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

EXAM TWO **SIGNATURE IN INK** _____

FALL 2009 **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. Continuous random variables have probability only on specific values of the variable.

T 2. The expected value of a variable is mean of the variable and indicates the average value of the variable in the long run.

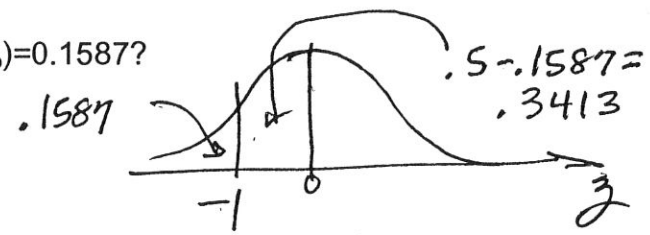
T 3. The probability distribution of a discrete random variable indicates the values of the variable and the probability of those values.

F 4. The Poisson probability mass function is left skewed, right skewed or symmetric depending on the value of lamda, the mean of the distribution.

T 5. The probability density function for the normal distribution is a bell-shaped curve centered at the value of the mean.

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

-1.0 6. What is z_o, such that $P(Z< z_o)=0.1587$?

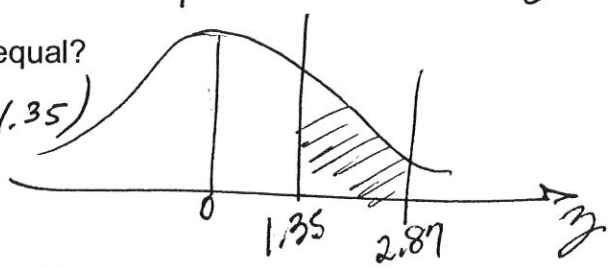


.0864 7. What does P(1.35 < Z < 2.87) equal?

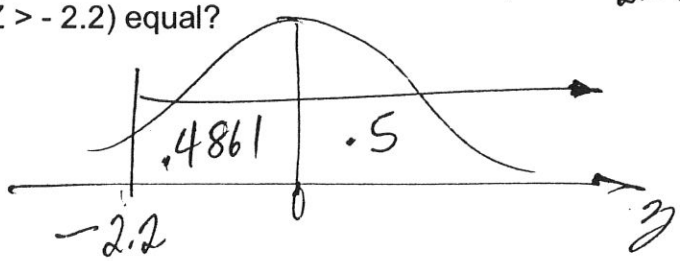
$= P(0<z<2.87) - P(0<Z<1.35)$

$= .4979 - .4115 =$

$= .0864$



.9861 8. What does P(Z > - 2.2) equal?



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

392.5 9. Suppose a person is shooting at a very small target. Assume that the person hits the target 3.5 percent of time. If the person hits the target, then that person wins $25,000. If the target is missed the loss is $500. What is the expected amount of money to be won?

x	25,000	−500
$p(x)$	.035	.965

$M = \sum x p(x) = 392.5$

.3 10. Assume that a discrete random variable has the values of 15, 25, 35, and 45 with probability of 0.40 on 15, 0.30 probability on 25, 0.20 probability on 35 and the remaining probability on 45. What is the probability that such a random variable is at least the value of 35?

x	15	25	35	45
$p(x)$	.4	.3	.2	.1

$P(X \geq 35) = .2 + .1$

.9787 11.Fifteen percent of people who buy a ticket in a certain game will win some prize. Assume 8 people purchase these tickets. What is the chance that at most three of them will win some prize? State the answer with four digits past the decimal.

X = # of people out of 8 who win a prize.

$X \sim Bi(n = 8, p = .15)$

$P(X \leq 3) = P(X=0) + P(X=1) + P(X=2) + P(X=3)$

.887549 12.Twelve percent of the people who visit the Amazon.com website buy some product. If five people go to Amazon.com, what is the probability that fewer than two of them will buy some product? State your answer with six digits past the decimal.

