

Once this exam is graded and returned to you, retain it for grade verification.

TRUE OR FALSE. Answer with a capital T or F.

(3 points each)

F 1. The mode < median < mean in a left skewed distribution, but in a right skewed distribution the mean < median < mode.

T 2. If the relative frequency of a category of data is 25% in a data set with 1,240 observations, then there are 310 observations in that category.

F 3. The variance of a data set measures the deviations around the median of the data set in squared units.

F 4. If an individual data value of 38 is from a population with standard deviation of 4 and the associated z-score for the data value is equal to -1.5, then the mean of the population is the value 32.

$$T \quad z = \frac{x - \bar{x}}{s} = \frac{38 - \bar{x}}{4} = -1.5, \text{ if mean is } 32$$

T 5. The mean of a data set is the balance point of the data, if the data are represented in a dot diagram.

F 6. If a data set is mound-shaped with a mean of 130 and a variance of 25, then about 100% of the data would be between 55 and 205.  $\text{variance} = 25 \Rightarrow \text{standard dev} = 5$

$$T \quad \bar{x} \pm 3s \Rightarrow 130 \pm 3(5) \Rightarrow (115, 145)$$

T 7. Conditional probability is the probability of an event assuming that some other event has occurred.

STATE THE ANSWER. State the answer on the line given. (3 points each)

For the remaining questions on this page consider the following data. The changes in percent for Helmerich & Payne stock for ten trading days were the following:

1.6, 2.8, -3.1, 0.8, 1.9, 2.0, -2.2, 0.4, -1.8, -2.2

$$\sum x = 0.2, \quad \sum x^2 = 41.34$$

0.02 8. What is the numerical value of the mean of the sample of daily changes for the Helmerich & Payne stock?

$$\bar{x} = \frac{\sum x}{n} = \frac{0.2}{10} = 0.02$$

41.34 9. What is the numerical value of the sum of squares for the sample of ten daily changes for the Helmerich & Payne stock?

$$\sum x^2 = x_1^2 + x_2^2 + \dots + x_{10}^2 = 1.6^2 + 2.8^2 + (-3.1)^2 + \dots + (-2.2)^2 = 41.34$$

4.59 10. What is the numerical value of the sample variance for the sample of ten daily changes for the Helmerich & Payne stock? Round your answer to two digits past the decimal.

$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1} = \frac{41.34 - \frac{0.2^2}{10}}{9} = 4.592\bar{8}$$

STATE THE ANSWER. State the answer on the line given.

(3 points each)

3

11. In a data set with 245 observations if there are 58 ones, 49 twos, 77 threes and 61 fours, what is the median of the data set?

 $1, \dots, 1_{58}, 2_{59}, \dots, 2_{107}, 3_{108}, \dots, 3_{184}, 4_{185}, \dots, 4_{245}.$ position of median is  $\frac{n+1}{2} = \frac{245+1}{2} = 123 \Rightarrow$  median is 30.37512. If from a data set with 888 observations the sum of squares is 2,222 and the square of the sum is 110,889 what is the numerical value of the sample mean? State your answer with three digits past the decimal.  $n = 888, \sum x^2 = 2,222, (\sum x)^2 = 110,889$ 

$$\bar{x} = \frac{\sum x}{n} = \frac{\sqrt{(\sum x)^2}}{n} = \frac{\sqrt{110,889}}{888} = 0.375$$

2.3613. If from a data set with 888 observations the sum of squares is 2,222 and the square of the sum is 110,889, what is the numerical value of the sample variance? Round your answer to two digits past the decimal.  $n = 888, \sum x^2 = 2,222, (\sum x)^2 = 110,889$ 

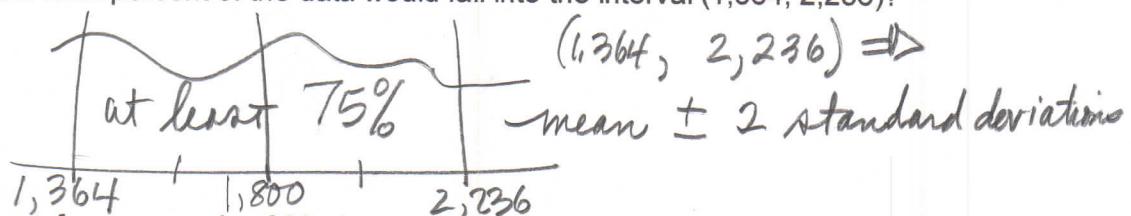
$$s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1} = \frac{2,222 - \frac{110,889}{888}}{888-1} = \frac{2097.125}{887} = 2.3643$$

50%

14. If a data set produces a first quartile of 52 and a third quartile of 94, then what percent of the data are outside of the interval (52, 94)?

