Review of the Exact Test of Hypotheses (Binomial Test) for one population proportion p.

Answer the following questions by using the appropriate commands of binomial distributions in R.

1. Suppose you suspect a coin is biased against tails, and that you decided to conduct a test of hypothesis by tossing the coin n = 15 times.

a. What are the null and the alternative hypotheses?

b. What is the rejection region in terms of X = number of tails obtained in the 15 tosses that you need to use so that the level α of the test is as close as 0.05 (remember your α needs to be below 0.05).

c. If the coin you are tossing is truly biased against tails, and has a probability of tails equal to 0.3, what is the probability that you will let the owner of the coin walk scotch free when using the α level you set in part b above? That is, what is the probability β that you will make at Type II error?

d. If the coin you are tossing is truly biased against tails, and has a probability of tails equal to 0.1, what is the probability that you will let the owner of the coin walk scotch free when using the α level you set in part b above? That is, what is the probability β that you will make at Type II error?

e. If once you tossed the coin 15 times you obtain 6 tails, can you reject the null hypothesis? Why? Interpret your results in terms of the subject matter.

f. What is the p-value of your result in part e?

g. If once you tossed the coin 15 times you obtain 3 tails, can you reject the null hypothesis? Why? Interpret your results in terms of the subject matter.

h. What is the p-value of your result in part g?

i. Suppose you decide to conduct a test so that you have a lower probability of Type I error than that you used in part a above. What is the rejection region in terms of X = number of tails obtained in the 15 tosses that you need to use so that the level α of the test is as close as 0.01 (remember alpha needs to be below 0.01).

j. If the coin you are tossing is truly biased against tails, and has a probability of tails equal to 0.3, what is the probability that you will let the owner of the coin walk scotch free when using the α level you set in part i above? That is, what is the probability β that you will make at Type II error? Compare this value with the one you obtained in part c above and comment on this comparison.

k. If the coin you are tossing is truly biased against tails, and has a probability of tails equal to 0.1, what is the probability that you will let the owner of the coin walk scotch free when using the α level you set in part b above? That is, what is the probability β that you will make at Type II error? Compare this value with the one you obtained in part d above and comment on this comparison.