

Math 1530 Final Exam Fall 2015

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 can use a calculator but a calculator manual cannot 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

1. Which of these questions from the Fall 2015 MATH1530 class survey produced variables that are categorical?
- i. What is your age?
 - ii. Should military personnel be armed in military buildings on United States soil (Yes or No)?
 - iii. How much did you spend on your last meal that you ate at an off campus restaurant (Round to the nearest whole dollar)?
 - iv. If you had to lose one of your five senses, which would you choose (Hearing, Seeing, Touch, Smell, Taste)?
 - v. What is your favorite number between 0 and 30??
- (A) ii (B) iv (C) ii, iv (D) i, iii, v (E) ii, iii, iv

2. The Fall 2015 MATH1530 class survey asked “Approximately, how many times do you eat at an off campus restaurant during the week?” The table below represents the responses of 811 students.

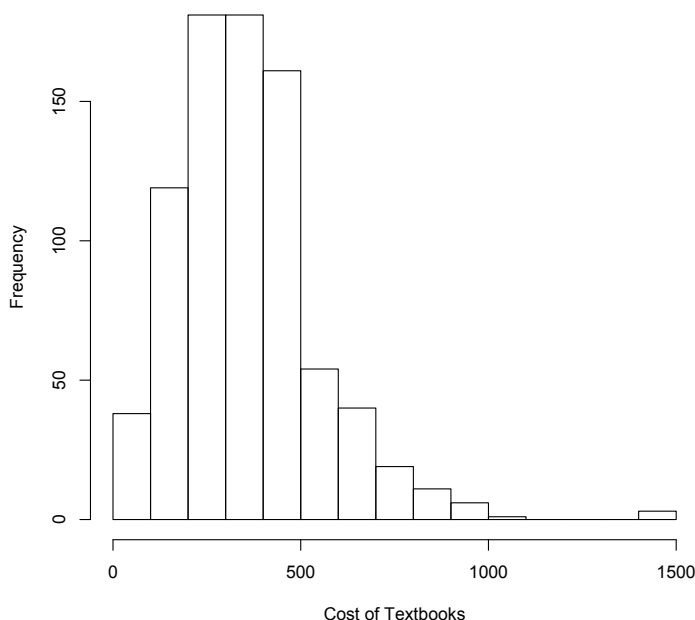
Eat at an off campus restaurant	0	1	2	3	4	5	6	7	8 or more
Number of Students	44	150	175	159	91	85	13	40	54

Estimate the median number of times that the 811 students ate at an off campus restaurant during the week.

- (A) 3 (B) 4 (C) 91 (D) 159 (E) 406
3. You look at real estate ads for houses in Naples, Florida. There are many houses ranging from \$200,000 to \$500,000 in price. The few houses on the water, however, have prices up to \$15 million. The distribution of house prices will be
- (A) roughly symmetric. (C) skewed to the right.
- (B) skewed to the left. (D) roughly normal.
- (E) correlated to land and water.
4. What are all the values that a standard deviation s can possibly take?
- (A) $0 \leq s \leq 1$ (B) $0 \leq s$ (C) $-1 \leq s \leq 1$ (D) $-\infty < s < \infty$ (E) $68 - 95 - 99.7$

Use the following for the next 2 questions. The Fall 2015 MATH class survey asked “Approximately how much did you spend on books for school this semester?” The figure below is a histogram of the cost of schoolbooks claimed by 814 students in this survey.

Histogram of textbook cost for 814 students



5. Which of the following best describes this distribution? This distribution is
- (A) left-skewed with an outlier.
 - (B) somewhat symmetric with center around \$750, and very little variation.
 - (C) multi-peaked with the bulk of data from \$0 to \$1000.
 - (D) right-skewed, with center around \$350, spread from \$0 to \$1500 with a possible outlier.
 - (E) evenly-spaced from \$0 to \$1500.
6. What percent (approximately) of the students spent at most \$100 on books this semester?
- (A) 165 (B) 100 (C) 40% (D) 20% (E) 5%

Use the following for the next 2 questions. The table below represents the responses of 814 students to the MATH1530 survey question “If you had to lose one of your five senses, which would you choose?”

