Quiz 6

Started: Nov 28 at 4:20pm

Quiz Instructions

Question 1	1 pts

2,000 adults between 20-30 years old, were randomly collected from the target population suffering from constant tiredness. Then the participants were randomly divided into 2 groups, with 1000 participants in each. One group of participants (the intervention group) were given a new drug to treat the fatigue. The control group of participants was given a placebo pill. Neither the participants nor the researchers involved in the experiment knew whether they were taking the new drug or the placebo. The participants took the pills for 3 weeks, 2 per day. A scale is used to measure participants' levels of tiredness. A 95% confidence interval, $1 \leq \mu_1 - \mu_2 \leq 5$, of mean difference of tiredness scores for the two groups was derived from the data. Which statement is true about this confidence interval?

○ This is a one sample mean confidence interval.

○ We are 95% confident that the difference of the sample mean tiredness scores between the two groups is between 1 and 5.

◉ We are 95% confident that the true difference of the population mean tiredness scores between the two groups is between 1 and 5.

○ 0 is a plausible value for the mean difference at confidence level of 0.95.

Question 2	1 pts

The National Center of Education Statistics conducted a survey of high school seniors, collecting test data on reading, writing, and several other subjects. We examine a simple random sample of 200 students from this survey. We want to test if there is an evident difference in the average scores of students in the reading and

writing exam. We measured the read and write scores for each student and have the following hypotheses:

H_0: mean read score = mean write score

H_a: mean read $\neq$ mean write score

The average observed difference in scores is $\bar{d}_{read-write} = 0.545$, and the standard deviation of the differences is 8.887 points.

To test the hypotheses, we should be using [paired t test ⌄] . The

standard error is [0.6284 ⌄] . The 95% confidence interval for the

average difference between the reading and writing scores of all students is

[(-0.7, 1.78) ⌄] . You need to read the appropriate critical value from

a t table. This confidence interval leads us to [fail to reject ⌄] the null

hypothesis.

Question 3   0.5 pts

In a paired analysis where the two groups are dependent, we first take the difference of each pair of observations and then do inference on these differences.

🔘 True

⚪ False

Question 4   0.5 pts

When comparing means of two independent samples of size $n_1=40$ and $n_2=45$, the samples don't seem to be from normal distributed populations. But we can still apply two sample t test.

⦿ True

○ False

Question 5   0.5 pts

As the degrees of freedom decreases, the t-distribution approaches normal distribution.

○ True

⦿ False

Question 6   0.5 pts

We would like to test if means of gas price are the same in the Texas, California, Colorado, and New York. Which test should we choose?

○ Multiple individual two-sample t tests

⦿ ANOVA

○ Multiple individual paired t tests

○ two-sample t test

Question 7   0.5 pts

In which of the following scenarios, the data is NOT paired?

○ We would like to know if Intel's stock and Southwest Airlines' stock have similar rates of return. To find out, we take a random sample of 50 days, and record Intel's and Southwest's

stock on those same days

⦿ A school board would like to determine whether there is a difference in average SAT scores for students at one high school versus another high school in the district. To check, they take a simple random sample of 100 students from each high school.

○ We randomly sample 50 employee's salary from Target stores compare to the salary of 50 employee from Walmart stores.

Question 8   1 pts

Table below shows the summary statistics (sample mean, sample standard deviation and sample size) of prices of diamond of 0.99 carats and 1 carat. The critical t value for significance level of 0.05 is 2.015 (but you should be able to find the critical value from the t-table or from a software). If all assumptions were satisfied including equal

variances, the SE is [4.36   ⌄] and 95% confidence interval for

the average difference between the prices of 0.99 and 1 carat diamonds is

[(-21.09, -3.51)   ⌄] .

	0.99 carats	1 carat
Mean	$44.51	$56.81
SD	$13.32	$16.13
n	23	23

Question 9   0.5 pts

When doing an ANOVA, you observe large differences in means between groups and small variation within each group. Within the ANOVA framework, which of the followings would you expect?

