

**Apple vs. Android**

**Final Project**

**Fall 2019**

For our final project, we chose to compare Apple and Android users and their respective GPA's (grade point average). This topic was chosen due to the feud in our group over which operating system is superior as well as our overall interest in the correlation between cellular devices and GPA's. Our null hypothesis was that the GPA's for Apple and Android users would be equal. This hypothesis was tested using two populations with a 5% significance level. Therefore, our results will reveal if there is a correlation between the type of phone you have and your GPA.

To begin the two population hypothesis test, we conducted a six question survey (**Figure 1**) through *SurveyMonkey* to collect data. The 6 questions on our survey were presented in the following order: 1) What kind of phone do you own? iPhone, Android, Other. 2) What is your gender? Male, Female. 3) What grade level are you? Freshman, Sophomore, Junior, Senior, Graduate Student. 4) What is your major? 5) How many hours are you taking this semester? 6) What is your cumulative GPA? We included the extra questions such as gender, grade level, and major in order to test other hypotheses in addition to our main focus. The survey was sent to current UT Tyler students only and a total of 60 responses were received. An Excel table below (**Appendix 1-1 & 1-2**) shows the raw data from our sample. Using the information gathered, we will decide whether or not there is enough evidence to reject the null hypothesis which states  $\text{Apple GPA's} = \text{Android GPA's}$ .

First we established our two populations (iPhone users and Android users) and stated the null and alternative hypotheses (**Appendix 2-1**). Next a test statistic was used to find our P-value. The first hypothesis test, iPhone vs. Android, yielded a P-value of 0.846. Since this P-value is greater than alpha which is 0.05, we fail to reject the null hypothesis. Therefore there

is not enough evidence to conclude that the average GPA for Apple users is different than that of Android users (**Graph 4**). This conclusion is true until the 15.4% significance level. At this evaluation point, there would be enough evidence to suggest that iPhone users had a higher GPA than Android users. The 98% confidence interval for this data was  $(-0.429, 0.509)$ . The other two tailed hypothesis test we conducted was Male vs. Female GPA's. This P-value came out to 0.04 which is less than 0.05 (alpha), therefore there is enough evidence to suggest that the average GPA for males is different than females (**Graph 1**). This conclusion is true for all significant levels up to and including 5%. The 98% confidence interval for this test was  $(-0.059, 0.560)$ .

Two separate two-tailed hypothesis tests were conducted and the results of the first one matched our assumption. Upon reviewing the data it was clear that iPhone users greatly outnumbered Android users, however, there was not enough evidence to conclude that the average GPA's differed. The average GPA for iPhone users was 3.61 with a standard deviation of 0.36 while the average GPA for Android users was 3.57 with a standard deviation of 0.57. There were about 4 iPhone responses for every 1 Android response and the percentages came out to be 78.3% Apple, 20% Android, and 1.67% other. This breaks down into 47, 12, and 1 persons respectively. The gender divide was stark as well. Females had 39 responses which made up 65% of the results whereas males had 21 responses and was 35% of the results. Unlike the Apple vs. Android hypothesis test, there was enough evidence to suggest that the average GPA for males and females differed. Infact, the average GPA for females was 3.68 with a standard deviation of 0.36 while the average male GPA was 3.43 with a standard deviation of 0.45. This trend could be defended by concluding female GPA's are higher due to their fewer hours taken whereas the increased hours taken by males negatively affect their GPA's (**Graph 6**).

**Figure 1**

## Apple vs. Android

1. What kind of phone do you own?

- ☐ iPhone
- ☐ Android
- ☐ Other

2. What is your gender?

- ☐ Male
- ☐ Female

3. What grade level are you?

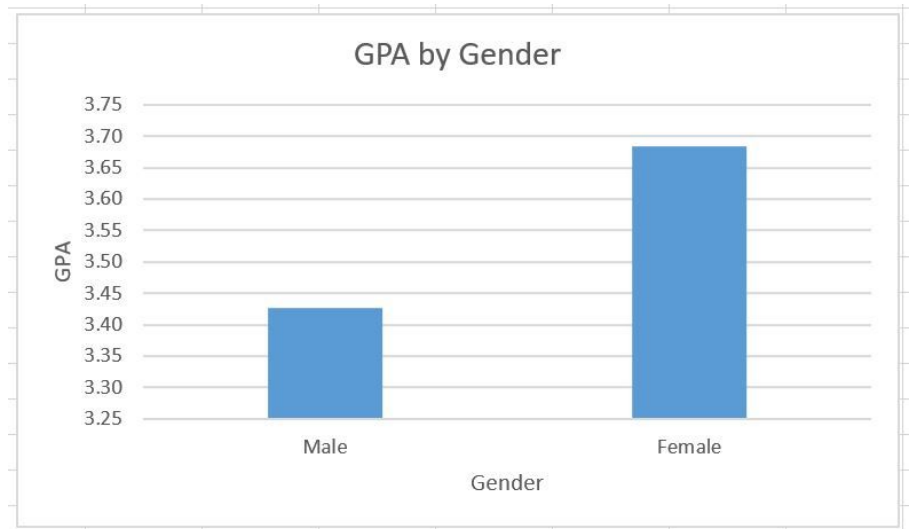
- ☐ Freshman
- ☐ Sophomore
- ☐ Junior
- ☐ Senior
- ☐ Graduate student