Area below  $Q_1$  is 25% + Area above  $Q_3$  is 25%75%

15. If a data set with unknown shape has a mean of 1,800 units and a standard deviation of 218 units then at least what percent of the data would fall into the interval (1,364, 2,236)?

-1.516. Suppose from a sample of 20 observations the mean is 255 and the standard deviation is 54 what is the z score for a data value of 174? State your answer with one digit past the decimal.  $n = 20, \bar{x} = 255, s = 54$ , what is  $z$  for  $x = 174$ ?

$$z = \frac{x - \bar{x}}{s} = \frac{174 - 255}{54} = -1.5$$

373.817. Suppose from a sample of 20 observations the mean is 255 and the standard deviation is 54, if a data value has a z score of 2.2 what is the data value? State your answer with one digit past the decimal.  $n = 20, \bar{x} = 255, s = 54$ , what is  $x$  if  $z = 2.2$ ?

$$x = \bar{x} + z s = 255 + 2.2(54) = 373.8$$

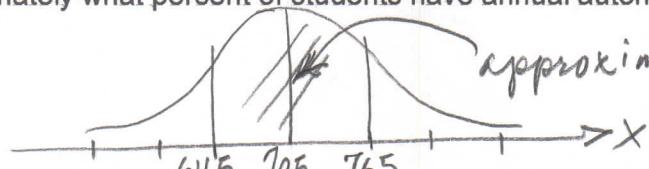
STATE THE ANSWER. State the answer on the line given.

(3 points each)

The annual automotive fuel expenses of a student at OSU has a mound-shaped distribution with a mean of \$705 and a standard deviation of \$60. Use this information to answer the questions below.

68%

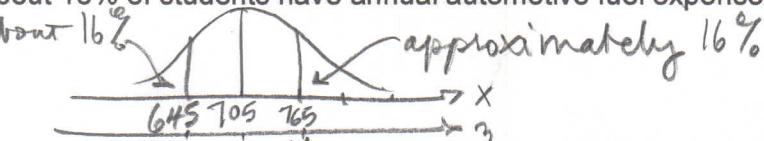
18. Approximately what percent of students have annual automotive fuel expenses between \$645 and \$765?



approximately 68%

\$645

19. About 16% of students have annual automotive fuel expenses less than how much?

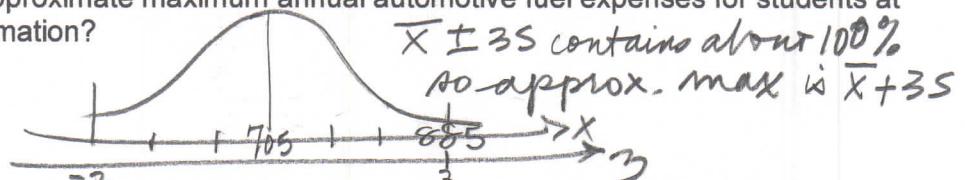


about 16%

approximately 16%

\$885

20. What is the approximate maximum annual automotive fuel expenses for students at OSU based on the above information?

 $\bar{X} \pm 3S$  contains about 100%so approx. max is  $\bar{X} + 3S$ 

\$585, \$825

21. What interval of annual automotive fuel expenses contains approximately 95% of the data?

$$\bar{X} \pm 2S$$

$$705 \pm 2(60)$$

$$585, 825$$

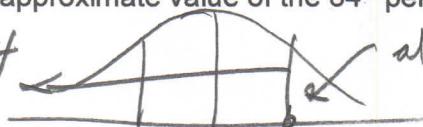
585, 825

 $\bar{X} \pm 2S$  contains approximately 95%

\$765

22. What is the approximate value of the 84<sup>th</sup> percentile of the distribution of annual automotive fuel expenses?

