Some Sample Problems for Exam 2

These are only a few *additional* problems to help you prepare for the exam. You should also be certain that you completely understand the assigned homework problems in the Problems Sets from Chapters 17, 18, 19, 20, 21, & 24, the Reading Assignments, the in-class work (posted to onCourse), and your class notes.

You should also briefly review the material from Exam 1. Since the course builds on earlier material, you should be very comfortable with this content.

1. Recall that some of the topics covered include:

   - ⊙ One sample z-test (hypothesis test and confidence interval for one proportion)
   - ⊙ Two sample z-test (hypothesis test and confidence interval for two proportions)
   - ⊙ One sample t-test (hypothesis test and confidence interval for a single mean)
   - ⊙ Two-sample t-tests (hypothesis test and confidence interval for two means)
   - ⊙ Paired t-tests (hypothesis test and confidence interval for the mean of the differences)
   - ⊙ ANOVA (hypothesis test for more than two means)

   Expect a multipart question that will ask you to select the appropriate test to apply in different scenarios.

2. Why do we pool the samples in a two proportion hypothesis test but we do not when creating a confidence interval for the difference between two proportions?

3. Some people claim that they can tell the difference between a diet soda and a regular soda in the first sip. A researcher wanting to test this claim randomly sampled 80 such people. He then filled 80 plain white cups with soda, half diet and half regular through random assignment, and asked each person to take one sip from their cup and identify the soda as diet or regular. If they were guessing randomly, then they would pick correctly half of the time.

   The researcher wants to determine if these data provide evidence that these people are any better or worse than random guessing at identifying the type of soda.

   (a) Define all variables and clearly state the null and alternative hypotheses to do the indicated test. Assume all conditions are met for the appropriate test.
   (b) What would a Type I error mean in this case?
   (c) The researcher found the test statistic to be 2.91. Is this a z-value, a t-value or an F-value?
   (d) Draw the picture that represents the P-value as an area under the appropriate distribution.
   (e) Without finding the P-value, determine whether to reject or fail to reject the P-value and explain your reasoning.
   State your conclusion in the context of this problem.
   (f) True or false: 0.50 is in the 95% confidence interval for the proportion of individuals who can correctly identify the soda. Explain.

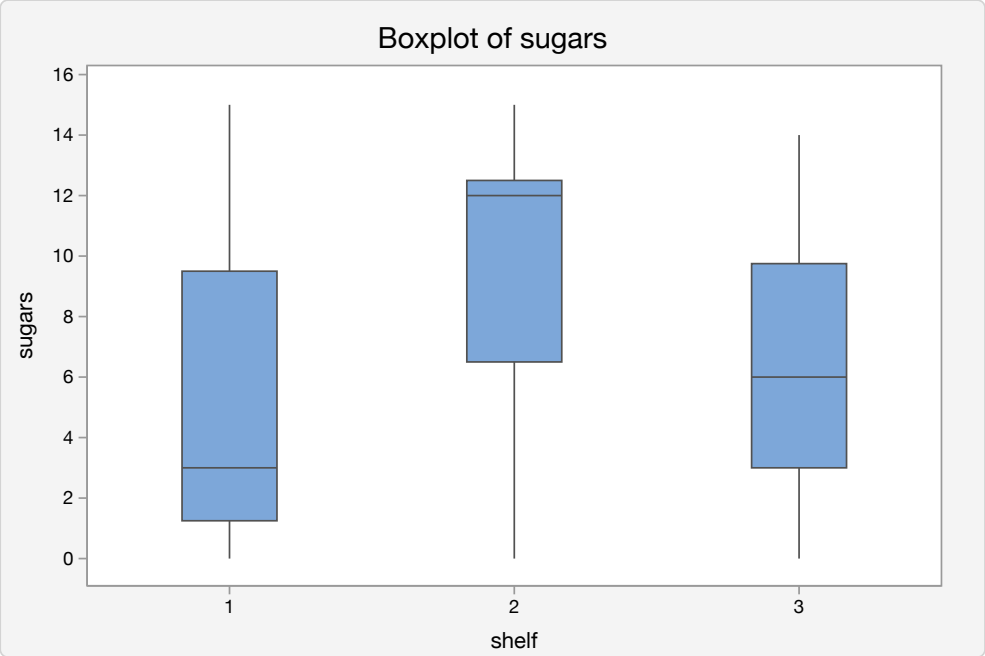
4. A group of researchers are interested in the possible effects of distracting stimuli during eating, such as an increase or decrease in the amount of food consumption. To test this hypothesis, they monitored food intake for a group of 44 patients who were randomized into two equal groups. The treatment group ate lunch while playing solitaire on an iPad, and the control group ate lunch without any added distractions. Patients in the treatment group ate 52.1 grams of biscuits, with a standard deviation of 45.1 grams, and patients in the control group ate 27.1 grams of biscuits, with a standard deviation of 26.4 grams.

   The researchers reported a 95% confidence interval of (2.33, 47.67). Interpret the confidence interval in this context.

5. Supermarkets often place similar types of cereal on the same supermarket shelf. We have data on the shelf as well as the sugar, sodium, and calorie content of 77 cereals. Does sugar content vary by shelf?