4. What is your major?

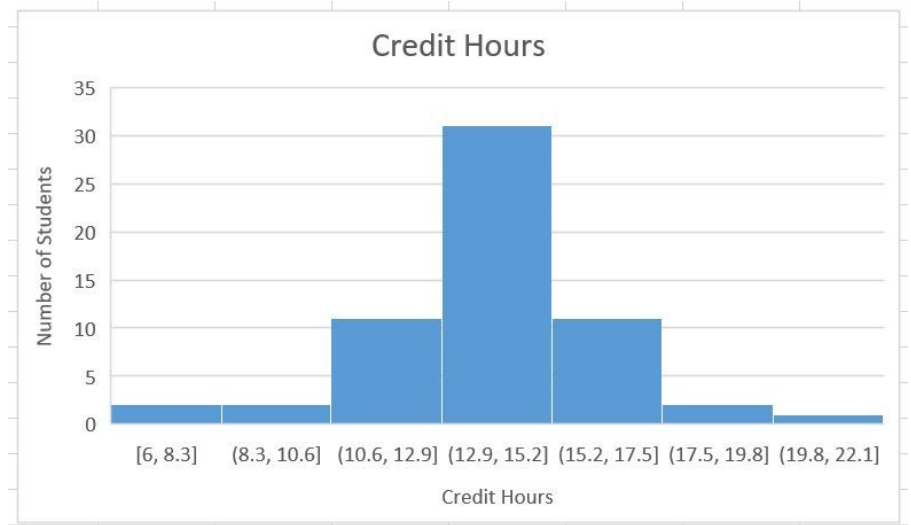
5. How many hours are you taking this semester?

