1. 0/0.69 points | Previous Answers MIntroStat9 6.E.075.

Computers in some vehicles calculate various quantities related to performance. One of these is the fuel efficiency or gas mileage, usually expressed as miles per gallon (mpg). For one vehicle equipped in this way, the miles per gallon were recorded each time the gas tank was filled, and the computer was then reset. In addition to the computer's calculations of miles per gallon, the driver also recorded the miles per gallon by dividing the miles driven by the number of gallons at each fill-up. The following data are the differences between the computer's and the driver's calculations for that random sample of 20 records. The driver wants to determine if these calculations are different. Assume that the standard deviation of a difference is $\sigma = 3.0$.

6.0	6.5	−0.6	1.7	3.7	4.5	6.0	2.2	4.6	3.0
4.4	0.5	3.0	1.4	1.4	5.0	2.1	3.6	−0.6	−4.2

(a) State the appropriate H_0 and H_a to test this suspicion.

- ○ H_0: $\mu = 3$ mpg; H_a: $\mu \neq 3$ mpg
- ○ H_0: $\mu > 3$ mpg; H_a: $\mu < 3$ mpg
- ● H_0: $\mu < 0$ mpg; H_a: $\mu > 0$ mpg
- ○ H_0: $\mu > 0$ mpg; H_a: $\mu < 0$ mpg
- ○ H_0: $\mu = 0$ mpg; H_a: $\mu \neq 0$ mpg

✗

(b) Carry out the test. Give the *P*-value. (Round your answer to four decimal places.)

0.0001 ✗

Interpret the result in plain language.

- ● We conclude that $\mu = 0$ mpg; that is, we have strong evidence that the computer's reported fuel efficiency differs from the driver's computed values.
- ○ We conclude that $\mu = 3$ mpg; that is, we have strong evidence that the computer's reported fuel efficiency does not differ from the driver's computed values.
- ○ We conclude that $\mu \neq 0$ mpg; that is, we have strong evidence that the computer's reported fuel efficiency differs from the driver's computed values.
- ○ We conclude that $\mu \neq 0$ mpg; that is, we have strong evidence that the computer's reported fuel efficiency does not differ from the driver's computed values.
- ○ We conclude that $\mu \neq 3$ mpg; that is, we have strong evidence that the computer's reported fuel efficiency differs from the driver's computed values.

✗

2. 0.23/0.69 points | Previous Answers MIntroStat8 6.E.129.

Patients with chronic kidney failure may be treated by dialysis, in which a machine removes toxic wastes from the blood, a function normally performed by the kidneys. Kidney failure and dialysis can cause other changes, such as retention of phosphorus, that must be corrected by changes in diet. A study of the nutrition of dialysis patients measured the level of phosphorus in the blood of several patients on six occasions. Here are the data for one patient (in milligrams of phosphorus per deciliter of blood).

5.3 5.1 4.4 4.9 5.7 6.3

The measurements are separated in time and can be considered an SRS of the patient's blood phosphorus level. Assume that this level varies Normally with $\sigma = 0.9$ mg/dl. (Round your answers to three decimal places.)

(a) Give a 95% confidence interval for the mean blood phosphorus level.

(______ , ______)

(b) The normal range of phosphorus in the blood is considered to be 2.6 to 4.8 mg/dl. Is there strong evidence that this patient has a mean phosphorus level that exceeds 4.8?

- ○ Yes, there is strong evidence of a mean phosphorus level that exceeds 4.8.
- ○ Yes, there is not strong evidence of a mean phosphorus level that exceeds 4.8.
- ● No, there is not strong evidence of a mean phosphorus level that exceeds 4.8.
- ○ No, there is strong evidence of a mean phosphorus level that exceeds 4.8.

✓

3. 0.09/0.69 points | Previous Answers MIntroStat9 6.E.134.

An agronomist examines the cellulose content of a variety of alfalfa hay. Suppose that the cellulose content in the population has standard deviation $\sigma = 9$ milligrams per gram (mg/g). A sample of 14 cuttings has mean cellulose content $\bar{x} = 145$ mg/g.

