Math 1530 Final Exam Spring 2018

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 B

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 2018 MATH1530 class survey produced variables that are quantitative?

   i. How many days until your next birthday?
   ii. How worried are you that you or someone in your family will become a victim of a mass shooting?
   iii. How do you feel about the following statement? "I am confident that the major field of study I choose will lead me to a good job."
   iv. What is your religious preference?
   v. How many times a week do you wash your hair?

   (A) i. ii. iii. iv. v. (B) ii. iii. iv. (C) i. v. (D) i. (E) None

2. A student survey asked "How tall are you (in inches)?" Here is the data:

   67 72 73 60 65 86 72 69 74

   What is the mean height?

   (A) 73.5 (B) 72 (C) 70.9 (D) 66 (E) 65

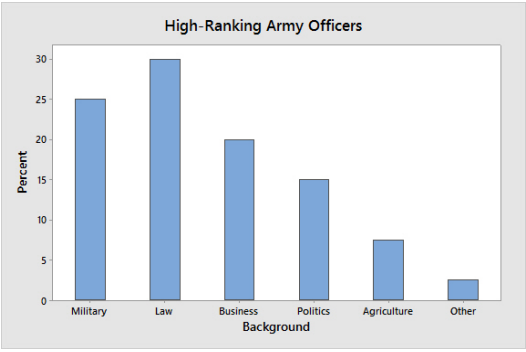
3. The _____ and _____ are good descriptions for symmetric distributions without outliers. Fill-in the blanks.

   (A) median, IQR
   (B) mean, IQR
   (C) median, standard deviation
   (D) mean, standard deviation
   (E) boxplot, five-number summary

4. The Spring 2018 MATH1530 survey asked "How worried are you that you or someone in your family will become a victim of a mass shooting?" The responses from 672 students were: Very worried, 105; Somewhat worried 202; Not too worried 241; Not worried at all 124. To display this data you should construct a

   (A) histogram. (B) stemplot. (C) time plot. (D) 5-number summary. (E) bar graph.

5. A survey was conducted on high-ranking officers serving in the army. One of the variables measured was his/her background before joining the army. The following graph displays the information on this variable:



Which of the following best describes this distribution?

(A) The most common background for high-ranking army officers before joining the army is Law.

(B) The distribution of background for high-ranking army officers is skewed to the right.

(C) The distribution of background for high-ranking army officers is skewed to the right with center between Business and Politics.

(D) The distribution of background for high-ranking army officers is skewed to the left.

(E) The distribution of background for high-ranking army officers is skewed to the left with center between Business and Politics.

Use the following for the next 3 questions. And the Oscar goes to... Here is the data (sorted) of the ages of 91 females that have won the Oscar as the actress in a leading role.

21	22	22	24	24	24	24	25	26	26	26	26	26	26	26	26	26	27	27	27	27	28	28
28	28	29	29	29	29	29	30	30	30	30	30	30	31	31	31	32	32	33	33	33	33	33
33	33	34	34	34	34	34	35	35	35	35	35	37	37	37	37	38	38	38	39	39	39	41
41	41	41	42	42	44	45	45	45	47	49	49	54	60	60	61	61	61	62	62	74	81	

6. The shape of the distribution is

(A) skewed left with possible outliers.

(B) skewed right with possible outliers.

(C) normally distributed with outliers.

(D) evenly spaced from 21 to 81.

(E) evenly spaced from 54 to 81.

