Name TEACHR

THIS WILL BE COLLECTED ON THE DAY OF THE EXAM FOR A GRADE. WILL NOT BE COLLECTED AFTER THAT TIME PERIOD (JUNE 18TH 7:30-9:30). DO NOT FORGET TO BRING THIS WITH YOU AS WELL AS A PENCIL AND CALCULATOR. Thank you and have a nice day/future.

Chapter 4 - Discrete Probability Distributions

1) An insurance actuary asked a sample of senior citizens the cause of their automobile accidents over a two-year period. The random variable x represents the number of accidents caused by their failure to yield the right of way. Use the frequency distribution to construct a probability distribution.

Accidents	0	1	2	3	4	5
Senior Citizens	4	3	12	3	2	1

0	1	2	3	4	5
.16	.12	.48	.12	.08	.04

2) The random variable x represents the number of cars per household in a town of 1000 households. Find the probability of randomly selecting a household that has between one and three cars, inclusive.

Cars	Households
0	125
1	428
2	256
3	108
4	83

$\Rightarrow 792/1000 = \boxed{.792}$

SKIP

3) A test consists of 10 multiple choice questions, each with five possible answers, one of which is correct. To pass the test a student must get 60% or better on the test. If a student randomly guesses, what is the probability that the student will pass the test?

$\frac{1}{5} \cdot \frac{1}{5} \frac{1}{5}$ 20% $(.2)^6 = .000064 \Rightarrow .0064\%$

4) According to police sources a car with a certain protection system will be recovered 85% of the time. Find the probability that 5 of 7 stolen cars will be recovered.

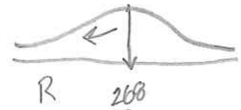
5) A company ships computer components in boxes that contain 20 items. Assume that the probability of a defective computer component is 0.2. Find the probability that the first defect is found in the seventh component tested.

6) A statistics professor finds that when he schedules an office hour at the 10:30 a.m. time slot, an average of three students arrives. Find the probability that in a randomly selected office hour no students will arrive.

Chapter 5 – Normal Probability Distributions

7) The lengths of pregnancies of humans are normally distributed with a mean of 268 days and a standard deviation of 15 days. A baby is premature if it is born three weeks early. What percentage of babies are born prematurely?

$z = \frac{\text{val} - \text{mean}}{SD}$ 24 21 days



$\frac{-21}{15} = -1.4 \Rightarrow z = .0808 \Rightarrow \boxed{8.08\%}$

8) The lengths of pregnancies of humans are normally distributed with a mean of 268 days and a standard deviation of 15 days. Find the probability of a pregnancy lasting more than 300 days.

chart

$\frac{32}{15} = 2.13 \Rightarrow .9834 \Rightarrow 1 - .9834 = \boxed{.0166} \Rightarrow 1.66\%$

9) An airline knows from experience that the distribution of the number of suitcases that get lost each week on a certain route is approximately normal with $\mu = 15.5$ and $\sigma = 3.6$. What is the probability that during a given week the airline will lose between 10 and 20 suitcases?

$P(10 < \bar{x} < 20) = P(-1.53 < z < 1.53)$

$\frac{10-15.5}{3.6}$ $z = -1.53$ $P = .0630$

$\frac{20-15.5}{3.6}$ 1.25 .8944

.1195

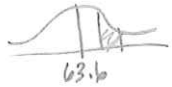
$P(z < 1.53) - P(z < -1.53)$

$.9370 - .0630 = \boxed{.874}$

.8336

10) Assume that the heights of women are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. The cheerleaders for a local professional basketball team must be between 65.5 and 68.0 inches. If a woman is randomly selected, what is the probability that her height is between 65.5 and 68.0 inches?

68 − 63.6



$P(z\ 68) - P(z\ 65.5)$

$P(1.76) - P(.76)$

$.9608 - .7764 = \boxed{.1844}$

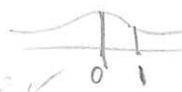
11) IQ test scores are normally distributed with a mean of 100 and a standard deviation of 15. Find the x-score that corresponds to a z-score of −1.645.

$z = \frac{x - \mu}{SD}$ $-1.645 = \frac{x - 100}{15}$ $\boxed{x = 75.3}$

12) A mathematics professor gives two different tests to two sections of his college algebra courses. The first class has a mean of 56 with a standard deviation of 9 while the second class has a mean of 75 with a standard deviation of 15. A student from the first class scores a 62 on the test while a student from the second class scores an 83 on the test. Compare the scores.

compare 2 scores

$\frac{62-56}{9}$ $z = .667$ Better b/c farther from mean $\frac{83-75}{15}$ $z = .53$



13) Assume that the heights of women are normally distributed with a mean of 64.9 inches and a standard deviation of 1.6 inches. Find Q_3, the third quartile that separates the bottom 75% from the top 25%.