(a) Give a 90% confidence interval for the mean cellulose content in the population. (Round your answers to two decimal places.)

(______ , ______)

(b) A previous study claimed that the mean cellulose content was $\mu = 140$ mg/g, but the agronomist believes that the mean is higher than that figure. State H_0 and H_a.

- (●) $H_0: \mu = 140$ mg/g; $H_a: \mu > 140$ mg/g
- ( ) $H_0: \mu < 140$ mg/g; $H_a: \mu = 140$ mg/g
- ( ) $H_0: \mu = 140$ mg/g; $H_a: \mu \neq 140$ mg/g
- ( ) $H_0: \mu = 140$ mg/g; $H_a: \mu < 140$ mg/g
- ( ) $H_0: \mu > 140$ mg/g; $H_a: \mu = 140$ mg/g

✔

Carry out a significance test to see if the new data support this belief. (Use $\alpha = 0.05$. Round your value for z to two decimal places and round your P-value to four decimal places.)

z = ______

P-value = ______

Do the data support this belief? State your conclusion.

- ( ) Reject the null hypothesis, there is significant evidence of a mean cellulose content greater than 140 mg/g.
- ( ) Reject the null hypothesis, there not is significant evidence of a mean cellulose content greater than 140 mg/g.
- ( ) Fail to reject the null hypothesis, there is significant evidence of a mean cellulose content greater than 140 mg/g.
- (●) Fail to reject the null hypothesis, there not is significant evidence of a mean cellulose content greater than 140 mg/g.

✘

(c) The statistical procedures used in (a) and (b) are valid when several assumptions are met. What are these assumptions? (Select all that apply)

- [ ] Because our sample is not too large, the standard deviation of the population and sample must be less than 10.
- [ ] We must assume that the 14 cuttings in our sample are an SRS.
- [x] We must assume that the sample has an underlying distribution that is uniform.
- [ ] Because our sample is not too large, the population should be normally distributed, or at least not extremely nonnormal.

✗

4. 0.15/0.69 points | Previous Answers MIntroStat9 6.E.135.

Many food products contain small quantities of substances that would give an undesireable taste or smell if they are present in large amounts. An example is the "off-odors" caused by sulfur compounds in wine. Oenologists (wine experts) have determined the odor threshold, the lowest concentration of a compound that the human nose can detect. For example, the odor threshold for dimethyl sulfide (DMS) is given in the oenology literature as 25 micrograms per liter of wine (μg/l). Untrained noses may be less sensitive, however. Here are the DMS odor thresholds for 10 beginning students of oenology.

30 23 35 37 32 40 34 31 26 22

Assume (this is not realistic) that the standard deviation of the odor threshold for untrained noses is known to be $\sigma = 7$ μg/l.

(a) Make a stemplot to verify that the distribution is roughly symmetric with no outliers. (A normal quantile plot confirms that there are no systematic departures from normality. Enter numbers from smallest to largest, separated by spaces. Enter NONE for stems with no values.)

2	
2	
3	
3	
4	

(b) Give a 95% confidence interval for the mean DMS odor threshold among all beginning oenology students. (Round your answers to three decimal places.)

(______ , ______)

(c) Are you convinced that the mean odor threshold for beginning students is higher than the published threshold, 25 µg/l? Carry out a significance test to justify your answer. (Use $\alpha = 0.05$. Round your value for z to two decimal places and round your P-value to four decimal places.)

z = [ ]

P-value = [ ]

State your conclusion.

- (●) Reject the null hypothesis. There is significant evidence that the mean odor threshold for beginning students is higher than the published threshold.
- ( ) Reject the null hypothesis. There is not significant evidence that the mean odor threshold for beginning students is higher than the published threshold.
- ( ) Fail to reject the null hypothesis. There is significant evidence that the mean odor threshold for beginning students is higher than the published threshold.
- ( ) Fail to reject the null hypothesis. There is not significant evidence that the mean odor threshold for beginning students is higher than the published threshold.

5. 0.35/0.69 points | Previous Answers MIntroStat9 6.E.137.