7. The center of the distribution is close to

(A) 55 (B) 40 (C) 36 (D) 33 (E) 26

8. The five-number summary of the data is

(A) 21, 28, 33, 41, 81

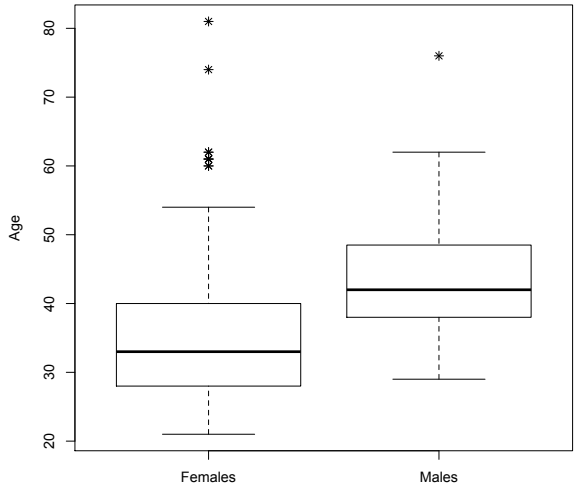
(B) 21, 26, 36, 81, 91

(C) 21, 26, 30, 54, 81

(D) 11.8, 21, 33, 36, 91

(E) 11.8, 13, 21, 33, 91

9. Here are the boxplots of the ages of all Oscar winners for the Best Actress and Best Actor.



Which of the following best describes the plot?

(A) There is less diversity in age among the Best Actresses than among the Best Actors.

(B) The oldest person winning a Best Actor/Actress award was a man.

(C) The youngest man winning a Best Actor award is younger than the youngest woman winning a Best Actress award.

(D) The margin of error in age among the Best Actresses is larger than the margin of error in age among the Best Actors.

(E) The Best Actresses are generally younger than the Best Actors.

10. The Spring 2018 MATH1530 survey asked "Do you think abortions should be legal under any circumstances, legal only under certain circumstances, or illegal in all circumstances?" The responses from 671 students were: Legal under any circumstances, 180; Legal only under certain circumstances, 359; Illegal in all circumstances, 132. Which of the following is valid in describing this data?

(A) Min = Illegal in all circumstances, Median = Legal under any circumstances, Max = Legal only under certain circumstances

(B) Illegal in all circumstances, 19%; Legal under any circumstances, 27%; Legal only under certain circumstances, 54%

(C) $\bar{x} = 224$

(D) median = 336

(E) Cannot determine based on the information provided.

11. Suppose that you are about to purchase a car and have narrowed your choices to two models–Model A and Model B. All things are about equal, such as price, options, even the average annual maintenance costs. You find an owner survey in an auto magazine that indicates that the standard deviation of maintenance costs is smaller for Model B. Based on this information, which of the following statements is most appropriate?

(A) They are equally acceptable, because standard deviations are not useful for comparisons of data sets.

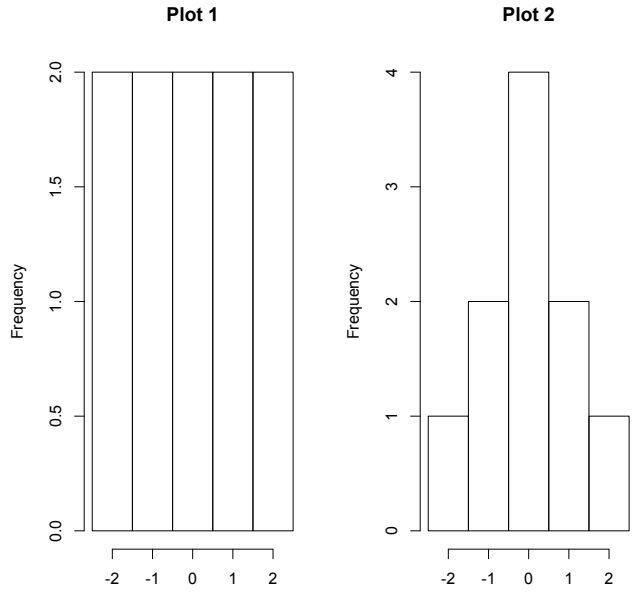
(B) Neither since both standard deviations are not equal to 0.

(C) Model B with the smaller standard deviation is preferable, because the smaller value implies that the mean is a more reliable representation of maintenance costs.

(D) Model A with the larger standard deviation is preferable, because the larger value implies a smaller amount of variation in the data.

(E) Cannot determine based on the information provided.

12. Consider the following two histograms based on two sets of data with 10 observations:



Which of the following is true?

(A) The means are equal and the standard deviation of Plot 1 is larger than the standard deviation of Plot 2.

(B) The means are equal and the standard deviations are equal.

(C) The means are equal and the standard deviation of Plot 1 is smaller than the standard deviation of Plot 2.

(D) The mean and standard deviation of Plot 2 are larger than the mean and standard deviation of Plot 1.

(E) Cannot determine based on the information provided.

