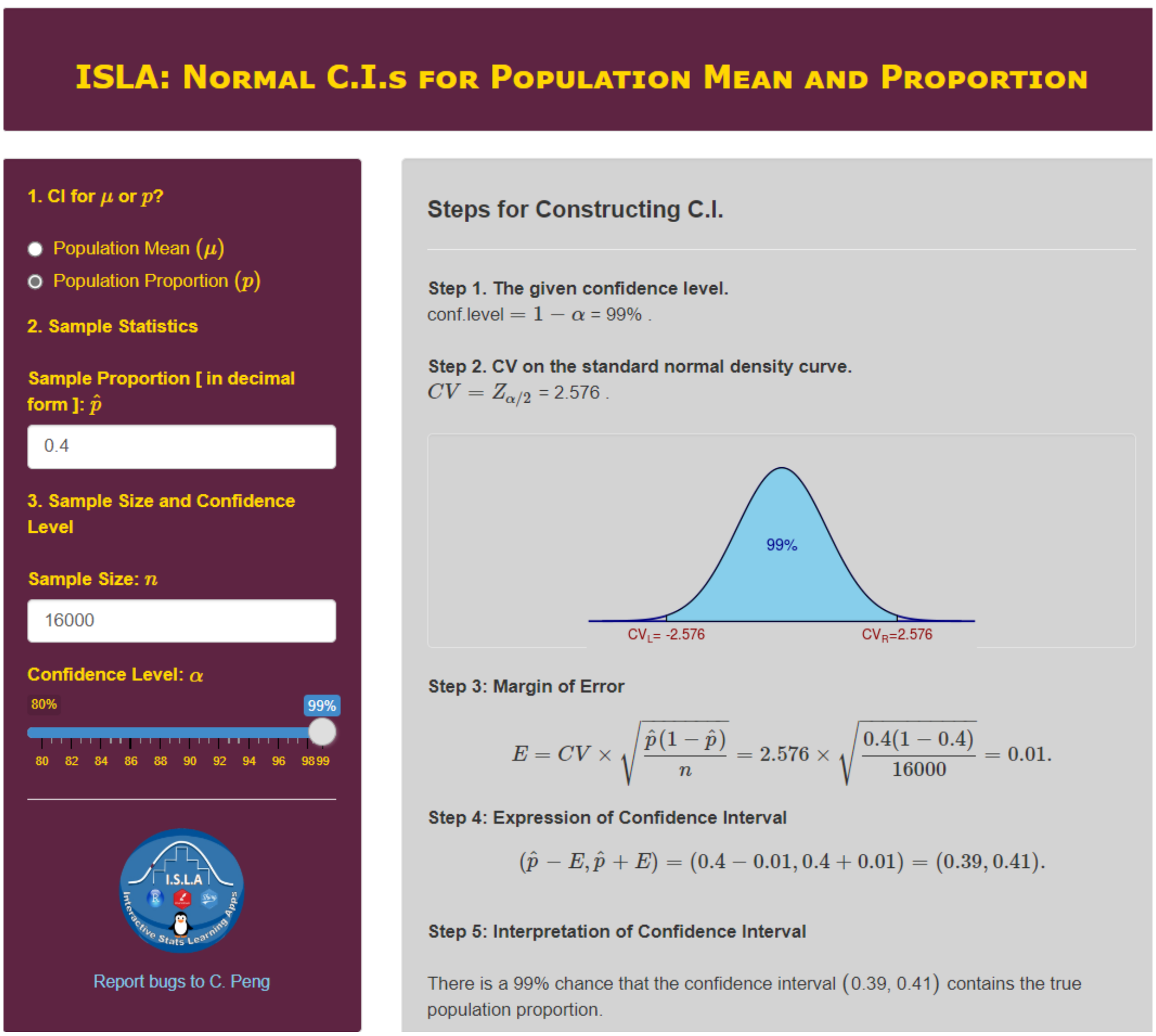
MAT121 Midterm Exam 03

Problem 1

A major metropolitan newspaper selected a simple random sample of 1,600 readers from their subscribers. They asked whether the paper should increase its coverage of local news. 40% of the sample wanted more local news. What is the 99% confidence interval for the proportion of readers who would like more coverage of local news? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

(A) 0.30 to 0.50
(B) 0.32 to 0.48
(C) 0.35 to 0.45
(D) 0.39 to 0.41

Answer: D



Problem 2.
A survey was conducted at a local college to find the percentage of freshmen who were taking a math course. The results found that 75% were taking a math course with a margin of error of +/- 4%. What is the confidence interval? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

