

Math 1530 Final Exam Spring 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 A

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 Spring 2015 MATH1530 class survey produced variables that are quantitative?
- i. In a typical day, about how many times do you wash your hands?
 - ii. Should law enforcement officers be required to wear a camera on their uniform while on duty (Yes or No)?
 - iii. What is your current weight in pounds?
 - iv. Do you have good reason to think you have ever been in contact with a sexual predator over the internet (Yes or No)?
 - v. How safe would you feel if a nuclear energy plant were built near where you live (Extremely safe, Very safe, Moderately safe, Slightly safe, Not at all safe)?
- (A) ii. (B) iii. (C) i, iii. (D) ii, iii. (E) i, iv, v.

2. The Spring 2015 MATH1530 class survey asked “About how much time per week (on average) do you devote to physical fitness?” The table below represents the responses of 811 students.

Time spent on physical fitness	Between 0 and 2 hours	Between 2 and 5 hours	Between 5 and 9 hours	Between 9 and 15 hours	Over 15 hours
Number of Students	242	248	159	103	59

Estimate the median time spent on physical fitness per week for these 811 students.

- (A) 159 (B) 248 (C) 406 (D) Between 2 and 5 hours (E) Between 5 and 9 hours
3. A teacher summarizes grades on an exam by $\text{Min} = 26$, $Q_1 = 67$, $\text{Median} = 80$, $Q_3 = 87$, $\text{Max} = 100$, $\text{Mean} = 76$, $\text{Mode} = 100$, $\text{Standard deviation} = 76$, $\text{IQR} = 20$. The teacher incorrectly recorded one of these. Which one do you think it was? Why?
- (A) The mean, should be larger than the median. (C) The IQR, should be equal to the standard deviation.
- (B) The minimum, should be larger. (D) The mode, cannot be equal to the maximum.
- (E) The standard deviation, much too large.
4. Which of these variables is most likely to have a Normal distribution?
- (A) Lengths of 1000 newborns in Tennessee
- (B) Income per person for 150 different countries
- (C) The responses to the survey question “Should law enforcement officers be required to wear a camera on their uniform while on duty (Yes or No)?”
- (D) Heights of all humans
- (E) 10,000 numbers from 0 to 1 produced from a random number generator.

5. The following data (sorted) are the percents of residents aged 65 and older in the 50 states, according to the 2000 censuses.

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		

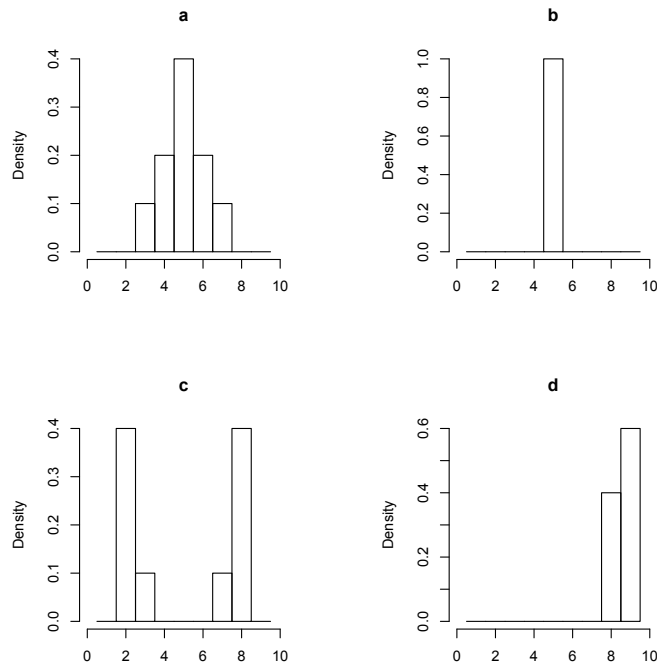
Which of the following best describes the distribution?

