STATISTICS 2023 NAME, PRINT IN INK______________________

EXAM TWO SIGNATURE, IN INK______________________

SPRING 2011 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. (4 points each)

__F__ 1. The number of children a person has is a continuous random variable.

__T__ 2. The Binomial and the Poisson random variables are both discrete random variables.

__T__ 3. The area associated with values less than the mean for a normal distribution is always equal to the area associated with the values more than the mean.

__F__ 4. Any normal distribution is a symmetric distribution which always has a mean value of zero and a standard deviation of one.

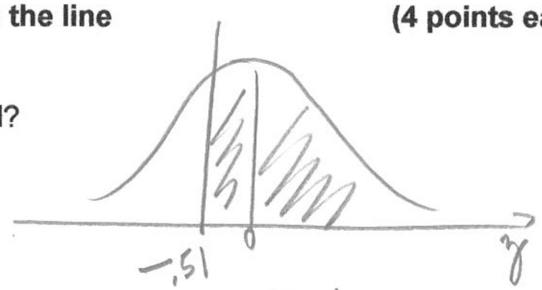
__F__ 5. An interval centered on the mean of a normal distribution that contains 95% of all the data is an interval of values that are within three standard deviations of the mean.

__F__ 6. The variance of the sample mean is equal to the variance of the original population variance.

Z-table Questions. Write your answer on the line (4 points each)

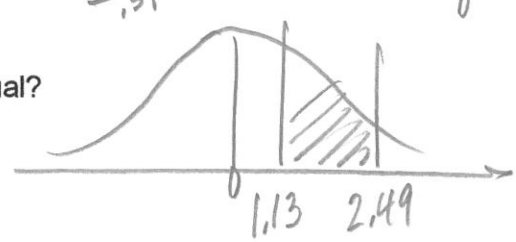
__.6950__ 7. What does $P(Z > -0.51)$ equal?

$.1950 + .5 = .6950$



__.1228__ 8. What does $P(1.13 < Z < 2.49)$ equal?

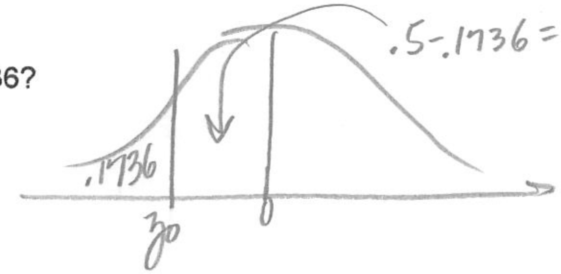
$.4936 - .3708 = .1228$



__-.94__ 9. What is z_o, such that $P(Z < z_o) = 0.1736$?

$.5 - .1736 = .3264$

	.04
.9	.3264



STATE THE ANSWER. State the answer on the line given. (4 points each)

25.76 10. Assume that a discrete random variable has five possible values (1, 2, 3, 5, 15) and each value has the same probability. What is the variance of such a random variable?

$\mu = \Sigma x \cdot p(x) = 1(.2) + 2(.2) + 3(.2) + 5(.2) + 15(.2) = 5.2$

$\sigma^2 = \Sigma x^2 \cdot p(x) - \mu^2 = 1^2(.2) + 2^2(.2) + 3^2(.2) + 5^2(.2) + 15^2(.2) - 5.2^2$

.43 11. In the gambling game Chunk-a-luck, it is possible to win \$0, \$1, \$2, or \$3 with respective probabilities 0.64, 0.30, 0.05, and 0.01. What is the expected value of the payoff for this game?

$\mu = \Sigma x \cdot p(x) = 0(.64) + 1(.30) + 2(.05) + 3(.01) =$

.1299 12. Forty-five percent of all college students plan to vote in the upcoming presidential election. If this percent is correct, then from a random sample of 20 college students, what is the probability that fewer than 7 of them will vote in the upcoming presidential election? State your answer with four digits past the decimal.

$X \sim Bi(n = 20, p = .45)$

$P(X < 7) = P(X = 0) + \ldots + P(X = 6) = .0000 + \ldots + .0746 = .1299$

.00908 13. A course that was served in a Chinese vegetarian banquet at a Buddhist temple was a platter of mushrooms. When attempting to pick up a round, slippery mushroom with chopsticks, an American tourist was successful 55% of the time. Assume that the attempts are independent trials. What is the probability that the tourist was successful at picking up fewer than 2 out of 9 mushrooms? Round your answer to five digits past the decimal.