Solve for x

$\frac{\boxed{x} - 64.9}{1.6} = .675$ From 75%

$x = 65.98$ or $\boxed{66\%}$

area/prob 75%

75%

14) Assume that blood pressure readings are normally distributed with a mean of 116 and a standard deviation of 4.8. If 36 people are randomly selected, find the probability that their mean blood pressure will be less than 118.

$z = \frac{118-116}{(4.8/\sqrt{36})} = \frac{2}{.77} = 2.597$ 2.6 $\boxed{p = .9953}$

15) The average number of pounds of red meat a person consumes each year is 196 with a standard deviation of 22 pounds (Source: American Dietetic Association). If a sample of 50 individuals is randomly selected, find the probability that the mean of the sample will be greater than 200 pounds.

$P(\mu_x > 200\text{lbs})$ so do 1 − p.

$\frac{200-196}{22/\sqrt{50}}$ $\frac{4}{3.11}$ $1.29 = z = .9015$

$1 - .9015 = \boxed{.0985}$

16) The failure rate in a statistics class is 30%. In a class of 50 students, find the probability that exactly five students will fail. Use the normal distribution to approximate the binomial distribution.

n = 50, p = .3, q = .7

$\sigma = \sqrt{npq} = 3.24$

$\frac{4.5 - 15}{3.24}$ val

$P(4.5 < x < 5.5)$

$P(-3.24 < x < -2.93)$

$.9917 - .0006 = \boxed{.0011}$

.00055 .055%, Binompdf (50,

17) A local motel has 50 rooms. The occupancy rate for the winter months is 60%. Find the probability that in a given winter month fewer than 35 rooms will be rented. Use the normal distribution to approximate the binomial distribution.

$P(x < 35)$ $P(x \le 34.5)$

p = .6, q = .4, $\sigma = 3.46$, np = 30

$z = \frac{35 - 30}{3.46}$ ~~.9265~~ .9044 ← binomcdf(50, .6, 34)

z = ~~1.45~~ 1.30 ⇒ $\boxed{.9032}$

Chapter 6 – Confidence Intervals

18) A group of 49 randomly selected students has a mean age of 22.4 years with a standard deviation of 3.8. Construct a 98% confidence interval for the population mean.

$\bar{x} \pm E$ $E = z_c \frac{\sigma}{\sqrt{n}} = 2.325\left(\frac{3.8}{\sqrt{49}}\right)$ E = 1.26

$\boxed{(21.14, 23.66)}$

19) Construct a 99% confidence interval for the population mean, μ. Assume the population has a normal distribution. A group of 19 randomly selected students has a mean age of 22.4 years with a standard deviation of 3.8 years.

$E = 2.878\left(\frac{3.8}{\sqrt{19}}\right)$

E = 2.51

$\boxed{(19.89, 24.91)}$

500 − 226 = 274

20) A survey of 500 non-fatal accidents showed that 226 involved the use of a cell phone. Construct a 99% confidence interval for the proportion of fatal accidents that involved the use of a cell phone.

q = .452, p = .548 ($\frac{274}{500}$)

$2.575\sqrt{\frac{(.452)(.548)}{500}}$

z = 2.575 E = .0573

$\boxed{(.3947, .5093)}$

$\hat{p} \pm E$ $E = z_c\sqrt{\frac{pq}{n}}$

.025

21) A student randomly selects 10 CDs at a store. The mean is $13.75 with a standard deviation of $1.50. Construct a 95% confidence interval for the population standard deviation, σ. Assume the data are normally distributed.

Chi

19.023 - R

$$\sqrt{\frac{9(1.5)^2}{2.70}} < X < \sqrt{\frac{9(1.5)^2}{19.023}}$$

2.73

$\boxed{(\$1.03 < x < \$2.73)}$

Chapter 7 – One-Sample Hypothesis Tests

22) A manufacturer claims that the mean lifetime of its fluorescent bulbs is 1000 hours. A homeowner selects 40 bulbs and finds the mean lifetime to be 990 hours with a standard deviation of 80 hours. Test the manufacturer's claim. Use α = 0.05.

