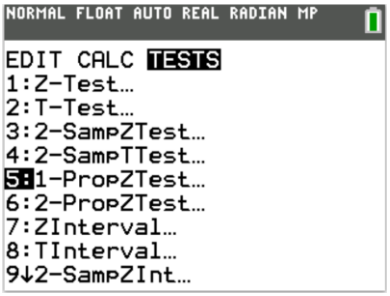
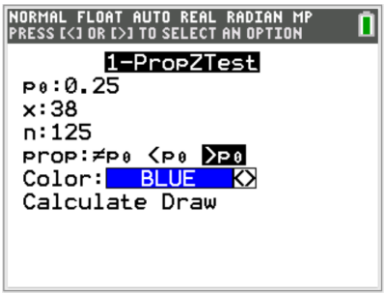
AP Statistics KEY Name:_____

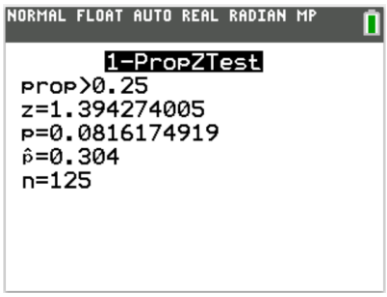
Course Review: Calculator Shortcuts Hour:____

1. 1 Sample Z Test for Proportions

A local newspaper claims that only 25% of voters in Livingston county would support a school bond. A school official believes the true percentage is larger and takes a random sample of city residents eligible to vote to find out. He finds that 38 of 125 support the proposed school bond. Does the sample support the claim? (6.6 Worksheet #1)



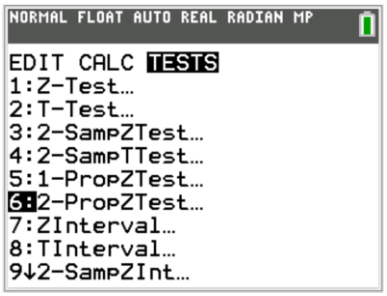


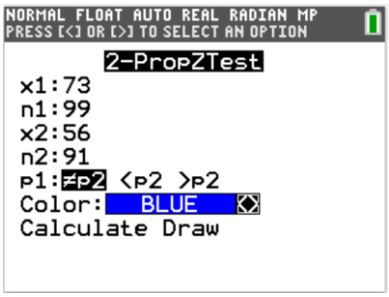


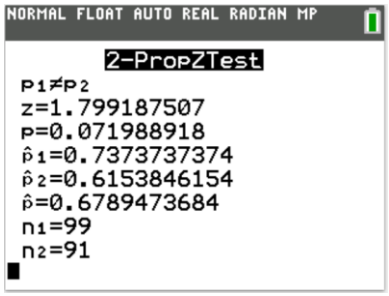
2. 2 Sample Z Test for Proportions

An airline wishes to know if the proportion of passengers who would pay $300 extra to upgrade to a first-class airline seat is different for international flights than for flights within the United States. To investigate, they asked each person in a random sample of passengers on international flights and in a random sample of domestic flights if they would pay extra. The results are displayed in the table. Is there convincing evidence that the proportion of international passengers who would pay extra is different than the proportion for passengers on domestic flights in the United States? Use a alpha level of 0.10. (6.10 – 6.11 Worksheet #3)

Type of Flight	Sample Size	# of Passengers Who Would Pay Extra
International	99	73
Domestic	91	56