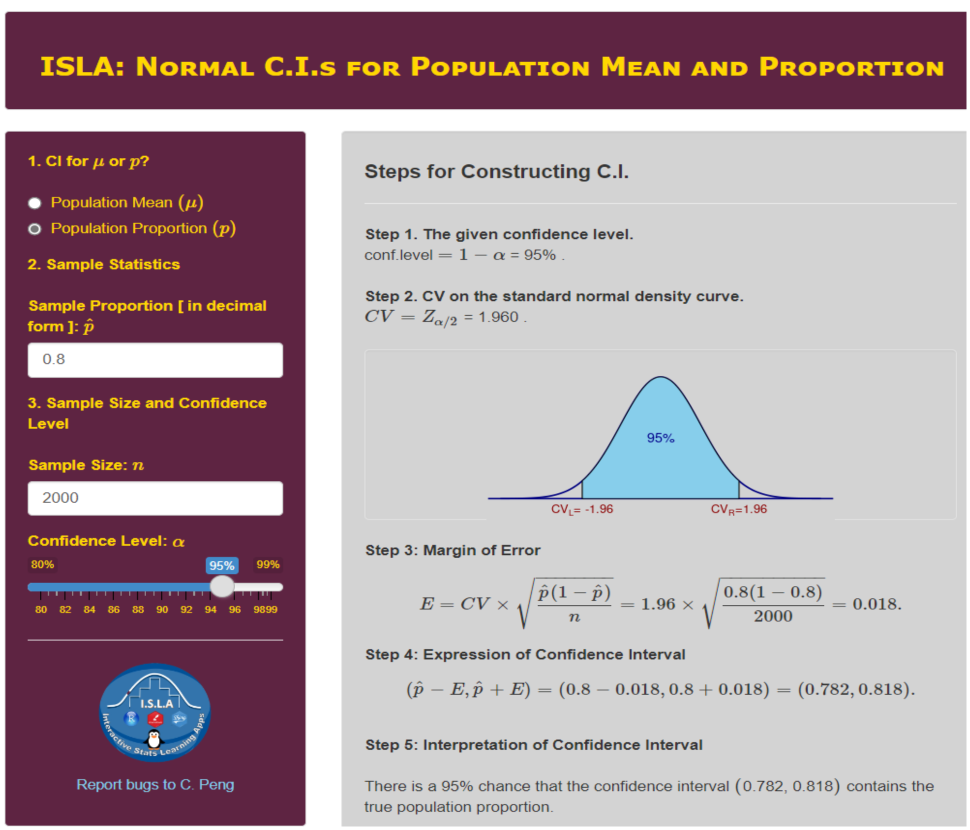
(A) (0.72, 0.77)
(B) (0.67, 0.82)
(C) (0.91, 0.99)
(D) (0.71. 0.79)

Answer: D.

Problem 3.
1,600 of 2,000 voters say they plan to vote Republican. Use a 95% confidence level to find the population proportion interval. [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A. 69.2% to 86.4%
B. 76.5% to 83.5%
C. 77.7% to 82.3%
D. 78.2% to 81.8%

Answer: D.

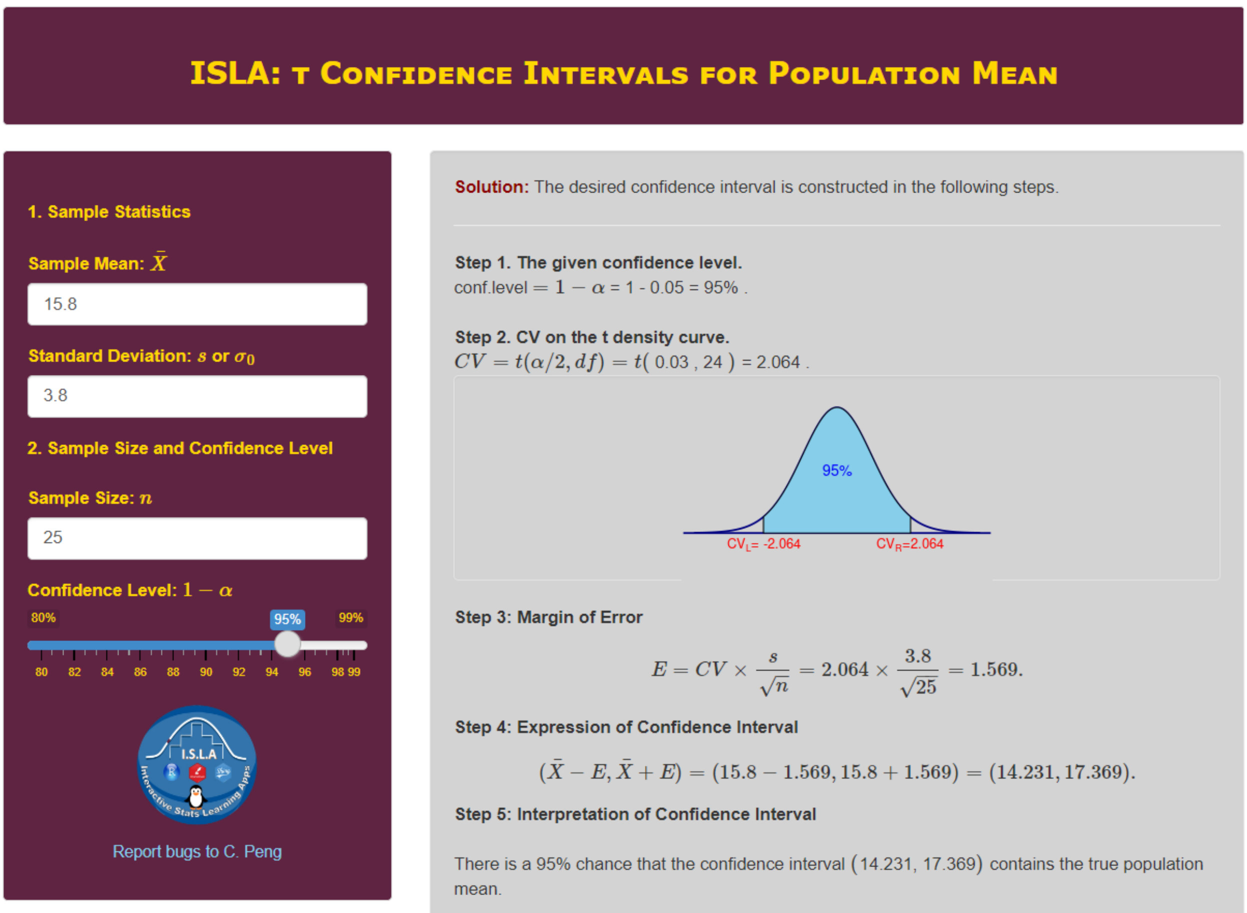


Problem 4.

