STATISTICS 2023 **NAME, PRINT IN INK**_____

EXAM ONE **SIGNATURE, IN INK**_____

FALL 2016 **CWID, IN INK**_____

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)**

T 1. Relative frequency tells the proportion of the observations that are in a certain category of the variable and is represented by area in a pie chart.

F 2. If the mean of a data set is less than the median and the median is less than the mode of the data set, then the distribution is right skewed.

F 3. The numerical measures of variation include mean, median, and mode.

F 4. If a data set is assumed to be mound-shaped, then approximately 5% of the data set would lie outside of the interval of values that are within one standard deviation of the mean.

F 5. The third quartile of a data set is a value that 75% of the data are more than and 25% of the data are less than.

F 6. If the z score for an individual data value is -2.5 then the data value is located two and one-half standard deviations either above or below the mean of the data set.

F 7. The sample mean measures the middle of the data and always has 50% of the data less than the mean and 50% of the data more than the mean.

State the Answer. State the answer on the line given. **(3 points each)**
The daily changes in the value of a stock are listed below for 5 days of trading. Use these data to answer the remainder of the questions on this page.

2.55 -1.82 -1.24 3.84 0.55

26.4006 8. What is the value of the sum of squares? State 4 digits past the decimal.

$\sum x^2 = 2.55^2 + (-1.82)^2 + \ldots + (0.55)^2 = 26.4006$

0.78 9. What is the value of the sample mean for these five values? Round your answer to 2 digits past the decimal.

$\bar{x} = \frac{\sum x}{n} = \frac{3.88}{5} = 0.776 \Rightarrow 0.78$

2.42 10. What is the value of the sample standard deviation for these five values? Round your answer to 2 digits past the decimal.

$s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}} = \sqrt{\frac{26.4006 - \frac{3.88^2}{5}}{4}} = 2.418146$

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

204 11. If there are 1200 observations in a data set how many observations are in a certain category that has relative frequency of 0.17?

Rel Freq $= \frac{\text{Freq}}{n}$ so if $0.17 = \frac{\text{Freq}}{1200} \Rightarrow 0.17(1200) = 204$

1 12. If from a data set with 14 observations the sum of squares is 287 and the square of sum is 196 what is the numerical value of the sample mean?

If $(\Sigma x)^2 = 196$ then $\Sigma x = 14$. $\bar{x} = \frac{\Sigma x}{n} = \frac{14}{14} = 1$

21 13. If from a data set with 14 observations the sum of squares is 287 and the square of sum is 196 what is the numerical value of the sample variance?

$$s = \frac{\sum x^2 - \frac{(\Sigma x)^2}{n}}{n-1} = \frac{287 - \frac{14^2}{14}}{13} = 21$$

30 14. If a data set with seven hundred observations has two hundred 20's, two hundred and fifty 30's, one hundred 40's, one hundred and fifty 50's what is the numerical value of the median?

$20_1, \ldots, 20_{200}, 30_{201}, \ldots, 30_{450}, 40_{451}, \ldots, 40_{550}, 50_{551}, \ldots, 50_{700}$

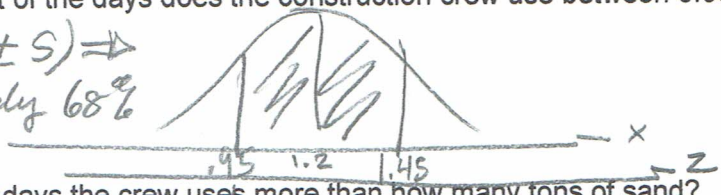
↑ The median is at position $\frac{n+1}{2} = \frac{700+1}{2} = 350.1 \Rightarrow 30$

25% 15. If a data set with unknown shape has a mean of 36 and a standard deviation of 12, then at most what percent of the observations would lie outside of the interval (12, 60)?

$(12, 60) \Rightarrow \bar{x} \pm 2s \Rightarrow$ at least 75% inside, so there is at most 25% outside.

The weight of sand needed daily by a construction crew has a mound-shaped distribution with a mean of 1.2 tons and a standard deviation of 0.25 tons. Use this information to answer the remainder of the questions on this page.

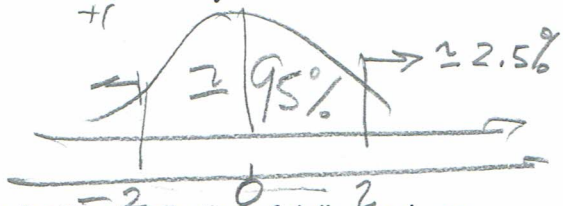
68% 16. Approximately what percent of the days does the construction crew use between 0.95 ton and 1.45 tons? $(.95, 1.45) \Rightarrow (\bar{x} \pm s) \Rightarrow$ Contains approximately 68%



1.70 17. About 0.025 or 2.5% of the days the crew uses more than how many tons of sand?

