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STAT 401
Project 2

1. A) A type 1 error would be if the FDA were to not approve a drug that is safe. This can be risky since people may need the drug to treat a certain condition but are not getting it when it is actually safe. A type 2 error would be if the FDA were to approve a drug as safe, when the drug is not safe. This would be riskier since individuals that take the drug may be affected negatively or harmed.

   B) The consumers are trying to avoid the Type 2 error since they believe the null, that the drug is safe, is being accepted too easily.

   C) The lobbyist are trying to limit the Type 1 error because they want a looser approval process, meaning more drugs are accepted, so a larger alpha, which leads to a higher type 1 error.

   D) The way to reduce both types of errors would be to increase the sample size, so that there is less variation among the sample population, leading to more accurate hypothesis testing and less error.

2.

Input:

```
n = 64;
x_bar = 350;
mew = 375;
sigma = 100;
alpha = 0.05;
ME = 1.96*sigma/sqrt(n);
z = (x_bar-mew)/(sigma/sqrt(n))
normcdf(z)
z < alpha
ci = [m-ME,m+ME]
```

Output:

z = -2

Pvalue = 0.0228

ans = True

ci = 325.5000 374.5000

a) There is sufficient evidence to conclude that the mean life of the lightbulb is different than 375 hours
b) T = (x_bar – mew)/(sigma/sqrt(n)) = -2
c) CI_95 = [x_bar - (1.96*sigma/(sqrt(n)), x_bar + (1.96*sigma/(sqrt(n))] = [325.5, 374.5]

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d) Part c backs up the claim made in part A since for a 95% confidence interval, the population mean, 375, was not included in the interval. With this you can conclude that there is a 95% chance the true population mean is between 325.5 hours and 374.5 hours

3. **Input:**

```
n = 15;
data = [7.42,6.29,5.83,6.50,8.34,9.51,7.1,6.8,5.9,4.89,6.50,5.52,7.9,8.3,9.6];
[h,p,ci,stats] = ttest(data,6.5)
```

Output:

```
h =
      0
p =
      0.1245
ci =
      6.3147    7.8720
stats =
      struct with fields:
      tstat: 1.6344
         df: 14
         sd: 1.4060
```

a) There is not enough evidence to suggest that the mean amount of money spent on lunch is different than $6.50

b) In order to conduct the hypothesis test in part a), you must assume that the distribution of lunch money spent on lunch of the population is normal

c) t = (x_bar – mew)/ s/(sqrt(n)) = 1.6344

d) CI_95 = (x_bar – t(.025,14)*s/(sqrt(n)), x_bar – t(.025,14)*s/(sqrt(n))] = [6.3147, 7.8720]