A study of the pay of corporate chief executive officers (CEOs) examined the incease in cash compensation of the CEOs o 110 companies, adjusted for inflation, in a ecent year. The mean increase in real compensation was $\bar{x}$ = 6.7%, and the standard deviation of the increases was s = 46%. Is this good evidence that the mean eal compensation μ of all CEOs increased that year?

H_o: $\mu = 0$ (no increase)

H_a: $\mu > 0$ (an increase)

Because the sample size is large, the sample s is close to the population σ, so take σ = 46%.

(a) Sketch the normal curve for the sampling distribution of $\bar{x}$ when H_o is true. Shade the area that represents the P-value for the observed outcome $\bar{x}$ = 6.7%. (Do this on paper Your instructor may ask you to turn in this work.)

(b) Calculate the P-value. (Round your answer to four decimal places.)

[ ]

(c) Is the result significant at the α = 0.05 level? Do you think the study gives strong evidence that the mean compensation of all CEOs went up?

- ○ Reject the null hypothesis, thee is significant evidence that the mean compensation of all CEOs went up.
- ○ Reject the null hypothesis, thee is not significant evidence that the mean compensation of all CEOs went up.
- ◉ Fail to reject the null hypothesis, thee is not significant evidence that the mean compensation of all CEOs went up.
- ○ Fail to reject the null hypothesis, thee is significant evidence that the mean compensation of all CEOs went up.

✓

6. 0.23/0.69 points | Previous Answers MIntroStat9 6.E.012.

A study of stress on the campus of your university reported a mean stress level of 75 (on a 0 to 100 scale with a higher score indicating more stress) with a margin of error of 6 for 95% confidence. The study was based on a random sample of 36 undergraduates.

(a) Give the 95% confidence interval.

(______ , ______)

(b) If you wanted 99% confidence for the same study, would your margin of error be greater than, equal to, or less than 6? Explain your answer.

- ○ The confidence level should never be changed for the same study.
- ◉ The new margin of error would be greater than 6. A larger margin of error is needed to be more confident that the interval includes the true mean.
- ○ It is impossible to determine if the margin of error will change using the information given.
- ○ The new margin of error would be equal to 6. The margin of error will not change when the confidence level is increased.
- ○ The new margin of error would be less than 6. A smaller margin of error is needed to be more confident that the interval includes the true mean.

✓

7. –/0.69 points MIntroStat9 6.E.502.XP.

You want to rent an unfurnished one-bedoom apartment in Dallas next year. The mean monthly rent for a random sample of 11 apartments advertised in the local newspape is $950. Assume the monthly ents in Dallas follow a Normal distribution with a standad deviation of $275. Find a 95% confidence inteval for the mean monthly ent for unfurnished one-bedroom apartments available for rent in this community (Round your answers to two decimal places.)

($ ______ , $ ______)

8. –/0.69 points MIntroStat9 6.E.058.

A test of the null hypothesis H_0: $\mu = \mu_0$ gives test statistic $z = 1.70$. (Round your answers to four decimal places.)

(a) What is the P-value if the alternative is H_a: $\mu > \mu_0$?

(b) What is the P-value if the alternative is H_a: $\mu < \mu_0$?

(c) What is the P-value if the alternative is H_a: $\mu \neq \mu_0$?

9. –/0.69 points MIntroStat8 6.E.506.XP.

A test of the null hypothesis H_0: $\mu = \mu_0$ gives test statistic $z = -1.22$. (Round your answers to four decimal places.)

(a) What is the P-value if the alternative is H_a: $\mu > \mu_0$?

(b) What is the P-value if the alternative is H_a: $\mu < \mu_0$?

(c) What is the P-value if the alternative is H_a: $\mu \neq \mu_0$?

10. 0.69/0.69 points | Previous Answers MIntroStat9 6.E.047.

The P-value for a two-sided test of the null hypothesis H_0: $\mu = 25$ is 0.033.

(a) Does the 95% confidence interval include the value 25? Why?

