

Show all of your work on your own paper.

1. (10 pts) State in its entirety the Central Limit Theorem for Means.
2. (12 pts) A recent article in the *Richmond Times-Dispatch* stated that in 2010, 84.3% of 20- to 34-year-olds had a drivers license. Suppose that this is based on a survey in which it was found that 337 out of 400 20- to 34-year-olds had a drivers license. Use these data to test the hypothesis at the 5% level of significance that more than 80% of 20- to 34-year-olds in 2010 had a drivers license.
3. (10 pts) Using the data of the previous problem, find a 95% confidence interval for the proportion of 20- to 34-year-olds in 2010 who had a drivers license.
4. (16 pts) The same article went on to say that in 1983 69% of 17-year-olds had drivers licenses, while in 2008, only 50% of 17-year-olds had drivers licenses. Suppose that these data are based on a survey of 100 17-year-olds in 1983 in which 69 had drivers licenses, and a survey of 50 17-year-olds in 2008 in which 25 had drivers licenses.
 - (a) (14 pts) Test the hypothesis at the 5% level of significance that a higher proportion of 17-year-olds had drivers licenses in 1983 than in 2008.
 - (b) (3 pts) What is the value of the pooled estimate of p ?
5. (12 pts) A forester is considering purchasing a 50-acre tract of land. He will purchase it if he is convinced that it has sufficiently many trees of diameter at least 6 inches. He selects eight 100' by 100' plots of land at random from the 50 acres and counts on each plot the number of trees with diameters of at least 6 inches. (The 50-acre tract contains over 200 such plots.) He obtains the following data.

Plot	#1	#2	#3	#4	#5	#6	#7	#8
No. of 6" trees	23	30	21	39	5	21	20	23

A histogram shows that it is reasonable to assume that these data come from a normal population. Test the hypothesis at that 10% level of significance that the average number of trees of diameter at least 6 inches is more than 20 per plot.

6. (10 pts) Using the data of the previous problem, find a 90% confidence interval for the average number of 6"-diameter trees per plot.

7. (16 pts) Researchers can feed their laboratory rats either of two diets. They are wondering if there is a difference in the weights of rats fed the different diets. To find out, they select 60 rats at random and feed them Diet 1 and they select 80 rats at random and feed them Diet 2. After 6 weeks, the group that was fed Diet 1 weighs an average of 8.4 oz with a standard deviation of 1.25 oz and the group that was fed Diet 2 weighs an average of 9.0 oz with a standard deviation of 0.95 oz.
- (a) (14 pts) Test the hypothesis at the 5% level of significance that there is a difference in weight between rats fed Diet 1 and rats fed Diet 2.
- (b) (3 pts) What is the value of the pooled estimate of s ?

Optional Problem

8. (12 pts) Suppose that the heights of adult males are normally distributed with a mean of 69.5 inches and a standard deviation of 2.9 inches.
- (a) (6 pts) Describe precisely the sampling distribution of sample means of samples of size $n = 25$ taken from this population.
- (b) (6 pts) In a random sample of 25 adult males, what is the probability that the mean height is at least 70 inches?