

Math 254 – Test #2

June 5, 2015

Name: Solution Set

Instructor: Patricia Wrean

Total: 30 points

1. What survey design is used in the following situations? (4 points)

- a) A few electoral districts are chosen at random, and every voter in that district is contacted. cluster
- b) The 17<sup>th</sup> person and then every 100<sup>th</sup> person thereafter on the list of registered voters in BC is contacted and asked a question. 1-in-100 systematic
- c) Every registered voter's name is written on paper and put into a really, really big hat. The hat is shaken and 1000 papers are selected. simple random
- d) The voters' list is divided up into electoral districts, and 100 names are chosen randomly from each district. stratified random

2. Random samples of plain and peanut M&M candies showed that 12 of the 56 plain M&Ms were red, while 8 of the 23 peanut M&Ms were red. A student wishes to determine whether the fraction of red candies in the two types of M&Ms is the same. (3 points)

Consider the following statements:

- a) There is no difference in the percentage of red candies between plain M&Ms and peanut M&Ms.
- b) There is a difference in the percentage of red candies between plain M&Ms and peanut M&Ms.
- c) There's a higher percentage of red candies in peanut M&Ms than in plain M&Ms.
- d) There's a higher percentage of red candies in plain M&Ms than in peanut M&Ms.

Which of the above statements is the null hypothesis? a

Which of the above statements is the alternate hypothesis? b

If you claim that the percentage of red candies between the two types of M&Ms is the same when there actually is a difference, which type of error is this? Circle one:

→ accept  $H_0$  when  $H_0$  actually false

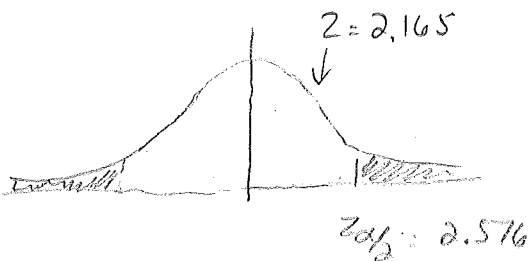
Type I / Type II

7. A study conducted by the doctors of a particular hospital involved monitoring a random sample of 75 patients. The results showed it took an average of 3.2 cc of tranquilizer to put a patient to sleep before surgery with a standard deviation of 0.4 cc. However, the latest medical research claims that the average amount of tranquilizer needed to put any patient to sleep is 3.1 cc. Use a test of hypothesis to determine with 99% confidence whether the hospital's average differs from the research value. (5 points)

$$H_0: \mu = \mu_0 \quad \text{two-tailed} \quad (\text{no difference})$$

$$H_a: \mu \neq \mu_0 \quad (\text{signif. diff})$$

test statistic:  $z = \frac{\bar{x} - \mu_0}{s/\sqrt{n}} = \frac{3.2 - 3.1}{0.4/\sqrt{75}} = 2.165$



$z$  is in acceptance region

There is not enough evidence at the 99% confidence level to suggest that the hospital's average is different than the research value.

(or with 99% confidence, can say they are the same)