The mean weight of trucks traveling on the highway is unknown. A state highway inspector needs an estimated mean. He selects 25 trucks passing the weighing station and gets a mean of 15.8 tons, with a standard deviation of the sample of 3.8 tons. Assume that the weights of trucks are normally distributed. Using the 95% confidence level, what is the confidence interval within which the population mean lies? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A. 14.23 and 17.37
B. 14.31 and 17.29
C. 11.08 and 20.52
D. 12.45 and 19.13

Answer: A.



Problem 5

In a random sample of 81 teenagers, the average number of texts handled in a day was 50 with a standard deviation of 15. What is the 95% confidence interval for the average number of texts handled by teens daily?

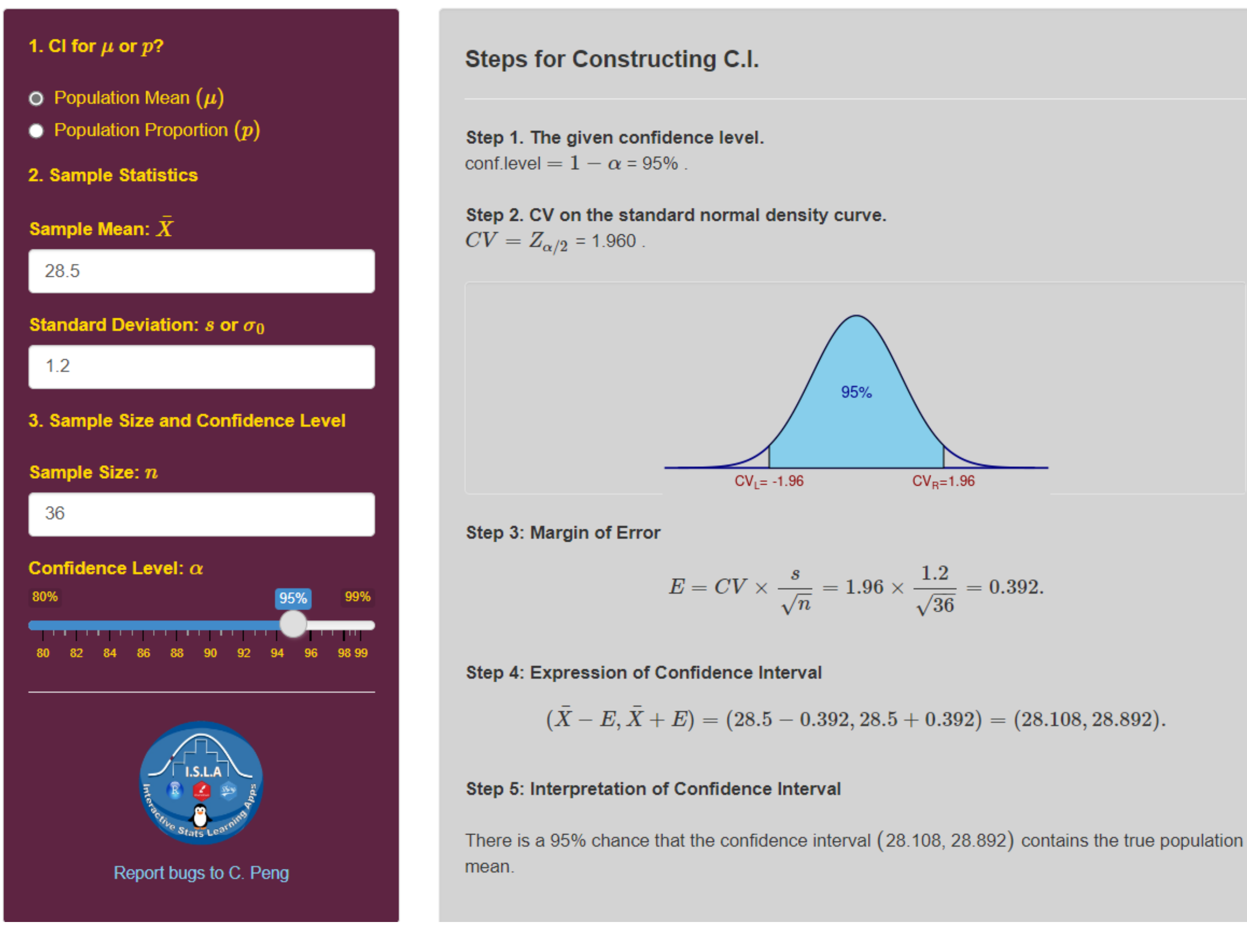
A. $50 \mp 1.96(15)$
B. $50 \mp 1.96(5/3)$
C. $50 \mp 1.96(5/9)$
D. $50 \mp 1.96(15/3)$

Answer: B.

Problem 6.
One gallon of gasoline is put in each of the 36 test autos, and the resulting mileage figures are tabulated with a sample mean of 28.5 and a standard deviation of 1.2. Determine a 95% confidence interval estimate of the mean mileage. [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A. (28.46, 28.54)
B. (28.42, 28.58)
C. (28.11, 28.90)
D. (27.36, 29.64)

