I have neither given nor received unauthorized assistance on this exam.

________________________________________________________
Name Signed                                               Date

________________________________________________________
Name Printed
1. Below are 5 histograms and 5 normal plots. Each normal plot was in fact made from one of the
data sets that produced the histograms. Match normal plots to histograms by writing a single letter
beside each histogram that you believe corresponds to the normal plot for that histogram.
2. The number of calls reaching a call center in a 1-minute period is reasonably modeled as Poisson with mean $\lambda = 2$. Use the central limit theorem and approximate the probability that in the next hour at least 100 calls total reach the call center. (You should treat the 60 1-minute periods as independent.)

3. A pre-election poll is based on a "random sample of $n = 1000$ likely voters" (nevermind the issue of how one could ever possibly obtain such a sample!). 547 of those polled express a preference for the party V candidate.

   a) What (using, say, 95% confidence) is an appropriate "margin of error" to attach to a news report that the party V candidate has a 54.7% voter share? (Show your work.)

   b) In an earlier poll (based on a different sample of $n = 1000$ likely voters), 521 of those polled expressed a preference for the party V candidate. What (using, say, 95% confidence) is an appropriate "margin of error" to attach to a news report that the party V candidate has increased voter share by 2.6%? (Show your work.)
4. Weights of so called "pre-forms" of plastic bottles produced in two different cavities of a die on a plastic injection molding machine are summarized below. (Suppose that in fact these 16 pre-forms came from 16 different molding cycles, and that pre-form weights for a particular cavity are approximately normally distributed.)

<table>
<thead>
<tr>
<th>Cavity #1</th>
<th>Cavity #2</th>
</tr>
</thead>
<tbody>
<tr>
<td>( n_1 = 8 )</td>
<td>( n_2 = 8 )</td>
</tr>
<tr>
<td>( \bar{x}_1 = 22.34 \text{ g} )</td>
<td>( \bar{x}_2 = 23.07 \text{ g} )</td>
</tr>
<tr>
<td>( s_1 = 0.005 \text{ g} )</td>
<td>( s_2 = 0.008 \text{ g} )</td>
</tr>
</tbody>
</table>

**a)** Is there clear evidence (with \( \alpha = .10 \)) of a difference between the two cavities in terms of the consistency of pre-form weights they produce? (Carefully show the entire 7-step format.)
b) Give end-points of a two-sided interval that you are "95% sure" contains the standard deviation of pre-form weights produced in Cavity #1. (PLUG IN COMPLETELY, but there is no need to simplify.)

c) Give end-points of a two-sided interval that you are "95% sure" contains the mean pre-form weight produced in Cavity #1. (PLUG IN COMPLETELY, but there is no need to simplify.)

d) Engineering requirements are that individual pre-form weights are between 22.9 g and 23.9 g. On the basis of some appropriate form of statistical interval (show it), state whether or not you are reasonably sure that most individual pre-form weights from Cavity #2 meet these requirements. Explain carefully.

e) Give end-points of a two-sided interval that you are "95% sure" contains the difference in mean pre-form weights produced in the two cavities. (PLUG IN COMPLETELY, but there is no need to simplify.)
5. (This problem is about the logic/concepts of hypothesis testing. It is NOT an application of any of the standard methods on the posted summary of one- and two-sample inference methods.)

The lifetimes (in $10^3$ hours) of a type of electronic component are modeled as Exponential with parameter $\lambda$ (and thus mean $1/\lambda$). We'll suppose that the possibility that $\lambda = 1$ is acceptable, but if $\lambda > 1$ the mean lifetime is too small for a particular application. One component of this type is tested to failure and

\[ X = \text{the lifetime (in $10^3$ hours) of the tested component} \]

**a)** Suppose that one will declare that $\lambda$ is apparently too large if $X \leq 0.5$.

- **i)** What $\alpha$ is being employed? (Explain if you hope for any credit if your number is wrong!)

- **ii)** What is $\beta$ if in fact $\lambda = 4.0$? (Explain if you hope for any credit if your number is wrong!)

**b)** What $p$-value for a test of $H_0: \lambda = 1.0$ is associated with an observation $X = 0.20$? (Explain if you hope for any credit if your number is wrong!)