# Practice Test 3

**Quiz Instructions**

<table>
<thead>
<tr>
<th>Question 1</th>
<th>1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>After correctly conducting a test of hypothesis, you have rejected the null hypothesis. The null hypothesis may still be true.</td>
<td></td>
</tr>
<tr>
<td>○ True</td>
<td></td>
</tr>
<tr>
<td>○ False</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 2</th>
<th>1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>The p-value is __________________.</td>
<td></td>
</tr>
<tr>
<td>○ the probability of a type II error occurring</td>
<td></td>
</tr>
<tr>
<td>○ the proportion of values that fall to the left of the observed value</td>
<td></td>
</tr>
<tr>
<td>○ the probability of a type I error occurring</td>
<td></td>
</tr>
<tr>
<td>○ the probability of obtaining a value as extreme or more extreme than the observed value by chance alone, assuming the null hypothesis is true.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question 3</th>
<th>1 pts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which setting would probably use the smallest level of significance?</td>
<td></td>
</tr>
<tr>
<td>○ Professors testing the proportion of students who cheat.</td>
<td></td>
</tr>
<tr>
<td>○ A gardener testing whether a manure helps his garden grow.</td>
<td></td>
</tr>
<tr>
<td>○ Researchers testing whether a new medication causes cancer.</td>
<td></td>
</tr>
<tr>
<td>○ A chef testing the proportion of customers who order a specific appetizer.</td>
<td></td>
</tr>
</tbody>
</table>
Question 7

The average room rate in hotels in a certain region is $82.53. A travel agent believes that the average in a particular resort area is different. The agent tests $H_0 : \mu = 82.53$; $H_a : \mu \neq 82.53$, and calculates a p-value of 0.013. At a 5% level of significance, the agent should reject the null hypothesis. There is sufficient evidence to claim that the average in the resort area differs from that of the region.

Question 8

The average room rate in hotels in a certain region is $82.53. A travel agent believes that the average in a particular resort area is different. The agent tests $H_0 : \mu = 82.53$; $H_a : \mu \neq 82.53$, and calculates a p-value of 0.063. At a 5% level of significance, the agent should fail to reject the null hypothesis. There is sufficient evidence to claim that the average in the resort area differs from that of the region.

Question 9

Which of the following statements are true in hypotheses testing?
(i) If we reject $H_0$ when $H_0$ is in fact true, we made Type I error.
(ii) If we reject $H_0$ when $H_0$ is in fact false, we made Type II error.
(iii) One will reject $H_0$ if the P-value is smaller than the significance level.

- (i), (ii) and (iii)
- (ii) only
- (i) and (iii)
- (iii) only
- (i) only
The government of a particular country reports its literacy rate as 52%. A nongovernmental organization believes it to be less. The organization takes a random sample of 600 inhabitants and obtains a literacy rate of 42%. Perform the relevant test at the 5% level of significance.

Set up the null and alternative hypotheses to test whether the proportion of literate citizens is less than the proportion reported by the government.

<table>
<thead>
<tr>
<th></th>
<th>(a) $\bar{x}$</th>
<th>(e) =</th>
<th>(i) 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) $\mu$</td>
<td>(f) &gt;</td>
<td>(j) 0.42</td>
<td></td>
</tr>
<tr>
<td>(c) $p$</td>
<td>(g) &lt;</td>
<td>(k) 0.50</td>
<td></td>
</tr>
<tr>
<td>(d) $p'$</td>
<td>(h) $\neq$</td>
<td>(m) 0.52</td>
<td></td>
</tr>
</tbody>
</table>
In March, 2020, the proportion of US grocery stores experiencing a toilet paper shortages was 87%. An emergency preparedness task force believes that the proportion of stores experiencing toilet paper shortages is lower in April. The task force sampled 120 US grocery stores, 96 of the sampled stores reported shortages.

Set up the null and alternative hypotheses to test whether the proportion of US grocery stores experiencing toilet paper shortages is lower in April than it was in March.

<table>
<thead>
<tr>
<th>(a) $x$</th>
<th>(e) =</th>
<th>(i) 0.87</th>
</tr>
</thead>
<tbody>
<tr>
<td>(b) $\mu$</td>
<td>(f) &gt;</td>
<td>(j) 0.80</td>
</tr>
<tr>
<td>(c) $p$</td>
<td>(g) &lt;</td>
<td>(k) 0.96</td>
</tr>
<tr>
<td>(d) $p'$</td>
<td>(h) $\neq$</td>
<td>(m) 0.50</td>
</tr>
</tbody>
</table>
Question 18

The null and alternative hypotheses are statements about:

- a sample statistic
- It depends - sometimes a parameter and sometimes a statistic
- a population parameter

Question 19

Which of the following symbols denotes a hypothesis that includes an equality?

