RETURN THIS EXAM TO DISCUSSION SECTION NUMBER_____

STATISTICS 2023   NAME, IN INK_____

EXAM ONE   SIGNATURE, IN INK_____

SPRING 2000   SS NUMBER, 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. The range of a data set is the number of units that the individual observations typically miss the mean of the data set.

___T___ 3. If a data set is assumed to be mound-shaped then approximately ~~34~~ 32% of the observations would lie more than one standard deviation from the mean of the data set.

___F___ 4. The mean, mode and standard deviation of a data set measure the amount of dispersion in the set.

___F___ 5. If the z score for an individual data value is -1.5 then the data value is located one and one-half standard deviations either above or below the mean of the data set.

___T___ 6. If the shape of a data set is unknown then maybe none of the data values lie within one standard deviation of the mean.

___F___ 7. The sample space of an experiment is the set of the five most likely outcomes of the experiment.

___T___ 8. The median of a data set is the 50th percentile of the data set and the second quartile of that data set.

___F___ 9. The probability of the union of two events is the sum of the marginal probabilities of the two events for any two events, A and B.

___T___ 10. Two events, A and B, are known to be independent if the product of their marginal probabilities is equal to the probability of the intersection of the two events.

____160____ 11. How many observations are in a data set if a category with 24
observations has a relative frequency of 0.15?

$$\frac{24}{X} = 0.15 \Rightarrow 24 = .15X \Rightarrow \frac{24}{.15} = X = 160$$

____8.5____ 12. If a data set with 75 observations yields a sum of squares equal to
10,154.75 and a sum of 637.5 what is the numerical value of the sample mean? State
your answer with one digit past the decimal. $n = 75, \Sigma x^2 = 10,154.75, \Sigma x = 637.5$

$$\bar{X} = \frac{\Sigma x}{n} = \frac{637.5}{75} = 8.5$$

____64____ 13. If a data set with 75 observations yields a sum of squares equal to
10,154.75 and a sum of 637.5 what is the numerical value of the sample variance?

$$S^2 = \frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1} = \frac{10,154.75 - \frac{(637.5)^2}{75}}{74} = \frac{4736}{74} = 64$$

____30____ 14. If a data set with a thousand observations has one-hundred fifty 20's, three-
hundred fifty 20's, four-hundred 30's, and one-hundred fifty 40's what is the numerical
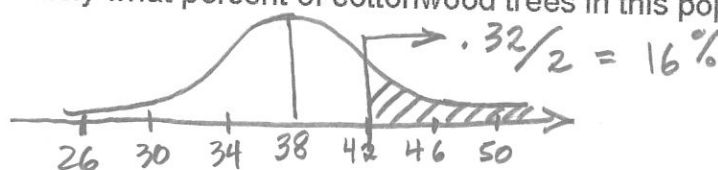value of the median?

$$10_1, \ldots, 10_{100}, 20_{101}, \ldots, 20_{450}, 30_{451}, \ldots, 30_{850}, \ldots, 40_{851}, \ldots, 40_{1000}$$

____25%____ 15. The mean tuition cost per semester at a state university is $1,100 and
the standard deviation for tuition cost per semester is $150. If nothing is known about the
shape of the distribution then at most what percent of students pay more than $1400
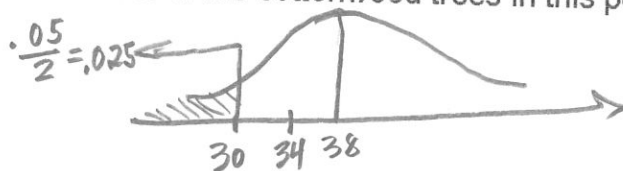tuition per semester?

$$1400 = M + 2\sigma \Rightarrow \text{% at most above is } 25\%$$

The height of mature cottonwood trees along the creeks and rivers in eastern Oklahoma
has a mound-shaped distribution with a mean of 38 feet and a standard deviation of 4
feet. Use this information to answer the remainder of the questions on this page.

$$M = 38, \quad \sigma = 4$$

____16%____ 16. Approximately what percent of cottonwood trees in this population are
taller than 42 feet?

$$\frac{.32}{2} = 16\%$$

26 30 34 38 42 46 50

____30____ 17. Only about 2.5% of the cottonwood trees in this population are shorter
than what height?

$$\frac{.05}{2} = .025$$

30 34 38

____26, 50____ 18. Almost all of the cottonwood trees in this population would be between
what two heights?

$$\approx 100\% \text{ w/n } M \pm 3\sigma \Rightarrow 38 \pm 3(4) \Rightarrow (26, 50)$$

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

___−1.5___ 19. The grade distribution of an accounting test has a mean of 62 with a standard deviation of 12. What is the z score associated with the exam grade of 44? State your answer with one digit past the decimal. $M = 62, \ \sigma = 12$

If $X = 44$ then $y = \dfrac{X - M}{\sigma} = \dfrac{44 - 62}{12} = -1.5$

___92___ 20. The grade distribution of an accounting test has a mean of 62 with a standard deviation of 12. What is the value of a student's exam grade if the z score associated with the grade is 2.5? $M = 62, \ \sigma = 12$

If $y = 2.5$ then $X = M + y\sigma = 62 + (2.5)12 = 92$

A random sample of eight blue heron was chosen in Payne and Pawnee Counties of Oklahoma. The standing height was measured on each bird. The heights recorded in inches are stated below. Use this sample of standing heights of blue heron to answer the remainder of the questions on this page.