about .84

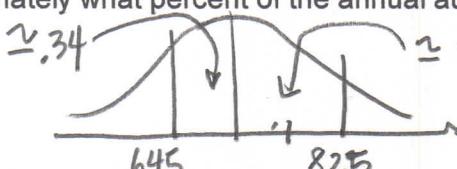


about 16%

$$\bar{X} + S = 705 + 60 = 765$$

81.5%

23. Approximately what percent of the annual automotive fuel expenses are between \$645 and \$825?

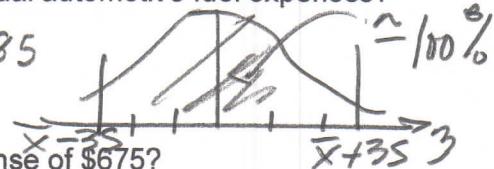


$$.34 + .4750 = .815$$

\$525, \$885

24. What interval of values contains about 100% of the annual automotive fuel expenses?

$$\bar{X} \pm 3S \Rightarrow 705 \pm 3(60) = 525, 885$$



-0.5

25. What is the z score for the annual automotive fuel expense of \$675?

$$z = \frac{X - \bar{X}}{S} = \frac{675 - 705}{60} = -.5$$

789

26. What is the annual automotive expense associated with a z-score of 1.4?

$$X = \bar{X} + zS = 705 + 1.4(60) = 789$$

0.0004 27. The disease of tuberculosis, TB, is on the increase worldwide. If a person has the disease of TB, the probability of a negative TB test result is 0.04, which is called a false negative. If the probability of having TB is 0.01, what is the probability of having TB and receiving a negative test result on your TB test? State your answer with four digits past the decimal.  $P(\text{Neg} | \text{TB}) = .04$ ,  $P(\text{TB}) = .01$

$$P(\text{TB} \cap \text{Neg}) = P(\text{Neg} | \text{TB}) \cdot P(\text{TB}) = .04 (.01) = .0004$$

0.9616 28. An accounting firm in Tulsa hires both graduates with bachelor's degrees in accounting and MBA graduates from OSU. Of the MBA graduates they hire, 44% have a bachelor's degree in accounting. Over all employees, 36% have MBA degrees and 76% have bachelor's degrees in accounting. What is the probability of an employee having either an MBA or a bachelor's degree in accounting? State your answer with four digits past the decimal.  $P(\text{BA} | \text{MBA}) = .44$ ,  $P(\text{MBA}) = .36$

$$P(\text{MBA} \cup \text{BA}) = P(\text{MBA}) + P(\text{BA}) - P(\text{MBA} \cap \text{BA})$$

$$= P(\text{MBA}) + P(\text{BA}) - P(\text{BA} | \text{MBA}) \cdot P(\text{MBA}) = .36 + .76 - .44(.36) = .9616$$

In Yellowstone National Park, an administrating officer surveyed 400 visitors and recorded their preferences for the Guided Day Trip. They obtained the data given in the table below. Do not reduce fractional answers. State all of your answers as ratio fractions. Do not state decimal fraction answers.

	Interested in the Trip		Not Interested in the Trip		
	Male	Female	Male	Female	
Single	72	73	25	50	220
Married	78	47	20	35	180
	<u>130</u>	<u>150</u>	<u>120</u>	<u>45</u>	<u>85</u>
	<u>400</u>				<u>400</u>

45+85/400 29. What is the probability that a randomly selected person is not interested in the trip?

$$\frac{45+85}{400} = \frac{130}{400}$$

78/98 30. Assume a person is randomly selected from all married males, what is the probability that he will be interested in the trip?

$$\frac{78}{78+20} = \frac{78}{98}$$

78/400 31. What is the probability that a randomly selected person is a married male and interested in the trip?

$$\frac{98}{180}$$

78+20/180 32. If a married person is selected, what is the probability that the person is male?

$$\frac{78+20}{180} = \frac{98}{180}$$

250/400 33. What is the probability of randomly selecting a person who is female or is not interested in the trip?

$$\frac{(120+85)+(45+85)-85}{400} = \frac{250}{400}$$