STATISTICS 2023 **NAME IN PRINT** Key

EXAM ONE **SIGNATURE IN INK** _____

FALL 2007 **CWID IN INK** _____

Correct CWID is REQUIRED to record your exam grade. CWID is an 8 digit number that starts with 10 or 11.

TRUE OR FALSE. Answer with a capital T or F. **(3 points each)**

F 1. A relative frequency bar graph indicates frequency with height, not width or area, whereas, a pie chart indicates relative frequency with both area and height.

F 2. If the mean and the median of a data set exceed the mode then the data set is probably left skewed.

T 3. If the range in a mound-shaped data set is 150 units then it is reasonable that the standard deviation is 25 units.

T 4. The variance of a sample of data measures the spread of the data about the sample mean in squared units.

F 5. If a data set is mound shaped then approximately 95% of the data set is within one standard deviation of the mean.

F 6. The probability of an event is the likelihood of the event stated as a number between one and zero, but cannot be equal to one or zero.

F 7. Conditional probability is the probability of the intersection of two events.

CALCULATION QUESTIONS. Write the answer on the line. **(3 points each)**

The accounting records of eight prominent American corporations were investigated to determine the number of questionable accounting practices used in each company. The resulting data representing numbers of unethical, and possibly illegal, accounting practices in these eight corporations are:

23, 11, 8, 12, 42, 4, 9, 17

126 8. What is the numerical value of the sum of the observations?

$\Sigma X = 23 + 11 + \ldots + 17 = 126$

3008 9. What is the numerical value of the sum of the squares of the observations?

$\Sigma X^2 = 23^2 + 11^2 + \ldots + 17^2 = 3,008$

15,876 10. What is the numerical value of the square of the sum of the observations?

$(\Sigma X)^2 = (126)^2 = 15,876$

15.75 11. What is the numerical value of the mean of the data set listed above? State your answer with two digits past the decimal.

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

2

12. If the square of the sum of the values in a sample with 260 observations is 270,400 then what is the numerical value of the sample mean?

$(\Sigma X)^2 = 270{,}400 \Rightarrow \Sigma X = \sqrt{270{,}400} = 520$

$\bar{X} = \frac{\Sigma X}{n} = \frac{520}{260} = 2$

23.04

13. If the sum of squares in a sample with 260 observations is 138,531 and the sum is 520 then what is the numerical value of the sample standard deviation? Round your answer to two digits past the decimal.

$S = \sqrt{\frac{\Sigma X^2 - \frac{(\Sigma X)^2}{n}}{n-1}} = \sqrt{\frac{138{,}531 - \frac{(520)^2}{260}}{259}} = 23.04$

5000.5

14 If a data set with ten-thousand observations is comprised of 2,500 ones, 4,000 twos, 1,500 threes, and 2,000 fours, what is the value of the median?

$1, \ldots 1_{2{,}500}, 2_{2{,}501}, \ldots 2_{6{,}500} \ldots$ median at 5000.5 position in data

The American Dental Association states that people should brush their teeth for two minutes or more at least twice a day. In a study that measured the length of tooth-brushing time for eight randomly chosen adults the resulting data in minutes are:

2.2, 1.5, 1.2, 1.8, 1.5, 1.7, 2.4, 1.6

1.7

15. What is the numerical value of the observed mean tooth-brushing time that results from the data? Round your answer to one digit past the decimal.

$\bar{X} = \frac{\Sigma X}{n} = \frac{2.2 + 1.5 + \ldots + 1.6}{8} = 1.7$

1.65

16.What is the numerical value of the median of the observed tooth-brushing times?

1.2 1.5 1.5 1.6 1.7 1.8 2.2 2.4

1.5

17. What is the numerical value of the mode of the observed tooth-brushing times?

mode with frequency 2 is 1.5

.4

18. What is the numerical value of the standard deviation associated with the observed tooth-brushing time? Round your answer to one digit past the decimal.

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

2.5

19. If nothing is known about the shape of the distribution of the variable tooth-brushing time, then at most twenty-five percent of the tooth-brushing times are more than what numerical value? Round to one digit past the decimal.

at most 25% | at least 75% | at most 25%

$\bar{X}$ $\bar{X} + 2S = 1.7 + 2(.4) = 2.5$

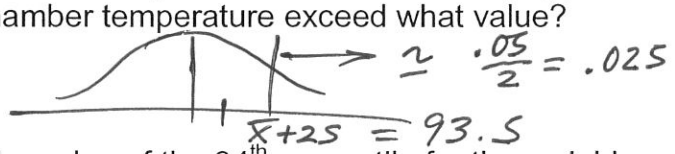
STATE THE ANSWER. Write the answer on the line. (3 points each)

The former President of Oklahoma State University, David J. Schmidly, wrote a book titled, **The Bats of Texas**. A type of bat described in the book is the **Ghost-faced Bat**. This is a cave dwelling bat and the non-reproducing females live in interior cave chambers that have an average temperature of 92.8F with a standard deviation of 0.35F. Use this information to answer the remainder of the questions on this page.

