How are males and females in Math 171 and Math 301 representative of the Longwood population?

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MATH 171

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**3.2 Introduction:**

 In this project, we took a random sample from a voluntary survey that 349 Longwood University Students from Math 171 and Math 301 STAT students participated in during Spring 2019. We looked at their presidential approval and BMI statistics and computed histograms and boxplots to visualize the data that was collected. These results can be viewed in the Appendix section.

During the second section of this project, we used the data collected from part one and we answered the question “Is there a difference in BMI between male and female statistics students at Longwood University?” In order to answer that question we conducted a hypothesis test and created a 95% confidence interval. We conducted a two sample t-test as well as we constructed a 95% confidence interval to verify whether or not there was a difference in the students BMI depending on the gender of Longwood University statistic students who participated in this survey.

**3.3 Data Collection:**

The population in this study is all Math 171 and Math 301 students Spring 2019 in who took voluntary surveys. The categorical values are sex, class, and presidential approval. The quantitative variable is the BMI of each student. The BMI is also continuous. When looking at the excel file, we took ID numbers 1-219 by using the MATH button on the calculator, move to PROB, and move the arrow down to number 8, randIntNoRep(, to get a random sample of 20 females, i.e., randIntNoRep(1, 219, 20). To find a random sample of 20 males, i.e., randIntNoRep( 210, 350, 20). We used ID numbers 210-349 by using the same commands we used for the females. We went and copied and pasted each ID number into an excel file to have our random samples together. This is an observational study, because it is observing the population of Math 171 and Math 301 students, and collecting personal data from each individual without using a cause and effect method. It is reasonable to use our simple random sample to approximate the population because it was not only drawn randomly but we had a sample of 20 males and females, which all together is 40. This is a larger sample which makes it a better approximate. However, the larger the sample the more reasonable it becomes. Therefore, if we were to take a larger random sample we would be able to have a more accurate approximation.

**3.4 Data Description:**

1. **Histogram for SRS of 20 Female LU STAT Students Presidential Approval**

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The mode is disapproval. 60% of students disapproved.

**Histogram for SRS of 20 Male LU Stat Students Presidential Approval**

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The mode is approval and disapproval. 40% approved and 40% disapproved.

The majority of females disapproved of the job the president is doing. However, male students equally approved and disapproved. There was 20% of male and females who were unsure.

2 and 5. **Histogram and Boxplot for SRS of 20 Female LU Stat Students for BMI**

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Between 24 and 30 BMI there is 45% of female students. The shape of this distribution would be skewed right. The center occurs between 24 and 30 BMI. It is spread across with a middle BMI occurring the most frequently.

 **Histogram and Boxplot for SRS of 20 Male LU Stat Students for BMI**

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Between 18 and 24 BMI there are 40% of male students. The shape of this distribution would be skewed right. The center would be between 24 and 30. It is spread across with the lowest BMI occurs the most frequently. There are more males with lower BMI than females.

3. **Descriptive STATS for Female BMI (5 number summary)**

Mean: 26.5

Min Value: 18.9

Max Value: 44.7

Q1: 20.75

Q3: 29.1

M: 25.2

**Summary Statistics**

|  |  |  |
| --- | --- | --- |
| Mean | 26.5 |  |
| Std Dev | 6.5689861 |  |
| Std Err Mean | 1.46887 |  |
| Upper 95% Mean | 29.57438 |  |
| Lower 95% Mean | 23.42562 |  |
| N | 20 |  |

**Descriptive STATS for Male BMI (5 number summary)**

Mean: 26.795

Min Value: 19.6

Max Value: 43.1

Q1: 22.45

Q3: 31.6

M: 24.4

**Summary Statistics**

|  |  |  |
| --- | --- | --- |
| Mean | 26.795 |  |
| Std Dev | 6.0761375 |  |
| Std Err Mean | 1.3586657 |  |
| Upper 95% Mean | 29.63872 |  |
| Lower 95% Mean | 23.95128 |  |
| N | 20 |  |

4. Outliers for females

* The upper outlier for females is the female with ID number 139 because it is above the upper fence which was 38.79. There are no lower outliers for BMI for females.

 Outliers for males

* The male with ID number 311 is a high outlier because it is above the upper fence which was 38.17 for BMI. There are no low outliers for male BMI.