Senses	Hearing	Seeing	Smell	Taste	Touch
Count	40	36	504	132	102

7. Which is the most appropriate graph to display the data?
- (A) Histogram (B) Scatterplot (C) Stemplot (D) Minitab (E) Bar Chart
8. What can we conclude about this distribution?
- (A) It is somewhat symmetric with smell as the center of the distribution.
 - (B) It is slightly left-skewed with smell as the center and a spread of hearing to touch.
 - (C) It is slightly right-skewed with smell being the median.
 - (D) Smell is the most popular sense to lose and sight/hearing are the least popular senses to lose.
 - (E) There is a 1 in 5 chance that smell will be selected as the most popular sense to lose.

9. Here are the weights (lbs.) of 109 members of the ETSU football team. Which of the following best describes the distribution of weights?

150	160	160	163	166	166	166	167	167	169	170	170	170	172	174	175	175	177	178	178	179	181	181
182	182	182	183	184	184	184	185	185	186	187	188	190	192	194	195	195	195	196	198	201	204	205
205	206	206	210	210	211	212	213	213	213	214	217	218	220	221	223	225	225	227	227	229	230	230
230	234	235	238	239	240	241	241	248	252	252	255	255	256	260	266	267	268	269	270	271	272	273
275	275	276	278	278	280	281	282	285	285	290	297	297	297	309	310	315						

- (A) The distribution is evenly spaced between 150 and 315 lbs. The middle value is about $(150 + 315)/2 = 232.5$ lbs.
- (B) The distribution is bell-shaped with mean 221 lbs. and standard deviation 43 lbs. The middle 68% of the weights are between 178 and 264 lbs.
- (C) The distribution is right-skewed with and three outliers: 309, 310, and 315.
- (D) The distribution is uniform.
- (E) The distribution is centered around 213 lbs. The IQR is about 71 lbs., with middle 50% of the weights between 184 and 255 lbs. The distribution appears slightly right-skewed and multimodal.

Use the following for the next 2 questions. The Fall 2015 MATH 1530 survey asked “How much did you spend on your last meal that you ate at an off campus restaurant?” The descriptive statistics below summarize the student responses by gender of the meal purchase.

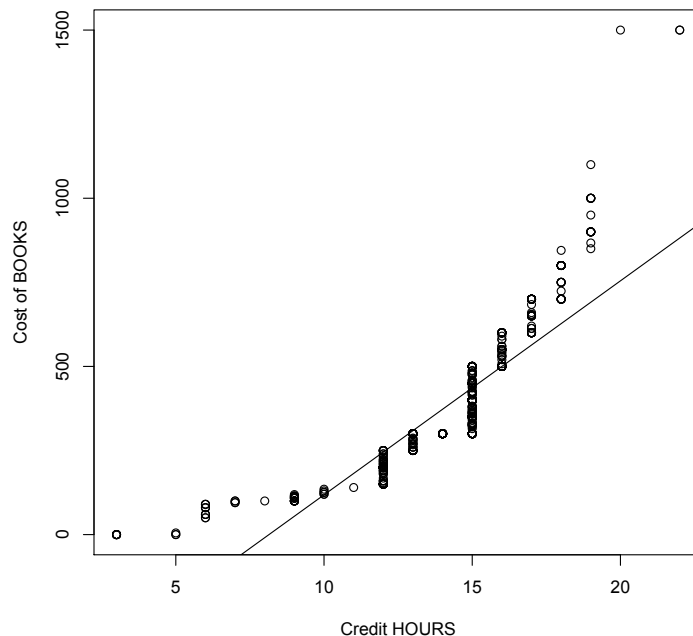
Descriptive Statistics: MEAL									
Variable	GENDER	N	Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Meal Cost	Female	473	11.25	13.01	0.00	6.00	9.00	12.00	200.00
	Male	341	11.55	10.72	0.00	6.00	9.00	12.00	130.00