- ○ Yes, 25 is in the 95% confidence interval, because $P = 0.033$ means we reject H_0 at $\alpha = 0.05$.
- ○ Yes, 25 is in the 95% confidence interval, because $P = 0.033$ means we fail to reject H_0 at $\alpha = 0.01$.
- ○ Yes, 25 is in the 95% confidence interval, because $P = 0.033$ means we fail to reject H_0 at $\alpha = 0.05$.
- ◉ No, 25 is not in the 95% confidence interval, because $P = 0.033$ means we reject H_0 at $\alpha = 0.05$.
- ○ No, 25 is not in the 95% confidence interval, because $P = 0.033$ means we fail to reject H_0 at $\alpha = 0.05$.

✓

(b) Does the 99% confidence interval include the value 25? Why?

- ○ Yes, 25 is in the 99% confidence interval, because $P = 0.033$ means we reject H_0 at $\alpha = 0.01$.
- ◉ Yes, 25 is in the 99% confidence interval, because $P = 0.033$ means we fail to reject H_0 at $\alpha = 0.01$.
- ○ No, 25 is not in the 99% confidence interval, because $P = 0.033$ means we reject H_0 at $\alpha = 0.01$.
- ○ No, 25 is not in the 99% confidence interval, because $P = 0.033$ means we reject H_0 at $\alpha = 0.10$.
- ○ No, 25 is not in the 99% confidence interval, because $P = 0.033$ means we fail to reject H_0 at $\alpha = 0.01$.

✓

11. 0.51/0.69 points | Previous Answers MIntroStat9 7.E.055.

In each of the following situations explain what is wrong and then either explain why it is wrong or change the wording of the statement to make it true.

(a) A researcher wants to test H_0: $\bar{x}_1 = \bar{x}_2$ versus the two-sided alternative H_a: $\bar{x}_1 \neq \bar{x}_2$.

- ○ The null hypothesis (but not the alternative hypothesis) should involve μ_1 and μ_2 (population means) rather than $\bar{x}_1$ and $\bar{x}_2$ (sample means).
- ○ The null hypothesis H_0 should indicate that the two means are not equal.
- ◉ Hypotheses should involve μ_1 and μ_2 (population means) rather than $\bar{x}_1$ and $\bar{x}_2$ (sample means).
- ○ This alternative hypothesis indicates a one-sided hypothesis instead of a two-sided hypothesis.
- ○ The alternative hypothesis H_a should indicate that $\bar{x}_1 \geq \bar{x}_2$.

✓

(b) A study recorded the IQ scores of 100 college freshmen. The scores of the 56 males in the study were compared with the scores of all 100 freshmen using the two-sample methods of this section.

- ◉ The samples are not independent; we would need to compare the 56 males to the 44 females.
- ○ A two-sample method is not appropriate in this situation.
- ○ The sample sizes are too different to be used for hypothesis testing; we would need to have more males in the sample.
- ○ The samples are too large to be used for hypothesis testing.
- ○ The samples are too small to be used for hypothesis testing.

✓

(c) A two-sample *t* statistic gave a *P*-value of 0.94. From this we can reject the null hypothesis with 90% confidence.

- ○ We need the *P*-value to be negative to reject H_0.
- ○ We can reject the null hypothesis, but with less than 90% confidence.
- ○ A *P*-value of this size is impossible.
- ◉ We need the *P*-value to be small to reject H_0.
- ○ We can reject the null hypothesis, but with more than 90% confidence.

✓

(d) A researcher is interested in testing the one-sided alternative $H_a: \mu_1 < \mu_2$. The significance test gave $t = 2.15$.

Because the *P*-value for the two-sided alternative is 0.036, he concluded that his *P*-value was 0.018.

- ○ The alternative hypothesis should state that $H_a: \mu_1 \leq \mu_2$.
- ○ Assuming the researcher computed the *t* statistic using $\bar{x}_1 - \bar{x}_2$, a positive value of *t* does not support H_a.
- ◉ A *t* statistic of this size should have a much larger *P*-value associated with it.
- ○ A one-sided alternative should never be used.
- ○ The alternative hypothesis should state that $H_a: \mu_1 \neq \mu_2$.

✗

12. 0.35/0.69 points | Previous Answers MIntroStat9 7.E.073.

