Statistics 3—assignment---session 17

Problem 1

Step 1: State the null hypothesis: H_0:μ=100
Step 2: State the alternate hypothesis: H_1:≠100
Step 3: State your alpha level. We'll use 0.05 for this example. As this is a two-tailed test, split the alpha into two.
0.05/2=0.025
Step 4: Find the z-score associated with your alpha level. You're looking for the area in one tail only. A z-score for 0.75(1-0.025=0.975) is 1.96. As this is a two-tailed test, you would also be considering the left tail (z=1.96)

$$Z = \frac{\overline{x} - \mu_0}{\sigma / \sqrt{n}}$$

Step 5: Find the test statistic using this formula:
z=(108-100)/(15/√36)=0.08
Step 6: If Step 5 is less than -1.96 or greater than 1.96 (Step 3), reject the null hypothesis. In this case, it is lesser than 1.96, so you cannot reject the null hypothesis.

Problem 2

For this analysis, let P_1 = the proportion of Republican voters in the first state

P_2 = the proportion of Republican voters in the second state

p_1 = the proportion of Republican voters in the sample from the first state

p_2 = the proportion of Republican voters in the sample from the second state.

The number of voters sampled from the first state (n_1) = 100

the number of voters sampled from the second state (n_2) = 100.

The solution involves four steps.

- n_1P_1 = 100 * 0.52 = 52
- $n_1(1 - P_1)$ = 100 * 0.48 = 48
- n_2P_2 = 100 * 0.47 = 47

- $n_2(1 - P_2) = 100 * 0.53 = 53$

- the mean of the difference in sample proportions: $E(p_1 - p_2) = P_1 - P_2 = 0.52 - 0.47 = 0.05$.

- the standard deviation of the difference.

$$\sigma_d = \text{sqrt}\{ [P_1(1 - P_1) / n_1] + [P_2(1 - P_2) / n_2] \}$$
$$\sigma_d = \text{sqrt}\{ [(0.52)(0.48) / 100] + [(0.47)(0.53) / 100] \}$$
$$\sigma_d = \text{sqrt}\ (0.002496 + 0.002491) = \text{sqrt}(0.004987) = 0.0706$$

- This problem requires to find the probability that p_1 is less than p_2. This is equivalent to finding the probability that $p_1 - p_2$ is less than zero. To find this probability, we need to transform the random variable $(p_1 - p_2)$ into a z-score. That transformation appears below.

$$z_{p1 - p2} = (x - \mu_{p1 - p2}) / \sigma_d = = (0 - 0.05)/0.0706 = -0.7082$$

the probability of a z-score being -0.7082 or less is 0.24.

Therefore, the probability that the survey will show a greater percentage of Republican voters in the second state than in the first state is 0.24.

Problem 3

My score = 1100

Mean = 1026

Standard deviation = 209

$z= (x-\mu)/\sigma = (1100-1026)/209 = .3541$
1-.3541=0.6368
By 63% scores are less than 1100.

So by 63% did well than an average test taker