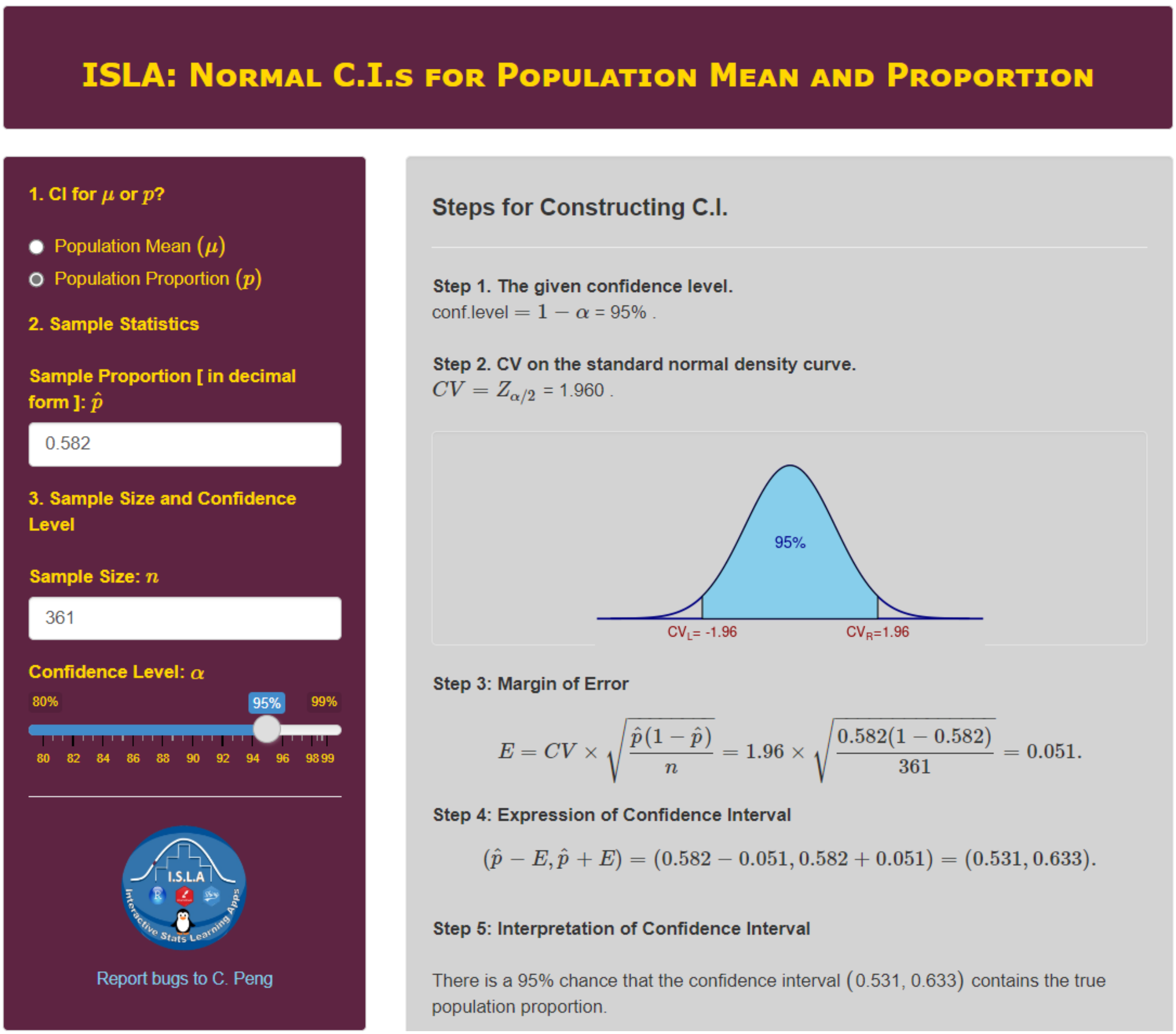
Answer: C.



Problem 7.
The National Research Council of the Philippines reported that 210 of 361 members in biology are women. Find the margin of error for constructing a 95% confidence interval estimate of women in biology in the Philippines. [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A. 0.051
B. 0.54
C. 0.95
D. 1.96

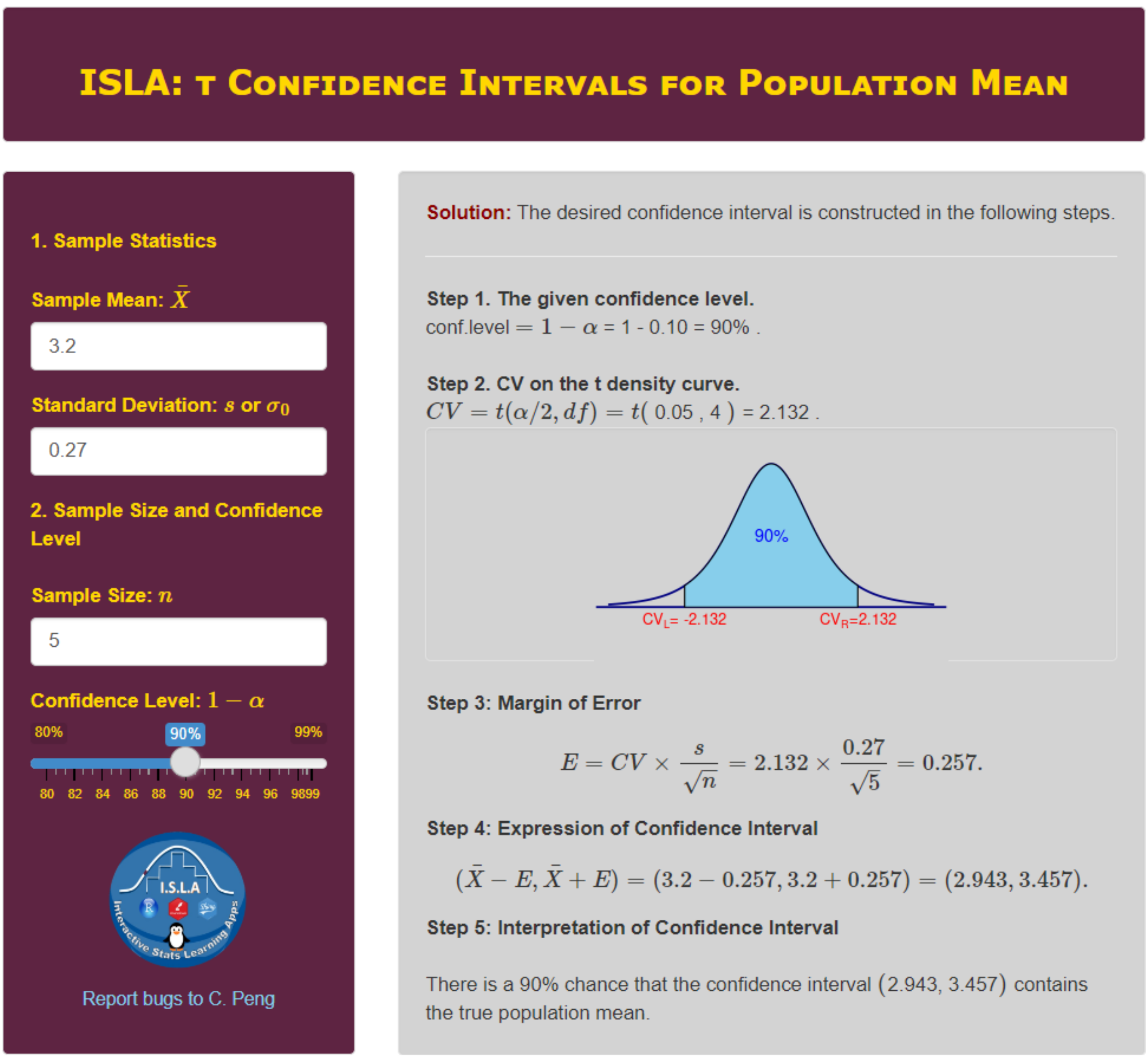
Answer: A.