13. To completely specify the shape of the Normal distribution, you must give

(A) the five-number summary. (C) the mean.

(B) the median and the quartiles. (D) the mean and the standard deviation.

(E) the histogram.

Use the following for the next 2 questions. In its Fuel Economy Guide for 2014 model vehicles, the Environmental Protection Agency gives data on 1160 vehicles. There are a number of high outliers, mainly hybrid gas-electric vehicles. If we ignore the vehicles identified as outliers, however, the combined city and highway gas mileage of the 1134 vehicles is approximately Normal with mean 22.2 miles per gallon (mpg) and standard deviation 5.2 mpg.

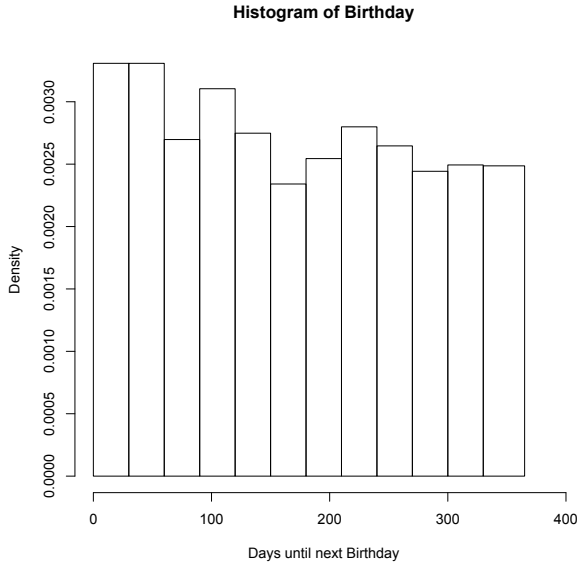
14. What percent of all vehicle's gas mileage falls between 17 and 27.4 mpg?

(A) 100% (B) 99.7% (C) 95% (D) 68% (E) 50%

15. How high must a 2014 vehicle's gas mileage be to fall in the top 2.5% of all vehicles?

(A) 32.6 (B) 27.4 (C) 25.7 (D) 18.7 (E) 11.8

16. The Spring 2018 MATH1530 survey asked "How many days left until your next birthday?" The figure below represents the responses of 655 students.



Which of the following best describes this distribution? This distribution is

(A) left-skewed with outliers.
(B) right-skewed with outliers.
(C) bimodal.
(D) normal.
(E) fairly uniform.

17. Assuming that we have a linear relationship between two quantitative variables, a large negative correlation shows that

(A) as one variable increases, the other variable tends to increase.
(B) as one variable increases, the other variable tends to decrease.
(C) as one variable decreases, the other variable tends to decrease.
(D) as one variable increases, the other variable tends to stay the same.
(E) there is a weak relationship between the two variables.

18. A study of consumer behavior finds a positive correlation between sales of ice cream (x) and sales of beer (y). What is a plausible explanation for the observed correlation?

(A) Both x and y are changing with the lurking variable outdoor temperature.
(B) Ice cream creates a thirst for beer.
(C) The possible correlation can only be the result of an arithmetic mistake.
(D) People generally have ice cream for dessert if they have drunk beer with a meal.
(E) As ice cream sales go up beer sales go down and vice versa.

Use the following for the next 5 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