○ high F ratio

○ low F ratio

○ F ratio equals to 1

Question 10   **1 pts**

The National Center of Education Statistics conducted a survey of high school seniors, collecting test data on reading, writing, and several other subjects. We examine a simple random sample of 60 students from this survey. We want to test if there is an evident difference in the average scores in the reading and writing exam.

We measured the read and write scores for each student and have the following hypotheses:

H_0: mean read score = mean write score

H_a: mean read $\neq$ mean write score

The average observed difference in scores is $\bar{d}_{read-write} = 2.3$, and the standard deviation of the differences is 4.5 points.

We calculated the 95% confidence interval for the average difference between the reading and writing scores of all students as (1.14, 3.46). Does this confidence interval provides sufficient evidence that there is a real difference in the average scores?

◉ True

○ False

Question 11   **0.5 pts**

There is no requirement of the sample size for each group before performing 2-sample t test because this test is very robust to normal distribution assumption.

○ True

◉ False

Question 12   0.5 pts

We would like to test if students who are majored in the social sciences, natural sciences, arts and humanities, and other fields spend the same amount of time (a continuous variable) studying for this course. We cannot use ANOVA in here because we're not comparing means of two groups.

○ True

◉ False

Question 13   1 pts

A boutique examined a simple random sample of 120 customers. They then performed a two-sample test to compare customers' ratings (on 100 scale) on stores in two locations (60 customers from each store). Below are the hypotheses: H_0: diff=0, H_a: diff$\neq$0.

The average observed difference is 1.5, and the pooled standard deviation is 8.2 points.

What is the **test statistic** to test our hypothesis?

○ 2.00

◉ 0.086

○ 1.53

○ 1.42

Question 14   0.5 pts

A study compared four different methods for teaching descriptive statistics. The four methods were traditional lecture and discussion, programmed textbook instruction, programmed text with lectures, and computer instruction with lectures. 100 students were randomly assigned, 25 to each method. After completing the course, students took a 1-hour exam.

What are the degrees of freedom associated with the F-test for evaluating these hypotheses?

Hint: If H_0 is true and the model conditions are satisfied, the statistic F follows an F distribution with two degrees of freedom: k - 1 and n - k.

○ dfB = 4, dfW= 40

◉ dfB= 3, dfW= 96

○ dfB = 4, dfW= 100

○ dfB= 5, dfW= 20

Question 15   1 pts

Undergraduate students taking an introductory statistics course at Duke University conducted a survey about GPA and major. The side-by-side box plots show the distribution of GPA among three groups of majors. The ANOVA output is provided with the last column showing the p-value.
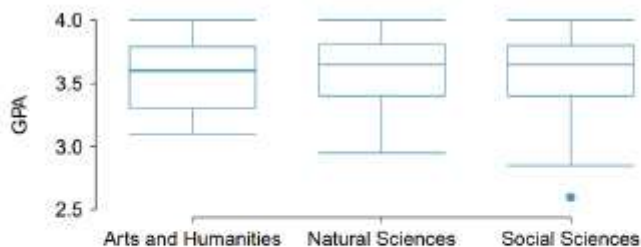
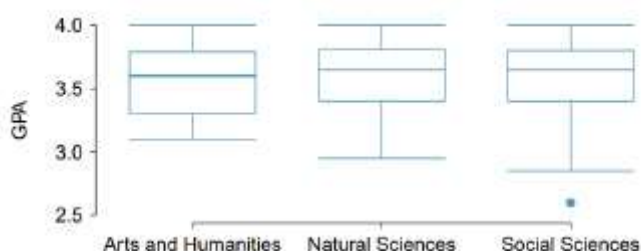|	Df	Sum Sq	Mean Sq	F value	Pr(>F)
major	2	0.03	0.015	0.185	0.8313
Residuals	195	15.77	0.081		

The null hypothesis is that average GPA is the same for all majors. What is the conclusion of the hypothesis test at significance level of 0.05?