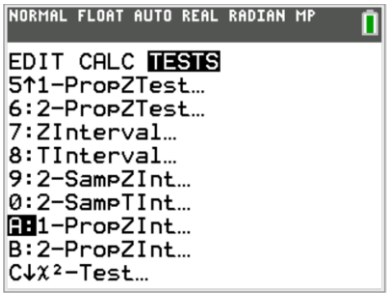


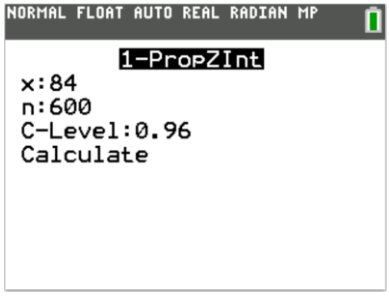


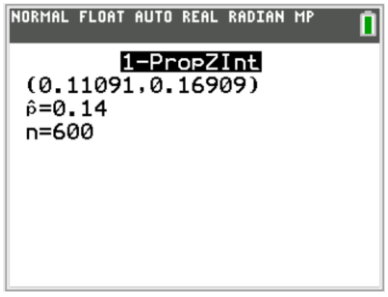


3. 1 Sample Z Interval for Proportions

When the economy improves, more people are likely to purchase items that "wants" and not "needs." With the growing economy, Harley-Davidson wants to predict the proportion of people that would buy one of their motorcycles in the next 12 months. They interview a SRS of 600 people and find that 0.14 of them plan on purchasing a Harley. Estimate the actual proportion of the population that would buy a Harley using a 96% confidence interval. Interpret this interval. (6.2 – 6.3 Worksheet #5)







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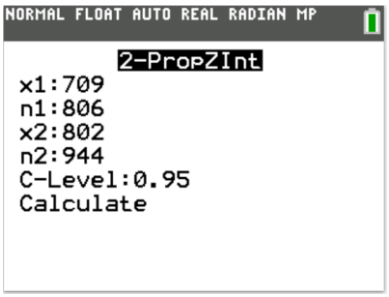
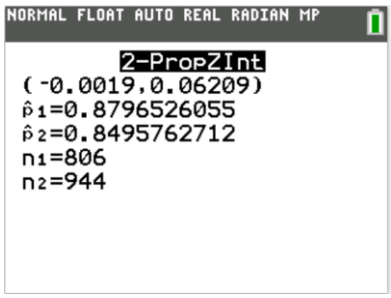
4. 2 Sample Z Interval for Proportions

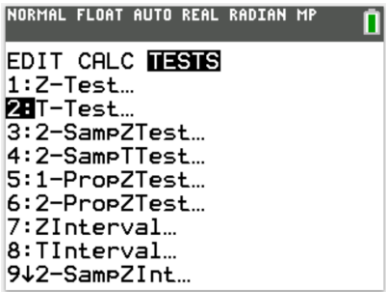
A Pew Research Center poll asked independent random samples of working women and men how much they value job security. Of the 806 women, 709 said job security as very or extremely important compared with 802 of the 944 men surveyed. Construct and interpret a 95% confidence interval for the difference in the proportion of all working women and men who consider job security very or extremely important. (6.8 – 6.9 Worksheet #2)

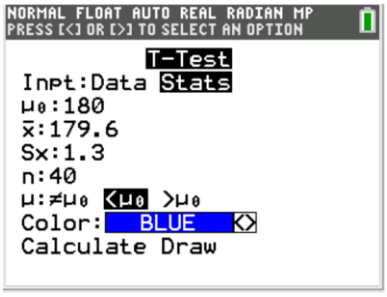


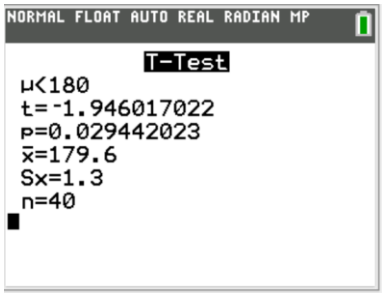


5. 1 Sample T Test for Means

One company's bottles of grapefruit juice are filled by a machine that is set to dispense an average of 180 milliliters (ml) of liquid. The company has been getting negative feedback from customers about underfilled bottles. To investigate, a quality-control inspector takes a random sample of 40 bottles and measures the volume of liquid in each bottle. The mean amount of liquid in the bottles is 179.6 ml and the standard deviation is 1.3 ml. Do these data provide convincing evidence at the $\alpha = 0.05$ significance level that the machine is underfilling the bottles? (7.5 – 7.6 Worksheet #5)