   Use the Minitab output on the following pages to perform a statistical analysis of this question.

Boxplot of sugars



Summary Statistics

shelf	N	Minimum	Q1	Median	Q3	Maximum	95% Median CI
1	20	0.000	1.250	3.000	9.500	15.000	(2.000, 7.530)
2	21	0.0000	6.5000	12.0000	12.5000	15.0000	(8.3470, 12.0000)
3	36	0.0000	3.0000	6.0000	9.7500	14.0000	(5.0000, 8.0000)

One-Way ANOVA: sugars versus shelf

Method

Null hypothesis	H_0: All means are equal
Alternative hypothesis	H_1: At least one mean is different

Equal variances were assumed for the analysis.

Factor Information

Factor	Levels	Values
shelf	3	1, 2, 3

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
shelf	2	244.20	122.100	7.27	0.0013
Error	74	1242.47	16.790		
Total	76	1486.68			

Model Summary

S	R-sq	R-sq(adj)	R-sq(pred)
4.09758	16.43%	14.17%	9.26%

Means

shelf	N	Mean	StDev	95% CI
1	20	4.850	4.511	(3.024, 6.676)
2	21	9.6190	4.1289	(7.8374, 11.4007)
3	36	6.5278	3.8358	(5.1670, 7.8885)

Pooled StDev = 4.09758

Grouping Information Using the Tukey Method and 95% Confidence

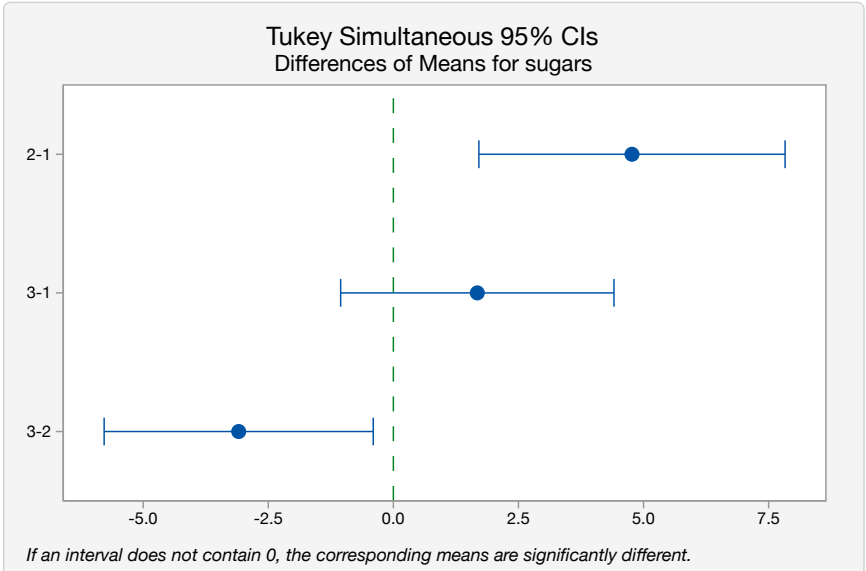
shelf	N	Mean	Grouping
2	21	9.6190	A
3	36	6.5278	B
1	20	4.850	B

Means that do not share a letter are significantly different.

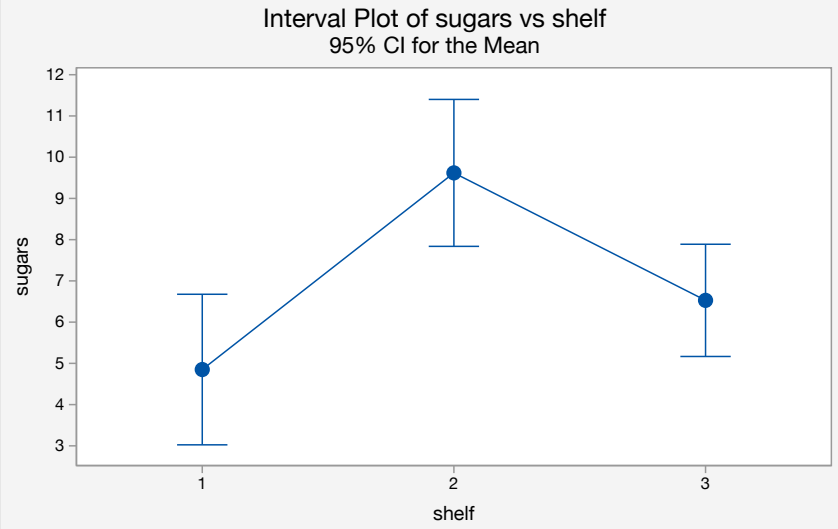
Tukey Simultaneous Tests for Differences of Means

Difference of Levels	Difference of Means	SE of Difference	95% CI	T-Value	Adjusted P-Value
2-1	4.769	1.280	(1.709, 7.829)	3.73	0.0011
3-1	1.678	1.143	(-1.053, 4.409)	1.47	0.3120
3-2	-3.091	1.125	(-5.780, -0.402)	-2.75	0.0204

Individual confidence level = 98.06%



If an interval does not contain 0, the corresponding means are significantly different.



The pooled standard deviation was used to calculate the intervals.