- (A) strongly skewed left (C) double peaked
(B) ignoring the outliers, it is close to symmetric (D) strongly skewed right
(E) 5-number summary with an outlier

Use the following for the next 2 questions. The table below represents the responses of 811 students to the MATH1530 survey question “How many days in a typical week do you talk about politics with family or friends?”

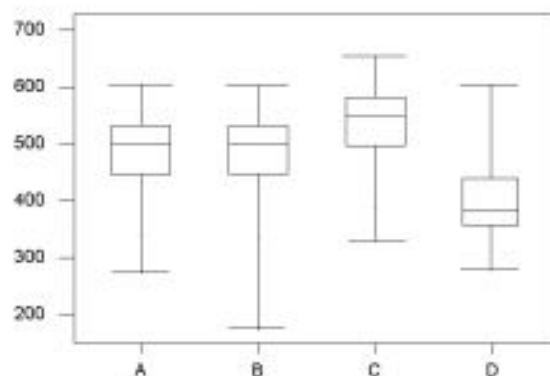
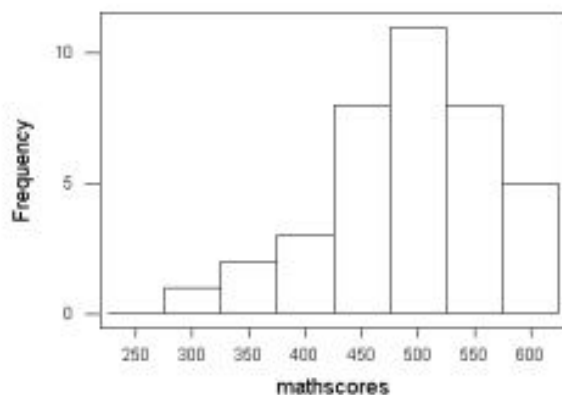
No. of Days	0	1	2	3	4	5	6	7
Count	306	202	130	64	32	31	13	33

6. Which is the most appropriate graph to display the data?
(A) Bar Chart (B) Scatterplot (C) Pie Chart (D) Minitab (E) Histogram
7. Based on a sketch of a graph for this data, this distribution can be characterized as
(A) skewed left. (B) skewed right. (C) symmetric. (D) linear. (E) bell-shaped.
8. The figure shows histograms for four different samples, each with sample size $n = 100$. Which sample has the (i) smallest and (ii) largest standard deviation?



- (A) **c** has the smallest standard deviation and **d** has the largest standard deviation
(B) **a** has the smallest standard deviation and **d** has the largest standard deviation
(C) **c** has the smallest standard deviation and **b** has the largest standard deviation
(D) **b** has the smallest standard deviation and **d** has the largest standard deviation
(E) **b** has the smallest standard deviation and **c** has the largest standard deviation

9. The histogram below displays the 1999 average mathematics achievement scores for eighth graders in 38 nations. Which of the following boxplots corresponds to the histogram?



- (A) Boxplot A (B) Boxplot B (C) Boxplot C (D) Boxplot D (E) None of the boxplots.

Use the following for the next 3 questions. The Spring 2015 MATH1530 survey asked “How much money did you spend on your last clothing purchase?” The descriptive statistics below summarize the student responses by gender of the clothing purchase.

Descriptive Statistics: PURCHASE										
Variable	GENDER	N	Mean	SE Mean	StDev	Minimum	Q1	Median	Q3	Maximum
Clothing Purchase	Female	464	65.50	5.59	120.49	0.00	20.00	34.50	75.00	2000.00
	Male	347	67.72	4.97	92.51	0.00	20.00	40.00	75.00	850.00