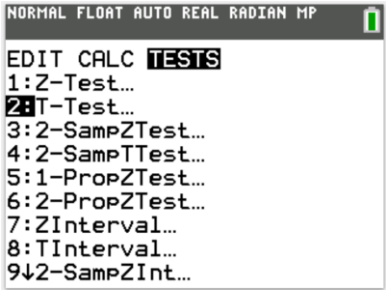


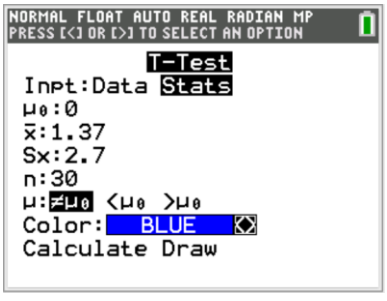


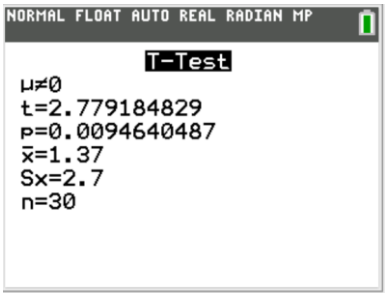


6. Paired Samples T Test for Means

Does listening to music while studying help or hinder students' learning? An experiment was conducted in which 30 students from Brighton High School were randomly selected to participate. Each student was given 10 minutes to memorize two different lists of 20 words, once while listening to music and once in silence. The order of the two word lists was determined at random, as was the order of the treatments. The difference (Silence – Music) in the number of words recalled was recorded for each subject. The mean difference was 1.37 and the standard deviation of the differences was 2.70. Does the data provide convincing evidence at the $\alpha = 0.03$ significance level that the number of words recalled in silence or when listening to music differs, on average, for students at this school? (7.4 – 7.5 Worksheet #8)



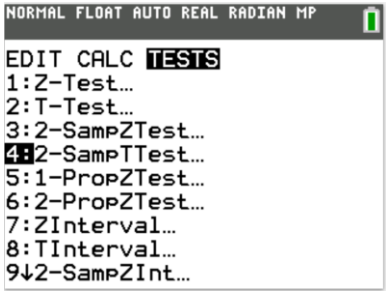


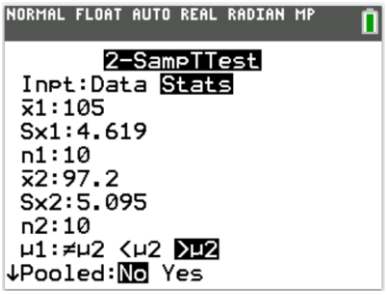


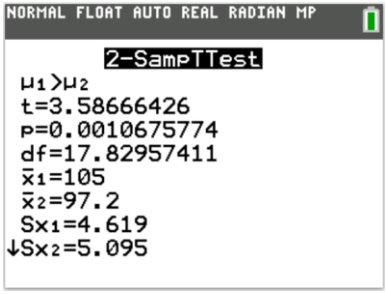
7. 2 Sample T Test for Means

Some students at Hartland High School wondered if students who take AP® Statistics have greater IQ scores, on average, than students who don't take AP® Statistics. To investigate, they took a random sample of 10 AP® Statistics high school students and a separate random sample of 10 non-AP® Statistics high school students and had each of the students take an IQ test. Does the data provide convincing evidence that high school students in Hartland who take AP® Statistics have a greater mean IQ score than high school students who don't take AP® Statistics? (7.8 – 7.9 Worksheet #2)

AP® Statistics	103	110	99	103	109	111	99	102	104	110
Non-AP® Statistics	102	99	100	104	95	92	99	101	90	90



