Worksheet 6D

Null hypothesis: population parameter is *equal to* claimed value

Alternative hypothesis: population parameter is *less than*/ *greater than*/ *not equal to* claimed value

Hypothesis test: to *reject* the null hypothesis or to *not reject* it (thus, support the alternative hypothesis).

An observed event is **statistically significant** if it is unlikely to have occurred by chance. It is **statistically significant at level 0.05 (or 0.01)** if the probability of the event *as extreme as or more extreme than* the observed event is less than 5% (or less than 1%, respectively).

Central Limit Theorem: $\bar{X} = \frac{X_1+X_2+\cdots+X_n}{n}$ is approximately normally distributed with $\mu = \mu_{X_1}$, $\sigma = \frac{\sigma_{X_1}}{\sqrt{n}}$.

Sample proportion: the proportion of data in the sample that satisfies a certain property

The **95% confidence interval** is $\left[p - \frac{1}{\sqrt{n}},\ p + \frac{1}{\sqrt{n}}\right]$ (good to use when the sample proportion $p \approx 0.5$) and the **margin of error** is $\frac{1}{\sqrt{n}}$.

In Problems 1-3, state the null and alternative hypotheses for a hypothesis test. Describe the two possible outcomes of the test, using the context of the given situation.

1) The Superintendent claims that the median salary of a high school teacher in her school district is above the national median of $62,000.

2) The state hydrologist claims that the total precipitation for the year just ended is less than the average of 27.5 inches recorded over the prior ten years.

3) A candy factory produces bags that should contain 50 candies. After examining 1000 bags, a quality-control team claims that the machine is not properly calibrated (meaning, the average number of candies per bag is not 50).

In Problem 4-7,

- *state whether you think the observed event is statistically significant,*
- *state the implied null hypothesis and alternative hypothesis,*
- *describe the event as extreme as or more extreme than the observed event*
- *calculate the probability of the event as extreme as or more extreme than the observed event*
- *determine if the observed event is of level of significant 0.05 or 0.01 or neither*

4) In 10 coin flips, you get all Tails. You suspect that the coin is biased toward Tail.

5) In 10 coin flips, you get exactly one Head. You suspect that the coin is biased toward Tail.

6) In 10 coin flips, you get exactly two Heads. You suspect that the coin is biased toward Tail.

7) In 10 coin flips, you get exactly two Heads. You suspect that the coin is unfair.

In Problems 8-10,

- *determine the population, sample, population parameter, sample parameter,*
- *find the margin of error (in percentage),*
- *find the 95% confidence interval (in percentage),*
- *briefly interpret the 95% confidence interval.*

8) A survey of 65,000 households by the U.S. Department of Labor reported an unemployment rate of 4.3%.

9) A tech company released a new feature in its mobile app: the “one-tap payment” function. The company wants to estimate what proportion of its users have tried or activated that new feature. A survey of 950 customers reported that 64% of them have tried the feature.

10) A university wants to estimate what proportion of all admitted applicants will actually accept their offer. They send out offers of admission to 800 number of applicants and found that 42% of those applicants accept the offer, while the rest decline.