6. What is your cumulative GPA?

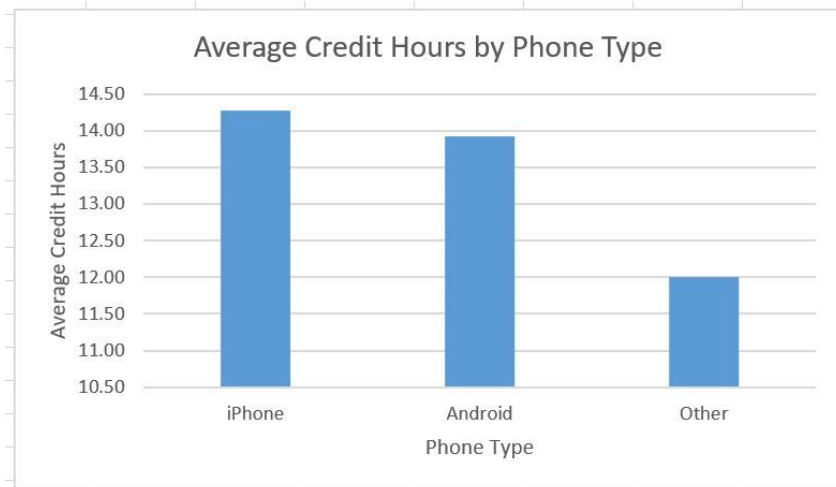
**Graph 1**



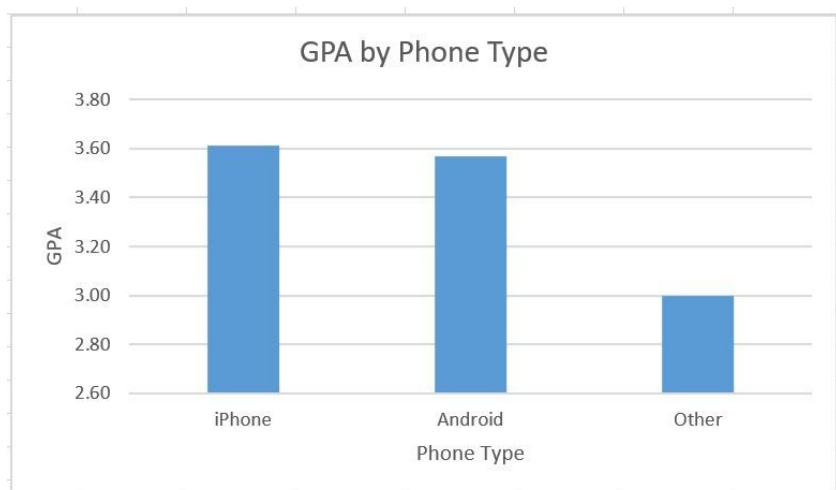
**Graph 2**



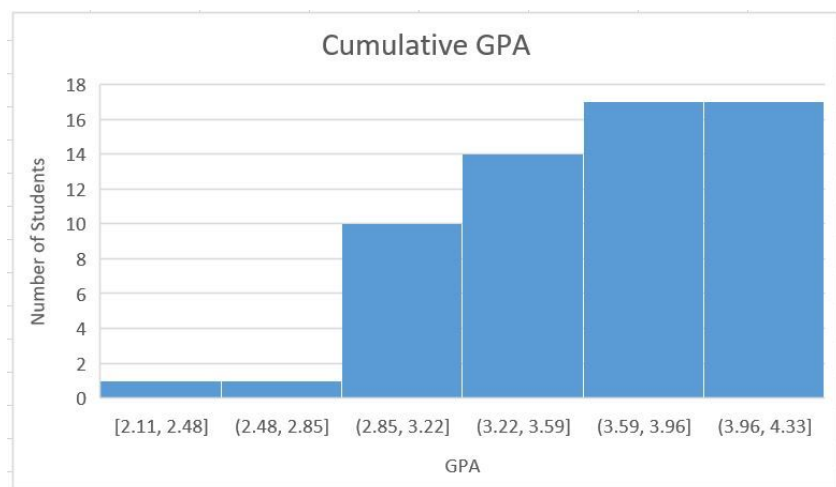
**Graph 3**



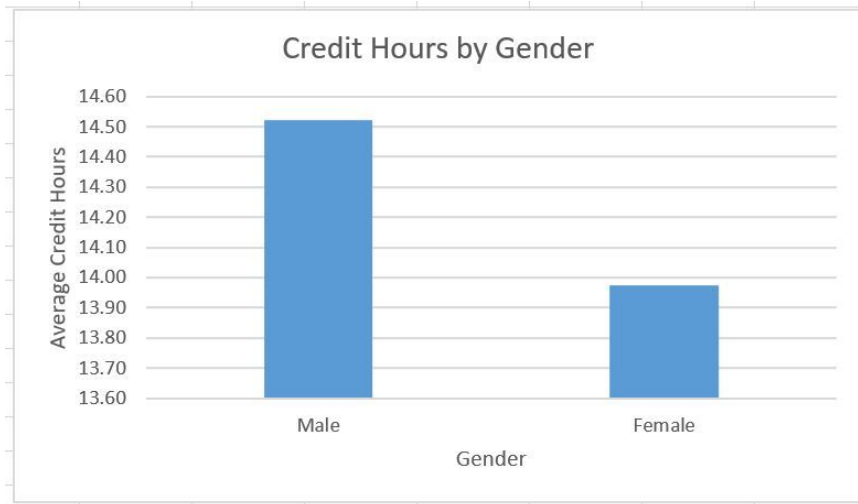
**Graph 4**



**Graph 5**



**Graph 6**



**Table 1**

| Classification | Responses |
|----------------|-----------|
| Freshman       | 5         |
| Sophomore      | 15        |
| Junior         | 29        |
| Senior         | 10        |
| Graduate       | 1         |
|                |           |
| Credit Hours   | Responses |
| <12            | 4         |
| 12             | 11        |
| 13             | 7         |
| 14             | 1         |
| 15             | 23        |
| 16             | 7         |
| 17             | 4         |
| 18             | 2         |
| >18            | 1         |

**Table 2**

| Major                        | Responses |
|------------------------------|-----------|
| Accounting                   | 1         |
| Art                          | 1         |
| Biochemistry                 | 1         |
| Biochemistry/Chemistry       | 3         |
| Biology                      | 4         |
| Business                     | 1         |
| Civil Engineering            | 9         |
| Computer Information Systems | 1         |
| Construction Management      | 2         |
| Criminal Justice             | 1         |
| Economics/Finance            | 1         |
| Elementary Education         | 1         |
| English                      | 2         |
| Health Sciences              | 1         |
| History                      | 2         |
| Human Resource Development   | 1         |
| Interdisciplinary Studies    | 1         |
| IT                           | 2         |
| Kinesiology                  | 1         |
| Leadership                   | 1         |
| Marketing                    | 1         |
| Mechanical Engineering       | 3         |
| Nursing                      | 13        |
| Psychology                   | 5         |
| Speech/Communication         | 1         |