A recent study of food portion sizes reported that over a 17-year period, the average size of a soft drink consumed by Americans aged 2 years and older increased from 13.1 ounces (oz) to 19.9 oz. The authors state that the difference is statistically significant with $P < 0.01$.† Explain what additional information you would need to compute a confidence interval for the increase, and outline the procedure that you would use for the computations. (Select all that apply.)

- [ ] Degrees of freedom and a more accurate *P*-value could be used to find the confidence interval. In this case we could determine t, then calculate SE_D and t^*.
- [x] Sample sizes and standard deviations could be used to find the confidence interval. In this case we could find the interval in the usual way.
- [x] Sample sizes and a more accurate *P*-value could be used to find the confidence interval. In this case we could determine standard deviations and the confidence interval in the usual way.
- [x] t and degrees of freedom could be used to find the confidence interval. In this case we could compute SE_D and use degrees of freedom to find t^*.
- [x] Standard deviations and degrees of freedom could be used to find the confidence interval. In this case we could now find the *P*-value, which could be used to find SE_D.

✗

Do you think that a confidence interval would provide useful additional information? Explain why or why not.

- ○ Yes, the confidence interval could give us useful information about the variability between sample participants in the study.
- ● Yes, the confidence interval could give us useful information about the magnitude of the difference.
- ○ No, the confidence interval could give us no more useful information because the *P*-value already tells us that the interval does not contain 0.
- ○ Yes, the confidence interval could give us useful information about the average size of soft drinks.
- ○ No, the confidence interval could give us no more useful information because it cannot tell us the sample size in the study.

✓

13. 0/0.69 points | Previous Answers MIntroStat9 7.E.082.

A friend has performed a significance test ofthe null hypothesis that two means ae equal. His report states that the null hypothesis is rejected in favor of the alternative that the first mean is lager than the second. In a pesentation on his work, he notes that the first sample mean was lager than the second mean and this is why he chose this paticular one-sided alternative.

(a) Explain what is wrong with your friend's procedure and why.

- ○ The null hypothesis in this case should have been that the first mean is lager than the second.
- ◉ The first mean can never be larger than the second mean; this indicates a mistake was made during statistical analysis.
- ○ The null hypothesis in this case should have been that the two means were not equal.
- ○ We should only choose a one-sided alternative if we have some reason to expect a specific directional outcome before looking at the sample results.
- ○ We should never choose a one-sided alternative.

✗

(b) Suppose he reported $t = 1.65$ with a P-value of 0.06. What is the correct P-value that he should report?

[ ]

14. 0.33/0.69 points | Previous Answers MIntroStat9 7.E.083.

A study of iron deficiency among infants compared samples of infants following different feeding regimens. One group contained breast-fed infants, while the infants in another group were fed a standard baby formula without any iron supplements. Here are summary results on blood hemoglobin levels at 12 months of age.

Group	n	$\bar{x}$	s
Breast-fed	24	13.2	1.7
Formula	19	12.4	1.8

(a) Is there significant evidence that the mean hemoglobin level is higher among breast-fed babies? State H_0 and H_a.

- ○ $H_0: \mu_{\text{breast-fed}} \neq \mu_{\text{formula}}$; $H_a: \mu_{\text{breast-fed}} < \mu_{\text{formula}}$
- ○ $H_0: \mu_{\text{breast-fed}} < \mu_{\text{formula}}$; $H_a: \mu_{\text{breast-fed}} = \mu_{\text{formula}}$
- ○ $H_0: \mu_{\text{breast-fed}} > \mu_{\text{formula}}$; $H_a: \mu_{\text{breast-fed}} = \mu_{\text{formula}}$
- ● $H_0: \mu_{\text{breast-fed}} = \mu_{\text{formula}}$; $H_a: \mu_{\text{breast-fed}} > \mu_{\text{formula}}$

✓

Carry out a t test. Give the P-value. (Use $\alpha = 0.01$. Use $\mu_{\text{breast-fed}} - \mu_{\text{formula}}$. Round your value for t to three decimal places, and round your P-value to four decimal places.)

t = [ ]

P-value = [ ]

What is your conclusion?