10. Based on these statistics, what would you surmise about the shape of the distribution for the females?
- (A) The distribution is skewed left with possible outlier(s). (C) The distribution is skewed right with possible outlier(s).
 (B) 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 \$40 on their last clothing purchase?
- (A) 50% (C) 40
 (B) 75% (D) $40/347 = 0.115$ or 11.5%
 (E) (Area under Normal Curve = 38% based on $z = (40 - 67.72)/92.51 = -.30$)
12. Approximately how many students spent between \$20 and \$75 on their last clothing purchase?
- (A) 50 (B) 232 (C) 55 (D) 406 (E) 110
13. A new roller coaster at an amusement park requires individuals to be at least 50 inches tall to ride. It is estimated that the heights of 10-year-old boys are normally distributed with $\mu = 54.5$ inches and $\sigma = 4.5$ inches. What proportion of boys is tall enough to ride this coaster? Use the 68 – 95 – 99.7 rule.
- (A) 16% (B) 34% (C) 50% (D) 68% (E) 84%

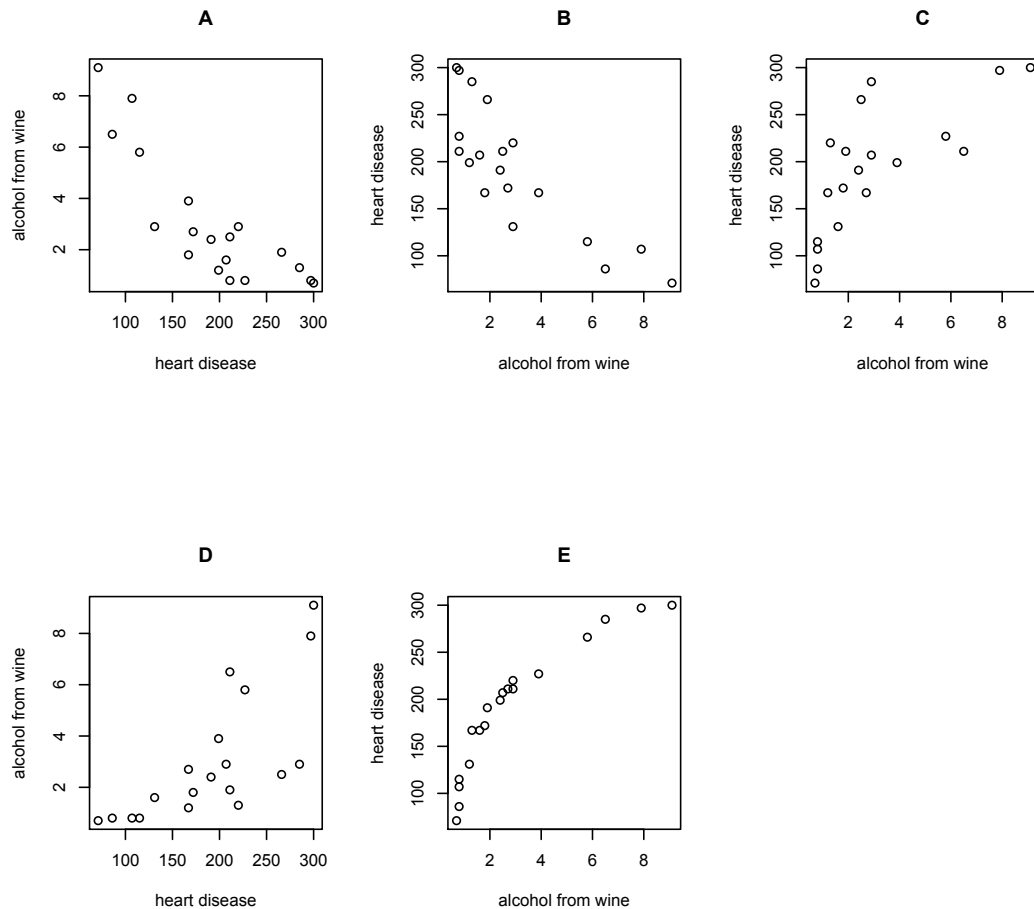
14. Which of the following is NOT a proper use of correlation?
- (A) The correlation between years of experience and salary is 0.67.
 - (B) The correlation between weight and waist circumference is 0.35.
 - (C) The correlation between job status and salary is 0.89 dollars.
 - (D) The correlation between years of education and salary is 0.67.
 - (E) The correlation between salary and years of education is 0.67.
15. Creating a scatterplot requires two _____ variables.
- (A) categorically quantitative
 - (B) quantitative
 - (C) categorical
 - (D) associated
 - (E) linearly related
16. To examine whether two variables are related, we _____.
- (A) measure the variables on different sets of variables.
 - (B) take independent random samples from two groups of individuals.
 - (C) construct side-by-side box plots.
 - (D) measure the two variables on the same set of individuals.
 - (E) conduct a two sample t-test
17. For the Spring 2015 MATH1530 survey data, the correlation between height (inches) and weight (pounds) is 0.48. This is based on 811 student responses. If we converted inches to centimeters and pounds to kilograms, what would be the correlation? (Note: 1 inch = 2.54 centimeters and 1 pound = 0.453592 kilograms)
- (A) 0.48
 - (B) $0.48 / (2.54 \times .453592) = 0.42$
 - (C) $0.48 \times 2.54 \times .453592 = 0.55$
 - (D) 0.48 centimeters per kilograms
 - (E) Cannot be determined without converting all English unit measurements (in & lb) to Metric units (cm & kg).
18. A recent study found that the following behaviors—smoking, drinking too much alcohol, not exercising, and not eating enough fruits and veggies—can reduce your lifespan (on average). Whether moderation of these behaviors will extend life is not clear. Suppose that the added life expectancy from moderation of these behaviors is just 3 months. A statistical test is more likely to find a significant increase in mean life if
- (A) The size of the sample doesn't have any effect on the significant of the test.
 - (B) it is based on a very small random sample.
 - (C) it is based on a very large random sample.
 - (D) it is of practical significance.
 - (E) the p-value is large.

