Disclaimer

You should use this practice exam to assess your speed and to improve your ability to correctly identify different problem types. The questions on this practice exam are taken from exams given in previous semesters, but they may not be representative of the questions that will appear on this semester's exam. You should also invest time re-reading the relevant parts of your textbook, reviewing your notes, and practicing homework problems.
You will not receive full credit if you do not clearly show work as demonstrated in class. Show all work in the space provided on this exam. Circle your answers.

1. A college professor claims that the average cost of a paperback textbook is less than $27.50. A sample of 50 books has an average cost of $26.00. The population standard deviation is $5.00. At $\alpha = 0.01$, is the professor’s claim correct? Use the traditional method.

\[
\begin{align*}
    n &= 50 \\
    \bar{X} &= 26.00 \\
    \sigma &= 5 \\
    \alpha &= 0.01 \\
    k &= 27.50
\end{align*}
\]

**Step 1: State the hypotheses and identify the claim**

\[H_0 : \mu \geq 27.50\]

\[H_1 : \mu < 27.50 \text{ (claim)}\]

**Step 2: Find the critical value(s)**

C.V. = -2.33 \hspace{1cm} (left-tailed test with $\alpha = 0.01$)

**Step 3: Compute the test value**

\[
z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} = \frac{26.00 - 27.50}{5 / \sqrt{50}} = -2.12
\]

**Step 4: Determine whether to reject the null (circle the correct phrase)**

Don’t reject $H_0$.

**Step 5: Summarize the results (circle the correct terms.)**

We don’t have sufficient evidence to support the claim.
2. The percentage of physicians who are women is 27.9%. In a survey of physicians employed by a university health system, 45 of 120 randomly selected physicians were women. Is there sufficient evidence at the 0.025 level of significance to support the claim that the proportion of women physicians in this health system exceeds 27.9%? Use the traditional method.

\[
\begin{aligned}
\{ n = 120 & \quad \alpha = 0.025 \\
X = 45 & \quad k = 0.279
\end{aligned}
\]

**Step 1: State the hypotheses and identify the claim**

\[ H_0 : p \leq 0.279 \]
\[ H_1 : p > 0.279 \text{ (claim)} \]

**Step 2: Find the critical value(s)**

\[
\text{C.V.} = +1.96 \quad \text{(right-tailed test with } \alpha = 0.025 \text{ )}
\]

**Step 3: Compute the test value**

\[
\hat{p} = \frac{X}{n} = \frac{45}{120} = 0.375
\]
\[
q = 1 - p = 1 - 0.279 = 0.721
\]
\[
z = \frac{\hat{p} - p}{\sqrt{pq/n}} = \frac{0.375 - 0.279}{\sqrt{(0.279)(0.721)/120}} = +2.34
\]

**Step 4: Determine whether to reject the null (circle the correct phrase)**

Do reject \( H_0 \).

**Step 5: Summarize the results (circle the correct terms.)**

We do have sufficient evidence to support the claim.
3. The average salary for all U.S. public school teachers for a specific year was reported to be $39,385. A random sample of 50 public school teachers in a particular state had a mean of $41,202. The population standard deviation of $5975. Is there sufficient evidence at the $\alpha = 0.01$ level to support the claim that the mean salary in this state is higher than the national average? Use the $P$-value method.

\[
\begin{align*}
  n &= 50 \\
  \bar{X} &= 41,202 \\
  \sigma &= 5975 \\
  k &= 39,385 \\
  \alpha &= 0.01
\end{align*}
\]

Step 1: State the hypotheses and identify the claim

\[H_0 : \mu \leq 39,385\]

\[H_1 : \mu > 39,385 \text{ (claim)}\]

Step 2: Compute the test value

\[
z = \frac{\bar{X} - \mu}{\sigma / \sqrt{n}} = \frac{41,202 - 39,385}{5975 / \sqrt{50}} = 2.150
\]

Step 3: Find the $P$-value

\[
P\text{-value} = P(z > 2.15) = 1 - 0.9842 = 0.0158 > \alpha
\]

(right-tailed test with $\alpha = 0.01$)

Step 4: Determine whether to reject the null (circle the correct phrase)

Don’t reject $H_0$.

Step 5: Summarize the results (circle the correct terms.)

We don’t have sufficient evidence to support the claim.
4. The average salary of graduates entering the actuarial field is reported to be $40,000. (24 points)
A statistics professor claims that this reported salary is correct. She surveys twenty graduates and finds their average salary to be $38,216 with a standard deviation of $4000. Using $\alpha = 0.05$, can the professor support her claim?

Use the traditional method.

\[
\begin{align*}
\{ n = 20 \} & \quad \alpha = 0.05 \\
\{ \bar{X} = 38,216 \} & \quad d.f. = n - 1 = 20 - 1 = 19 \\
\{ s = 4000 \} & \quad k = 40,000
\end{align*}
\]

**Step 1: State the hypotheses and identify the claim**

$H_0 : \mu = 40,000$ (claim)

$H_1 : \mu \neq 40,000$

**Step 2: Find the critical value(s)**

C.V. = $\pm 2.093$ (two-tailed test with $\alpha = 0.05$ and $d.f. = 19$)

**Step 3: Compute the test value**

\[
t = \frac{\bar{X} - \mu}{s / \sqrt{n}} = \frac{38,216 - 40,000}{4000 / \sqrt{20}} = -1.995
\]

**Step 4: Determine whether to reject the null (circle the correct phrase)**

Don’t reject $H_0$.

**Step 5: Summarize the results (circle the correct terms.)**

We don’t have sufficient evidence to reject the claim.