## Appendix 1-1

| Response | Phone Type | Gender | Classification | Major                        | Credit Hours | Cumulative GPA |
|----------|------------|--------|----------------|------------------------------|--------------|----------------|
| 1        | iPhone     | Female | Sophomore      | Biochemistry/Chemistry       | 17           | 3.3            |
| 2        | iPhone     | Female | Sophomore      | Biochemistry/Chemistry       | 15           | 4              |
| 3        | iPhone     | Male   | Sophomore      | English                      | 15           | 4              |
| 4        | iPhone     | Female | Sophomore      | IT                           | 15           | 4              |
| 5        | iPhone     | Female | Sophomore      | Art                          | 15           | 4              |
| 6        | Android    | Female | Sophomore      | Psychology                   | 15           | 3.8            |
| 7        | iPhone     | Female | Sophomore      | Psychology                   | 16           | 3.3            |
| 8        | iPhone     | Male   | Sophomore      | Biochemistry/Chemistry       | 16           | 3.5            |
| 9        | iPhone     | Female | Junior         | History                      | 15           | 4              |
| 10       | iPhone     | Female | Sophomore      | Nursing                      | 16           | 4              |
| 11       | Android    | Male   | Senior         | Civil Engineering            | 15           | 3.8            |
| 12       | iPhone     | Female | Sophomore      | Marketing                    | 15           | 4              |
| 13       | iPhone     | Male   | Junior         | Human Resource Development   | 15           | 4              |
| 14       | iPhone     | Female | Junior         | Nursing                      | 15           | 3.6            |
| 15       | iPhone     | Female | Junior         | English                      | 12           | 3.62           |
| 16       | iPhone     | Female | Senior         | Psychology                   | 12           | 3.7            |
| 17       | iPhone     | Female | Freshman       | Nursing                      | 10           | 3.3            |
| 18       | iPhone     | Female | Freshman       | Nursing                      | 13           | 3              |
| 19       | iPhone     | Female | Freshman       | Nursing                      | 13           | 3.5            |
| 20       | iPhone     | Female | Junior         | Psychology                   | 17           | 3.3            |
| 21       | iPhone     | Male   | Junior         | Civil Engineering            | 16           | 3.3            |
| 22       | iPhone     | Male   | Junior         | Civil Engineering            | 15           | 3.1            |
| 23       | iPhone     | Female | Junior         | IT                           | 12           | 2.8            |
| 24       | iPhone     | Male   | Junior         | Civil Engineering            | 13           | 3.25           |
| 25       | Android    | Male   | Junior         | Civil Engineering            | 16           | 3.1            |
| 26       | iPhone     | Female | Junior         | Biochemistry                 | 12           | 3              |
| 27       | iPhone     | Female | Senior         | Health Sciences              | 15           | 4              |
| 28       | iPhone     | Female | Senior         | Speech/Communication         | 12           | 3              |
| 29       | Android    | Female | Junior         | Biology                      | 12           | 3              |
| 30       | Android    | Male   | Junior         | Computer Information Systems | 18           | 3.9            |
| 31       | Other      | Male   | Junior         | History                      | 12           | 3              |
| 32       | iPhone     | Female | Senior         | Interdisciplinary Studies    | 9            | 4              |
| 33       | iPhone     | Male   | Junior         | Construction Management      | 21           | 3.5            |
| 34       | iPhone     | Female | Junior         | Biology                      | 17           | 3.95           |
| 35       | Android    | Male   | Junior         | Mechanical Engineering       | 15           | 3.53           |
| 36       | iPhone     | Male   | Senior         | Nursing                      | 14           | 3.2            |
| 37       | iPhone     | Female | Senior         | Biology                      | 6            | 3.8            |
| 38       | iPhone     | Female | Freshman       | Business                     | 15           | 4              |



