

Math 1530 Final Exam Spring 2016

Name _____
Section # _____
Instructor _____

There are five possible responses to each of the following multiple choice questions. There is only one “BEST” answer. Be sure to read all possible choices before selecting your answer. You may mark on this examination. You may use a calculator but a calculator manual may not be used.

Form C

Please circle your answer to each question and fill the blank sheet. After you finish the exam, log into D2L and input your answers under the right quiz item. There are a total of 43 questions.

- If your test is Form A, take Quiz item *Final Form A*.
- If your test is Form B, take Quiz item *Final Form B*.
- If your test is Form C, take Quiz item *Final Form C*.
- If your test is Form D, take Quiz item *Final Form D*.

CONFIDENCE LEVEL	90%	95%	99%
z^*	1.645	1.96	2.576

- Which of these questions from the Spring 2016 MATH1530 class survey produced variables that are quantitative?
 - What is your age?
 - Do you favor or oppose daily prayer in the classroom? (Favor or Oppose)
 - How much do you believe minimum wage should be? (Enter in \$0.00 format.)
 - What is your favorite way of spending an evening? (Staying at home, Watching Television, Resting/Relaxing, Reading, Visiting with friends, Other)
 - What is your religious identification? (Christian Religion, Non-Christian Religion, None)

(A) i (B) iii (C) i, iii (D) ii, iv, v (E) i, ii, iii, iv, v
- The following set of observations is the number of moons of each planet in our Solar System.

0 0 1 2 63 61 27 13

The five-number summary is

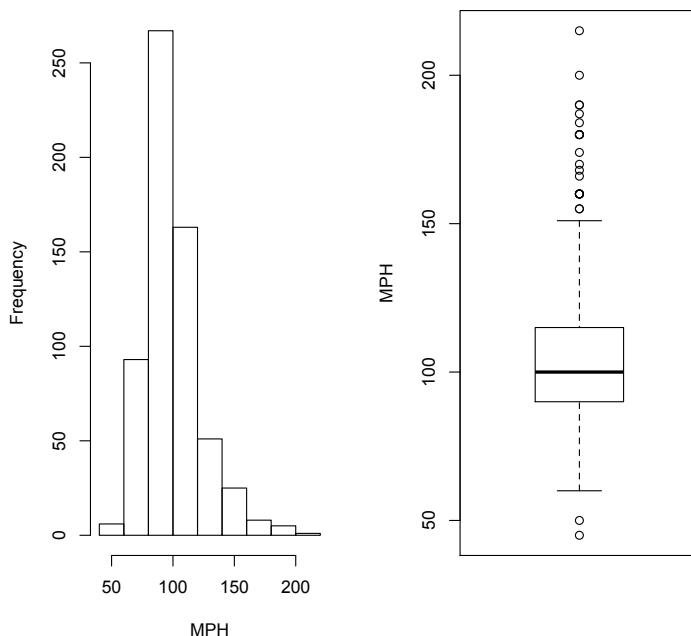
- (A) 0, 0.5, 7.5, 44, 63
(B) 0, 0.5, 32.5, 44, 13
(C) 0, 0.5, 32.5, 44, 63
(D) Median = 7.5, Mean = 20.88, Standard Deviation = 27, Min = 0, Max = 63
(E) N=8, IQR = 43.5, Standard Deviation = 27, Range = 63, Median = 32.5
- The Spring 2016 MATH1530 class survey asked “How many different people do you text on a normal day?” The table below represents the responses of 702 students.

Number of different people texted	0	1	2	3	4	5	6	7	8	9 or more
Number of Students	13	32	75	129	119	142	51	31	22	88

Estimate the median number of different people that the 702 students texted on a normal day.

- (A) 4 (B) 5 (C) 4.5 (D) $(119 + 142)/2 = 130.5$ (E) 351
- The scores students earned on an easy test range from 0 to 100. There are many scores ranging from 85 to 100, some scores ranging from 70 to 80, and a few scores below 70. The distribution of test scores will be
 - skewed to the right.
 - skewed to the left.
 - roughly symmetric.
 - roughly normal.
 - correlated to age of the student.

Use the following for the next 2 questions. The Spring 2016 MATH class survey asked “What is the fastest you have driven a car (in mph)?” The figures below represent the fastest speed ever driven claimed by 619 students in this survey.