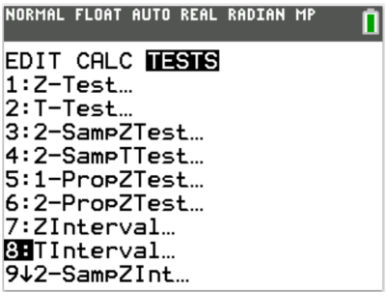


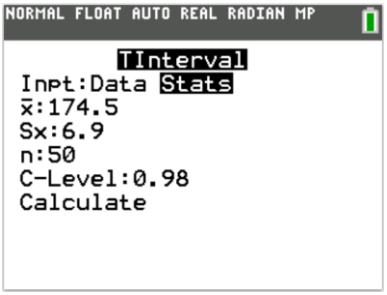


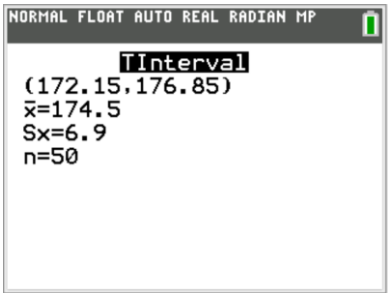
**Notice the df calculation is different, which results in a slightly different $p-value$. This is because the calculator uses the more complicated degrees of freedom calculation, while we use the lesser of the two samples minus 1 to calculate by hand. Both methods are accepted on the AP exam.

8. 1 Sample T Interval for Means

The heights of a random sample of 50 college students showed a mean of 174.5 cm and a standard deviation of 6.9 cm. Construct a 98% confidence interval for the mean height of all college students. (7.1 – 7.3 Worksheet #4)



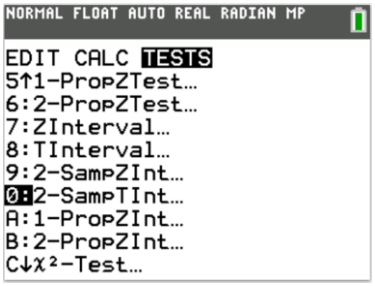


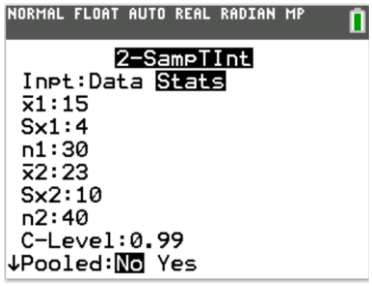


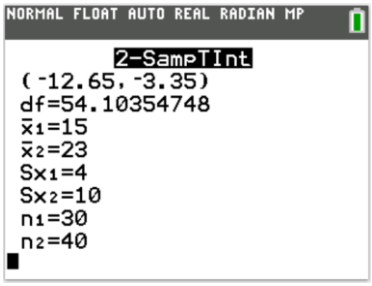
9. 2 Sample T Interval for Means

To compare the effect of stress in the form of noise on the ability to perform a simple task, 70 subjects were randomly divided into two groups. The first group of 30 subjects acted as a control, while the second group of 40 subjects was the experimental group. Although each subject performed the task in the same control room, each of the experimental group subjects had to perform the task while loud rock music was playing. The time to finish the task was recorded for each subject and the following results were obtained. Find a 99% confidence interval for the difference in mean completion times for the two groups. (7.6 – 7.7 Worksheet #4)

	Control Group	Experimental Group
Sample Size	30	40
Average Time to Complete Task	15 minutes	23 minutes
Standard Deviation	4 minutes	10 minutes





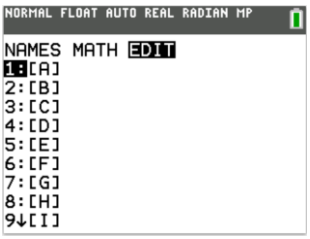


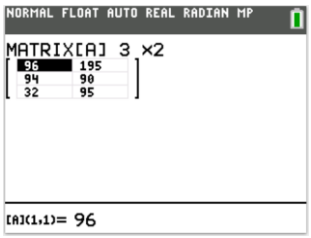
**Notice the df calculation is different, which results in a slightly different $t^*$and margin of error. This is because the calculator uses the more complicated degrees of freedom calculation, while we use the lesser of the two samples minus 1 to calculate by hand. Both methods are accepted on the AP exam.