Problem 8.
A catch of five fish of a certain species yielded the following ounces of protein per pound of fish: 3.1, 3.5, 3.2, 2.8, and 3.4. We can calculate the sample mean and standard deviation to be 3.20 and 0.27 respectively. Assume that the protein contents are normally distributed. What is a 90% confidence interval estimate for ounces of protein per pound of this species of fish?

A. 3.2 ± 0.257
B. 3.2 ± 0.237
D. 4.0 ± 0.257
E. 4.0 ± 0.237

Answer: A.

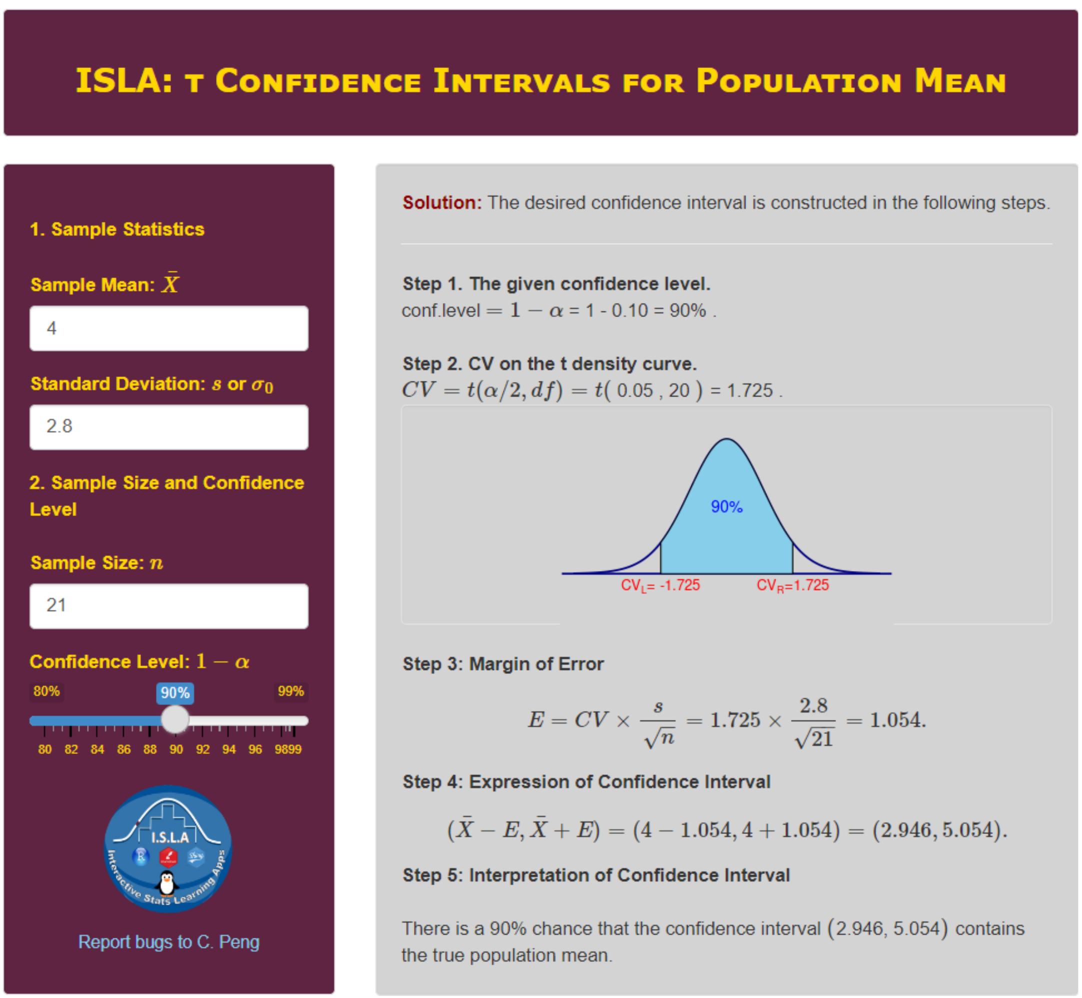


Problem 9.

