Hypothesis Testing Homework

1. Long-term data show that 80% of smokers who attempt to quit smoking relapse. Another way to say this is that the Prob(Relapse) = .8 for people attempting to quit smoking. Suppose that a scientist develops a new treatment for helping people quit smoking. His scientific hypothesis is that the new treatment (NT) will reduce the relapse rate. He samples 10 volunteers who want to quit smoking and provides them NT. His DV is an indicator variable X. X = 0 if the volunteer does not relapse in 6 months; X = 1 if the volunteer does relapse in 6 months. His Test Statistic (TS) = ΣX.

   A) What is the scientific hypothesis? Is it directional or non-directional? What is the skeptical hypothesis?

   B) Following the procedure in class, state H_0 and H_1. Is H_1 one- or two-tailed?

   C) In simple words, what does the TS tell you? Why is this a sensible thing to measure in this study?

   D) Use StatCenter's binomial tool to find the sampling distribution of TS. Sketch it clearly.

   E) Explain in simple words why it makes sense to use the binomial distribution to find the probability distribution of TS. I'm looking for a simple, easy answer.

   F) What is the range of your TS?

   G) Where would put your critical value(s) to get α near .05? If it's a hard choice choose the smaller alpha level.

2. If he sampled n = 20 volunteers instead of 10:

   H) Use StatCenter's binomial tool to find the sampling distribution of TS. Sketch its main shape clearly.

   I) What is the range of your TS?

   J) Where would put your critical value(s) to get α near .05? If it's a hard choice choose the smaller alpha level.

3. If he sampled n = 90 volunteers:

   K) Use StatCenter's binomial tool to find the sampling distribution of TS. Sketch its main shape clearly, but obviously don't show the details of every probability.

   L) What is the range of your TS?

   M) Where would put your critical value(s) to get α near .05?

   N) If you put the critical value between 59 and 60, what is α?

4. In terms of the above, describe why you need to specify degrees of freedom (some formula involving n) in order to set critical values.

t for single mean

a. Scientific: verbal assessment will improve scores above the national average (500)
Skeptical: there will be no improvement in scores, still at the national average (500)
Null: chance / Results favoring scientific hypothesis are due to chance alone

b. directional, specify that they do better

c. H_0: $\bar{C}(M) = 500$
H_1: $\bar{C}(M) > 500$

d. t test for single mean

e. .05

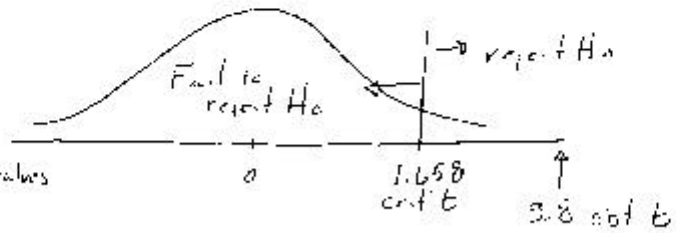
f. Probability of rejecting H_0 when it is true

g. $df = n - 1 = 122 - 1 = 121$

h. one tailed, scientific hypothesis is directional

i. crit $t(121)_{.05} = 1.658$

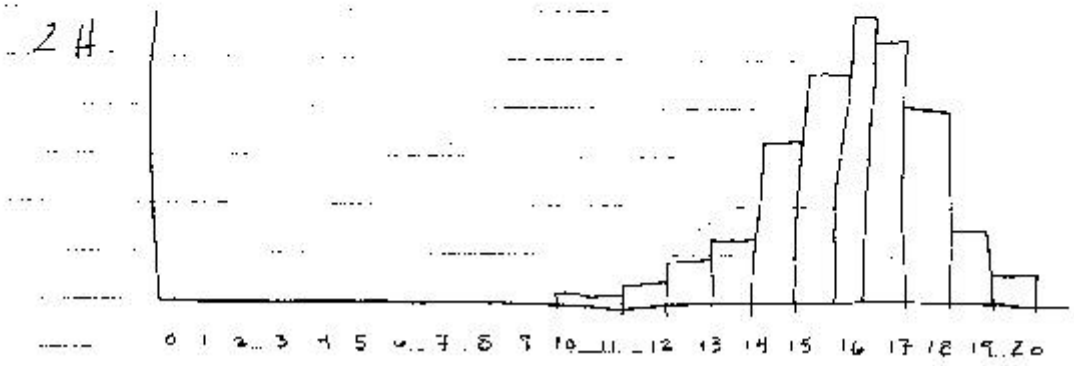
j.



F. TS = ΣX. Range: Lowest value to highest value
0 to 10

G. p (5 and below) = 0.328

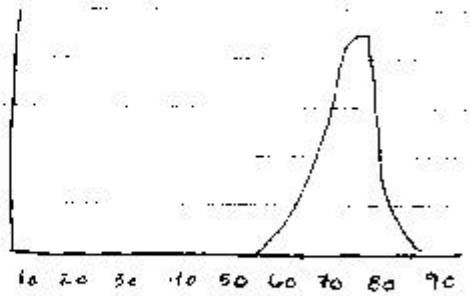
2 H.



I. TS = ΣX Range. Lowest value to highest value
0 to 20.

J. p (12 and below) = .0321

3K.



L. Range Lowest to highest
0 to 90

M. p (65 and below) = .047

N. p (59 and below) = .001

4. As n changes, the shape of the distribution changes Critical value (keep $\alpha \leq .05$) changes as the shape of the distribution changes