$X \sim Bi(n = 9, p = .55)$

$P(X < 2) = P(X = 0) + P(X = 1) = \binom{9}{0} .55^0 .45^9 + \binom{9}{1} .55^1 .45^8 =$

.16332 14. On average there are 4.2 fire alarms per month called into a small rural volunteer fire department in northeastern Oklahoma. Based on this average, what is the probability that five fire alarms will be called into the fire department in one month? Round your answer to five digits past the decimal.

$X \sim Poi(\lambda = 4.2)$

$P(X = 5) = \frac{4.2^5 e^{-4.2}}{5!} = .16331586 7$

or .1911 .1912 15. Large bakeries typically have fleets of delivery trucks. One such bakery determined that the expected number of delivery truck breakdowns per day is 1.5. The bakery gets behind on deliveries when 3 or more break downs occur in the same day. What is the probability of that happening? State your answer with four digits past the decimal.

$X \sim Poi(\lambda = 1.5)$

$P(X \geq 3) = 1 - P(X \leq 2) = 1 - [P(X = 0) + P(X = 1) + P(X = 2)] \doteq .1912$

STATE THE ANSWER. State the answer on the line given. **(4 points each)**

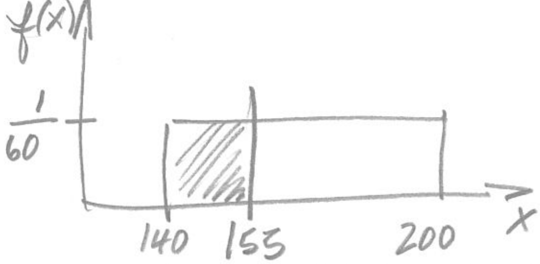
Suppose the research department of a steel manufacturer knows that one of the company's rolling machines produces sheets of steel of varying thickness. The thickness is a uniform random variable with values between 140 and 200 millimeters. Use this information to answer the next two questions. $X \sim Unf(140, 200)$

$\frac{15}{60}$ OR $.25$ 16. Sheets with thickness less than 155 millimeters must be scrapped because they are unacceptable to buyers. What is the probability sheets produced by this machine have to be scrapped?

$P(X < 155) =$

$= (155-140)\frac{1}{60}$

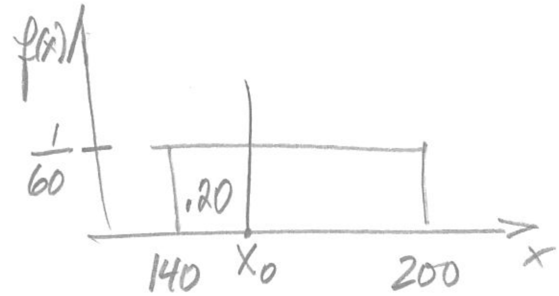
$= \frac{15}{60} = .25$



152 17. Twenty percent of the time the thickness of a sheet of this steel is less than how many millimeters?

Find X_0, $P(X < X_0) = .2$

$X_0 = 140 + .2(60) = 152$



Suppose a normally distributed random variable has a mean of 112 and a standard deviation of 22 units. Use this information to answer the last two questions on this page. $X \sim N(112, 22^2), \sigma = 22$

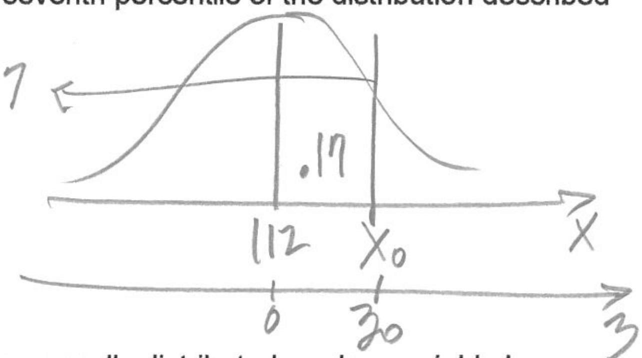
121.68 18. What is the value of the sixty-seventh percentile of the distribution described above?

