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

EXAM ONE **SIGNATURE, IN INK** _____

SPRING 2019 **CWID, IN INK** _____

SEAT LETTER AND NUMBER _____

Once this exam is graded and returned to you at SLIC, retain it for grade verification.
TRUE OR FALSE. Answer with a capital T or F. **(3 points each)**

T 1. Bar graphs represent categorical data and histograms represent interval or ratio data.

F 2. The mean is the middle of the data and the median is the balance point or average in the data.

F 3. For any mound-shaped data set, approximately 5% of the data set would lie outside of an interval of values that are within one standard deviation of the mean.

T 4. The median of a data set is always the 50th percentile of the data set.

F 5. If the individual data value is 63 and it belongs to a population with mean of 56 and variance is 49 then the Z-Score is equal to 2. $Z = \frac{x-\mu}{\sigma} = \frac{63-56}{7} = 1$

T 6. If a data set is mound shaped with a mean of 210 and a standard deviation of 25 then about 68% of the observations would be between 185 and 235. $\mu \pm \sigma \Rightarrow 210 \pm 25 \Rightarrow 185, 235$

Calculation Questions **(3 points each)**

The following sample is a set of observations on the daily point change for the stock of an oil well services company: 3.2, -4.6, 2.5, -3.9, 4.1, -3.4

-2.1 7. What is the sum of the data?

$\sum x = x_1 + x_2 + \ldots + x_n = 3.2 + (-4.6) + \ldots + (-3.4) = -2.1$

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

$\sum x^2 = x_1^2 + x_2^2 + \ldots + x_n^2 = 3.2 + (-4.6)^2 + \ldots + (-3.4)^2 = 81.23$

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

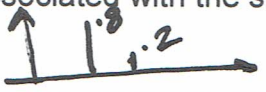
$(\sum x)^2 = (-2.1)^2 = 4.41$

4.01 10. What is the value of the standard deviation of the data? Round your answer to two digits past the decimal.

$s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}} = \sqrt{\frac{81.23 - \frac{(-2.1)^2}{6}}{5}} = 4.012356$

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

0.20 11. If a categorical variable has only two categories, then the associated bar graph has only two bars. If the taller bar is four times the height of the shorter one, what is the relative frequency of the category that is associated with the shorter bar?



16 12. If from a data set with eighty observations the sum of squares is 1,526.8125 and the sum is 145, what is the value of the sample variance?

100 13. If a data set with twenty observations has only four different values, which are 100, 200, 300, and 400, and 17 of the 20 observations are 100, but there is only one 200, one 300, and one 400 in the set of 20. What is the value of the median?

840 14. If the mean for a mound-shaped data set is 585 units and the approximate minimum value is 330, what is the approximate maximum value?

25% 15. If a data set with unknown shape has a mean of 220 units and a standard deviation of 55 units, then at most what percent of the data would be below 110?

During the extended draught that Oklahoma experienced during 2011 and 2012, many water wells went dry and new wells were drilled. The following sample of well depths is the number of feet required for new water wells to provide a significant amount of water per day. Use this sample of well depths measured in feet to answer the remainder of the questions on this page.

245.6, 232.2, 253.8, 229.1, 144.9, 251.7, 335.2, 253.1

243.2 16. What is the value of the mean of the above sample of well depths? State your answer with one digit past the decimal.

$$\bar{x} = \frac{\Sigma x}{n} = \frac{1,945.6}{8} = 243.2$$

248.65 17. What is a value for the median of the above sample of well depths? State your answer with two digits past the decimal.

144.9 229.1 232.2 245.6 251.7 253.1 253.8 335.2

between 245.6 and 251.7

51.7 18. What is the value of the standard deviation of the above sample of well depths? Round your answer to one digit past the decimal.

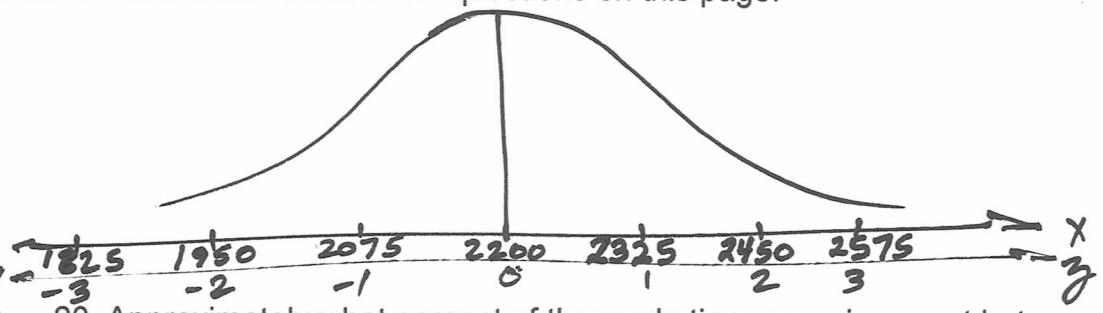
$$s = \sqrt{\frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1}} = \sqrt{\frac{491,905 - \frac{1945.6^2}{8}}{7}} = 51.7343$$