- ○ Reject the null hypothesis. There is significant evidence that the mean hemoglobin level is higher among breast-fed babies.
- ○ Reject the null hypothesis. There is not significant evidence that the mean hemoglobin level is higher among breast-fed babies.
- ◉ Fail to reject the null hypothesis. There is not significant evidence that the mean hemoglobin level is higher among breast-fed babies.
- ○ Fail to reject the null hypothesis. There is significant evidence that the mean hemoglobin level is higher among breast-fed babies.

(b) Give a 95% confidence interval for the mean difference in hemoglobin level between the two populations of infants.

(Round your answers to three decimal places.)

(________ , ________)

(c) State the assumptions that your procedures in (a) and (b) require in order to be valid.

- ◉ We need two independent SRSs from normal populations.
- ○ We need two dependent SRSs from normal populations.
- ○ We need sample sizes greater than 40.
- ○ We need the data to be from a skewed distribution.

15. 0.23/0.69 points | Previous Answers MIntroStat9 7.E.145.

On the morning of March 5, 1996, a train with 14 tankers of propane derailed near the center of the small Wisconsin town of Weyauwega. Six of the tankers were ruptured and burning when the 1700 residents were ordered to evacuate the town. Researchers study disasters like this so that effective relief efforts can be designed for future disasters. About half of the households with pets did not evacuate all of their pets. A study conducted after the derailment focused on problems associated with retrieval of the pets after the evacuation and characteristics of the pet owners. One of the scales measured "commitment to adult animals," and the people who evacuated all or some of their pets were compared with those who did not evacuate any of their pets. Higher scores indicate that the pet owner is more likely to take actions that benefit the pet. Here are the data summaries.

Group	n	$\bar{x}$	s
Evacuated all or some pets	112	7.94	3.61
Did not evacuate any pets	129	6.25	3.53

Analyze the data and prepare a short report describing the results. (Use $\alpha = 0.01$. Round your value for t to three decimal places and your P-value to four decimal places.)

t = [ ]

P-value = [ ]

State your conclusion.

- ○ Fail to reject the null hypothesis. There is not significant evidence of a higher mean score for people who evacuated all or some pets.
- ○ Reject the null hypothesis. There is not significant evidence of a higher mean score for people who evacuated all or some pets.
- ○ Fail to reject the null hypothesis. There is significant evidence of a higher mean score for people who evacuated all or some pets.
- ● Reject the null hypothesis. There is significant evidence of a higher mean score for people who evacuated all or some pets.

✓

16. 0.17/0.69 points | Previous Answers MIntroStat9 7.E.524.XP.

Do various occupational groups differ in their diets? A British study of this question compared 93 drivers and 51 conductors of London double-decker buses. The conductors' jobs require more physical activity. The article reporting the study gives the data as "Mean daily consumption ± (*se*)." Some of the study results appear below.

	Drivers	Conductors
Total calories	2822 ± 44	2847 ± 45
Alcohol (grams)	0.22 ± 0.05	0.4 ± 0.14

What justifies the use of the pooled two-sample *t* test?

- (●) The similarity of the sample standard deviations suggests that the population standard deviations are likely to be similar.
- ( ) The similarity of the sample means suggests that the population standard deviations are likely to be different.
- ( ) The similarity of the sample standard deviations suggests that the population standard deviations are likely to be different.
- ( ) The similarity of the sample means suggests that the population standard deviations are likely to be similar.

✓

Is there significant evidence at the 5% level that conductors consume more calories per day than do drivers? Use the pooled two-sample *t* test to obtain the *P*-value. (Give answers to 3 decimal places.)