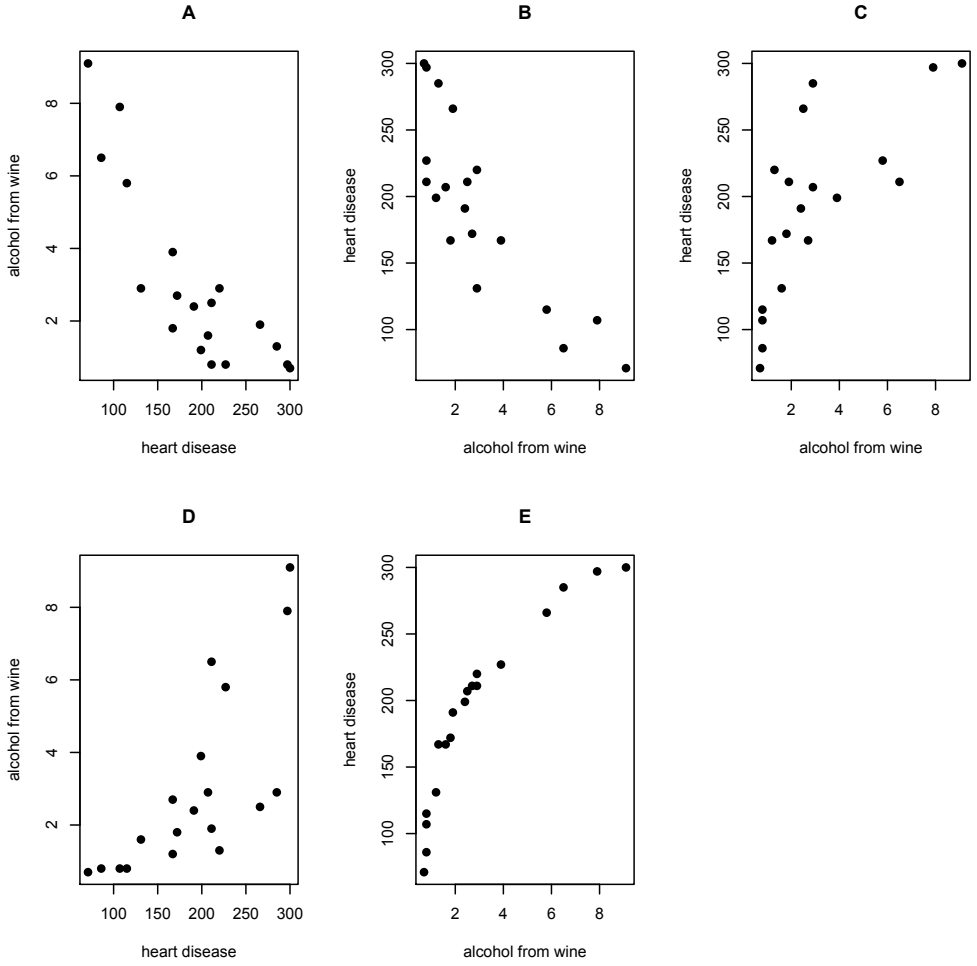
19. Using the above data, we can investigate whether drinking moderate amounts of wine may help prevent heart attacks. What is the response variable?

(A) Alcohol from wine (C) 19 developed countries

(B) Heart disease death rate (D) Adults that drink wine

(E) The investigators

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 has groups: small, medium, and large.

(D) The association between heart death rate and alcohol from wine consumption is nearly perfect.

(E) The association between heart disease death rate and alcohol from wine consumption is negative, linear, and strong.

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

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

23. The equation of the least squares regression line for the data is (approximately)

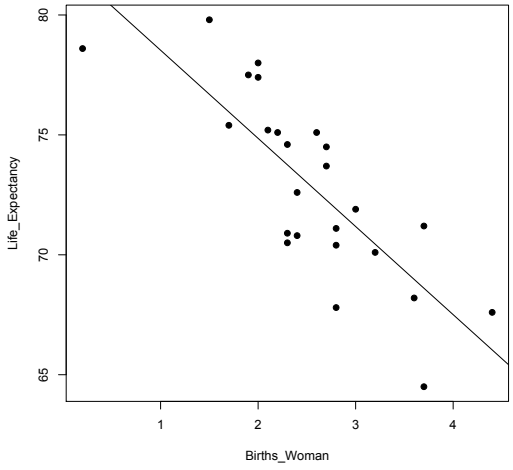
(A) $\hat{y} = 22.97 - 260.56x$ (C) $\hat{y} = 260.56 - 22.97x$

(B) $\hat{y} = 8.93 - 0.03x$ (D) $\hat{y} = -0.03 + 8.93x$

(E) $\hat{y} = 260.56 + 22.97x$

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 $r = -0.80$ and the least-squares regression equation is

$$Life\ Expectancy = 82.2 - 3.7 \times Births\ per\ Woman.$$



24. Which is the most appropriate interpretation of the slope?

(A) For each additional child a female has, the estimated life expectancy is 82.2 years, on average.

(B) For each additional child a female has, the life expectancy will decrease by 3.7 years, on average.