Use the following for the next 4 questions. Drinking moderate amounts of wine may help prevent heart attacks. The table below gives data on yearly wine consumption (liters of alcohol from drinking wine, per person) and yearly deaths from heart disease (deaths per 100,000 people) in 19 developed countries.

Country	AUS	AUT	BEL	CAN	DEU	DNK	FIN	FRA	ISL	IRL	ITA	NLD	NZL	NOR	ESP	SWE	CHE	GBR	USA
Alcohol from wine	2.5	3.9	2.9	2.4	2.7	2.9	0.8	9.1	0.8	0.7	7.9	1.8	1.9	0.8	6.5	1.6	5.8	1.3	1.2
Heart disease death rate	211	167	131	191	172	220	297	71	211	300	107	167	266	227	86	207	115	285	199

19. Using the above data, we can investigate whether drinking moderate amounts of wine may help prevent heart attacks. What is the response variable?
- (A) Alcohol from wine
 - (B) 19 developed countries
 - (C) Adults that drink wine
 - (D) The investigators
 - (E) Heart disease death rate

20. Which option is a plausible scatterplot of the data?



21. Which of the following statements is true regarding the data?

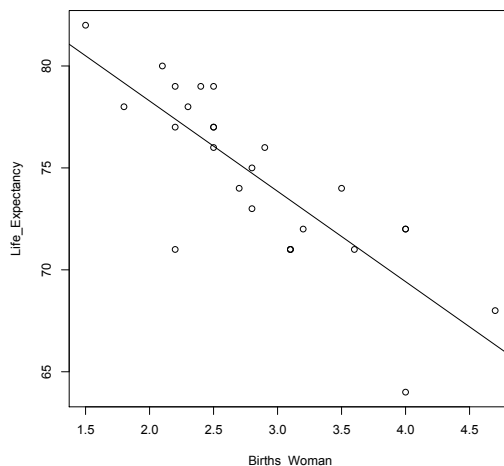
- (A) The association between heart disease death rate and alcohol from wine consumption is positive, slightly curved, and strong.
- (B) The association between heart disease death rate and alcohol from wine consumption is positive, slightly curved, and weak.
- (C) The association between heart disease death rate and alcohol from wine consumption is negative, linear, and strong.
- (D) The association between heart disease death rate and alcohol from wine consumption has groups: small, medium, and large.
- (E) The association between heart death rate and alcohol from wine consumption is nearly perfect.

