Exam 2 Review Problems

1. The distribution of heights of adult American men is approximately normal with a mean of 69 inches and a standard deviation of 2.5 inches. Based on this information, what is the probability that a man selected a random is
   1. At least 72 inches (6 feet) tall?
   2. Between 60 and 72 inches tall?
   3. Less than 68 inches tall?
2. Weekly demand at a grocery store for a brand of breakfast cereal is normally distributed with a mean of 800 boxes and a standard deviation of 75 boxes. What is the probability that the weekly demand is
   1. Less than 959 boxes
   2. More than 1004 boxes
   3. Between 650 and 950 boxes
3. Marketing research done by a fast food restaurant indicates that coffee tastes best if its temperature is between 153oF and 167oF. The restaurant has found the temperature of cups of coffees follows a normal distribution with a mean of 159oF and a standard deviation of 6.4. What is the probability that the temperature of a cup of coffee will be
   1. Between 153 and 167 degrees?
   2. Greater than 170 degrees?
   3. Less than 150 degrees?
4. In a metal fabrication process, metal rods are produced that have an average length of 20.5 feet with a standard deviation of 2.3 feet. A quality control specialist collects a random sample of 35 rods and measures their lengths.
   1. Describe the sampling distribution for the mean length of the rods from this sample (type of distribution, mean, standard deviation). Hint: Central Limit Theorem
   2. If another quality control specialist came in and collected a separate sample of 35 rods and measured their lengths, would you expect the average length calculated from the first specialist’s sample to be the same as the average length calculated from the second specialist’s sample? Why or why not?
5. A manufacturer of cheese filled ravioli supplies a pizza restaurant chain. Based on data collected from its automatic filling process, the amount of cheese inserted into the ravioli is normally distributed with a mean of 15 grams and a standard deviation of 0.15 grams. To insure that the automatic filling process is on target, quality control inspectors take a sample of 15 ravioli and find that the average amount of cheese for the sample is 14.9 grams.
   1. What are the mean and standard deviation of the sampling distribution of the mean in this case?
   2. Construct a 99% confidence interval for the average amount of cheese inserted into the ravioli by the automatic filling process and interpret the results in the context of this problem.
   3. Suppose that the quality control inspectors sampled 100 ravioli. How would the sampling distribution of the mean (and hence the margin of error for the confidence interval) change (e.g., would it increase or decrease)?
   4. How many ravioli should the inspector sample to insure that they can estimate the mean weight of cheese inserted by the automatic filling machine to within 0.25 grams with 99% confidence?
6. The United Nations wants to determine the percentage of females in the US labor force. Representatives from the US Department of Labor take a random sample of 525 employment records and find that 229 of the people are females.
   1. Construct a 90% confidence interval for the true proportion of females in the US labor force. Report the upper and lower limits as well as the margin of error.
   2. Interpret the confidence interval in this context.
   3. Are the assumptions and conditions for constructing a confidence interval met in this situation?
   4. Suppose that we constructed a 95% confidence interval instead. Would the margin of error increase or decrease?
7. Automobile mechanics conduct diagnostic tests on 150 new cars of a particular make and model to determine the extent to which they are affected by a recent recall due to faulty catalytic converters. They find that 42 of the new cars tested do have faulty catalytic converters.
   1. Construct a 95% confidence interval for the proportion of new cars that have faulty converters and report the upper and lower confidence limits and margin of error.
   2. Interpret the confidence interval in the context of this problem.
8. Cola makers test new recipes for loss of sweetness during storage. Trained tasters rate the sweetness before and after storage. Assume that the sweetness ratings are normally distributed. Based on a sample of 10 tasters, the average sweetness rating for a new cola was found to be 1.02 with a sample standard deviation of 1.196.
   1. Construct a 90% confidence interval for the average sweetness rating and interpret the result in the context of this problem.
9. Insurance companies track life expectancy information to assist in determining the cost of life insurance policies. Last year the average life expectancy of all policyholders was 77 years. ABI insurance wants to determine if their clients now have a longer life expectancy, on average, so they randomly sample 20 of their recently paid policies. The ages of the clients were entered into Excel and summarized as shown below.
   1. Based on the sample results, find the 90% confidence interval and interpret in the context of this problem.

|  |  |  |  |
| --- | --- | --- | --- |
| Age |  | Sample Statistics |  |
| 86 |  | Mean = | 78.60 |
| 75 |  | Std. Deviation = | 4.48 |
| 83 |  |  |  |
| 84 |  | d.f. (n-1) | 19 |
| 81 |  |  |  |
| 77 |  | t(alpha) | 1.729 |
| 78 |  |  |  |
| 79 |  | Confidence Interval |  |
| 79 |  | Upper Limit |  |
| 81 |  | Lower Limit |  |
| 76 |  |  |  |
| 85 |  |  |  |
| 70 |  |  |  |
| 76 |  |  |  |
| 79 |  | Margin of Error |  |
| 81 |  |  |  |
| 73 |  |  |  |
| 74 |  |  |  |
| 72 |  |  |  |
| 83 |  |  |  |

1. A bank manager wants to get a better understanding of the amount of time customers spend waiting to be served by tellers during peak business hours. The waiting times are known to have a population standard deviation of 2.47 minutes. Suppose the manager samples 100 customers and finds that their average waiting time is 5.46 minutes.
   1. Compute a 95% confidence interval for the average waiting time at this bank and report the upper and lower confidence limits.
   2. The bank manager would like to be able to say that the average waiting time is less than 7 minutes. Would he be able to confidently make that statement based on this confidence interval?