(C) For each additional year a female lives, the average number of children women give birth to decreases by 3.7.

(D) The average number of births is decreasing by 3.7 years.

(E) For each additional child a female has, the life expectancy will increase by 3.7 years, on average.

25. According to the least-squares regression equation, what is the predicted female life expectancy for a woman that has 3 children?

(A) $(-.80)^2 = 64$ yrs. (B) 71 yrs. (C) 78.5 yrs. (D) 82.2 yrs. (E) 85 yrs.

26. If government leaders wanted to increase life expectancy in their country, should they encourage women to have fewer children?

(A) Yes, females will have shorter life expectancies by having more children.

(B) Yes, for each additional child a female will live 3.7 years less.

(C) No, the graph indicates more births means longer lives.

(D) No, all the points are not exactly on the line.

(E) No, while there is an association, there is no reason to expect causality. There may be lurking variables.

27. In an effort to survey the attitudes of former university undergraduate students, the registrar randomly selects 100 names from each of the four past graduating classes. What kind of sample is this?

    (A) simple random sample (C) stratified random sample

    (B) voluntary response sample (D) double-blind random sample

    (E) cluster random sample

28. Does peer victimization during adolescence have an impact on depression in early adulthood? A recent study in the United Kingdom examined data on 3898 participants for which they had information on both victimization by peers at age 13 and the presence of depression at age 18. The study found more than a twofold increase in the odds of depression between children who were not victimized and those who were frequently victimized. This is an example of

    (A) a randomized comparative experiment. (C) a double-blind experiment.

    (B) a matched pairs experiment. (D) an observational study.

    (E) a block design experiment.

29. A trainer for the ETSU men's baseball team records resting heart rates of the 28 team members. You should not trust a confidence interval for the mean resting heart rate of all male students at ETSU based on these data because

    (A) with only 28 observations, the margin of error will be large.

    (B) the standard deviation will not be known.

    (C) the sample is too large.

    (D) heart rates may not follow the Normal distribution.

    (E) the members of the baseball team can't be considered a random sample of all male students at ETSU.

30. A researcher investigating whether people who exercise on a regular basis are less likely to get colds than people who do not exercise found a P-value of 3%. This means that

    (A) the differences observed would occur only 3% of the time if exercising had no effect on getting colds.

    (B) 3% of exercisers get colds.

    (C) exercisers get 3% fewer colds than non-exercisers.

    (D) there's a 3% chance that exercisers get fewer colds.

    (E) there's a 3% chance that exercisers don't get fewer colds.

31. Which of the following is correct about tests of hypotheses?

    (A) If we take a large enough random sample, any effect (however small) will be deemed statistically significant.

    (B) The measure of statistical significance (a P- value) depends heavily on the sample size.

    (C) Practical significance is not the same thing as statistical significance.

    (D) If the consequences of rejecting the null hypothesis are very serious, we should conduct the test using a very small level of significance.

    (E) All the statements above are true.

32. A tax assessor wants to assess the mean property tax bill for all homeowners in Madison, Wisconsin. A survey ten years ago yielded a standard deviation of $1000. How many tax records should be sampled for a 90% confidence interval to have a margin of error of $100?

    (A) 271 (B) 270 (C) 100 (D) 17 (E) 16

Use the following for the next 3 questions. As men age, their testosterone levels gradually decrease. This may cause a reduction in lean body mass, an increase in fat, and other undesirable changes. Do testosterone supplements reverse some of these effects? A study in the Netherlands assigned 237 men aged 60 to 80 with low or low-normal testosterone levels to either a testosterone supplement or a placebo. The report in the *Journal of the American Medical Association* described the study as a "double-blind, randomized, placebo-controlled trial."

33. What is the meaning of **double-blind** in this study?

(A) The 237 men did not know who received the testosterone supplement or the placebo but the people interacting with them did know who received the testosterone supplement or the placebo.

(B) The people interacting with them did not know who received the testosterone supplement or the placebo but the men did know who received the testosterone supplement or the placebo.

(C) Neither the 237 men nor the people interacting with them knew who received the testosterone supplement or the placebo.

(D) Chance was involved in assigning the men into the testosterone treatment or the placebo treatment.

(E) All men took either the testosterone supplement or the placebo.