Acute renal graft rejection can occur years after the graft. In one study (The Lancet, December 24, 1994, page 1737), 21 patients showed such late acute rejection when the ages of their grafts (in years) were 9, 2, 7, 1, 4, 7, 9, 6, 2, 3, 7, 6, 2, 3, 1, 2, 3, 1, 1, 2, and 7, respectively. The mean and the standard deviation are 4 and 2.8. Assume that the ages of renal grafts are normally distributed. What is the margin of error for constructing a 90% confidence interval estimate for the ages of renal grafts that undergo late acute rejection? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A. 0.799
B. 1.725
C. 0.799
D. 1.041

Answer D.



Problem 10
What is the critical t-value for finding a 90% confidence interval estimate from a sample of 15 observations? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A. 1.341
B. 1.761
C. 1.350
D. 1.753

Answer. B.

$$CV = t_{0.05,14} = 1.7613$$

ISLA: t-Distribution Table

Instruction

This app creates a t-table that is commonly used in introductory statistics textbooks. It is primarily used for finding critical values.

1. What Tail Probability Is Given?

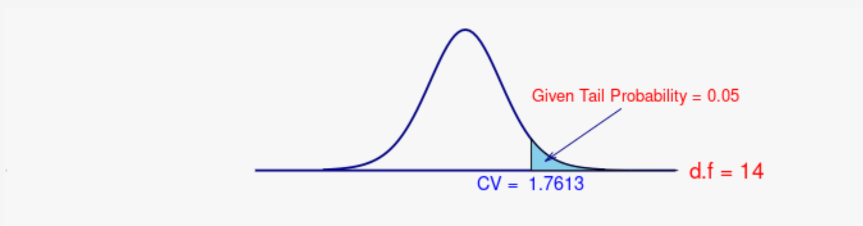
- Right
- Left

2. Given Right Tail Probability

0.05

3. Degrees of Freedom $(n-1)$

14



The numbers in the top row are tail probabilties.

d.f	0.4000	0.2500	0.1000	0.0500	0.0250	0.0100	0.0050	0.0025
9	0.2610	0.7027	1.3830	1.8331	2.2622	2.8214	3.2498	3.6897
10	0.2602	0.6998	1.3722	1.8125	2.2281	2.7638	3.1693	3.5814
11	0.2596	0.6974	1.3634	1.7959	2.2010	2.7181	3.1058	3.4966
12	0.2590	0.6955	1.3562	1.7823	2.1788	2.6810	3.0545	3.4284
13	0.2586	0.6938	1.3502	1.7709	2.1604	2.6503	3.0123	3.3725
14	0.2582	0.6924	1.3450	1.7613	2.1448	2.6245	2.9768	3.3257
15	0.2579	0.6912	1.3406	1.7531	2.1314	2.6025	2.9467	3.2860
16	0.2576	0.6901	1.3368	1.7459	2.1199	2.5835	2.9208	3.2520
17	0.2573	0.6892	1.3334	1.7396	2.1098	2.5669	2.8982	3.2224
18	0.2571	0.6884	1.3304	1.7341	2.1009	2.5524	2.8784	3.1966

Problem 11.

Suppose (25, 30) is a 90% confidence interval estimate for a population mean μ. Which of the following is the margin of error? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

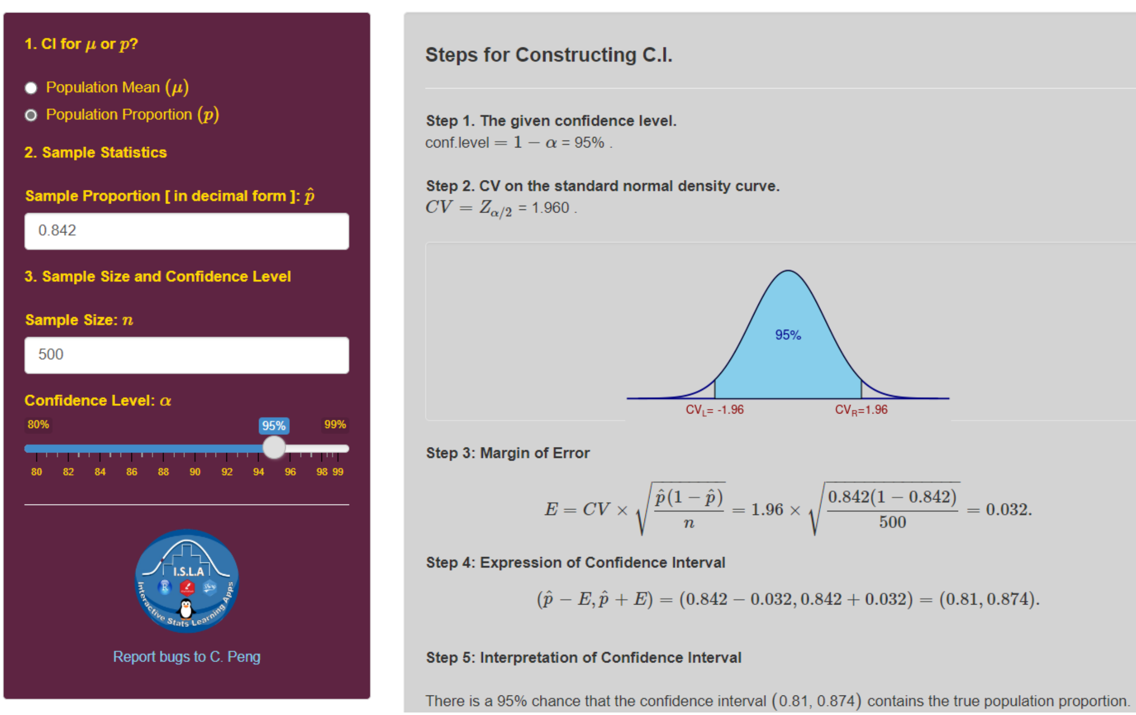
A. 5.
B. 2.5.
C. 27.5.
D. 1.645

Answer. B. (half of the width of the confidence interval)

Problem 12

Suppose that a market research firm is hired to estimate the percentage of adults living in a large city who have cell phones. Five hundred randomly selected adult residents in this city are surveyed to determine whether they have cell phones. Of the 500 people surveyed, 421 responded yes – they own cell phones. Construct a 95% confidence interval for the proportion of adult residents of this city who have cell phones. [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].
A. (0.176, 0.190)
B. (0.810, 0.874)
C. (0.19, 0.81)
D. (0.715, 0.915)

Answer: B.