X = # of people out of 5 who buy some product.

$X \sim Bi(n = 5, p = .12)$

$P(X<2) = P(X=0) + P(X=1) = \binom{5}{0}.12^0 .88^5 + \binom{5}{1}.12^1 .88^4$

.4815 13.If the average number of customers coming to the counter at a diner in 5 minutes is 2.6, what is the probability that at least three customers will come to the counter in 5 minutes? State your answer with four digits past the decimal.

X = # of customers coming to the counter at a diner in 5.

$X \sim Poi(\lambda = 2.6)$

$P(X \geq 3) = P(X=3) + P(X=4) + \ldots = .4815$

$1 - P(X \leq 2) = .4816$

.149587 14. If the average number of accidents in a chemical manufacturing plant is 1.7, per year what is the probability that three accidents occur in one year? Round your answer to six digits past the decimal.

X = # of accidents in a chemical plant per yr.

$X \sim Poi(\lambda = 1.7)$

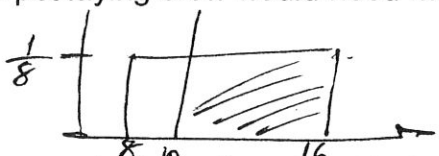
$P(X=3) = \dfrac{1.7^3 e^{-1.7}}{3!} = .149587$

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

The amount of floor glue needed by a carpet laying crew for a one-day shift is uniformly distributed between the values of 8 and 16 gallons. Use this information to answer the next two questions.

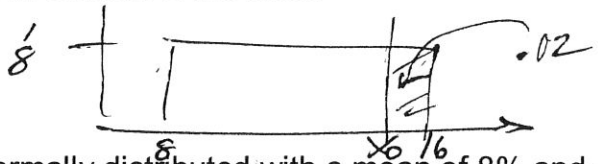
$\frac{6}{8}$ or .75 15. What is the probability that the carpet laying crew would need more than 10 gallons of floor glue for a one-day shift?

$Bh = P(X>10) = (16-10)\frac{1}{8} = \frac{6}{8}$



15.6 16. Every night the construction company who hires the carpet laying crew needs to stock pile the amount of floor glue needed for the next day's shift. How many gallons of floor glue should they have in stock at the beginning of each day if they want to have enough glue on hand so that they only run out 5% of the time?

$X_0 = 16 - .02(8) =$
$= 15.6$



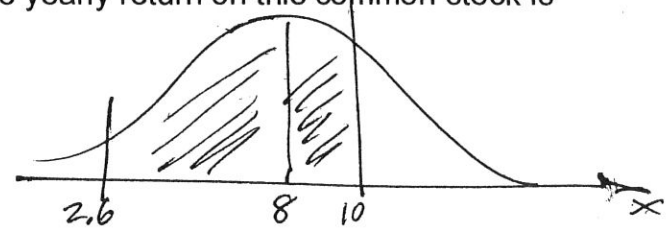
The yearly return on a common stock is normally distributed with a mean of 8% and a standard deviation of 4%. Use this information to answer the next five questions.

8% 17. The expected yearly return on the common stock is what percent?

$EX = M = 8\%$

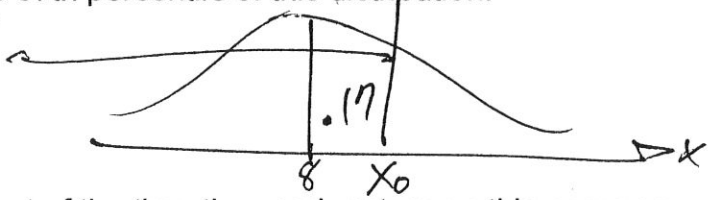
.603 18. What is the probability that the yearly return on this common stock is between 2.6% and 10%?