22. Which option is a plausible value for the correlation coefficient between heart disease death rate and alcohol from wine consumption? (approximately)

- (A) -0.843 (B) 0.731 (C) 0 (D) 0.905 (E) -1.00

Use the following for the next 3 questions. Data from the World Bank for 25 Western Hemisphere countries were collected to examine the association between female life expectancy and the average number of children women give birth to. The observations and the least-squares regression line appear in the scatterplot. The correlation between the two variables is $r = -0.815$ and the least-squares regression equation is

$$\text{Life Expectancy} = 87.2 - 4.4 \times \text{Births per Woman}.$$



23. Which is the most appropriate interpretation of the slope?
- (A) For each additional child a female has the estimated life expectancy is 87.2 years on the average.
 - (B) For each additional year a female lives the average number of children women give birth to decreases by 4.4.
 - (C) The average number of births is decreasing by 4.4 years.
 - (D) For each additional child a female has the life expectancy will decrease by 4.4 years on the average.
 - (E) For each additional child a female has the life expectancy will increase by 4.4 years on the average.
24. According to the least-squares regression equation, what is the predicted female life expectancy for a woman that has 3 children?
- (A) 60 yrs. (B) $(-0.815)^2 = 66.4$ yrs. (C) 71 yrs. (D) 74 yrs. (E) 82.8 yrs.
25. If government leaders wanted to increase life expectancy, in their country, should they encourage women to have fewer children?
- (A) No, all the points are not exactly on the line.
 - (B) No, while there is an association, there is no reason to expect causality. There may be lurking variables.
 - (C) Yes, females will have shorter life expectancies by having more children.
 - (D) Yes, for each additional child a female will live 4.4 years less.
 - (E) No, the graph indicates more births means longer lives.
26. A sample of households in a community is selected at random from the telephone directory. In this community, 4% of households have no telephone, 10% have only cell phones, and another 25% have unlisted telephone numbers. The sample will certainly suffer from
- (A) question wording bias. (C) undercoverage bias.
 - (B) interviewer bias. (D) nonresponse bias.
 - (E) response bias.

27. A radio show conducts a phone-in survey each morning. Listeners are asked to call in with a response to the question of the day. One morning in 2011, listeners were asked if they supported or opposed term limits for members of Congress. Remarkably, 88% of listeners that called in favored term limits. We may safely conclude that
- (A) it is unlikely that if all Americans were asked their opinion, the results would differ from that obtained in the poll.
 - (B) there is strong evidence that the majority of Americans believe that there should be congressional term limits.
 - (C) there is overwhelming approval for congressional term limits among Americans generally.
 - (D) there is overwhelming approval for congressional term limits among all people living in the listening area of the radio station.
 - (E) nothing, except that a great majority of those with strong enough feelings on the issue to call in are in favor of congressional term limits. We cannot generalize any of this survey's results to any larger population.
28. Asking students about the quality of food available in the cafeteria as they leave is an example of a _____.
- (A) simple random sample (C) stratified random sample
 - (B) convenience sample (D) cluster sample
 - (E) matched pairs design
29. A simple random sample of size n requires that
- (A) the population be unbiased.
 - (B) the distribution or original data be approximately normal.
 - (C) the population size is large.
 - (D) sample size is large.
 - (E) every set of n individuals in the population has an equal chance of being selected.
30. At a local health club, a researcher samples 75 people whose primary exercise is cardiovascular and 75 people whose primary exercise is strength training. The researcher's objective is to assess the effect of type of exercise on cholesterol. Each subject reported to a clinic to have his or her cholesterol measured. The subjects were unaware of the purpose of the study, and the technician measuring the cholesterol was not aware of the subjects' type of exercise. This is
- (A) an observational study. (C) a double-blind experiment.
 - (B) an experiment, but not a double-blind experiment. (D) a matched pairs experiment.
 - (E) a simple random sample.
31. The Spring 2015 MATH 1530 class survey asked "How many articles of clothing are you wearing right now?" A distribution of proportions for the number of articles of clothing is displayed below. If we randomly select a student who responded to this survey, what is probability that random student will be wearing at most 1 article of clothing?