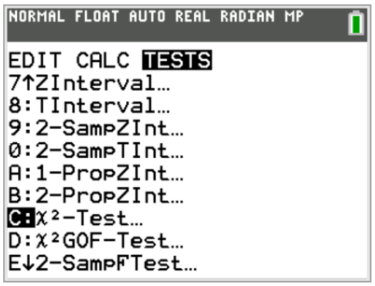
10. χ^2 Test for Homogeneity

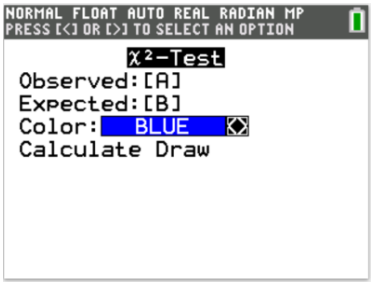
A study was performed to examine the personal goals of children in grades 4, 5, and 6. A random sample of students was selected from grades 4, 5, and 6 from schools in Georgia. The students received a questionnaire regarding achieving personal goals. They were asked what they would most like to do at school: make good grades, be good at sports, or be popular. Results are presented in the table below by the gender of the child. Is there sufficient evidence that there is a difference between boys and girls (grade 4-6) and their personal goals in school? (Unit 8 Review FRQ #2b)

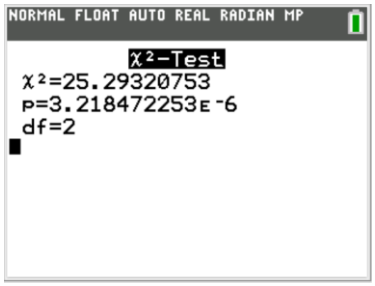
	Male	Female
Make good grades	96	195
Be good at sports	94	90
Be popular	32	95











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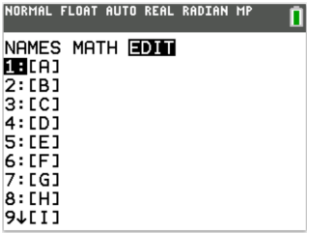
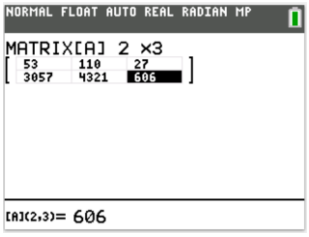
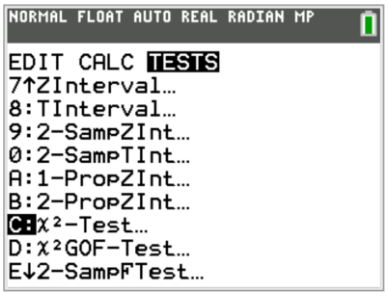
11. χ^2 Test for Independence

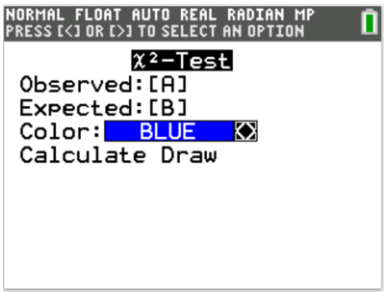
8174 random Americans were studied to determine if there was a relationship between heart disease and anger. All subjects were free from heart disease at the beginning of the study. The findings are summarized in the table below. Test to determine if there is a significant relationship between anger level and heart disease at $\alpha = 0.01$ level. (8.6 Notes Example 2)

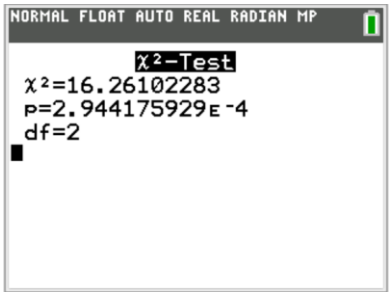
	Low Anger	Moderate Anger	High Anger	Total
Heart Disease	53	110	27	190
No Heart Disease	3057	4321	606	7984
Total	3110	4431	633	8174