48.2, 46.1, 50.4, 44.5, 43.6, 47.2, 49.1, 50.9

___18,099.28___ 21. What is the numerical value of the sum of the squares for the above sample?

$$\Sigma x^2 = 48.2^2 + 46.1^2 + \ldots + 50.9^2 = 18,099.28$$

___380___ 22. What is the numerical value of the sum for the above sample?

$$\Sigma x = 48.2 + 46.1 + \ldots + 50.9 = 380$$

___47.5___ 23. What is the numerical value of the mean of the above sample of heights? State your answer with one digit past the decimal.

any # between 48.2 & 47.2

$$\bar{X} = \frac{\Sigma X}{n} = \frac{380}{8} = 47.5$$

___47.7___ 24. What is a numerical value for the median of the above sample of heights?

Rank Order: 43.6, 44.5, 46.1, 47.2, 48.2, 49.1, 50.4, 50.9
           1   2   3   4 \ / 5   6   7   8

$$\text{Position} = \frac{n+1}{2} = \frac{8+1}{2} = 4.5$$

$$\frac{47.2 + 48.2}{2} = 47.7$$

___7.04___ 25. What is the numerical value of the variance of the above sample of heights? State your answer with two digits past the decimal.

$$S^2 = \frac{\Sigma x^2 - \frac{(\Sigma x)^2}{n}}{n-1} = \frac{18,099.28 - \frac{(380)^2}{8}}{7} = 7.04$$

___2.65___ 26. What is the numerical value of the standard deviation of the above sample of heights? Round your answer to two digits past the decimal.

$$S = \sqrt{7.04} = 2.653299832 \Rightarrow 2.65$$

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

____.95____ 27. Two students, John and Michele, who are both in STAT 2023 usually study together. The probability that John completes his homework is .8 and the probability that Michele completes her homework is .9. If both John and Michele complete the homework 75% of the time, what is the probability that John or Michele completes the homework?

$$P(J) = .8 \quad P(m) = .9 \quad P(J \cap m) = .75$$

$$P(J \cup m) = P(J) + P(m) - P(J \cap m) = .8 + .9 - .75 = .95$$

____.45____ 28. You have two friends who enjoy cooking and they often invite you to their home to eat. Suppose they invite you 50% of the time, and when invited, you go over to eat 90% of the time. What is the probability that they invite you and you go over to eat?

$$P(INV) = .5 \qquad P(EAT \mid INV) = .9$$

$$P(INV \cap EAT) = P(EAT \mid INV) \cdot P(INV) = .9(.5) = .45$$

Six hundred college students were questioned about whether or not they plan to attend graduate school. What college their major is located in was also recorded. The results are shown in the following table. Use this table to answer the remainder of the questions on this page. Do not reduce fractional answers.

Plan to go to Graduate School		Yes	No	Don't Know	
Major in College:	Business	76	136	55	267
	Arts & Sciences	49	88	126	263
	Agriculture	22	34	14	70
		147	258	195	600

OR
.245

____147/600____ 29. What is the probability of choosing a student who is planning to go to graduate school?

$$P(YES) = \frac{147}{600}$$

.50936

____136/267____ 30. If the one student chosen has a major in the College of Business what is the probability that the student is not planning to go to graduate school?

$$P(NO \mid Business) = \frac{136}{267}$$

.3

____49/147____ 31. Given that a student who plans to go to graduate school is chosen what is the probability that the student has a major in the College of Arts & Sciences?

$$P(Art \& Sciences \mid Yes) = \frac{49}{147}$$

.146

____88/600____ 32. What is the probability that if one student is chosen that the student does not plan to go to graduate school and has a major in the college of Arts & Sciences?

$$P(NO \cap Arts \& Sciences) = \frac{88}{600}$$

.6783

____407/600____ 33. What is the probability that if one student is chosen that the student currently does not know if they want to go to graduate school or has a major in the College of Business?

$$P(Doesn't\ Know \cup Business) =$$

$$= P(Doesn't\ Know) + P(Business) - P(Doesn't\ Know \cap Business)$$

$$= \frac{195 + 267 - 55}{600} = \frac{407}{600}$$