Number of clothing articles	0	1	2	3	4	5	6	7	8	9	10	11
Proportions	0.022	0.016	0.059	0.118	0.171	0.232	0.210	0.107	0.037	0.017	0.009	0.001

- (A) 0.978 (B) 0.022 (C) 0.016 (D) 0.038 (E) 0.962
32. You read online that the chance of winning the Powerball lottery is one in 175 million. This means
- (A) if 175 million lottery tickets are sold, exactly one of them will be the winning ticket.
 - (B) if 175 million lottery tickets are sold, at least one of them will be the winning ticket.
 - (C) if billions of Powerball lottery tickets are purchased, the fraction of them that are winning tickets will be very close to one in 175 million.
 - (D) if someone wins the lottery, at least 175 million tickets must have been sold.
 - (E) none of the above.

33. During World War II, the British found that the probability that a bomber was lost through enemy action on a mission over occupied Europe was 0.05. The probability that the bomber returned safely from a mission was therefore 0.95. It is reasonable to assume that missions were independent. The probability that a bomber survives mission 1 and mission 2 is
- (A) $0.95 + 0.95 = 1.9$ (C) $(0.05)(0.05) = 0.0025$
(B) $(0.95)(0.95) = 0.9025$ (D) $0.05 + 0.05 = 0.10$
(E) $(0.95)(0.95) - (0.05)(0.05) = 0.90$

Use the following for the next 3 questions. The MATH1530 survey asked students “How safe would you feel if a nuclear energy plant were built near where you live?” The response may differ for females and males. The distribution of counts is shown in the table.

Nuclear safe	Female	Male	Total
Extremely safe	10	27	37
Very safe	26	43	69
Moderately safe	132	107	239
Slightly safe	114	75	189
Not at all safe	182	95	277
Total	464	347	811

34. What percent of the students feel extremely safe if a nuclear energy plant were built near them?
(A) 3.33% (B) 4.56% (C) 7.78% (D) 42.79% (E) 72.97%
35. What percent of students feel extremely safe if a nuclear energy plant were built near them given they are males?
(A) 3.33% (B) 4.56% (C) 7.78% (D) 42.79% (E) 72.97%
36. What percent of the students are male given they feel extremely safe if a nuclear energy plan were built near them?
(A) 3.33% (B) 4.56% (C) 7.78% (D) 42.79% (E) 72.97%
37. The length of human pregnancies from conception to birth varies according to a distribution that is approximately Normal with mean 266 days and standard deviation 16 days. The distribution of the sample mean pregnancy length for 100 randomly chosen women is
- (A) approximately Normal, mean 266 days, standard deviation 16 days
(B) approximately Normal, mean 266 days, standard deviation 0.16 days
(C) approximately Normal, mean 26.6 days, standard deviation 16 days
(D) approximately Normal, mean 266 days, standard deviation 1.6 days
(E) approximately Normal, mean equal to the observed value of the sample mean, standard deviation 16 days

38. The Spring 2015 MATH1530 survey asked students “What is the lowest gas price you recall seeing at the gas station?” The price of regular gas is lower than the other grades, so if students are reporting the lowest price, we will assume it is probably for regular. AAA reports in their Daily Fuel Gauge Report that the average price of regular grade gasoline, in the state of Tennessee, was \$1.922 per gallon during the first week of February (when many of our MATH1530 students took the survey). Do students, on the average, recall seeing the lowest gas price less than the reported \$1.922 from AAA? In the sample of 789 students who responded to the question, the sample mean was $\bar{x} = \$1.771$. Regard these students as an SRS from the population of all students at ETSU. The hypotheses of interest are