- $H_o$
- $H_{eq}$
- $H_0$
- $H_a$

Question 20

Identify the steps for the p-value method:

Step 1:

Step 2:

Step 3:

Step 4:

Step 5:

Match Choices:

<table>
<thead>
<tr>
<th>Find the margin of error</th>
<th>Make a decision</th>
<th>Find the test statistic</th>
<th>Find the p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Note the type I and type II errors</td>
<td>State the hypotheses</td>
<td>Provide an interpretation</td>
<td></td>
</tr>
</tbody>
</table>
Question 24

A test is made of $H_0: \mu = 20$ versus $H_a: \mu \neq 20$. Suppose the true value of $\mu$ is 25, and $H_0$ is rejected. Determine whether the outcome is a Type I error, a Type II error, or a correct decision.

- Insufficient information to decide
- Type I Error
- Both Type I and II Errors
- Type I Error
- Correct Decision

Question 25

The average yield per acre for all types of corn in a recent year was 161.9 bushels. An economist believes that the average yield per acre is lower this year. In this scenario, a Type II error would be:

(a) Deciding that the yield is lower when it isn't.
(b) Deciding that the yield is not lower when it is.

- (a)
- (b)
The formula that we should use in Excel to calculate the p-value is (choose from below, where $Z^*$ is the test statistic):

A) $2 \times \text{NORM.DIST}(Z^*, 0, 1, \text{TRUE})$
B) $1 - \text{NORM.DIST}(Z^*, 0, 1, \text{TRUE})$
C) $\text{NORM.DIST}(1 - Z^*, 0, 1, \text{TRUE})$
D) $2 \times (1 - \text{NORM.DIST}(Z^*, 0, 1, \text{TRUE}))$
E) $\text{NORM.DIST}(Z^*, 3.58, 1.82, \text{TRUE})$
F) $1 - \text{NORM.DIST}(Z^*, 3.58, 1.82, \text{TRUE})$
G) $2 \times \text{NORM.DIST}(Z^*, 3.58, 1.82, \text{TRUE})$

**PART 5:**

Assume that the p-value calculated in part 4 was 0.0365. Based on this p-value, we should [Select] the null hypothesis. There is [Select] enough evidence to reject the sociologist's claim.
The formula that we should use in Excel to calculate the p-value is (choose from below, where $Z^*$ is the test statistic calculated in part 3):

A) $2\times\text{NORM.DIST}(Z^*, 0, 1, \text{TRUE})$
B) $1\times\text{NORM.DIST}(Z^*, 0, 1, \text{TRUE})$
C) $\text{NORM.DIST}(1-Z^*, 0, 1, \text{TRUE})$
D) $2\times(1-\text{NORM.DIST}(Z^*, 0, 1, \text{TRUE}))$
E) $\text{NORM.DIST}(Z^*, 0.961, 0.039, \text{TRUE})$
F) $1\times\text{NORM.DIST}(Z^*, 0.961, 0.039, \text{TRUE})$
G) $2\times\text{NORM.DIST}(Z^*, 0.961, 0.039, \text{TRUE})$

PART 5:

Assume that the p-value calculated in part 4 was 0.0706. Based on this p-value, we should reject the null hypothesis. There is not enough evidence to support the sociologist's claim.
The formula that we should use in Excel to calculate the p-value is (choose from below, where $T^*$ is the test statistic calculated in part 3):

A) $2\times T.DIST(T^*, 18, \text{TRUE})$
B) $1-T.DIST(T^*, 18, \text{TRUE})$
C) $T.DIST(T^*, 18, \text{TRUE})$
D) $2(1-T.DIST(T^*, 19, \text{TRUE}))$
E) $T.DIST(T^*, 19, \text{TRUE})$
F) $1-T.DIST(T^*, 19, \text{TRUE})$
G) $2-T.DIST(T^*, 19, \text{TRUE})$

PART 5:

Assume that the p-value calculated in part 4 was 0.1486. Based on this p-value, we should fail to reject the null hypothesis. There is not a large enough $n$ to reject the nutritionist's claim.