

## 1 Z-Test

1. An infomercial claims that a miracle drug will cause you to grow all your hair back. There are 25 brave participants and surprisingly 7 people regrew their hair. If normally 10% of people regrow their hair, can you say that this drug worked with significance level .05?
2. You flip a coin 100 times and get 55 heads. Can you say that it is biased towards heads? (use  $\alpha = 0.05$ )
3. An infomercial claims that a miracle drug will cause you to grow all your hair back. There are 100 brave participants and this time 20 people regrew their hair. If normally 10% of people regrow their hair, can you say that this drug worked with significance level .05?

## 2 T-Test

For a sample of size  $n$ , the  $t$ -statistic is a measure of how far the sample mean  $\bar{X}$  lies from the hypothesized population mean  $\mu_0$ , measured in units of the standard error in the mean  $s/\sqrt{n}$ . The  $t$ -statistic is given by

$$T_{n-1} = \frac{(\bar{X} - \mu_0)\sqrt{n}}{s}$$

It is used during hypothesis testing to determine whether the sample data are compatible with the null hypothesis. It usually deal with the case that has small sample size.

1. The heart rates of 40 patients in an ICU have mean 95.3 beats per minute and standard deviation 16.9 beats per minute. Are heart rates from ICU patients unusual given normal heart rate has mean of 72 beats per minute with a significance of .01?
  - (a) What is the degree of freedom?
  - (b) What is the t-statistic and significance?
2. When individuals become infected with malaria the parasite consumes red blood cells, causing the patient to become anemic. Red blood cell concentration was measured in a group of 18 mice, 10 days after infection, giving the following data, in (cells  $\times 10^6/\mu L$ )

3.2	4.5	3.7	3.3	2.5	3.6
3.3	3.6	4.2	3.5	2.0	3.1
2.3	2.9	6.9	4.5	7.3	3.0

which has an average of 3.75 and standard deviation of 1.4. Assume the data is from a normal distribution. Does the data provide evidence that the mean red blood cell concentration differs from  $(3.0 \times 10^6)$  cells/ $\mu L$  at the  $\alpha = .01$  significance level?