- (A) $H_0 : \mu = 1.922$ vs. $H_a : \mu < 1.922$
- (B) $H_0 : \mu = 1.922$ vs. $H_a : \mu > 1.922$
- (C) $H_0 : \mu = 1.771$ vs. $H_a : \mu < 1.771$
- (D) $H_0 : \bar{x} = 1.771$ vs. $H_a : \bar{x} < 1.771$
- (E) $H_0 : \mu = 1.922$ vs. $H_a : \mu < 1.771$

39. The Spring 2015 MATH1530 survey asked students “Should law enforcement officers be required to wear a camera on their uniform while on duty?” In the sample of 811 students who responded to this question, 640 said “YES.” The sample proportion $\hat{p}$ that responded “YES” is _____.

- (A) 0.211 (B) 640 (C) 811 (D) 0.789 (E) 1.267

Use the following for the next 2 questions. The Spring 2015 MATH1530 survey asked students “Do you have good reason to think you have ever been in contact with a sexual predator over the internet?” In the sample of 811 students, 20% said “YES.” Assume the 811 respondents are an SRS of all ETSU students.

40. A 95% confidence interval for p is

- (A) 17.2% to 22.8% (B) 20% to 95% (C) 164 to 647 (D) 19.96% to 20.04% (E) 0 to 811

41. Which of the following is the best interpretation of the above calculated confidence interval?

- (A) There is a 95% probability that the true proportion of students who believe they had been in contact with a sexual predator over the internet is within the calculated interval.
- (B) With 95% confidence, the true proportion of students who believe they had been in contact with a sexual predator over the internet is within the calculated interval.
- (C) The proportion of students who believe they had been in contact with a sexual predator over the internet is within the 95% confidence interval.
- (D) 95% of all students who believe they had been in contact with a sexual predator over the internet had the proportion within calculated confidence interval.
- (E) With 95% confidence, all the sample proportions will be within the calculated confidence interval.

42. You use software to carry out a test of significance. The program tells you that the P -value is $P = 0.031$. You conclude

- (A) that the probability that H_0 is true is 0.031.
- (B) that the probability that H_a is true is 0.031.
- (C) that the probability, computed assuming that H_0 is true, that the test statistic would take a value as extreme or less extreme than that actually observed is 0.031.
- (D) that the probability, computed assuming that H_0 is false, that the test statistic would take a value was extreme or more extreme than that actually observed is 0.031.
- (E) that the probability, computed assuming that H_0 is true, that the test statistic would take a value as extreme or more extreme than that actually observed is 0.031.

43. What is the average age of an undergraduate at ETSU? The 2014 ETSU Fact Book reports the average age of an undergraduate at ETSU is 23.1. In the Math 1530 survey, students were asked “What is your age?” Assume the students who responded to the survey represent an SRS of all undergraduates at ETSU. A one-sample t-test was performed to see if the average age of an undergraduate at ETSU is less than the reported 23.1 years old and the analysis is found below.

One-Sample T: AGE(yrs)

Test of $\mu = 23.1$ vs < 23.1

Variable	N	Mean	StDev	SE Mean	95% Upper Bound	T	P
AGE(yrs)	800	21.293	5.720	0.202	198.7	-8.94	0.000

Is there significant evidence at the 5% level that the average age for an undergraduate at ETSU is less than the reported 23.1 years old?

- (A) No. There is weak evidence ($P = 0$) that, on average, the age for an undergraduate at ETSU is less than 23.1 years old.
- (B) No. We fail to reject H_0 since the P is close to 0.
- (C) There is strong evidence ($P = 0$) that, on average, the age for an undergraduate at ETSU is less than 23.1 years old.
- (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.