Problem 13.

If my null hypothesis is "*Dutch people do not differ from English people in height*", what is my alternative hypothesis?

A. All of the statements are plausible alternative hypotheses.
B. Dutch people are taller than English people.
C. English people are taller than Dutch people.
D. Dutch people differ in height from English people.

Correct Answer: D

"Do not differ" $\Rightarrow$ "$=$" : H_0 $=$ vs H_a : $\neq$

Therefore D is correct.

Problem 14

If my experimental hypothesis were "*Eating cheese before bed affects the number of nightmares you have*", what would the null hypothesis (Ho) be?

A. Eating cheese before bed gives you more nightmares.
B. Eating cheese before bed gives you fewer nightmares.
C. Eating cheese is linearly related to the number of nightmares you have.
D. The number of nightmares you have is not affected by eating cheese before bed.

Correct Answer: D

"affects" $\Rightarrow$ "$\neq$" therefore: H_0 $=$ "Do not affect"

H_a: $\neq$ "affect"

Problem 15

In hypothesis testing, the hypothesis which is tentatively assumed to be true is called the

A. correct hypothesis
B. null hypothesis
C. alternative hypothesis
D. level of significance

Correct Answer: B

By the logic of testing hypothesis.

Problem 16
A researcher claims that 62% of voters favor gun control. Determine the null and alternative hypotheses.
A Ho: $p \neq 0.62$ vs. Ha: $p = 0.62$
B Ho: $p \geq 0.62$ vs. Ha: $p < 0.62$
C Ho: $p < 0.62$ vs. Ha: $p \geq 0.62$
D Ho: $p \geq 0.62$ vs. Ha: $p<0.62$
E Ho: $p = 0.62$ vs. Ha: $p \neq 0.62$

Correct Answer: E

claim: $p = 0.62$. does have an equal sign,

H_0: $p = 0.62$ vs. H_a: $p \neq .62$

Problem 17
Nestor Milk Powder is sold in packets with an advertised *mean weight of 1.5 kg*. The standard deviation is known to be 184 grams. *A consumer group wishes to check the accuracy of the advertised mean and takes a sample of 52 packets finding an average weight of 1.49kgs.* What is the set of hypotheses that should be used to test the accuracy of advertised weight?

A Ho: $\mu = 1.5$ vs Ha: $\mu \neq 1.5$
B Ho: $\mu = 1.5$ vs Ha: $\mu < 1.5$
C Ho: $x = 1.49$ vs Ha: $x \neq 1.49$
D Ho: $x = 1.5$ vs Ha: $x < 1.5$

Correct Answer: A

Claim: $\mu = 1.5$ $\Rightarrow$ H_0. $\mu = 1.5$ vs H_a: $\mu \neq 1.5$

$n = 50 > 30$

$\Rightarrow$ C.L.T.

Problem 18
Mr. Rumpole *believes that* the mean income of lawyers is now *more than* $65000 thousand per year. Which is the correct set of hypotheses to test this belief?
A Ho: $\mu \geq 65000$ vs Ha: $\mu < 65000$
B Ho: $\mu \leq 65000$ vs Ha: $\mu > 65000$
C Ho: $\mu = 65000$ vs Ha: $\mu \neq 65000$
D Ho: $\mu < 65000$ vs Ha: $\mu \geq 65000$

Correct Answer: B

claim: $\mu > 65000$. $\Rightarrow$ $H_0: \mu \leq 65000$ v.s. $H_a: \mu > 65000$

Problem 19
Suppose a businessperson wishes to open a store in a local shopping center only if there is strong evidence that the average number of people in the center *is greater than* 5000 per day. The null hypothesis will be

A H0: μ ≤ 5000
B H0: μ > 5000
C H0: μ ≥ 5000
D H0: μ < 5000

Correct Answer: A

Claim: $\mu > 5000$

$\Rightarrow$ $H_0: \mu \leq 5000$

Problem 20
A manufacturer of chocolate toppings uses machines to dispense liquid ingredients into bottles that move along a filling line. The machine that dispenses toppings is working properly when 8 grams are dispensed. The standard deviation of the process is 0.15 grams. A sample of 50 bottles is selected periodically and the filling line is stopped *if there is evidence that the average amount dispensed is less than* 8 grams. Suppose that the average amount dispensed in a sample of 50 bottles is 7.983 grams. What is the null hypothesis (Ho)?

A. μ < 8
B. μ ≥ 8
C. μ > 8
D. μ ≤ 8
E. μ = 8

Correct Answer: B

Claim : $\mu < 8$

$\Rightarrow H_0: \mu \geq 8$ vs $H_a: \mu < 8$

Problem 21
The standard deviation of a large population is 20. To test

$H_o: \mu \leq 4$ vs. $H_a: \mu > 4$

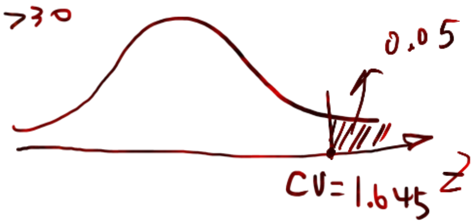
at a level of significance of .05, a sample of size 100 will be taken.
You will reject H_O if the test statistic