5. Which of the following best describes this distribution? This distribution is
- (A) left-skewed with outliers.
 - (B) symmetric around 100, very little variation, and many outliers.
 - (C) multi-peaked with the bulk of data from 50 to 150.
 - (D) evenly-spaced from 40 to 200.
 - (E) slightly right-skewed, with center around 100 mph, spread from 40 to over 200 mph, and there are many outliers.

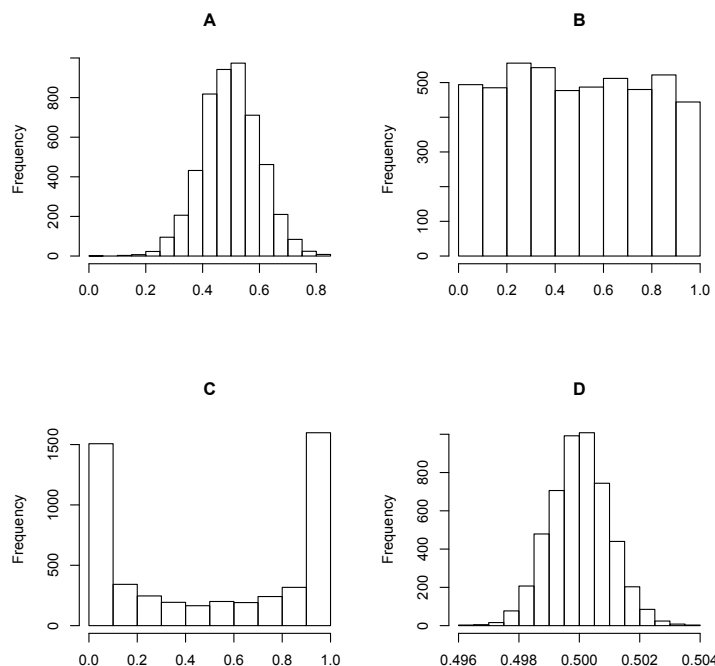
6. Approximately what percent of the students have driven at least 100 mph?
- (A) $160/619 = 25\%$ (B) $275/619 = 44\%$ (C) 50% (D) 100 (E) 310

Use the following for the next 2 questions. The table below represents the responses of 708 students to the MATH1530 survey question “What is your favorite way of spending an evening?”

Evening Time	Visiting with Friends	Resting/Relaxing	Other	Staying at Home	Watching TV	Reading
Count	259	166	97	78	61	46

7. Which of the following graphs is most appropriate to describe these responses?
- (A) histogram (B) boxplot (C) scatterplot (D) bar chart (E) stem plot
8. What can you conclude about this distribution?
- (A) It is somewhat symmetric with ‘Other’ as the center of the distribution.
 - (B) ‘Visiting with Friends’ is the most popular way of spending an evening and the least popular time spent is ‘Reading.’
 - (C) It is left-skewed with a spread from ‘Visiting with Friends’ to ‘Reading.’
 - (D) It is right-skewed with ‘Other’ being the median.
 - (E) Min = ‘Reading’, Q1 = ‘Watching TV’ to ‘Reading’, Median = ‘Other’, Q3 = ‘Visiting with Friends’ to ‘Resting/Relaxing’, Max = ‘Visiting with Friends’

9. Which of the following histograms has the largest standard deviation? Each histogram ranges from 0 to 1 and is fairly symmetric around 0.5.



- (A) Histogram A (B) Histogram B (C) Histogram C (D) Histogram D (E) No way to tell.

Use the following for the next 3 questions. The descriptive statistics below summarizes the heights (inches) of the women's and men's ETSU basketball teams.

Descriptive Statistics: HEIGHT									
Variable	GENDER	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Height (inches)	Women	12	69.75	2.90	66.00	67.75	69.50	71.50	74.00
	Men	16	77.25	3.42	72.00	74.75	77.00	80.00	84.00

10. Based on these statistics, what can we say about the distributions of the women's and men's heights?
- (A) Both distributions are strongly skewed right with possible outlier(s).
 (B) The distributions are positively correlated; as women's statistics increase so do the men's.
 (C) We are 95% confident the men have heights between 77.25 ± 6.84 inches and we are 95% confident the women have heights between 69.75 ± 5.8 inches.
 (D) Both distributions are fairly symmetric. The smallest male player is taller than 75% of the female players.
 (E) The distributions are very similar except that there are more male players than female players.
11. For the men, approximately what percent of the heights in the distribution are less than or equal 74.75 inches?
- (A) 25% (B) 50% (C) 75% (D) 100% (E) Unable to determine
12. One female player is 73 inches tall, her z-score is
- (A) -1.12 (B) 1.12 (C) 3.25 (D) -3.25 (E) in the top 1%.