10. Based on these statistics, what would you surmise about the shape of the distribution for the males?
 - (A) The distribution is skewed right with possible outlier(s).
 - (B) The distribution is skewed left with possible outlier(s).
 - (C) The distribution is bell-shaped.
 - (D) The distribution is fairly uniform.
 - (E) The distribution is both left and right skewed.
11. About what percent of the male students spent at most \$12 on their last off campus meal?
 - (A) 6
 - (B) 12
 - (C) 25%
 - (D) 50%
 - (E) 75%
12. Which of the following is least affected if an extreme high outlier is added to your data?
 - (A) The mean
 - (B) The median
 - (C) The standard deviation
 - (D) The z-score
 - (E) The correlation
13. Your body mass index (BMI) is your weight in kilograms divided by the square of your height in meters. Many online BMI calculators allow you to enter weight in pounds and height in inches. High BMI is a common but controversial indicator of overweight or obesity. A study by the National Center for Health Statistics found that the BMI of America young men (ages 20 to 29) is approximately Normal with mean 26.8 and standard deviation 5.2. What percent of men aged 20 to 29 are under 16.4 BMI? Use the 68 – 95 – 99.7 rule.
 - (A) 95%
 - (B) 50%
 - (C) 5%
 - (D) 2.5%
 - (E) -2
14. There is a positive correlation between the size of a hospital (measured by number of beds) and the median number of days that patients remain in the hospital. Does this mean that you can shorten a hospital stay by choosing to go to a small hospital?
 - (A) Yes, the data show that stays are shorter in smaller hospitals.
 - (B) Yes, the correlation can't be just by an accident.
 - (C) No, the positive correlation is probably explained by the fact that seriously ill people go to large hospitals.
 - (D) No, a negative correlation would allow that conclusion, but this correlation is positive.
 - (E) No, this is reverse cause-and-effect.
15. Researchers asked mothers how much soda (in ounces) their kids drank in a typical day. They also asked these mothers to rate how aggressive their kids were on a scale of 1 to 10, with larger values corresponding to a greater degree of aggression. The correlation between amount of soda consumed and aggression rating was found to be $r = 0.3$. If the researchers had measured amount of soda consumed in liters instead of ounces, what would be the correlation? (There are about 34 ounces in a liter.)
 - (A) 0.3
 - (B) $0.3/34 = 0.009$
 - (C) $(0.3)(34) = 10.2$
 - (D) 0.3 ounces per point on scale.
 - (E) Cannot be determined without converting ounces to liters.
16. Which of the following correlation values indicates the strongest linear relationship between two quantitative variables?
 - (A) $r = 0.30$
 - (B) $r = 0.00$
 - (C) $r = 0.65$
 - (D) $r = 0.11$
 - (E) $r = 0.60$

17. Make _____ to display the relationship between two quantitative variables measured on the same subjects.
- (A) a scatterplot (C) back-to-back stemplots
- (B) side-by-side boxplots (D) the five-number summary
- (E) a two sample t-test
18. The website www.twiigs.com allows you to vote on polls that interest you or to post one of your own. Once you have found a poll of interest, you just click "Vote," and your response becomes part of the sample. One of the questions in July 2010 was, "How many times have you been pulled over by the police?" Of the 780 people responding, 70% said "1–5 times." You can conclude that
- (A) about 70% of Americans have been pulled over by the police "1–5 times."
- (B) the poll uses voluntary response, so there results tell us little about the population of all adults.
- (C) more people still need to vote on the question, as a larger sample is required to reduce bias.
- (D) the result is statistically significant since the percent of people that responded yes is greater than 0.
- (E) nothing because this an observational study.
19. Archaeologists plan to examine a sample of two-meter-square plots near an ancient Greek city for artifacts visible in the ground. They choose separate samples of plots from floodplain, coast, foothills, and high hills? This is an example of
- (A) a simple random sample. (C) an observational sample.
- (B) a voluntary response sample. (D) a stratified random sample.
- (E) an experiment.
20. Which of the following questions does a test of significance answer?
- (A) Is the observed effect important? (C) Is the null hypothesis true?
- (B) Is the sample or experiment properly designed? (D) Is it based on a very small random sample?
- (E) Is the observed effect due to chance?