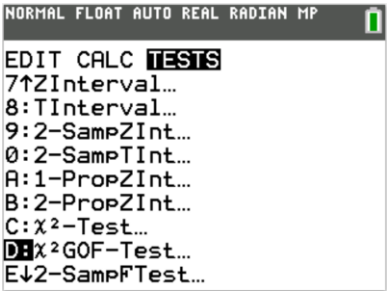


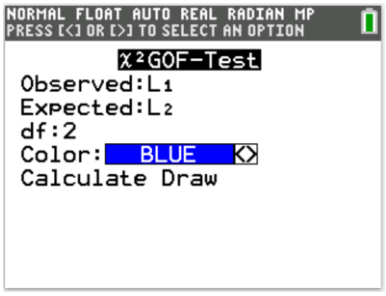


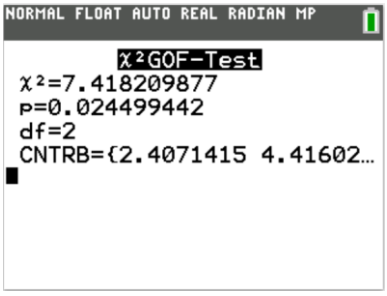


12. χ^2 Goodness of Fit Test

Researchers studied the behaviors of birds that were searching for seeds and insects in an Oregon forest. In this forest, 54% of the trees are Douglas firs, 40% are ponderosa pines, and 6% are other types of trees. At a randomly selected time during the day, the researchers observed 156 red-breasted nut-hatches: 70 were seen in Douglas firs, 79 in ponderosa pines, and 7 in other types of trees. Does the data provide convincing evidence that nut-hatches prefer particular types of trees when they're searching for seeds and insects? (8.3 Worksheet #6)







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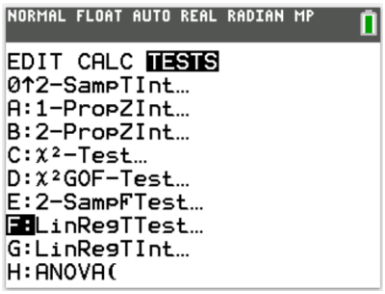
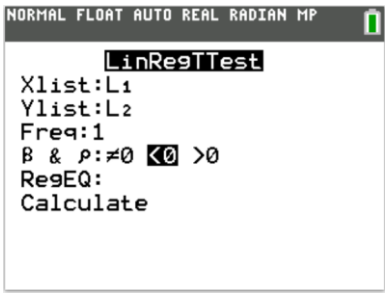
13. T-Test for Slope

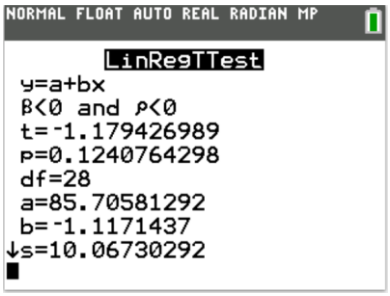
Consider the row and score data from the warm up and provided output from a regression analysis. Assuming all conditions are met, does the data Bill collected provide convincing evidence at the 10% significance level of a negative linear relationship between seat location and academic performance? (9.4 – 9.5 Notes Ex 1)

Row	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4
Score	76	77	94	99	83	85	74	79	90	88	68	78	94	72	101

Row	4	4	5	5	5	5	5	6	6	6	6	7	7	7	7
Score	70	79	76	65	90	67	96	88	79	90	83	79	76	77	63







**Notice this TI shortcut cannot be used if you do not have a data list.

14. T-Interval for Slope

Researchers randomly looked at 16 healthy young adult subjects to identify whether fidgeting and other "nonexercise activity" (NEA) explain why some people don't gain weight even when they overeat. They measured fat gain (in kilograms) and change in energy use (in calories) from activity other than deliberate exercise for each subject. Below is the data. Construct and interpret a 90% confidence interval for the slope of the population regression line. (Unit 9 Review FRQ #1)

NEA change (cal):	−94	−57	−29	135	143	151	245	355
Fat gain (kg):	4.2	3.0	3.7	2.7	3.2	3.6	2.4	1.3
NEA change (cal):	392	473	486	535	571	580	620	690
Fat gain (kg):	3.8	1.7	1.6	2.2	1.0	0.4	2.3	1.1