13. The population of the United States is aging, though less rapidly than in other developed countries. Here are the percents (sorted) of residents aged 65 and older in the 50 states, according to the 2000 census.

5.7	8.5	9.6	9.7	9.9	10.6	11.0	11.2	11.2	11.3	11.3	11.6	11.7	11.7	12.0	12.0	12.1	12.1	12.1	12.1
12.3	12.4	12.4	12.5	12.7	12.8	12.9	13.0	13.0	13.0	13.1	13.2	13.2	13.3	13.3	13.3	13.4	13.5	13.5	13.6
13.8	14.0	14.3	14.4	14.5	14.7	14.9	15.3	15.6	17.6										

Which of the following best describes the distribution of the percents of residents aged 65 and older in the 50 states?

- (A) The distribution is multimodal with no outliers. There are many centers and the variability in the percents among the states is quite small.
- (B) The distribution is evenly spaced between 5.7 and 17.6 with outliers. The middle value is about $(5.7 + 17.6)/2 = 11.65\%$ and the spread is approximately 12%.
- (C) The distribution is single-peaked, skewed right and has possible outliers.
- (D) The distribution is normally distributed ranging from 5.7 to 17.6. We are 95% confident that the true mean percent of residents aged 65 and over lies between ± 2 standard deviations of the mean.
- (E) The distribution is fairly symmetric with center around 12.75%. The percents range from 5.7% to 17.6%, which shows variability in the percents of residents aged 65 and older among the states. There are also possible outliers.

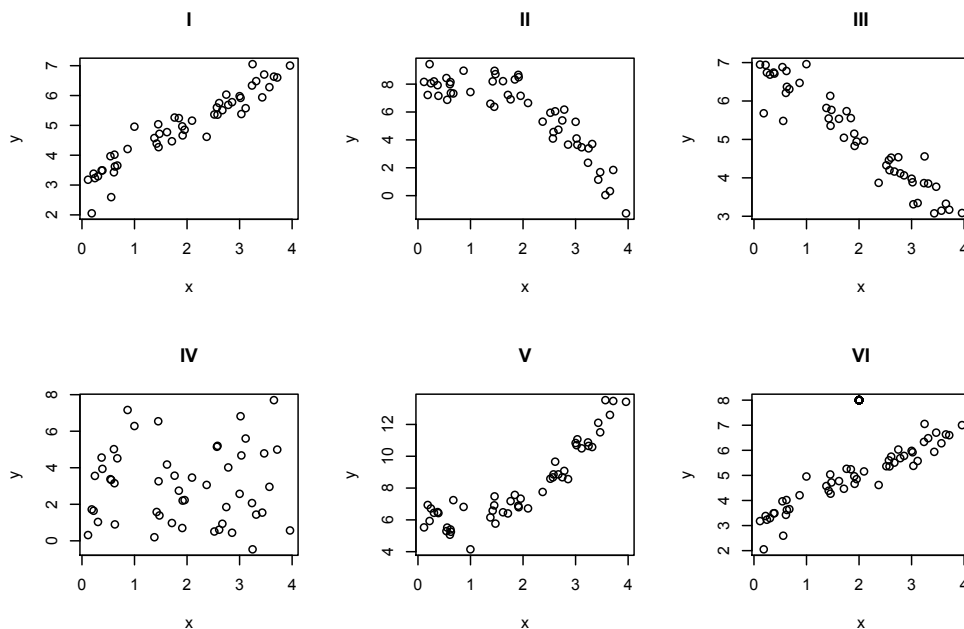
Use the following for the next 2 questions In a study of exercise, a large group of male runners walk on a treadmill for 6 minutes. Their heart rates in beats per minute at end vary from runner to runner according to the Normal distribution with mean 130 and standard deviation 17. (Hint: Use the 68 – 95 – 99.7 rule.)

14. What percent of the runners have heart rates above 147?
- (A) 5% (B) 16% (C) 32% (D) 68% (E) 84%
15. How low must a runner's heart rate beat per minute in order to place in the bottom 2.5% of all runners participating in this study?
- (A) 164 (B) 147 (C) 113 (D) 96 (E) 79

16. Which of the following correlation values indicates the weakest linear relationship between two quantitative variables?