50% 19. What percent of the well depths are less than 250 feet?

$$\frac{4}{8} = 50\%$$

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

The cost of a standardized marketing campaign for local businesses is a variable with a mound-shaped distribution with an average of \$2,200 per week with a standard deviation \$125. Use this information to answer the questions on this page.



95% 20. Approximately what percent of the marketing campaigns cost between \$1,950 and \$2,450?

$z_{1,950} = \frac{1,950 - 2200}{125} = -2$ within 2σ of M about 95%

$z_{2450} = \frac{2450 - 2200}{125} = +2$

2075 21. About 16% of the marketing campaigns cost less than what amount?

within one σ of M about 68%
less than one σ below M about 16%
$M - \sigma = 2200 - 125 = 2075$

2575 22. The approximate maximum cost for the marketing campaign is what amount?

within 3σ of M is about 100%
to M−3σ is min, M+3σ is max
$M + 3\sigma = 2200 + 3(125) = 2575$

2075, 2325 23. What is the interval of values that are within one standard deviation of the mean?

$M \pm \sigma$
2200 ± 125
(2075, 2325)

−1.6 24. For a marketing campaign cost of \$2,000, what is the associated Z-score?

$z_{2000} = \frac{2000 - M}{\sigma} = \frac{2000 - 2200}{125} = -1.6$

2412.5 25. What is the cost of a marketing campaign, if the cost is associated with a Z-score of 1.7?

$X = M + z\sigma = 2200 + (1.7)125 = 2412.5$

2325 26. What is the 84th percentile of the distribution of marketing campaign costs?

within one σ of M is about 68%. so
about 84% below $M + \sigma = 2200 + 125 = 2325$

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

0.7125 27. Assume that one-year after graduating with a Master's degree in accounting, that the probability of having a job as an accountant is 95%. Also, assume that of those who have jobs as accountants, that 75% of them have already passed the CPA exam. What is the probability that a randomly chosen graduate has a job as an accountant and has already passed the CPA exam? State your answer with four digits past the decimal.

$P(\text{Acct job}) = .95, P(\text{Pass CPA} \mid \text{Acct job}) = .75$ $= 0.7125$

0.84 $P(\text{Acct job} \cap \text{Pass CPA}) = P(\text{Pass CPA} \mid \text{Acct job}) \cdot P(\text{Acct job}) = .75(.95)$

28. Assume that 80% of the new oil wells in Oklahoma are horizontal wells. Further assume that 76% of all the new oil wells in the state have more than more than 10 barrels per day initial production. Of the new horizontal wells, 90% result in more than 10 barrels of oil per day in initial production. What is the probability that a new oil well is a horizontal well or will result in more than 10 barrels of oil per day in initial production? State your answer with two digits past the decimal.

$P(\text{horiz}) = .80, P(>10\text{BPD}) = .76, P(>10\text{BPD} \mid \text{horizontal}) = .90$

$P(\text{horizontal} \cup >10\text{BPD}) = .80 + .76 - .90(.80) = 0.84$

A research institute surveyed 650 people between age 20 and 40 in a certain city for their MARITAL STATUS. They obtained the information given in the table below. One of these 650 people is selected at random. Do not reduce fractional answers. State all of your answers as ratio fractions. Do not state decimal fraction answers.

	Married		Single		
	Male	**Female**	**Male**	**Female**	
Under Age 30	54	72	124	40	290
Above Age 30	148	126	48	38	360
	202	198	172	78	

290/650 29. What is the probability that the person selected is under age 30?

0.44615

274/400 30. If the person selected is married, what is the probability that the person is above age 30?

0.685

78/276 31. If the person selected is female, what is the probability that the person is still single?

54/650 0.282609 32. What is the probability that the selected person is a married male and under age 30?

40/78 0.08308 33. Assume the person is selected from all single females, what is the probability that she will be under age 30?

0.51282