Interpreting distribution results

6 questions | 13 marks

Equivalent correct methods earn the corresponding marks.

1. A sample fault count has mean 1.8. Explain whether any sample can contain exactly 1.8 faults. [2 marks]

Expectation is a weighted average across possible counts.

It is not an individual sample outcome.

Answer: No; the count is an integer, while its mean need not be.

2. A model gives probability 0.04 that demand exceeds capacity. Find the expected number of exceedances in 250 comparable days. [2 marks]

Expected count $= 250 \times 0.04 = 10$.

This is an average over repetitions, not a fixed schedule.

Answer: 10 days.

3. $X \sim \text{Bin}(5, 0.1)$. Is observing $X = 0$ inconsistent with the model? Quantify your answer. [3 marks]

Zero is in the support.

Its probability is about 59%, so it is not even unusual under the model.

Answer: No; $P(X = 0) = 0.9^5 = 0.59049$.

4. Two systems have equal expected daily cost. Explain why that alone does not establish which one a risk-averse manager should choose. [2 marks]

Equal means match only one summary.

The manager needs the risk criteria and further distribution information.

Answer: Their variability and high-cost tail probabilities may differ.

5. A binomial probability is displayed as 0.0000 after rounding. Must the event be impossible? [2 marks]

A positive probability below 0.00005 rounds to 0.0000 at four decimal places.

Use more precision or scientific notation when the distinction matters.

Answer: No.

6. A return rate estimated last year is used for this year's changed product range. Give a specific limitation of a binomial forecast using the old rate. [2 marks]

The binomial calculation is conditional on its p value.

Changed products can alter the return probability, so investigate updated data before trusting the forecast.

Answer: The success probability may no longer be appropriate or constant.