

1 Z-Test

1. When Thanos snapped his fingers, everyone had a $p = 0.5$ chance of disintegrating. I think that this probability was much lower for the original Avengers. Out of the 6 of them, no one got disintegrated. Can you reject the null hypothesis that there was a $p = 0.5$ chance of each of them disintegrating with an $\alpha = 0.05$?
2. An infomercial claims that a miracle drug will cause you to grow all your hair back. There are 36 brave participants and surprisingly 10 people regrew their hair. If normally 10% of people regrow their hair, can you say that this drug worked?
3. You flip a coin 100 times and get 55 heads. Can you say that it is biased towards heads? (use $\alpha = 0.05$)
4. 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?

2 T-Test

Review: The t -statistic is given by

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

We use it instead of the Z -test when dealing with small sample sizes (e.g. $n < 30$).

1. The heart rates of 20 patients in the ICU have mean 95.3beats/min and sample standard deviation 16.9 beats/min. Are heart rates from ICU patients unusual given the normal heart rate has a mean of 72 beats/min?
 - (a) What is the degrees of freedom?
 - (b) What is the t -statistic?
2. Scores on the SAT math section follow a normal distribution with mean 500. You suspect you are better than the average SAT taker at math and so take five different SAT math tests. If your scores on these exams are 570, 620, 710, 440, and 710:
 - (a) calculate the average and sample standard deviation of your scores.
 - (b) calculate the t -statistic of your scores.
 - (c) get a p -value for this result. At $\alpha = 0.05$ significance, should you conclude that you're good at SAT math tests?
 - (d) Suppose your two 710 scores had actually been perfect 800s. How does your t -statistic change, and why?