◉ Since Pr (>F) is higher than 0.05, we failed to reject the null hypothesis. There is no evidence of a statistically significant difference between the average GPAs across majors.

◯ We look at the F value, if it is less than 1, then we reject the null and conclude that there is statistically significant differences across majors.

◯ Since Pr (>F) is higher than 0.05, we reject the null hypothesis and find statistically significant evidence showing that at least one pairs of means is different.

◯ We should perform a t test to answer the question.

Question 16   1 pts

Undergraduate students taking an introductory statistics course at Duke University conducted a survey about GPA and major. The side-by-side box plots show the distribution of GPA among three groups of majors. The ANOVA output is also provided.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
major	2	0.03	0.015	0.185	0.8313
Residuals	195	15.77	0.081		

How many students answered these questions on the survey

○ 195

○ 197

◉ 198

○ 193

Question 17   **0.5 pts**

A researcher tested pain threshold for women with different natural hair colors – light blonde, dark blonde, light brunette, and dark brunette – using a one-way analysis of variance. The null hypothesis for this ANOVA test is:

○ H0: The average pain threshold is different for at least one hair color group.

◉ H0: The average pain threshold is the same for all hair color groups.

○ H0: The average pain threshold for a certain hair color group is greater than the average of other three groups

○ H0: The average pain threshold for two of the hair color groups is the same as the average of the other two groups.

Question 18   **1 pts**

The blood pressure (average of systolic and diastolic measurements) of each of 38 randomly selected persons was measured. The average was 94.5 mm Hg and the standard deviation 8.0497 mm Hg. Which of the statistical procedures below would you use to estimate the population mean blood pressure?

○ Confidence interval comparing means of two independent samples

◉ Confidence interval of a single mean

○ Confidence interval comparing two independent proportions

○ ANOVA

Question 19   0.5 pts

A researcher claims that the current average height of women aged 20 years or older is greater than the mean height of 63.7 inches in 1994. She obtains a random sample of 45 women aged 20 years or older and finds the mean to be 63.9 inches and the standard deviation to be 3.5 inches. Which of the following tests is most appropriate to test the researcher's claim (assuming all assumptions are satisfied)?

○ One-sample proportion test

◉ One-sample t-test

○ Two-sample t-test

○ Chi-square test

Question 20   1 pts

How would you interpret the 95% confidence interval (0.56, 3.00) for the difference in average heights between 11-year-old boys and 11-year-old girls?

○ One population may have a larger average height than the other population, but there is insufficient evidence to make that claim.

○ There is no reason to believe that the average heights of the two populations differ.

◉ There is sufficient evidence to claim that one population has a higher average height than the other group.

Question 21

0.5 pts

Table below shows the summary statistics (sample mean, sample standard deviation and sample size) of prices of diamond with weights 0.99 carats and 1 carat. If assumptions were satisfied (including equal population variances), calculate the 95% confidence interval for the average difference between the prices of 0.99 and 1 carat diamonds. To use the pooled t test, what is the degree of freedom?

	0.99 carats	1 carat
Mean	$44.51	$56.81
SD	$13.32	$16.13
n	23	23

○ 23

○ 22

○ 46

◉ 44

Question 22

1 pts

Table below shows the summary statistics (sample mean, sample standard deviation and sample size) of prices of diamond with weights 0.99 carats and 1 carat. Which of following statement is true about making inference of the average difference between the prices of 0.99 and 1 carat diamonds?

	0.99 carats	1 carat
Mean	$44.51	$56.81
SD	$13.32	$16.13
n	23	23

○ The two-sample t test and confidence interval may provide different conclusions even if all assumptions are satisfied.

◉ We can perform a two sample t test or build a confidence interval to draw the same conclusion if all assumptions are satisfied.

○ If all other assumptions are satisfied, the assumption of independence is not important.

