

“Solutions” to practice midterm:

Attention: These solutions represent only the numerical answers to the practice midterm questions, not the approach. When you work out your problems on the test, you need to provide both the approach and the numerical answer. I have excluded the approach only to provide a quicker response to you.

1. Which product?

- If X_a = lifetime of item from manufacturer A, Normally distributed
 $P(X_a < 4) = 0.184$
- If X_b = lifetime of item from manufacturer B, Exponentially distributed
 $P(X_b < 4) = 0.5507$
- Use your INFORMED-BY-STATISTICS judgment - arguments, substantiated with your probabilities, can be made for either case.

2. X = Fracture strength, $\mu_x = 14$, $\sigma_x = 2$, $n = 100$

- $P(\bar{X} > 14.5) = \dots = 0.006210$
- IGNORE – This specific problem is not representative of our test.

3. Repairs per day

- Y_a = # repairs per day for machine A, Poisson with $E[Y_a] = \lambda_a = 1.0$
 - Y_b = # repairs per day for machine B, Poisson with $E[Y_b] = \lambda_b = 1.2$
- $P(Y_a = 0)$ given Y_a is Poisson = 0.367,
 $P(Y_b = 0)$ given Y_b is Poisson = 0.3012

NOTE: You can also solve these problems by defining exponential random variables (T_a and T_b) that represent the time to repair. Then you would solve for $P(T_a > 1)$ and $P(T_b > 1)$ since the Y values (and the λ 's) are in terms of days. You should get the same answers.

- IGNORE – This specific problem is not representative of our test.
- Use your INFORMED-BY-STATISTICS judgment.

4. Hypothesis Testing on mean

- Use t test because $n < 30$ and standard deviation is unknown
- $T_0 = -1.00$, rejection region is $t_0 < t_{\alpha, n-1}$ or $t_0 < t_{0.05, 5}$ or $t_0 < -2.015$
- Decision – not enough evidence to reject.

5. Hypothesis Testing, means

- Standard deviation is unknown so use T-test (however since n is large, could get approximately the same results with Z-test)

- $T_0 = -2.95$, rejection region is $t_0 > t_{\alpha/2, n-1}$ and $t_0 < -t_{\alpha/2, n-1}$ (where $t_{0.025, 34} = 2.03$)
- Decision – Reject.
- ** You should be able to write an interpretation for this in English.

6. Hypothesis Testing, camera lifetime

- a. $b = 9.06$
- b. Use your INFORMED judgment
- c. $X_c = 11.24$ (i.e., the boundary of the critical region is 11.24)
- d. Cannot reject. (you should be able to express this in terms of the problem context also)