [5 marks]

(a) Find its equation. [3 marks]

(b) Interpret the intercept cautiously. [2 marks]

8. A model was fitted to a culture for only the first four days. [5 marks]

(a) Why is predicting its size after 100 days risky even if the model fits perfectly? [3 marks]

(b) Name one useful additional kind of evidence. [2 marks]

9. A normal sensor-error model has mean 0 and SD 0.6 units. [6 marks]

(a) Find $P(-0.9 < X < 0.9)$. [3 marks]

(b) Find the positive value c for which $P(X < c) = 0.975$. [3 marks]

10. A normal model for a measurement has mean 80 and SD 5. [5 marks]

(a) Find the probability that a measurement is at least 90. [3 marks]

(b) Out of 500 measurements, find the expected number at least 90. [2 marks]