- (A) $r = -0.65$ (B) $r = 0.90$ (C) $r = 0.11$ (D) $r = -0.90$ (E) $r = 0.00$

Use the following for the next 3 questions. Below are six scatterplots:



17. Which of the following has the highest positive correlation?

- (A) Plot I (B) Plot II (C) Plot III (D) Plot IV (E) Plot VI

18. Which plot shows very little relationship?

- (A) Plot I (B) Plot II (C) Plot III (D) Plot IV (E) Plot V

19. For the plot VI, if we exclude the data point that is far away from the rest then the relationship becomes

- (A) weaker. (B) the same. (C) negative. (D) perfectly linear. (E) stronger.

20. There is a positive correlation between ice cream sales and the rate of drowning deaths. Does this mean that ice cream consumption causes death by drowning?

- (A) Yes, the data show that eating cold ice cream must be causing cramps, which would cause a person to drown if they went swimming.
 (B) Yes, the correlation can't be just by an accident.
 (C) No, a negative correlation would allow that conclusion, but this correlation is positive.
 (D) No, this is reverse cause-and-effect.
 (E) No, the positive correlation is probably explained by the fact ice cream is sold during the hot summer months at a much greater rate than during colder times, and it is during these hot summer months that people are more likely to engage in activities involving water, such as swimming.

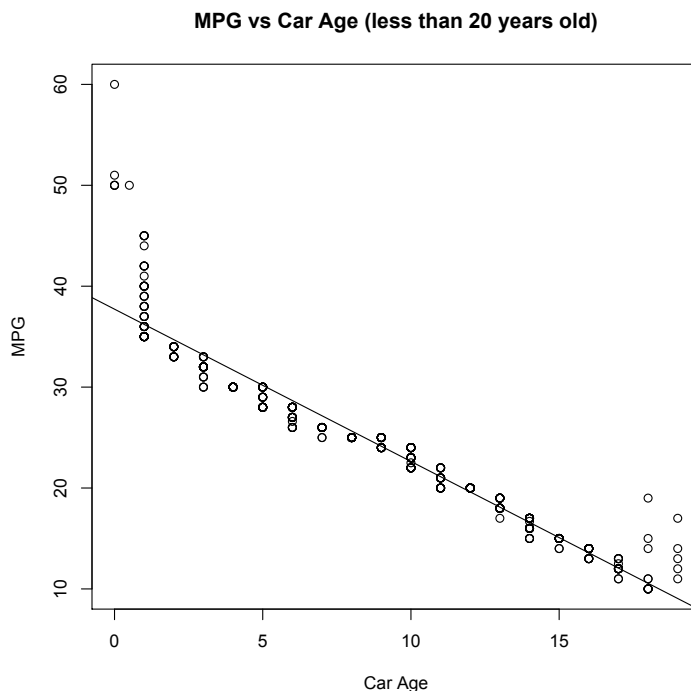
21. The use of _____ is the most effective way of establishing causality between two variables.

- (A) a scatterplot (C) a two sample t-test
 (B) a positive correlation (D) a randomized comparative experiment
 (E) an observational study

22. Ann Landers asked her readers if they would choose to have children again. An incredible 70% of respondents said that if they lived their lives over again, they would not have children. A similar poll in Good Housekeeping the same year resulted in 95% of people saying they would have children. You can conclude that
- (A) about $(70+95)/2 = 82.5\%$ of adults would not have children if they lived their lives over again.
 - (B) more parents still need to respond on the question, as a larger sample is required to reduce bias.
 - (C) these polls used voluntary response, so their results tell us little about the population of all adults.
 - (D) both polls reveal that most people would not have children again.
 - (E) the Good Housekeeping poll is more reliable than the Ann Landers poll since 95% is larger than 70%.
23. Suppose a farmer wishes to work out the average milk yield of each cow type in his herd, which consists of Ayrshire, Friesian, Galloway, and Jersey cows. He could divide up his herd into the four sub-groups and take random samples from each subgroup. This is an example of
- (A) a simple random sample. (C) a multistage random sample.
 - (B) a stratified random sample. (D) an observational sample.
 - (E) an experiment.
24. A very comprehensive study of an expensive new diet pill was conducted. After looking at 100,000 patients for a year they find that in almost every case everyone that took the diet pill lost exactly one pound. There was little variance, everyone lost that one pound, so there was a statistically significant loss of weight. The explanation is
- (A) the results are of practical significance.
 - (B) that mean weight loss of 1 pound is large compared to the mean weight loss of most diets.
 - (C) new diets typically have less variability than standard diets, and so small differences can appear to be statistically significant.
 - (D) that the sample size is large and it isn't surprising to find the results to be statistically significant.
 - (E) all of the above.
25. There is a very promising new cancer drug that only has a very small amount to test for further study. In an early clinical trial, the research found that there was a dramatic reduction in cancer growth rate on three subjects. Although the cancer growth rate dramatically decreased, the results are not statistically significant. The explanation is
- (A) that the sample size is small and it isn't surprising to find the results not statistically significant.
 - (B) the placebo effect is present, which limits statistical significance.
 - (C) the calculation was in error. The researchers forgot to include the P-value.
 - (D) that although the cancer growth rate has decreased, the test statistic was large in magnitude.
 - (E) the results are not of practical significance.

