

MAT 243 Project Two Summary Report

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1. Introduction: Problem Statement

We are using large data sets from the historical team the 1996-1998 Chicago Bulls and a more recent season for the 2013 - 2015 Wizards. The goal is to use population mean and proportions to test claims about the two teams. We will create a null and alternative hypothesis for claims and test for its rejection or acceptance based on the p value and test statistic. The primary variables in use will be the teams relative skill and total points scored per game.

2. Introduction: Your Team and the Assigned Team

Table 1. Information on the Teams

	Name of Team	Years Picked
1. Yours	Wizards	2013-2015
2. Assigned	Bulls	1996-1998

3. Hypothesis Test for the Population Mean (I)

This section of python code uses `scipy.stats` to take the mean relative skill per my chosen team and find the p score and test statistic for hypothesis testing. Oftentimes the hypothesis testing is related to the population mean which is true for this case.

The hypothesis hypothesized by the coach is that the Wizards from 2013-2015 averaged a higher skill level than 1340. Testing the hypothesis using the provided alpha significance level 0.05 we compare that to the p value which we returned as 0.0 despite the fact that it rounds to the nearest fourth decimal place. Therefore we can say that the p value is less than the significance level which means we reject the null hypothesis in favor of the alternative hypothesis. So it is true that the Wizards averaged a relative skill level greater than 1340, they averaged 1481.1 from 2013 to 2015.

- $H_0 : \mu = 1340$
- $H_a : \mu > 1340$
- $\alpha : 0.05$

Table 2: Hypothesis Test for the Population Mean (I)

Statistic	Value
Test Statistic	33.31
P-value	0.0

Since the P value is essentially zero for any significance level the null hypothesis would be rejected, suggesting the Wizards relative skill during 2013-2015 is well over 1340. The test statistic being 33.31 also supports the coaches right tailed hypothesis of the teams mean relative skill being greater than 1340.

4. Hypothesis Test for the Population Mean (II)

Alternatively to the previous hypothesis this time the coach predicts a left tailed hypothesis. The variable in use for the population mean in this hypothesis is the Wizards average points scored per game. The null hypothesis would be that the points scored per game is equal to 106. The alternative hypothesis is that the points scored by the Wizards is less than 106.

- $H_0: \mu = 106$
- $H_a: \mu < 106$
- $\alpha: 0.01$

Table 3: Hypothesis Test for the Population Mean (II)

Statistic	Value
Test Statistic	-11.35
P-value	0.0

Since the P value here is also 0.0 the null hypothesis is rejected and the alternative is accepted. The actual average points scored a game by the Wizards in 2013 to 2015 is 97.47. Therefore the coach's hypothesis that the team scored less than 106 points a game on average is correct. The test statistic being negative also supports the alternative hypothesis.

5. Hypothesis Test for the Population Proportion

The probability hypothesis by management is that when the Wizards during 2013 to 2015 scored 102 or more points they have a 90% probability of winning. The null hypothesis would be that the probability is accurate therefore equal, the alternative hypothesis is that they're not equal. This is a two tailed alternative hypothesis since the prediction does not specify a direction.

- $H_0: p = 0.90$
- $H_a: p \neq 0.90$
- $\alpha: 0.05$

Table 4: Hypothesis Test for the Population Proportion

Statistic	Value
Test Statistic	-3.79
P-value	0.0002

At first with the code I was making the mistake of using p for the null hypothesis value when I should have been using 0.9. I was confused and wondering why the P value was outputting as 1.0 since I knew that the actual probability of the team winning while scoring over 102 points was less than 0.9. After fixing the bug the proper output revealed that we should in fact reject the null hypothesis and the negative test statistic shows that the actual probability is less than 0.9. The true proportion of games won by the Wizards 2013 to 2015 while scoring 102 points or greater is 0.7722.

6. Hypothesis Test for the Difference Between Two Population Means

The hypothesis from the management is that the relative skill for the Wizards 2013 to 2015 is equal to the relative skill of the Bulls 1996 to 1998. Which is quite a bold claim.

- $H_0 : p_1 = p_2$
- $H_a : p_1 \neq p_2$
- $\alpha : 0.01$
- In general, how is hypothesis testing used to test claims about the difference between two population means?
- Summarize all important steps of the hypothesis test. This includes:
 - a. Null Hypothesis (statistical notation and its description in words)
 - b. Alternative Hypothesis (statistical notation and its description in words)
 - c. Level of Significance
 - d. Report the Test Statistic and the P-value in a formatted table as shown below:

Table 5: Hypothesis Test for the Difference Between Two Population Means

Statistic	Value
Test Statistic	48.15
P-value	0.0

In conclusion the relative skill for the Bulls 1996 to 1998 is significantly greater than the relative skill for the Wizards 2013 to 2015. The p value depicts that we should reject the null hypothesis since the two relative skill levels are indeed not equal. The Bulls relative skill is 1739.8 while the Wizards relative skill is 1481.4.

7. Conclusion

Using hypothesis testing on population mean and proportions allows us to determine whether or not certain claims are true. Gathering the mean of a population allows businesses to analyze the data in a way that targets the largest number of customers possible. In this specific scenario the population means of a single team were used to test certain claims. The population proportion was used to compare and contrast the relative skill from two different teams.