**Name: Math 153 Test #3**

Directions: For each problem conduct the appropriate hypothesis test using a 5% level of significance for each test. (Make sure to include all parts of the hypothesis test)

1. 100 Randomly selected Americans over the age of 18 were asked how many hours a night they sleep, and the selected Americans had a mean sleep time of 6.8 hours with a standard deviation of 0.9 hours. An MIT professor believed that people in Italy over the age of 18 sleep more on average then people over the age of 18 in America. So he also asked 120 randomly selected Italian citizens over the age of 18 how many hours a night they sleep. The selected Italians had a mean of 7.1 hours of sleep and a standard deviation of 0.6 hours. Is there enough evidence to support the professor’s claim?
2. A player wanted to see if their hitting coach was actually helping their batting average, so he did a statistical analysis to test the hypothesis that the coach was increasing his batting average. Before he hired the hitting coach the player got a hit about 27% of the time. After he hired the hitting coach he randomly selected 160 at bats in which he had 48 hits, is this enough statistical evidence that the coach has helped the player?
3. You are the manager of the packaging process at a cereal manufacturing plant. You want to determine if the cereal ﬁlling process is working properly. The process requires no corrective action if the correct amount of cereal per box is at least 368 grams. To study this, you decide to take a random sample of 45 boxes, weigh each one, and then evaluate the difference between the sample statistic and the hypothesized population parameter by comparing the mean weight from the sample to the expected population mean of 368 grams speciﬁed by the company. The sample mean is 372.5 and the sample standard deviation is 15 grams. Is there evidence that the weight is *different* from 368 grams?
4. A professor tells the class on the first day that the distribution for grades in all of his classes over the past 20 years, has been as shown:

21% A’s, 32% B’s, 25% C’s, 14% D’s, and 8% F’s

At the end of the semester the class of 40 students feels the professor was lying to them when he originally told them his normal break down of grades due to the fact that out of the 40 students there were 7 A’s, 10 B’s, 14 C’s, 4 D’s and 5 F’s. Does this data support the class’s claim that the professor was probably lying to them at the beginning of the semester?

1. Explain what a Type I error and a Type II error would be in the context of the problem and state which one you think would be worse and why? All court cases in the United States start by assuming the person is Not Guilty (Ho).

**Scenario:** A man is on trial for stealing a piece of jewelry from a store, the punishment if found guilty is 1 year in prison.

1. If someone believes the average temperature in a specific state is over 76o and they take a sample of 50 days and record the temperatures for that state. The average temperature found for the 50 days is 80o. They conduct an appropriate hypothesis test and discover the p-value is equal to 0.04. **Explain in detail** what the p-value is actually saying in the context of this problem.
2. What type of test would we conduct if we were trying to see if the average salary in the United States was more than $41,000 per year given a sample mean of $41,750 and it is known that the population standard deviation is known to be $1,500? (Pick the best choice below)

A) One proportion D) One Sample T

B) Two proportion E) Two Sample Z

C) One Sample Z F) Chi-Squared G.O.F

1. We are conducting a two proportion test to see if Males or Females are more likely to get a speeding ticket. We take a random sample of 30 Males and 25 Females and find out that 12 of the Males had received a speeding ticket and 8 of the Females had received a speeding ticket. Given this information check the conditions for the Hypothesis Test and state which conditions (if any) are not met. If one or more conditions are not met what would we do to fix the problem?

**Inferential Statistics**

Standardized test statistic: statistic – parameter

 standard deviation of statistic

Confidence interval: statistic ± (critical value) • (standard deviation of statistic)

**Single–Sample**

|  |  |
| --- | --- |
| Statistic | Standard DeviationOf Statistic |
| Sample Mean |  |
| Sample Proportion |  |

**Two–Sample**

|  |  |
| --- | --- |
| Statistic | Standard DeviationOf Statistic |
| Difference ofsample means |  |
| Difference ofsample proportions |  |

Chi-square test statistic = 