Question 23   0.5 pts

Undergraduate students taking an introductory statistics course at Duke University conducted a survey about GPA and major. The side-by-side box plots show the distribution of GPA among three groups of majors. Also provided is the ANOVA output.
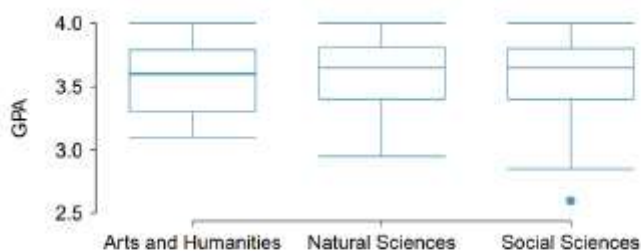
	Df	Sum Sq	Mean Sq	F value	Pr(>F)
major	2	0.03	0.015	0.185	0.8313
Residuals	195	15.77	0.081		

Which assumption is a crucial assumption (even when sample size is large) and can be roughly validated by the box-plot in this example?

○ independence

○ normality

◉ euqal variances

○ None

Question 24   **1 pts**

The National Center of Education Statistics conducted a survey of high school seniors, collecting test data on reading, writing, and several other subjects. We examine a simple random sample of 60 students from this survey. We want to test if there is an evident difference in the average scores in the reading and writing exam. We measured the read and write scores for each student and have the following hypotheses:

H_0: mean read score = mean write score

H_a: mean read $\neq$ mean write score

The average observed difference in scores is $\bar{d}_{read-write} = 2.3$, and the standard deviation of the differences is 4.5 points.
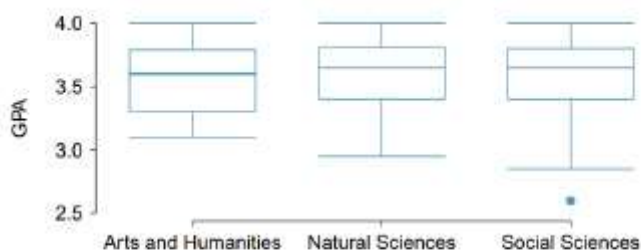
What is the **test statistic and df**?

○ 0 with df of 29

○ 2.96 with df of 58

◉ 3.96 with df of 59

○ 4.96 with df of 59

Question 25   **0.5 pts**

Undergraduate students taking an introductory statistics course at Duke University conducted a survey about GPA and major. The side-by-side box plots show the

distribution of GPA among three groups of majors. Also provided is the ANOVA output.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
major	2	0.03	0.015	0.185	0.8313
Residuals	195	15.77	0.081		

Which test can replace the box-plot to validate the very important assumption of ANOVA?

○ Shapiro-Wilk

◉ Levene's

○ Chi-square

○ t test

Question 26   0.5 pts

Which kind of test is essentially performed to compare means of two dependent groups?

◉ one sample t test

○ two sample t test

○ ANOVA

Question 27   1 pts

The National Center of Education Statistics conducted a survey of high school seniors, collecting test data on reading, writing, and several other subjects. We examine a simple random sample of 200 students from this survey. We want to test if there is an evident difference in the average scores of students in the reading and writing exam. We measured the read and write scores for each student and have the following hypotheses:

H_0: mean read score = mean write score

H_a: mean read $\neq$ mean write score

The average observed difference in scores is $\bar{d}_{write-read} = -0.545$, and the standard deviation of the differences is 8.887 points.

The test statistic is [-0.87 ⌄] and the degree of freedom is

[199 ⌄] . The p-value associated with the test statistic leads

us to [fail to reject ⌄] the null hypothesis. The reason we choose this

test is because the two score groups are [depedent ⌄] .

Question 28   0.5 pts

Table below shows the summary statistics (sample mean, sample standard deviation and sample size) of prices of diamond of 0.99 carats and 1 carat. Which assumption is required to perform a pooled t test if all other assumptions were satisfied?

	0.99 carats	1 carat
Mean	$44.51	$56.81
SD	$13.32	$16.13
n	23	23

⦿ equal variances of the two groups

○ unequal variances of the two groups

○ independence

○ normal distributions

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