Math 263
Quiz 6 **Name**_____

Is there a link between chocolate and depression? In a study, 931 people who were not taking depression medication were screened for depression and filled out a food survey.[1] The participants were divided into two groups, 311 who screened positive for depression and 620 who screened negative for depression. These two subgroups were believed to be representative of the populations of depressed people not on medication and of non-depressed people. For the depressed group, the mean number of servings per month of chocolate was 8.39, with standard deviation 14.83. For the non-depressed group, the mean number of servings per month of chocolate was 5.39, with standard deviation 8.76.

(a) Is there evidence that people who are depressed eat more chocolate? Use the following steps to decide:

(i) What is the null hypothesis?

(ii) What is the alternate hypothesis?

(iii) Find the test statistic. (That is, the value of t or z.)

(iv) What is distribution of the test statistic? (Is it a t or z-score? If t, what is its degree of freedom?)

(v) Find the p-value.

(vi) What is your conclusion?

(b) What can you say about causation in this context?
Mark each of the statements as **T** (True) or **F** (False). The study provides evidence that:

____Chocolate and depression are associated.

____Chocolate causes depression.

____Depression causes people to eat chocolate.

____Chocolate may cause depression.

____Depression may cause people to eat chocolate.

[1] "Mood food: chocolate and depressive symptoms in a cross-sectional analysis." Rose N, et al. http://www.ncbi.nlm.nih.gov/pubmed/20421555 . Reported in *Statistics: Learning from Data*, R. Peck Brooks-Cole 2014.

Answers

The variable is quantitative—-the number of servings of chocolate per month.

(a) This is a two-sample hypothesis test. Let Population 1 be the depressed group and Population 2 be the non-depressed group.

(i) Null hypothesis is that the two groups eat the same quantity of chocolate: $H_0: \mu_1 = \mu_2$.

(ii) Alternate hypothesis is that the depressed group eats more chocolate: $H_a: \mu_1 > \mu_2$.

(iii) The standard error of the difference in means is

$$SE = \sqrt{\frac{14.83^2}{311} + \frac{8.76^2}{620}} = 0.9116$$

Thus the *t*-value is

$$t = \frac{8.39 - 5.39}{0.9116} = 3.29.$$

(iv) The statistic has the t-distribution with 310 degrees of freedom.

(v) The p-value is small. Since the df is large, we use the z-table, giving $p = 1 - 0.995 = 0.005$.

(vi) We reject the null hypothesis and conclude that people in the depressed group eat significantly more chocolate.

(b) The study was not randomized; participants were observed. However, the two samples were believed to be representative of the depressed and non-depressed populations.

__T__Chocolate and depression are associated.

__F__Chocolate causes depression.

__F__Depression causes people to eat chocolate.

__T__Chocolate may cause depression.

___T_Depression may cause people to eat chocolate.