Find X_0, $P(X < X_0) = .67$

$z_0 = .44$

$X_0 = \mu + z_0\sigma$

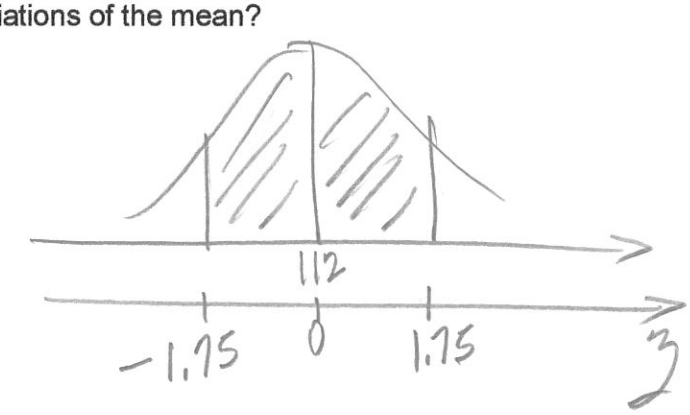
$= 112 + .44(22) =$



$.9198$ 19. What is the probability that the normally distributed random variable has values that are within 1.75 standard deviations of the mean?

$.4599 + .4599$

$= .9198$



STATE THE ANSWER. State the answer on the line given. **(4 points each)**

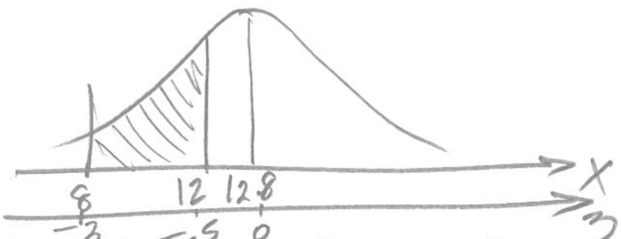
The estimated miles-per-gallon ratings of a class of trucks are normally distributed with a mean of 12.8 and a standard deviation of 1.6. $X \sim N(\mu = 12.8, \sigma^2 = 1.6^2), \sigma = 1.6$

$.3072$ 20. What is the probability that one of these trucks selected at random would get between 8 and 12 miles per gallon?

$P(8 < X < 12)$

$= P(-3 < Z < -.5)$

$= .4987 - .1915 =$

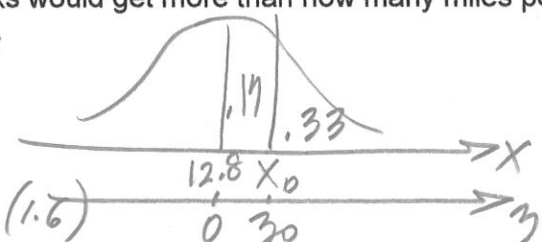


13.504 21. Thirty-three percent of these trucks would get more than how many miles per gallon?

Find X_0, $P(X > X_0) = .33$

$z_0 = .44$

$X_0 = \mu + z_0\sigma = 12.8 + .44(1.6)$



A manufacturer of automobile batteries claims that the lengths of life of its best battery has a mean of 54 months and a standard deviation of 5 months. Suppose a consumer group decides to check the claim by purchasing a sample of 100 of these batteries and subjecting them to tests that determine battery life. Use this information to answer the remaining questions.

$\mu = 54, \sigma = 5, n = 100$

54 22. What is the numerical value of the mean of the sampling distribution of the sample mean that results from the above situation?

$\mu_{\bar{x}} = \mu = 54$

$.5$ 23. What is the numerical value of the standard deviation of the sampling distribution of the sample mean that results from the above situation?

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{5}{\sqrt{100}} = .5$

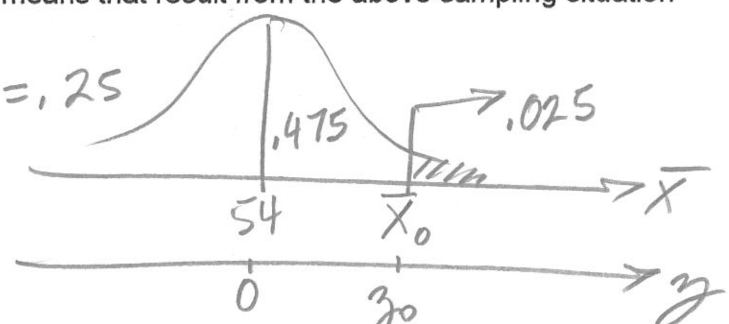
54.98 24. Only 2.5% of the sample means that result from the above sampling situation will be more than what value?

Find $\bar{X}_0$, $P(\bar{X} > \bar{X}_0) = .25$

$z_0 = 1.96$

$\bar{X}_0 = \mu_{\bar{x}} + z_0\sigma_{\bar{x}}$

$= 54 + 1.96(.5)$



$.6078$ 25. What is the probability that the sample mean which results from the above situation will be between 53.77 and 54.74?

$P(53.77 < \bar{X} < 54.74)$

$= P(-.46 < Z < 1.48)$

$= .1772 + .4306$