The interval $\bar{x} \pm 2s$ contains approximately 95%, so outside the interval is 5%, ½ on either side

$\bar{x} + 2s = 1.20 + 2(.25) = 1.70$

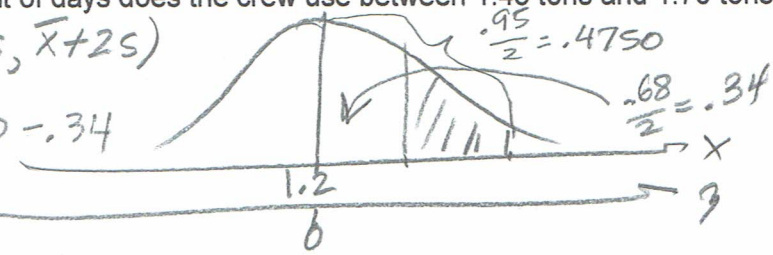


0.95 18. What is the approximate value of the 16th percentile for the distribution of daily sand use by this construction crew? $\bar{x} \pm s$ has about 68% inside and 32% outside the interval, 16% below $\bar{x} - s$ and about 16% above $\bar{x} + s$, so the 16th percentile is $\bar{x} - s = 1.2 - .25 = 0.95$

13.50% 19. Approximately what percent of days does the crew use between 1.45 tons and 1.70 tons of sand in a day? $(1.45, 1.70)$ is $(\bar{x}+s, \bar{x}+2s)$

$\approx P(1 < z < 2) = .4750 - .34$

$= .1350$ or 13.50%



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

The Hyatt Regency advertises one-night vacation packages. Listed below are the costs for these packages at six popular resorts. Use these data to answer the next 5 questions.

Hotel Location	Cost for One Night Package
Hyatt Regency Grand Cypress (Orlando, FL)	$ 205
Hyatt Regency Hill Country (San Antonio, TX)	$ 209
Hyatt Grand Champions (Indian Wells, CA)	$ 125
Hyatt Regency Pier 66 (Ft. Lauderdale, FL)	$ 159
Hyatt Regency Waikiki	$ 280
Hyatt Regency Lake Tahoe	$ 203

$\Sigma X = 1181$

$\Sigma X^2 = 246,221$

196.8 20. What is the numerical value of the mean for the above prices? Round your answer to 1 digit past the decimal.

$$\bar{X} = \frac{\Sigma X}{n} = \frac{1181}{6} = 196.8\bar{3}$$

204 21. What is the numerical value of the median for the above prices?

125 159 203 205 209 280

↑ median is average of 2 center #'s

1,394,761 22. What is the numerical value of the square of the sum for the above prices?

$$(\Sigma X)^2 = (1181)^2 = 1,394,761.$$

246,221 23. What is the numerical value of the sum of the squares for the above prices?

$$\Sigma X^2 = 205^2 + \ldots + 203^2 = 246,221$$

52.5 24. What is the numerical value for the standard deviation of the above prices? Round your answer to 1 digit past the decimal.

$$s = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}} = \sqrt{\frac{246,221 - \frac{1181^2}{6}}{5}} = 52.461$$

1.05 25. Suppose that the personnel manager of Texon Industries has administered an aptitude test with a mean of 65 and a standard deviation of 10. What is the z-score associated with a score of 75.50?

$$z = \frac{x - \bar{x}}{s} = \frac{75.50 - 65}{10} = 1.05$$

47.4 26. Suppose that the personnel manager of Texon Industries has administered an aptitude test with a mean of 65 and a standard deviation of 10. What is the test grade associated with the z-score of -1.76?

$$x = \bar{x} + zs = 65 + (-1.76)10 = 47.4$$

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

0.36 27. Suppose that P(Head) = 0.6 on an unfair coin. What is the probability of two heads occurring when the coin is flipped twice?

$P(\text{Head}_1 \cap \text{Head}_2) = P(\text{Head}_1) \cdot P(\text{Head}_2)$ due to independence

$= 0.6\,(0.6) = 0.36$

0.009 28. In the State of Oklahoma, it is believed that the deposits of 90% of the banks are insured by the Federal Depository Insurance Company (FDIC). It is also believed that 1% of the Oklahoma banks protected by FDIC will fail. What is the probability that, for a randomly chosen Oklahoma bank, the bank has deposits protected by FDIC and the bank will fail? Do not round.

$P(\text{Ins by FDIC}) = .90,\ P(\text{fail} \mid \text{FDIC}) = .01$

$P(\text{Ins by FDIC} \cap \text{fail}) = P(\text{fail} \mid \text{FDIC}) \cdot P(\text{FDIC}) = .01(.09)$

A research and develop company surveyed all 200 of its employees over the age of 60 and obtained the information given in the table below. One of these 200 employees is selected at random. Do not reduce fractional answers. State all of your answers as ratio fractions. Do not state decimal fraction answers. Use this information to answer the remaining questions on this page.

	UNDER 20 YEARS WITH COMPANY		**OVER 20 YEARS WITH COMPANY**		
	Technical Staff	**Nontechnical Staff**	**Technical Staff**	**Nontechnical Staff**	
Plan to Retire at Age 65	31	5	45	12	93
Plan to Retire at Age 68	59	25	15	8	107
	90	30	60	20	200

150/200 29. What is the probability that the person selected is on the technical staff?

$\frac{90+60}{200} = \frac{150}{200}$

23/80 30. If the person selected has over 20 years of service with the company, what is the probability that the person plans to retire at age 68?

$\frac{15+8}{80} = \frac{23}{80}$

90/150 31. If the person selected is on the technical staff, what is the probability that the person has been with the company less than 20 years?

12/200 $\frac{90}{150}$

32. What is the probability that the person selected has over 20 years with the company, is on the nontechnical staff, and plans to retire at age 65?

65/80 $\frac{12}{200}$

33. Assume the person selected has over 20 years with the company, what is the probability that the person is on the nontechnical staff or plans to retire at age 65?

$\frac{20 + 57 - 12}{80} = \frac{65}{80}$