

Final Exam

Math 112-N

Thursday, May 15, 2003

For full credit show all work. When in doubt, explain your reasoning. Show two digits after the decimal point when rounding your answers.

When performing a significance test, you must give the following answers to receive full credit:

- H_0
- H_a
- α , your significance level
- The value of your test statistic.
- The p -value.
- Whether you accept or reject H_0 .
- Your conclusion in the context of the question.

When constructing a confidence interval or performing a significance test, please list which function you use on the calculator.

1. Why do we care more about the proportion of a sample with a given property (such as injuries in a sport or babies born HIV-positive) than just the count of how many in the sample have that property?
2. A medication is tested with both a control group and a treatment group, both involving randomly selected patients suffering from a disease; the following sample data describes what proportion of each sample recovered from the disease in a given time period. Find a 95% confidence interval for the difference in proportions caused by the medication.

Treatment Group	Control Group
$n_1 = 45$	$n_2 = 53$
$\hat{p}_1 = 57\%$	$\hat{p}_2 = 38\%$

3. Given the following sample data, test at a 1% significance level whether or not there is a difference in the proportion of men and of women who smoke. Assume both samples are randomly selected.

	Men	Women
Sample size	140	150
Number who smoke	23	32

4. Construct a segmented bar chart for the following sport data, with one bar for each year:

	Year 2000	Year 2001	Year 2002
Games won	41	27	12
Games lost	13	25	40

5. If we keep the margin of error fixed, and the sample size increases, what happens to the confidence level?
6. Suppose that the proportion of all American adults with driver's licenses is 85%. A sample of size 150 is taken. Graph the sample proportion's distribution, labeling the axis where the mean and the inflection points occur.
7. A light bulb factory randomly selects 150 bulbs for quality control and measures how long it takes them to burn out. If the mean and standard deviation of bulb lifetime for all bulbs are 1000 hours and 220 hours, respectively, what is the probability that the sample average is over 950 hours?
8. In the previous question why is it better to work with a sample than with a population?
9. Find the interquartile range for the following data set.

45 39 65 9 89 53 83 41 61 52

10. How does the χ^2 test statistic differ from the other test statistics that we have discussed?
11. If the null hypothesis is true, will raising the significance level in a significance test from 1% to 5% make the test correct more often or less often?
12. 23 out of a random sample of 95 Elon students smoke; use this data to construct a 90% confidence interval for the proportion of all Elon students who smoke.

13. Construct a modified boxplot for the following data. Draw an axis underneath it labeled with numbers.

13 54 89 51 66 59 24 55 52 62 60 58 65

14. Explain the role of the null hypothesis in a significance test.
15. Give examples (in words, not pictures) of distributions that are:
- Skewed left
 - Skewed right
 - Symmetric
16. Construct a scatterplot for the following data, and also find the correlation coefficient.

x	2	3	5	7	11	13	17
y	1	4	9	16	25	36	49

17. Compute a regression model for the following sample data, and use it to predict y when $x = 24$.

x	42	24	45	32	44	37	41	27	40	39
y	86	46	88	62	90	72	84	52	82	76

18. For a given age group, height in inches is normally distributed with mean 56 and standard deviation 2.7; find the probability that a person selected at random from this population is over 57 inches tall.
19. A random sample of 500 American adults finds that their average spending on gas per week is \$15 with a standard deviation of \$2.30. Find a 99% confidence interval for the average cost of gas per week for all American adults.
20. A politician claims that a majority of American adults support a specific policy. A news organization checks the claim by polling 600 randomly selected Americans, finding that 340 of them support the policy. Test at a 5% significance level whether or not over half of American adults do support the policy.