Use the following for the next 3 questions. On the Fall 2015 Math 1530 survey, students were asked to give an estimate of how much money they spent on books for school this semester and how many credit hours they are taking this semester. We are interested in seeing whether we can use a student's credit hours (HOURS) to predict how much they will spend on books (BOOKS) for school for the semester (in US dollars). The observations and the least-squares regression line appear in the scatterplot. The correlation between the two variables is $r = 0.863$ and the least-squares regression equation is

$$BOOKS = -518.08 + 63.63 \times HOURS.$$



21. Which of the following statements is true about the relationship between these two variables?
- (A) The association between credit hours and cost of books is negative, curved, and strong.
 - (B) The association between credit hours and cost of books is positive, curved, and weak.
 - (C) The association between credit hours and cost of books is positive, curved, and strong.
 - (D) The association between credit hours and cost of books is negative, curved, and weak.
 - (E) The association between credit hours and cost of books is nearly perfect.
22. Which is the most appropriate interpretation of the slope?
- (A) For each additional credit hour taken in a semester, the estimated cost of books will increase by \$63.63.
 - (B) For each additional credit hour taken in a semester, the estimated cost of books is \$518.08.
 - (C) For each additional dollar spent on books, the number of credit hours taken increases by 63.63 hours.
 - (D) For each additional credit hour taken in a semester, the estimated cost of books will decrease by \$63.63.
 - (E) The average cost of books for a semester is \$518.08.
23. Use the regression equation to predict the cost of school books for the semester for a student who takes 12 credit hours.
- (A) \$200 (B) \$63.63 (C) \$245.48 (D) $(0.863)^2 = \$74.3$ (E) \$518.08
24. A simple random sample of size n requires that
- (A) the population be unbiased.
 - (B) every set of n individuals in the population has an equal chance of being selected.
 - (C) the distribution or original data be approximately normal.
 - (D) the population size is large.
 - (E) sample size is large.

Use the following for the next 2 questions. A large representative random sample of 6906 U.S. adults collected over 20 years showed that “parents reported higher levels of life satisfaction than non parents,” with the observed difference in life satisfaction between the two groups being statistically significant.

25. This is an example of
- (A) a randomized comparative experiment. (C) a block design.
 - (B) a matched pairs experiments. (D) a simple random sample.
 - (E) an observational study.
26. In this study, we can conclude
- (A) parents tend to have higher satisfaction in their lives than non parents. Because this was a survey, we cannot make conclusions about cause-and-effect.
 - (B) having children leads to higher levels of life satisfaction. We can reach this conclusion because we have a representative sample.
 - (C) having children leads to higher levels of life satisfaction. We can reach this conclusion because we have both a large and a representative sample.
 - (D) having children leads to higher levels of life satisfaction. We can reach this conclusion because this was an experiment.
 - (E) that a practical significance exists also. We can reach this conclusion because the result was statistically significant.

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 1234.

27. What is the probability that the winning number matches your number exactly?
- (A) 1234/10000 (B) 1/9999 (C) 4/10000 (D) 1/10000 (E) 0
28. What is the probability that the winning number has the same digits as your number *in any order*?
- (A) 4/10000 (B) 1/9999 (C) 4/9999 (D) 24/10000 (E) 0
29. An athlete suspected of having used steroids is given two tests that operate independently of each other. Test A has probability 0.9 of being positive if steroids have been used. Test B has probability 0.8 of being positive if steroids have been used. If steroids have actually been used, the probability that Test A is positive and Test B is positive is
- (A) $0.9 + 0.8 = 1.7$ (C) $0.9 \times 0.8 = 0.72$
 - (B) $0.1 \times 0.2 = 0.02$ (D) $0.1 + 0.2 = 0.3$
 - (E) $0.9 \times 0.8 - 0.1 \times 0.2 = 0.7$
30. In a large population of college-educated adults, the mean IQ score is 112 with standard deviation of 25. Suppose 300 adults from this population are randomly selected for a market research campaign. The distribution of the sample mean IQ is
- (A) approximately Normal, mean 112, standard deviation 1.443.
 - (B) approximately Normal, mean 112, standard deviation 25.
 - (C) approximately Normal, mean 112, standard deviation 0.083.
 - (D) approximately Normal, mean equal to the observed value of the sample mean, standard deviation 25
 - (E) Cannot determine based on the information provided.
31. The Fall 2015 MATH1530 survey asked students “Should military personnel be armed in military buildings on United States soil?” In the sample of 814 students who responded to this question, 717 said “YES.” The sample proportion $\hat{p}$ that responded “YES” is _____.
- (A) 814 (B) 717 (C) 1.135 (D) 0.119 (E) 0.881