A. TS ≥ 1.96
B. TS ≥ 0.95 or TS ≤ -1.96
C. TS ≥ 1.645
D. TS ≥ 1.645 or TS ≤ -1.645
E. TS > 1.285

Correct Answer: C

$n = 100 > 30$

$\Rightarrow$ C.L.T

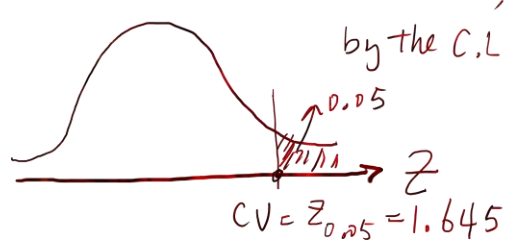


Problem 22
We are interested in conducting a test with the following hypothesis Ho: μ = 20 vs. Ha: μ > 20. If the sample size is 36, s = 12, the *population is normal*, and the level of significance is 0.05, what is the rejection region for this test? Reject H_0 if
A TS < 1.753
B TS > 2.575
C TS > 1.96
D TS > 1.645

$n = 36 > 30$,
by the C.L.T

Correct Answer: D

$H_a: \mu > 20$



Problem 23.

The null hypothesis is rejected if

A. The null hypothesis is true.
B. The alternative hypothesis is true.
C. The p-value is less or equal to the significance level.
D. The p-value is larger than the significance level.

Answer: C.

Problem 24.

For a two-tailed normal test, the p-value is defined to be

A). The area to the right of the test statistic of the normal density curve.
B). The area to the left of the test statistic of the normal density curve.
C). The area between the two critical values in the normal density curve.
D). Two times of the smaller tail area.

Answer D.

Problem 25.

Given H0: $\mu = 25$, Ha: $\mu \neq 25$, and P-value = 0.041. Do you reject or fail to reject H0 at the 0.01 level of significance?

A) fail to reject Ho
B) not sufficient information to decide
C) reject Ho

Answer: A.

Problem 26.

The area **to the left** of the test statistic is 0.375. What is P- the value if this is a **right tail test**? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A) 0.625
B) 0.1885
C) 0.750
D) 0.375

Answer: A. 1 – 0.375 = 0.625

Problem 27

The area to the left of the test statistic is 0.375. What is the P- value if this is a two-tail test? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].
A) 0.625
B) 0.750
C) 0.375
D) 0.1885

Answer: B. Double the smaller tail area.

Problem 28

Which of the statements about the sampling distribution of a sample mean is INCORRECT?

A. A large sample (n > 30) from a normal population with known variance, then the *sample mean* is normally distributed.

B. A large sample (n > 30) from a normal population with unknown variance, then the *sample mean* is approximately normally distributed.

C. A small sample (n < 30) from a normal population with known variance, then the *sample mean* is a normal distribution.

D. A small sample (n < 30) from a normal population with unknown variance, then *sample mean* is a t distribution with n-1 degrees of freedom.

Answer: D.

Problem 29

A simple random sample of 20 US adults is obtained and each person's red blood cell count (in cells per microliter) is measured. The sample mean is 4.63. Let be a mean blood cell count for all US adults.

Suppose the population standard deviation is unknown, but a sample standard deviation is given. If you wanted to compute a 90% confidence interval for and use a t-interval procedure, what is the appropriate t-value you need to use in computing the margin of error in your confidence interval, give appropriate degrees of freedom.

A df=19, t=1.729

B df=20, t=1.725

C df=19, t=1.328

D df=20, t=1.325

Answer: A

Problem 30

The effect of acid rain on the yield of crops is of concern in many places. To determine baseline yields, a sample of 13 fields was selected, and the yields of barley (g/400 m^2) were obtained, and the sample mean and standard deviation were given, respectively, by 220 and 60. Assume that yields of barley are normally distributed. A 95% confidence interval for the mean yield is

A $220 \pm 1.96(60/\sqrt{13})$

B $220 \pm 1.96(60/\sqrt{12})$

C $220 \pm 2.18(60/\sqrt{13})$

D $220 \pm 2.16(60/\sqrt{13})$

Answer: C.

Problem 31

In a random sample of 28 families, the average weekly food expense was $95.60 with a standard deviation of $22.50. Determine whether a normal distribution or a t-distribution should be used or whether neither of these can be used to construct a confidence interval. Assume the distribution of weekly food expenses is normally shaped.

A Cannot use normal distribution or t-distribution.

B Use normal distribution.

C Use the t-distribution.

Answer: C.

Problem 32.

Suppose we wish to test Ho: $\mu \geq 21$ vs Ha: $\mu < 21$. Which of the following sample results gives the most evidence to support Ha (i.e., reject Ha)? [Hint: compute TS = ?]

A $\bar{x} = 23,\ s = 3,\ n = 36$.

B $\bar{x} = 20,\ s = 6,\ n = 36$.

C $\bar{x} = 19,\ s = 7,\ n = 36$.

D $\bar{x} = 18,\ s = 8,\ n = 36$.

Answer: D.

Problem 33

Joe Palermo interviewed 507 randomly chosen WCU students and found that 59%of the students in his sample like to play chess. Consider the research question of whether a majority of WCU students like to play chess. The test for this research question is a:

A. Neither a one-sided nor two-sided test.
B. One-sided test.
C. Both a one-sided and two-sided test
D. Two-sided test

Answer: B.

Problem 34.

A hypothesis test is conducted to test whether the mean age of clients at a certain health spa is equal to 25 or not. 36 clients were randomly selected, and their ages were recorded, with the sample mean age being 27.8 and a standard deviation of 10. Assume that the population distribution of ages is skewed to the right. What is the p-value? [*Hint: if your answer is different from any of the provided ones, choose the closest one as your answer*].

A p-value = 1.68
B p-value = .9535
C p-value = 0.0465
D p-value = 0.093

Answer: D.