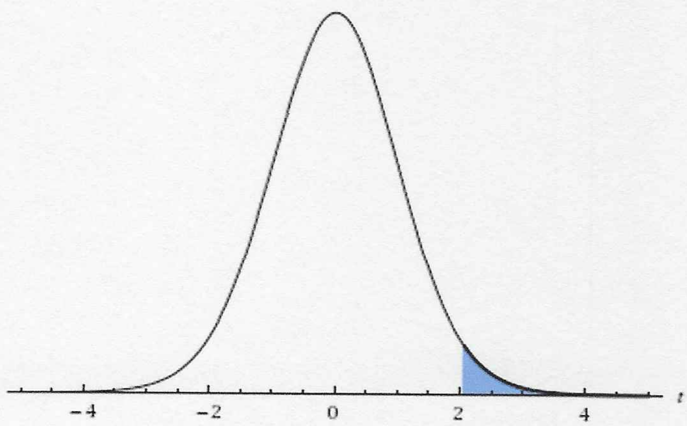
t = _____

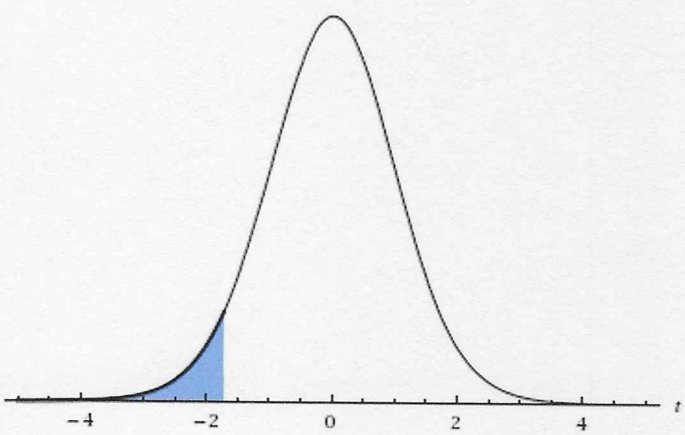
df = _____

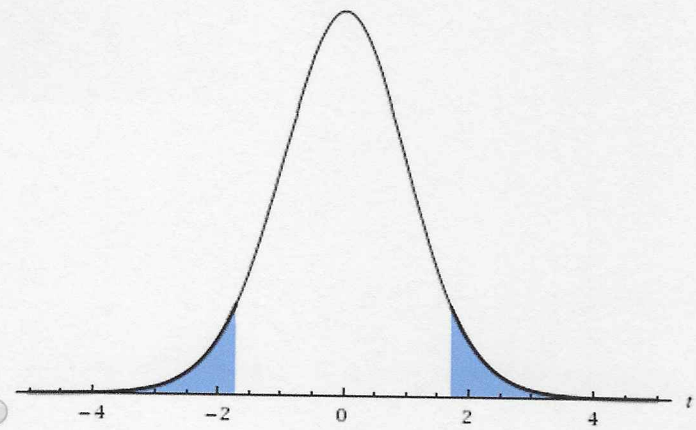
P-value = _____

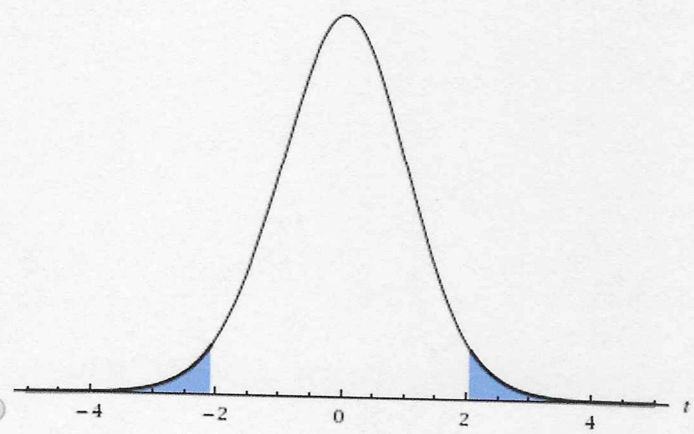
17. –/0.69 points MIntroStat9 7.E.016.

Assume a sample size of $n = 23$. Draw a picture of the distribution of the t statistic under the null hypothesis. Use Table D and your picture to illustrate the values of the test statistic that would lead to rejection of the null hypothesis at the 5% level for a two-sided alternative.









What is/are the value(s) of the critical t in this case? (Enter your answer as a comma-separated list using three decimal places.)

18. 0.27/0.69 points | Previous Answers MIntroStat9 7.E.502.XP.

The one-sample t statistic for testing

H_0: $\mu = 10$

H_a: $\mu > 10$

from a sample of n = 18 observations has the value t = 2.42.