$P(2.6 < X < 10) =$
$= P(-1.35 < Z < .5) =$
$.603$



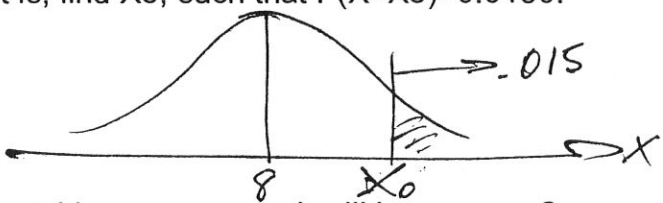
9.76% 19. Sixty-seven percent of the time the yearly return on this common stock is less than what percent? That is, find the 67th percentile of this distribution.

$X_0 = M + z_0\sigma$
$= 8 + (.44)4$



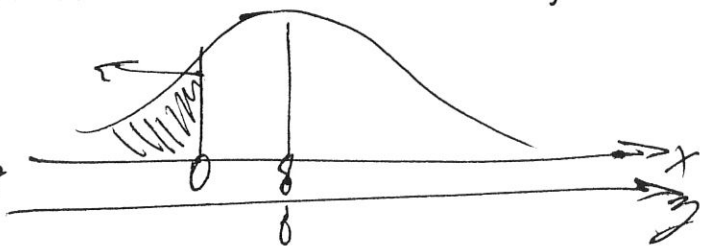
16.68 20. One and one-half percent of the time the yearly return on this common stock exceeds what percent return? That is, find Xo, such that P(X>Xo)=0.0150.

$X_0 = M + z_0\sigma$
$= 8 + 2.17(4)$
$= 16.68$



.0228 21. What is the probability that this common stock will lose money?

$P(X<0) =$
$= P(Z<-2) =$
$= .5 - .4772 = .0228$



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

The life of a car battery is measured in months rather than in miles that the car is driven. A certain type of car battery has a mean lifetime of 48 months with a standard deviation of 5 months. Assume that random samples of size one-hundred were repeated drawn from batteries of this type and the lifetimes in months were recorded. Use this information to answer the questions on this page.

48 22. What is the numerical value of the mean of all possible sample means that would result from repeated samples of one-hundred car battery lifetimes?

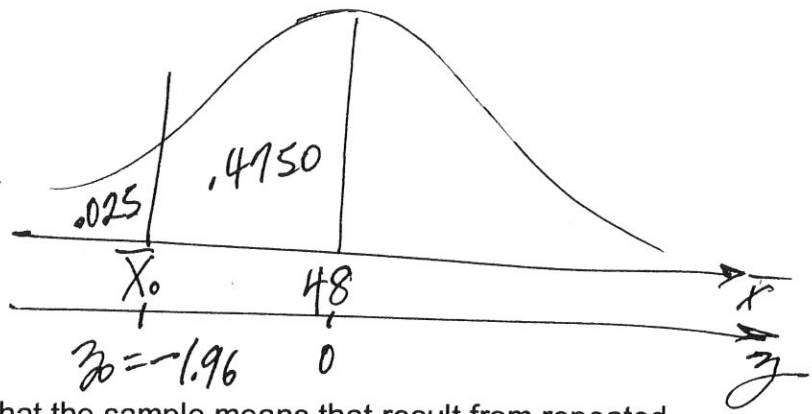
$$\mu_{\bar{x}} = \mu = 48$$

.5 23. What is the numerical value of the standard deviation of all possible sample means that would result from repeated samples of one-hundred car battery lifetimes?

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

47.02 24. Only 2.5% of the sample means of car battery lifetimes that result from the above repeated sampling situation will be less than what value?

$$\bar{x}_0 = \mu_{\bar{x}} + z_0 \sigma_{\bar{x}}$$
$$= 48 + (-1.96)(.5)$$
$$= 47.02$$



.8185 25. What is the probability that the sample means that result from repeated sampling of the car battery lifetimes will be between 47.5 and 49 months?

$$P(47.5 < \bar{x} < 49) =$$
$$= P(-1 < z < 2) =$$
$$= .3413 + .4772$$