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

EXAM ONE **SIGNATURE, IN INK**_____

SPRING 2020 **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.

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, mode, and median.

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 which 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 two events are independent, then they are mutually exclusive.

The percent changes in daily price for a specific stock are shown below. Use these data to answer the remaining questions on this page.

8.1 2.2 -5.6 0.8 -2.6 4.0 -2.1 3.6

8.4 7. What is the sum of the data?

$$\sum X = 8.1 + \ldots + 3.6 = 8.4$$

142.58 8. What is the sum of squares of the data?

$$\sum X^2 = 8.1^2 + 2.2^2 + (-5.6)^2 + \ldots + 3.6^2 = 142.58$$

70.56 9. What is the square of the sum of the data?

$$(\sum X)^2 = 8.4^2 = 70.56$$

1.1 10. What is the observed percent mean change in the daily price of this specific stock based on these data? Round your answer to one digit past the decimal.

$$\bar{X} = \frac{\sum X}{n} = \frac{8.4}{8} = 1.05 \Rightarrow 1.1$$

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 which has relative frequency of 0.17?

$1200(.17) = 204$

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?

$n = 14,\ \Sigma X^2 = 287\ \ (\Sigma X)^2 = 196,\ \bar{X} = \frac{\Sigma X}{n} = \frac{\sqrt{196}}{14} = 1$

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

$S^2 = \frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1} = \frac{287 - \frac{14^2}{14}}{13} = 21$

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, then what is the numerical value of the median?

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

Position of median is $\frac{n+1}{2} = \frac{700+1}{2} = 350.5 \Rightarrow$ median = 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)?

$(12, 60) \Rightarrow \bar{X} \pm 2S \Rightarrow$ contains @ least 75%

to outside @ most 25%.

1.05 16. 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?

$\bar{X} = 65,\ S = 10,\ X = 75.50$ then

$z = \frac{X - \bar{X}}{S} = \frac{75.50 - 65}{10} = 1.05$

47.4 17. 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?

$\bar{X} = 65,\ S = 10,\ z = -1.76,$ then

$X = \bar{X} + zS = 65 + (-1.76)10 = 47.4$

66 18. Supposed that 6 randomly chosen utility bills were the following amounts, \$158, \$255, \$88, \$139, \$98, and \$218. What is the standard deviation associated with these 6 utility bill? Round your answer to the nearest dollar.

$S = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}} = 66.12 \Rightarrow 66$

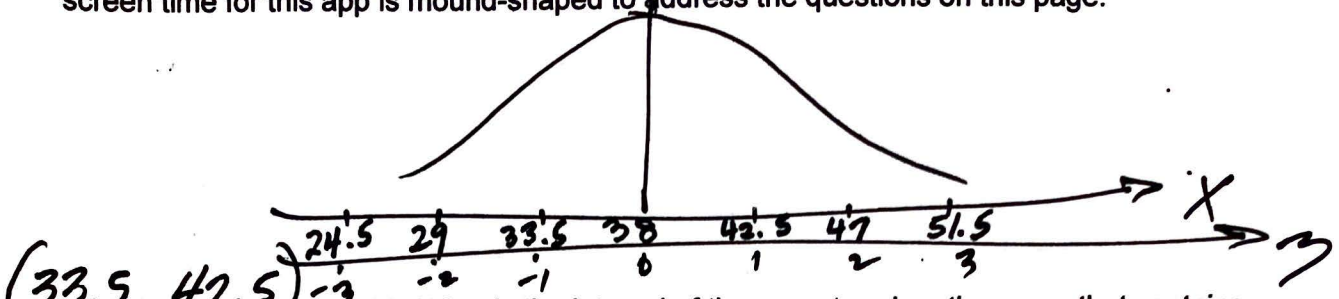
148.5 19. Supposed that 6 randomly chosen utility bills were the following amounts, \$158, \$255, \$88, \$139, \$98, and \$218. What is the median associated with these 6 utility bills?

88 98 139 158 218 255

$\text{median} = \frac{139 + 158}{2} = 148.5$

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

Smart phones record daily screen time, which is a measure of degree of interaction with apps. Assume that for a group of smart phone users that the screen time for a specific app has a daily mean screen time of 38 minutes with a standard deviation of 4.5 minutes. Also assume that the daily screen time for this app is mound-shaped to address the questions on this page.



(33.5, 42.5) 20. What is the interval of times centered on the mean that contains approximately 68% of the daily screen times for this app?

$\bar{X} \pm S \Rightarrow 38 \pm 4.5 \Rightarrow (33.5, 42.5)$

(29, 47) 21. What is the interval of times centered on the mean that contains approximately 95% of the daily screen times for this app?

$\bar{X} \pm 2S \Rightarrow 38 \pm 2(4.5) \Rightarrow (38-9,\ 38+9) \Rightarrow (29, 47)$

29 22. About 0.025 or 2.5% of the daily screen times for this app are less than how many minutes?

2.5% approximately are less than

$\bar{X} - 2S = 38 - 2(4.5) = 29$

33.5 23. What is the approximate 16th percentile of daily screen time for this app?

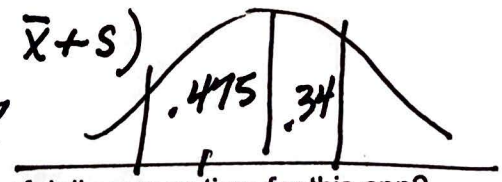
16th percentile is X_0, $P(X < X_0) = .16$

$\bar{X} - S$ has 16% below, so $X - S = 38 - 4.5$

.815 OR 81.5% 24. Approximately what percent of the screen times are between 29 and 42.5 minutes?

$(29, 42.5) \Rightarrow (\bar{X} - 2S,\ \bar{X} + S)$

$.4750 + .34 = 81.5\%$

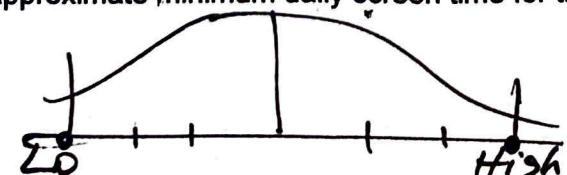


42.5 25. What is the approximate 84th percentile of daily screen time for this app?

84th percentile is X_0, $P(X < X_0) = .84$

$\Rightarrow \bar{X} + S = 38 + 4.5 = 42.5$

24.5 26. The approximate minimum daily screen time for this app is how many minutes?



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

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

$P(\text{Head Coin 1}) = 0.6,\ P(\text{Head on } C_2) = 0.6$

0.027 $P(C_1 \cap C_2) = P(C_1) \cdot P(C_2) = 0.6(0.6) = 0.36$

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 3% of the 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?

$P(FDIC) = .90,\ P(Fail \mid FDIC) = 0.03$

$P(FDIC \cap FAIL) = P(FAIL \mid FDIC) \cdot P(FDIC) = .03(.9)$

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. Use these data to answer the remaining questions on this page. **Do not reduce fractional answers. State all of your answers as ratio fractions. Do not state decimal fraction answers.**

	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?

$\frac{15+8}{60+20} = \frac{23}{80}$

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?

$\frac{31+59}{90+60} = \frac{90}{150}$

12/200 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?

$\frac{20+(45+12)-12}{60+20} = \frac{65}{80}$