Use the following for the next 3 questions. On the SPRING 2016 Math 1530 survey, questions 13 and 14 asked students to state the age of their car (in years) and the miles per gallon (mpg) for that car. We are interested in seeing whether we can use the age of the car to predict the miles per gallon of the car. The following least-squares regression analysis is based on cars that are less than 20 years old. The observations and the least-squares regression line appear in the scatterplot. The correlation between the two variables is $r = -0.961$ and the least-squares regression equation is

$$MPG = 37.72 - 1.51 \times Car\ Age$$



26. Which of the following statements is true about the relationship between these two variables?
- (A) The association between the age of a car and its miles per gallon is positive, strongly curved, and weak.
 - (B) The association between the age of a car and its miles per gallon is a straight line.
 - (C) The association between the age of a car and its miles per gallon is nearly perfect.
 - (D) The association between the age of a car and its miles per gallon is negative, fairly linear, and strong.
 - (E) The association between the age of a car and its miles per gallon is positive, fairly linear, and strong.
27. Which is the most appropriate interpretation of the slope?
- (A) As MPG increases on a car, the age of the car decreases by 1.51 years.
 - (B) For every year a car ages, the estimated miles per gallon of the car will increase by 37.72.
 - (C) For every year a car ages, the estimated miles per gallon of the car will decrease by 1.51, on average.
 - (D) For every year a car ages, the estimated miles per gallon of the car will increase by 1.51, on average
 - (E) The average miles per gallon is 37.72.
28. Use the regression equation to predict MPG for a car that is 5 years old.
- (A) 1.51 (B) 30.18 (C) 36.21 (D) 37.72 (E) 181.05

29. Which of the following is an example of a matched pairs design?
- (A) A teacher compares the pre-test and post-test scores of students.
 - (B) A teacher compares the scores of students using a computer-based method of instruction with the scores of other students using a traditional method.
 - (C) A teacher compares the scores of students in her class on a standardized test with the national average score.
 - (D) A teacher compares her class's average score on a standardized test with the national average score.
 - (E) None of the above.

Use the following for the next 2 questions. The Pick 4 games in many state lotteries announce a four-digit winning number each day. Each of the 10,000 possible numbers 0000 to 9999 has the same chance of winning. You win if your choice matches the winning digits. Suppose your choice is 0011.

30. What is the probability that the winning number matches your number exactly?
- (A) 0 (B) $1/9999$ (C) $1/10000$ (D) $4/10000$ (E) $11/10000$
31. What is the probability that the winning number has the same digits as your number *in any order*?
- (A) 0 (B) $1/9999$ (C) $4/9999$ (D) $4/10000$ (E) $6/10000$
32. If you flip a fair coin and roll a fair 6-sided die, what is the probability that you will flip a heads and roll a 5?
- (A) 0 (B) $1/12$ (C) $1/3$ (D) $2/3$ (E) 3
33. The ACT is an exam used by colleges and universities to evaluate undergraduate applicants. In a recent year, the mean test score was 20.8 and the standard deviation was 4.8. Suppose 100 students from this population are randomly selected. The distribution of the sample mean ACT score is
- (A) approximately Normal, mean 20.8, standard deviation 4.8.
 - (B) approximately Normal, mean 20.8, standard deviation 0.048.
 - (C) approximately Normal, mean 20.8, standard deviation 0.48.
 - (D) approximately Normal, mean equal to the observed value of the sample mean, standard deviation 4.8.
 - (E) Cannot determine based on the information provided.

Use the following for the next 2 questions. The Spring 2016 MATH1530 survey asked students "What is your religious identification?" In the sample of 707 students who responded to this question, 513 said "Christian Religion," 55 said "Non-Christian Religion," and 139 said "None."

