

Practice for Midterm 3 - Intro Stats

The format of the test will be the same as the others.

1. Five coins are flipped simultaneously 10 times, i.e., 10 trials of five flips per trial. We wish to determine if the five coins (together) are fair by counting the number of times exactly 4 heads appear. The observed number of times that exactly 4 heads appear is 3. Perform a hypothesis test at a significance level of 5% to test

H_0 : The five coins (together) are fair

H_A : The five coins (together) are not fair.

2. The probability that a 20 year-old owns a car is .2 (or 20%) while the probability that a 30 year-old owns a car is .7 (or 70%). Five thousand people, which were randomly picked from the population of 20 and 30 year-olds are placed in a room. It turns out that the room contains 2000 20 year-olds and 3000 30 year-olds.

a) Find a 99.7% confidence interval for the number of people in the room who own a car.

b) Interpret the meaning of the confidence interval found in part (a).

3. Suppose at a casino they use a small sized, unusual, roulette wheel: it has 5 red spaces, 5 black spaces, 2 blue spaces, and 1 green space. A government spy has recorded the last 130 spins and tallied the results given below.

Color	Observed frequency
Red	48
Black	51
Blue	11
Green	20
	130

The payout for the roulette wheel is as follows: If you bet \$1 on red and red shows you get back \$3 (your bet back plus \$1 winnings), if you bet \$1 on black and black shows you get back \$3, if you bet \$1 on blue and blue shows you get back \$4, and you are not allowed to bet on green. Answer the following questions pertaining to this roulette wheel and the results.

a) Assuming that the roulette wheel is fair, a person who places 100 consecutive bets on red is expected to win/lose (circle one) \$ _____ give or take \$ _____ or so.

b) Assuming that the roulette wheel is fair, a person who places 400 consecutive bets on blue is expected to win/lose (circle one) _____ % of the time give or take _____ % or so.

c) The government spy believes that blue does not show up as often as it should if the wheel were fair. Using the data above, test the null hypothesis that the number of blues is equal to the expected number of blues in 130 spins against the alternative hypothesis that the government spy believes to be true. Is there highly statistically significant evidence to support the government spy?

d) Perform a χ^2 test at a significant level of 1% to determine whether or not the roulette wheel is fair.

4. We want to determine if there is a relationship between class year and the highest grade (A, B, or C) received last semester. We randomly sample 200 students and find the following:

	A	B	C
2009	20	30	14
2010	16	34	4
2011	24	10	6
2012	30	22	6

At a significant level of 5%, would you conclude that class year and highest grade are independent?

5. We hope to determine whether parental income and SAT scores are correlated. We randomly sample 50 students and calculate a correlation coefficient of .29. At a significance level of 1%, would you conclude that SAT scores and parental income are positively correlated?