(a) What are the degrees of freedom for this statistic?

[ ]

(b) Give the two critical values t^* from the t distribution critical values table that bracket t.

[ ] < t < [ ]

(c) Between what two values does the P-value of the test fall?

- ○ $0.005 < P < 0.01$
- ● $0.01 < P < 0.02$
- ○ $0.02 < P < 0.025$
- ○ $0.025 < P < 0.05$
- ○ $0.05 < P < 0.1$

✓

(d) Is the value t = 2.42 significant at the 5% level?

- ● Yes
- ○ No

✓

Is it significant at the 1% level?

- ○ Yes
- ● No

✓

(e) If you have software available, find the exact P-value. (Round your answer to four decimal places.)

[ ]

19. 0.18/0.69 points | Previous Answers MIntroStat9 7.E.021.

The one-sample t statistic for testing

$$H_0: \mu = 40$$
$$H_a: \mu \neq 40$$

from a sample of $n = 18$ observations has the value $t = 2.78$.

(a) What are the degrees of freedom for t?

[ ]

(b) Locate the two critical values t^* from the Table D that bracket t.

[ ] $< t <$ [ ]

(c) Between what two values does the P-value of the test fall?

- ○ $0.005 < P < 0.01$
- ● $0.01 < P < 0.02$
- ○ $0.02 < P < 0.04$
- ○ $0.04 < P < 0.05$
- ○ $0.05 < P < 0.1$

✓

(d) Is the value $t = 2.78$ statistically significant at the 5% level?

- ○ Yes
- ○ No

Is it significant at the 1% level?

- ( ) Yes
- (•) No

(e) If you have software available, find the exact P-value. (Round your answer to four decimal places.)

20. 0.27/0.69 points | Previous Answers MIntroStat9 7.E.045.

Dual-energy X-ray absorptiometry (DXA) is a technique for measuring bone health. One of the most common measures is total body bone mineral content (TBBMC). A highly skilled operator is required to take the measurements. Recently, a new DXA machine was purchased by a research lab, and two operators were trained to take the measurements. TBBMC for eight subjects was measured by both operators. The units are grams (g). A comparison of the means for the two operators provides a check on the training they received and allows us to determine if one of the operators is producing measurements that are consistently higher than the other. Here are the data.

	Subject							
Operator	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
1	1.324	1.335	1.075	1.227	0.936	1.006	1.181	1.287
2	1.323	1.322	1.073	1.233	0.934	1.019	1.184	1.304

(a) Take the difference between the TBBMC recorded for Operator 1 and the TBBMC for Operator 2. (Use Operator 1 minus Operator 2. Round your answers to four decimal places.)

$\bar{x}$ = [ ]

s = [ ]

Describe the distribution of these differences using words.

- (●) The sample is too small to make judgments about skewness or symmetry.
- ( ) The distribution is right skewed.
- ( ) The distribution is Normal.
- ( ) The distribution is uniform.
- ( ) The distribution is left skewed.

✓

(b) Use a significance test to examine the null hypothesis that the two operators have the same mean. Give the test statistic. (Round your answer to three decimal places.)

t = [ ]

Give the degrees of freedom.

[ ]

Give the P-value. (Round your answer to four decimal places.)

[ ]

Give your conclusion. (Use the significance level of 5%.)

- ○ We can reject H_0 based on this sample.
- ◉ We cannot reject H_0 based on this sample.

(c) The sample here is rather small, so we may not have much power to detect differences of interest. Use a 95% confidence interval to provide a range of differences that are compatible with these data. (Round your answers to four decimal places.)

([ ] , [ ])

(d) The eight subjects used for this comparison were not a random sample. In fact, they were friends of the researchers whose ages and weights were similar to the types of people who would be measured with this DXA machine. Comment on the appropriateness of this procedure for selecting a sample, and discuss any consequences regarding the interpretation of the significance-testing and confidence interval results.

- ◉ The subjects from this sample may be representative of future subjects, but the test results and confidence interval are suspect because this is not a random sample.
- ○ The subjects from this sample, test results, and confidence interval are representative of future subjects.