Use the following for the next 4 questions. The MATH1530 survey asked students “What is your ideal pet?” The response may differ for females and males. The distribution of counts is shown in the table.

Ideal Pet	Female	Male	Total
Bird	2	3	5
Cat	106	42	148
Dog	290	255	545
Fish	10	8	18
Hamster/Gerbil	4	3	7
Horse	26	0	26
Lizard/Snake	5	6	11
Other	30	24	54
Total	473	341	814

32. What percent of females chose a cat as their ideal pet?
 (A) 13% (B) 18% (C) 22% (D) 58% (E) 72%
33. What percent of the students chose a cat as their ideal pet?
 (A) 13% (B) 18% (C) 22% (D) 58% (E) 72%
34. Given a student chose a cat as their ideal pet, what percent are females?
 (A) 13% (B) 18% (C) 22% (D) 58% (E) 72%
35. We are interested in testing whether females’ ideal pet choice differs significantly from males ideal pet choice. Which of the following statistical methods can be used to address this?
 (A) Chi-square test (B) Two-sample t procedure (C) Paired-t test (D) Z-test (E) Regression analysis
36. The Fall 2015 MATH1530 survey asked students “How many credit hours are you taking this semester?” In order to graduate in a timely manner, it is suggested that students take 15 or more credit hours per semester. Are students, on the average, taking less than the recommended 15 credit hours this semester? In the sample of 814 students who responded to the question, the sample mean was $\bar{x} = 14.23$ and the sample standard deviation was $s = 2.653$. Consider these students as an SRS from the population of all undergraduate students at ETSU. The hypotheses of interest are
 (A) $H_0 : \mu = 15$ vs. $H_a : \mu > 15$
 (B) $H_0 : \bar{x} = 14.23$ vs. $H_a : \bar{x} > 14.23$
 (C) $t = \frac{14.23 - 15}{2.653/\sqrt{814}} = -8.28$ Reject H_0
 (D) $H_0 : \mu = 15$ vs. $H_a : \mu < 15$
 (E) $H_0 : \mu = 15$ vs. $H_a : \mu < 14.23$
37. A medical researcher is working on a new treatment for a certain type of cancer. The average survival time after diagnosis on the standard treatment is one year. In an early trial, she tries the new treatment on four subjects who have an average survival time after diagnosis of three years. Although the survival time has tripled, the results are not statistically significant even at the 0.10 significance level. The explanation is
 (A) the placebo effect is present, which limits statistical significance.
 (B) that although the survival time has doubled, in reality the actual increase is really two years.
 (C) the calculation was in error. The researchers forgot to include the sample size.
 (D) the sample size is small.
 (E) the results are not of practical importance.