34. What is the meaning of **randomized** in this study?

(A) The 237 men did not know who received the testosterone supplement or the placebo but the people interacting with them did know who received the testosterone supplement or the placebo.

(B) The people interacting with them did not know who received the testosterone supplement or the placebo but the men did know who received the testosterone supplement or the placebo.

(C) Neither the 237 men nor the people interacting with them knew who received the testosterone supplement or the placebo.

(D) Chance was involved in assigning the men into the testosterone treatment or the placebo treatment.

(E) All men took either the testosterone supplement or the placebo.

35. What is the meaning of **placebo-controlled** in this study?

(A) The 237 men did not know who received the testosterone supplement or the placebo but the people interacting with them did know who received the testosterone supplement or the placebo.

(B) The people interacting with them did not know who received the testosterone supplement or the placebo but the men did know who received the testosterone supplement or the placebo.

(C) Neither the 237 men nor the people interacting with them knew who received the testosterone supplement or the placebo.

(D) Chance was involved in assigning the men into the testosterone treatment or the placebo treatment.

(E) All men took either the testosterone supplement or the placebo.

Use the following for next 2 questions. The Pick 4 games in many state lotteries announce a four-digit winning number each day. Each of 10,000 possible numbers 0000 to 9999 has the same chance of winning. You win if your choice matches the winning digits. Suppose your chosen number is 1234.

36. What is the probability that the winning number matches your number exactly?

(A) 0 (B) $1/10000$ (C) $24/10000$ (D) $1234/10000$ (E) 1

37. What is the probability that the winning number has the same digits as your number in any order?

(A) 0 (B) $1/10000$ (C) $24/10000$ (D) $1234/10000$ (E) 1

38. The Spring 2018 MATH1530 class survey asked "Did you make a New Year's resolution for 2018?" In the sample survey 292 students responded "Yes" and 381 students responded "No." Assume that this sample represents all college students. A large-sample 95% confidence interval for estimating the proportion of all college students who did make a 2018 New Year's resolution is

(A) 39.6% to 47.1% (B) 52.9% to 60.4% (C) 72.4% to 80.9% (D) 292 to 381 (E) 253.74 to 330.26

Use the following for the next 4 questions. Two questions asked on a survey were, "Would you say your health is excellent, very good, good, fair, or poor?" and "Do you smoke cigarettes now?" Here is a two-way table of the results:

	Current Smoker		
Health	**Yes**	**No**	**Total**
Excellent	25	484	509
Very Good	115	1557	1672
Good	145	1309	1454
Fair	90	545	635
Poor	29	11	40
Total	404	3906	4310

39. The percentage of current smokers in the sample is

(A) 90.63% (B) 9.97% (C) 9.37% (D) 6.19% (E) 4.91%

40. Given the group of people that are current smokers, what percent rate their health as fair?

(A) 63.6% (B) 24.1% (C) 22.3% (D) 14.2% (E) 2.1%

41. Given the group of people that rate their health as fair, what percent are current smokers?

(A) 63.6% (B) 24.1% (C) 22.3% (D) 14.2% (E) 2.1%

42. Minitab gives chi-square statistic $\chi^2 = 229.660$ and a P-value ≈ 0 for this data. We can conclude that

(A) smoking causes poor health.

(B) smoking causes people to feel they are unhealthy.

(C) there is no relationship between smoking and how people rate their health.

(D) the chance that the null hypothesis is true is 0.

(E) there is a relationship between smoking and how people rate their health.

43. In the Math 1530 survey, students were asked "How many times a week do you shower?" 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 of the number of times students shower per week is less than 7. Here is the output from Minitab:

```
One-Sample T: SHOWER

Test of mu = 7 vs < 7

95% Upper
Variable N Mean StDev SE Mean Bound T P
SHOWER 594 6.512 1.552 0.003 6.617 -7.67 0.000
```

Is there significant evidence at the 5% level that the average number of times ETSU undergraduates shower per week is less than 7?

(A) There is strong evidence $(P = 0)$ that, on average, the number of times ETSU undergraduates shower per week is less than 7.

(B) No. There is weak evidence $(P = 0)$ that the number of times per week that ETSU undergraduates shower is less than 7.

(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.