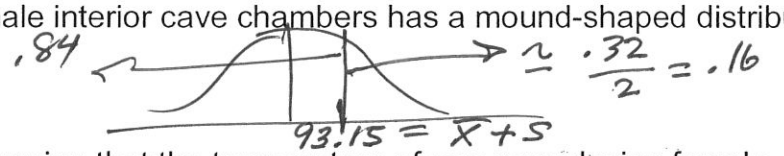
92.45 , 93.15 20. What is the numerical interval that describes the set of non-reproducing female interior cave chamber temperatures that are within one standard deviation of the mean?

$\bar{x} \pm s \rightarrow 92.8 \pm .35$

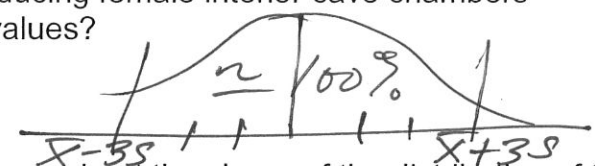
93.5 21. Assuming that the temperature of non-reproducing female interior cave chambers has a mound-shaped distribution, then only approximately 2.5% of the time the interior cave chamber temperature exceed what value?



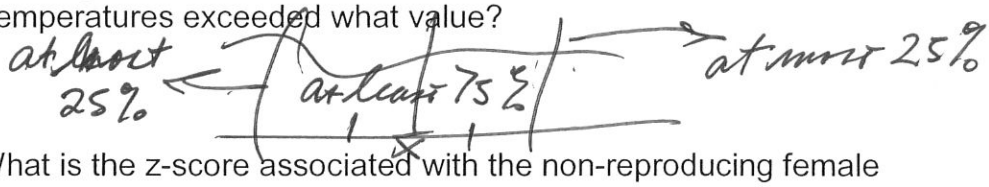
93.15 22. State the value of the 84th percentile for the variable non-reproducing female interior cave chamber temperature, assuming that the temperature of the non-reproducing female interior cave chambers has a mound-shaped distribution.



91.75, 93.85 23. Assuming that the temperature of non-reproducing female interior cave chambers has a mound-shaped distribution, then one could conclude that approximately 100% of the non-reproducing female interior cave chambers temperatures are between what two values?



93.5 24 If nothing is known about the shape of the distribution of the temperature of non-reproducing female interior cave chambers then one could conclude that at most 25% of the temperatures exceeded what value?



-2.18 25. What is the z-score associated with the non-reproducing female interior cave chamber temperature of 92.037?

$z_0 = \frac{x_0 - \bar{x}}{s} = \frac{92.037 - 92.8}{.35} = -2.18$

93.3 26. What is the temperature of a specific non-reproducing female interior cave chamber if it is associated with a z-score of 1.45? Round to 1 digit past decimal.

$x = \bar{x} + zs = 92.8 + 1.45(.35) = 93.3$

PROBABILITY QUESTIONS. State the answer on the line. (3 points each)

.0014 27. If you have two internet service providers connected to your home computer that function independently and one provider, Service A, has a failure rate of 0.0014 and the other provider, Service B, has a failure rate of 0.026. What is the probability of Service A failing given that Service B has already failed? Do not round your answer.

$P(A) = .0014$, $P(B) = .026$ $P(A|B) = \frac{P(A)\cdot P(B)}{P(B)} = .0014$

Remember independent $\Rightarrow P(A \cap B) = P(A)\cdot P(B)$

.44 28. Forty percent of all the employees of a company have an MBA degree. Twenty percent of all of the employees are managers. Of the managers in the company eighty percent have MBA degrees. What is the probability that a randomly chosen employee has an MBA degree or is a manager? Do not round your answer.

$P(MBA) = .4$, $P(manage) = .2$, $P(MBA | Manager) = .8$, $P(MBA \cup Manage) = .4 + .2 - .2(.8)$

The total student fees per credit hour now exceed the basic tuition level. The student fee to help to support the *The O'Colly*, the OSU student newspaper, is $.30 per credit hour. Five hundred students were questioned about whether they thought student fees should be collected to support the O'Colly and whether they had ever visited the new on-line version at ocolly.com. The data resulted in the following table. Use it to answer the remaining questions on this page. State your answer as an unreduced ratio fraction, do not simplify, and do not state a decimal fraction.

		In favor of student fees to support the O'Colly		
		YES	NO	
Has visited the newly designed site, ocolly.com	YES	150	55	205
	NO	85	210	295
		235	265	500

235/500 29. What is the probability that a randomly chosen student is in favor of student fees to support the O'Colly?

150/500 30. What is the probability that a randomly chosen student is in favor of the student fees and has visited the newly designed site, ocolly.com?

150/205 31. Given that a student has visited the newly designed site, ocolly.com, what is the probability that the student is in favor of the student fees to support the O'Colly?

150/235 32. What is the probability that a student who is in favor of the student fees to support the O'Colly has visited the newly designed site, ocolly.com?

290/500 33. What is the probability that a randomly chosen student either favors the fees to support the O'Colly or has visited the newly designed site, ocolly.com?

$$\frac{235 + 205 - 150}{500} = \frac{290}{500}$$