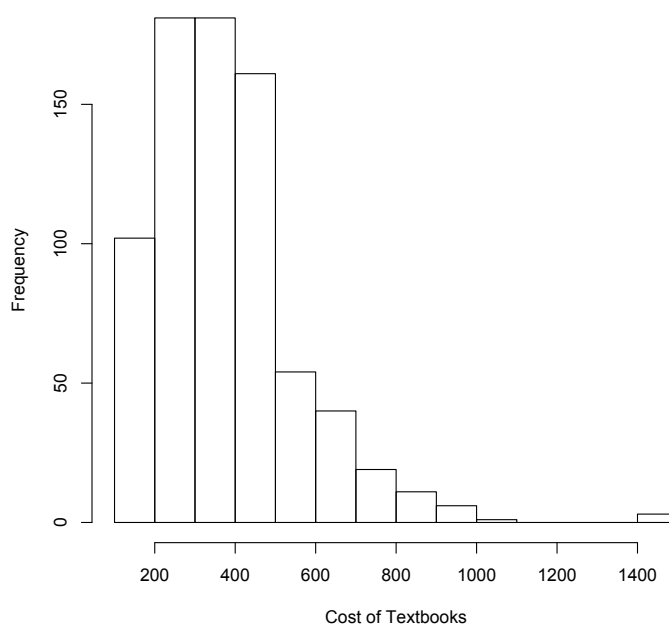
Use the following for the next 3 questions. National research indicates that full-time (12 credit hours or more) students spend, on the average, \$500 on textbooks per semester at 4-year public institutions. The Fall 2015 MATH1530 survey asked students “Approximately how much did you spend on books for school this semester?” Is there evidence that the mean textbook cost for ETSU students this semester differs from \$500? Use the output below to answer the next two questions.

One-Sample T: BOOKS

Test of $\mu = 500$ vs not equal 500

Variable	N	Mean	StDev	SE Mean	95% Lower Bound	95% Upper Bound	T	P
BOOKS	759	410.1	182.59	6.63	397.1	423.1	-13.6	0

Histogram of textbook cost for 759 full-time students



38. Which of the following is the best conclusion?

- (A) No. There is weak evidence ($P = 0$) that, on average, the cost of textbooks for full-time undergraduate students at ETSU is different from \$500.
- (B) There is strong evidence ($P = 0$) that, on average, the cost of textbooks for full-time undergraduate students at ETSU is different from \$500.
- (C) No. We fail to reject H_0 since the P is close to 0.
- (D) The probability that H_0 is true is 1 since the P -value is 0.
- (E) The data are not statistically significant since the P -value is small.

39. The most important condition for sound conclusions from statistical inference is usually that

- (A) the data can be thought of as a random sample from the population of interest.
- (B) the population distribution is exactly Normal.
- (C) the number of observations is large.
- (D) the t-test is used.
- (E) the p-value is small.

40. What is the difference between the computed confidence interval and the hypothesis test?
- (A) There is no difference between the two inference procedures since both methods say that $\mu \neq 500$.
 - (B) The confidence interval gives us a range of values (\$397.10 to \$423.10) for the mean book cost rather than just telling us whether or not the hypothesis test is significant.
 - (C) The confidence interval is 95% where as the P is 0%.
 - (D) The hypothesis test requires a different set of assumptions than the confidence interval.
 - (E) The hypothesis test describes the magnitude of an effect where as the confidence interval gives you a strict comparison with a pre-specified value.

Use the following for the next 2 questions. The Fall 2015 MATH1530 survey asked students “Do you think the government should require mandated childhood vaccinations?” In the sample of 814 students, 80.6% said “YES.” Assume the 814 respondents are an SRS of all ETSU students.

41. A 95% confidence interval for p is
- (A) 81% to 95% (B) 158 to 656 (C) 79% to 82% (D) 80.5% to 80.7% (E) 78% to 83%
42. Which of the following is the best interpretation of the above confidence interval?
- (A) There is a 95% probability that the true proportion of students who think the government should require mandated childhood vaccinations is within the calculated interval.
 - (B) 80.6% of the students who believe the government should require mandated childhood vaccinations is within the 95% confidence interval.
 - (C) 95% of all students who believe the government should required mandated childhood vaccinations are within the calculated confidence interval.
 - (D) With 95% confidence, the true proportion of students who believe the government should require mandated childhood vaccinations is within the calculated interval.
 - (E) With 95% confidence, all the sample proportions will be within the calculated confidence interval.
43. A medical experiment compared zinc supplements with a placebo for reducing the duration of colds. Let μ denote the mean decrease, in days, in the duration of a cold. A decrease of $\mu = 1$ is a practically important decrease. A statistical test is more likely to find a significant decrease in the mean duration of a cold if
- (A) it is based on a very small random sample.
 - (B) it is based on a very large random sample.
 - (C) The size of the sample doesn't have any effect on the significant of the test.
 - (D) it is of practical significance.
 - (E) the p-value is large.