**3.5 Data Analysis:**

 In order to accurately determine whether the conditions are satisfied we will assume that the BMI is normally distributed for both the male population of statistic students and the female population of statistic students. The other condition that was satisfied in this test was that the samples were drawn randomly which means the sample means are approximately normal. The two populations used were the male statistic students who took this survey and the female statistic students who took this survey. Let μm equal the mean BMI of the male population and let μf equal the mean BMI of the female population. The two hypotheses of the tests are Ho: μm=μf and Ha: μа≠μf. The degrees of freedom for the BMI of the statistics male and female students is 19. In order to determine the test statistic and p-value we used the 2-SampTTest on the calculator and entered the appropriate information. The test statistic is .1474345671. The p-value is .8835784777. After conducting the hypothesis tests and using the test statistic approach, we reject the null hypothesis because there is a high probability that the null hypothesis does not equal the alternative hypothesis. There is a high probability that the BMI of male statistic students at Longwood University that participated in the survey does not equal the BMI of female statistic students at Longwood University that participated in the survey. In order to conduct a 95% confidence interval, we used the 2SampleTInt command on the calculator and put in the appropriate data. The 95% confidence interval for the difference in the two population BMI means is (-3.757, 4.3466). This confidence interval supports the result of our hypothesis tests because the parameter is not in the confidence interval and we rejected our null hypothesis.

**3.6 Appendix:**

Male SRS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID  | sex  | class  | PA | BMI  |
| 254 | Male | Sophomore | Disapprove | 34 |
| 222 | Male | Sophomore | Disapprove | 20.4 |
| 348 | Male | Freshman | Disapprove | 25.7 |
| 237 | Male | Sophomore | Approve | 28.1 |
| 266 | Male | Freshman | Approve | 23.1 |
| 226 | Male | Freshman | Approve | 22.4 |
| 243 | Male | Sophomore | Approve | 34.9 |
| 330 | Male | Freshman | Unsure | 24.7 |
| 262 | Male | Sophomore | Unsure | 26.6 |
| 294 | Male | Freshman | Disapprove | 21.9 |
| 295 | Male | Senior | Approve | 32.6 |
| 220 | Male | Senior | Disapprove | 24.1 |
| 312 | Male | Junior | Approve | 30.6 |
| 311 | Male | Junior | Disapprove | 43.1 |
| 308 | Male | Sophomore | Disapprove | 22.5 |
| 334 | Male | Freshman | Unsure | 22.5 |
| 273 | Male | Freshman | Unsure | 19.6 |
| 349 | Male | Sophomore | Disapprove | 24.1 |
| 286 | Male | Freshman | Approve | 33 |
| 299 | Male | Freshman | Approve | 22 |

Female SRS

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID  | sex  | class | PA | BMI |
| 27 | Female | Freshman | Disapprove | 30.1 |
| 12 | Female | Freshman | Disapprove | 29.2 |
| 159 | Female | Junior | Unsure | 24.3 |
| 3 | Female | Freshman | Disapprove | 24.4 |
| 93 | Female | Junior | Unsure | 20 |
| 68 | Female | Freshman | Approve | 20.6 |
| 213 | Female | Freshman | Disapprove | 28.8 |
| 7 | Female | Freshman | Approve | 22 |
| 184 | Female | Junior | Disapprove | 28.2 |
| 136 | Female | Sophomore | Unsure | 20 |
| 45 | Female | Sophomore | Disapprove | 25.8 |
| 216 | Female | Freshman | Unsure | 18.9 |
| 67 | Female | Freshman | Disapprove | 20.9 |
| 55 | Female | Freshman | Approve | 24.6 |
| 208 | Female | Sophomore | Disapprove | 20.5 |
| 203 | Female | Senior | Disapprove | 29 |
| 10 | Female | Junior | Disapprove | 37.3 |
| 25 | Female | Junior | Disapprove | 34.2 |
| 153 | Female | Freshman | Approve | 26.5 |
| 139 | Female | Senior | Disapprove | 44.7 |

Graph 1: **Histogram for SRS of 20 Female LU STAT Students Presidential Approval**

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Graph 2: **Histogram for SRS of 20 Male LU Stat Students Presidential Approval**

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Graph 3: **Histogram and Boxplot for SRS of 20 Female LU Stat Students for BMI**

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Graph 4: **Histogram and Boxplot for SRS of 20 Male LU Stat Students for BMI**

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