## Appendix 1-2

|          |         |        |           |                         |       |      |
|----------|---------|--------|-----------|-------------------------|-------|------|
| 39       | iPhone  | Female | Sophomore | Biology                 | 17    | 3.5  |
| 40       | iPhone  | Female | Sophomore | Construction Management | 15    | 3.6  |
| 41       | iPhone  | Female | Sophomore | Nursing                 | 12    | 4    |
| 42       | iPhone  | Female | Junior    | Nursing                 | 18    | 3.72 |
| 43       | iPhone  | Female | Sophomore | Nursing                 | 13    | 4    |
| 44       | Android | Female | Junior    | Nursing                 | 15    | 4    |
| 45       | iPhone  | Female | Junior    | Nursing                 | 15    | 3.5  |
| 46       | iPhone  | Female | Junior    | Elementary Education    | 12    | 3.79 |
| 47       | iPhone  | Male   | Junior    | Civil Engineering       | 15    | 3    |
| 48       | iPhone  | Male   | Junior    | Mechanical Engineering  | 12    | 3.2  |
| 49       | Android | Male   | Graduate  | Leadership              | 6     | 4    |
| 50       | iPhone  | Female | Freshman  | Nursing                 | 16    | 4    |
| 51       | iPhone  | Male   | Junior    | Mechanical Engineering  | 15    | 3.67 |
| 52       | Android | Male   | Junior    | Criminal Justice        | 12    | 2.11 |
| 53       | Android | Female | Junior    | Economics and Finance   | 15    | 3.89 |
| 54       | iPhone  | Female | Sophomore | Nursing                 | 13    | 3.9  |
| 55       | Android | Female | Junior    | Accounting              | 15    | 3.89 |
| 56       | iPhone  | Female | Senior    | Psychology              | 15    | 4    |
| 57       | iPhone  | Male   | Senior    | Kinesiology             | 15    | 3.5  |
| 58       | iPhone  | Male   | Junior    | Civil Engineering       | 16    | 3.5  |
| 59       | iPhone  | Female | Junior    | Civil Engineering       | 13    | 3.9  |
| 60       | Android | Male   | Senior    | Civil Engineering       | 13    | 3.8  |
| AVERAGE  |         |        |           |                         | 14.17 | 3.59 |
| ST. DEV. |         |        |           |                         | 2.56  | 0.41 |
| iPhone   |         |        |           |                         | 14.28 | 3.61 |
| ST. DEV. |         |        |           |                         | 2.47  | 0.36 |
| Android  |         |        |           |                         | 13.92 | 3.57 |
| ST. DEV. |         |        |           |                         | 3.00  | 0.57 |
| Other    |         |        |           |                         | 12.00 | 3.00 |
| Male     |         |        |           |                         | 14.52 | 3.43 |
| ST. DEV. |         |        |           |                         | 2.84  | 0.45 |
| Female   |         |        |           |                         | 13.97 | 3.68 |
| ST. DEV. |         |        |           |                         | 2.41  | 0.36 |



## Appendix 2-1

2-Sample Null Hypothesis Test - iPhone vs Android GPA

iPhone:  $\bar{x} = 3.61$ ,  $S_1 = 0.36$ ,  $m = 47$

Android:  $\bar{y} = 3.57$ ,  $S_2 = 0.57$ ,  $n = 12$

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}} = \frac{3.61 - 3.57}{\sqrt{\frac{(.36)^2}{47} + \frac{(.57)^2}{12}}} = 0.231$$

$$D = 11$$

$$P = 0.423(2)$$

$$P = 0.846$$

## Appendix 2-2

2-Sample Difference Confidence Interval - iPhone vs Android GPA

$$\begin{aligned} \bar{x} - \bar{y} \pm t \sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}} \\ 3.61 - 3.57 \pm 2.718 \sqrt{\frac{(.36)^2}{47} + \frac{(.57)^2}{12}} \\ 0.04 \pm 0.469 \end{aligned}$$

$$(-0.429, 0.509)$$

### Appendix 2-3

#### 2-Sample Null Hypothesis Test - Male vs Female GPA

Female:  $\bar{x} = 3.68$ ,  $S_1 = 0.36$ ,  $m = 39$

Male:  $\bar{y} = 3.43$ ,  $S_2 = 0.45$ ,  $n = 21$

$$t = \frac{\bar{x} - \bar{y}}{\sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}} = \frac{3.68 - 3.43}{\sqrt{\frac{(0.36)^2}{39} + \frac{(0.45)^2}{21}}} = 2.20$$

$$df = 20$$

$$P = 0.02(2)$$

$$P = 0.04$$

### Appendix 2-4

#### 2-Sample Difference Confidence Interval - Male vs Female GPA

$$\bar{x} - \bar{y} \pm t \sqrt{\frac{s_1^2}{m} + \frac{s_2^2}{n}}$$
$$3.68 - 3.43 \pm 2.718 \sqrt{\frac{(0.36)^2}{39} + \frac{(0.45)^2}{21}}$$

$$0.25 \pm 0.309$$

$$(-0.059, 0.559)$$