34. The sample proportion $\hat{p}$ that responded "Christian Religion" is _____.
- (A) 0.078 (B) 0.197 (C) 0.726 (D) 513 (E) 707
35. A 95% confidence interval for p , where p is the proportion of all ETSU students who identify with a Christian religion, is
- (A) 69% to 76% (B) 73% to 95% (C) 513 to 707 (D) 68% to 77% (E) 70% to 80%

Use the following for the next 3 questions. The MATH1530 survey asked students “What political party do you identify with?” and “Do you favor or oppose daily prayer in the classroom?” The distribution of counts is shown in the table

Political ID	Favor	Oppose	Total
Republican	200	32	232
Democrat	72	94	166
Independent	105	74	179
Other	80	51	131
Total	457	251	708

36. What percent of Republicans favor daily prayer in the classroom?
 (A) 28% (B) 33% (C) 44% (D) 65% (E) 86%
37. What percent of the students surveyed favor daily prayer in the classroom?
 (A) 28% (B) 33% (C) 44% (D) 65% (E) 86%
38. Given that a student favors daily prayer in the classroom, what percent are Republicans?
 (A) 28% (B) 33% (C) 44% (D) 65% (E) 86%
39. An IQ test is designed to have scores that have a standard deviation of $\sigma = 15$. A simple random sample of students at a large university will be given the test in order to construct a 99% confidence interval for the mean IQ of all students at the university. How many students must be tested so that the margin of error will be equal to 3 points?
 (A) 13 (B) 97 (C) 10 (D) 45 (E) 166
40. The Spring 2016 MATH1530 survey asked students “How many speeding tickets have you gotten since you started driving?” Is there evidence that the mean number of speeding tickets for ETSU students is less than two? Consider these students as an SRS from the population of all undergraduate students at ETSU. The hypotheses of interest are
 (A) $H_0 : \mu = 2$ vs. $H_a : \mu < 2$
 (B) $H_0 : \mu = 2$ vs. $H_a : \mu > 2$
 (C) $H_0 : \bar{x} = 2$ vs. $H_a : \bar{x} < 2$
 (D) $H_0 : \mu < 2$ vs. $H_a : \mu = 2$
 (E) $H_0 : \mu = 2$ vs. $H_a : \mu \neq 2$
41. The Survey of Study Habits and Attitudes (SSHA) is a psychological test that measures the motivation, attitudes, and study habits of college students. Scores range from 0 to 200 and follow (approximately) a normal distribution with mean 115 and standard deviation $s = 25$. You suspect that incoming freshman have a mean μ , which is different from 115, since they often are excited yet anxious about entering college. To verify your suspicion, you test the hypotheses

$$H_0 : \mu = 115, H_a : \mu \neq 115$$

You give the SSHA to 25 randomly selected incoming freshmen and find their mean score. Based on this, you reject H_0 at significance level $\alpha = 0.05$. Which of the following would be most helpful in assessing the practical significance of your results?

- (A) Test your hypotheses again, this time using significance level $\alpha = 0.01$.
 (B) Report the P -value of your test.
 (C) Take another sample and retest just to make sure the results are not due to chance.
 (D) Test your hypotheses again, this time using a random sample of 250 incoming freshmen.
 (E) Construct a 95% confidence interval for μ to see the magnitude of the difference between 115 and your sample results.

42. Several factors are involved in the creation of a confidence interval. Among them are the sample size, the level of confidence, and the margin of error. Which statement is true?
- (A) For a given sample size, higher confidence means a smaller margin of error.
 - (B) For a specified confidence level, larger samples provide smaller margins of error.
 - (C) For a fixed margin of error, smaller samples provide greater confidence.
 - (D) For a specified confidence level, halving the margin of error means halving the sample size.
 - (E) All of the above.
43. National research indicates that a majority of Americans think the minimum wage should be \$12.50. The Spring 2016 MATH1530 survey asked students "How much do you believe minimum wage should be?"

One-Sample T: Min_Wage

Variable	N	Mean	StDev	SE Mean	95% CI
Min_Wage	694	9.42	2.242	0.085	(9.26, 9.59)

Which of the following is the best interpretation of the above confidence interval?

- (A) There is a 95% probability that students believe the mean minimum wage is within the calculated interval.
- (B) Students believe the minimum wage should be \$9.42 and it is within the 95% confidence interval.
- (C) 95% of all students who believe the minimum wage should be \$9.42 and it is within the calculated confidence interval.
- (D) With 95% confidence, the mean minimum wage proposed by all ETSU students should be within the calculated interval.
- (E) With 95% confidence, all the sample means will be within the calculated confidence interval.