(Z Test)

H_o $\mu = 1000$ claim

H_a $\mu \neq 1000$

Two Tailed

$z = -.79$

$z_c =$

FTR H_o ⇒ can not reject claim

23) A local group claims that the police issue at least 60 speeding tickets a day in their area. To prove their point, they randomly select two weeks. Their research yields the number of tickets issued for each day. The data are listed below. At α = 0.01, test the group's claim.

70	48	41	68	69	55	70
57	60	83	32	60	72	58

H_o: $\mu \geq 60$ claim

H_a: $\mu < 60$

Left tailed

$t = .059$

$t_c = +2.65$

FTR H_o → not enough evidence to reject Claim

24) A recent study claimed that at least 15% of junior high students are overweight. In a sample of 160 students, 18 were found to be overweight. If α = 0.05, test the claim.

Left Tailed

H_o $p \geq .15$ claim

H_a $p < .15$

$n = 160$

$.1 = \hat{p}$

$z = -1.33$

$z_c = -1.645$

FTR H_o insufficient evidence to reject claim

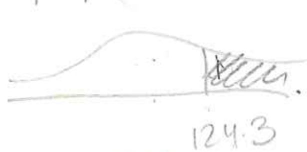
25) A trucking firm suspects that the variance for a certain tire is greater than 1,000,000. To check the claim, the firm puts 101 of these tires on its trucks and gets a standard deviation of 1200 miles. If α = 0.05, test the trucking firm's claim.

$$\chi^2 = \frac{(n-1)s^2}{\sigma^2}$$

$$\frac{100(1200)^2}{1000000}$$

H_o: $\sigma^2 \leq 1000000$

H_a: $\sigma^2 > 1000000$ claim



Reject H_o supp claim

$\chi^2 =$ ~~.0?~~ 124.3

$\chi^2 = 144$

~~Fail to Reject~~

Chapter 8 – Two-Sample Hypothesis Tests

26) A local bank claims that the waiting time for its customers to be served is the lowest in the area. A competitor bank checks the waiting times at both banks. The sample statistics are listed below. Test the local bank's claim. Use $\alpha = 0.05$.

Local Bank	Competitor Bank
$n_1 = 45$	$n_2 = 50$
$\overline{x}1 = 4.6$ minutes	$\overline{x}2 = 4.9$ minutes
$s_1 = 1.1$ minutes	$s_2 = 1.0$ minute

$H_0: \mu_L \geq \mu_C$

$H_a: \mu_L < \mu_C$ claim

$z = -1.39$

$z_c = -1.64$

FTR H_0

insufficient evidence to support claim

27) A sports analyst claims that the mean batting average for teams in the American League is not equal to the mean batting average for teams in the National League because a pitcher does not bat in the American League. The data listed below are from randomly selected teams in both leagues. Assume the population variances are equal. Test the analyst's claim using $\alpha = 0.05$.

American League
0.279 0.274 0.271 0.268
0.265 0.254 0.240

$n = 7$
$\bar{x} = .264$
$S_x = .0133$

National League
0.284 0.267 0.266 0.263
0.261 0.259 0.256

$n = 7$
$\bar{x} = .265$
$S_x = .009$

$H_0: \mu_A = \mu_N$

$H_a: \mu_A \neq \mu_N$ claim

$t_c = \pm 2.44$

$t = .117$

FTR Ho

can not support claim

28) Nine students took the SAT. Their scores are listed below. Later on, they took a test preparation course and retook the SAT. Their new scores are listed below. Test the claim that their scores improved. Use $\alpha = 0.05$. Assume that the distribution is normally distributed.

$L_1 - L_2$

B/C

Student	1	2	3	4	5	6	7	8	9
L_1 Scores before course	720	860	850	880	860	710	850	1200	950
L_2 Scores after course	740	860	840	920	890	720	840	1240	970

$H_0: \mu_d \geq 0$

$H_a: \mu_d < 0$ claim

Left Tailed

want difference to be neg to show L_2 higher thus better

$t = -2.40$

$t_c = -1.86$

Reject Ho

Support claim

students do Better

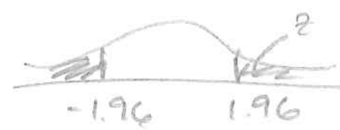
29) In a recent survey of gun control laws, a random sample of 1000 women showed that 65% were in favor of stricter gun control laws. In a random sample of 1000 men, 60% favored stricter gun control laws. Test the claim that the percentage of men and women favoring stricter gun control laws is the same. Use $\alpha = 0.05$.

$H_0: p_1 = p_2$ claim $n = 1000$ $n = 1000$

$H_a: p_1 \neq p_2$ $p = .65$ $p = .60$

$z = \pm 2.31$

$z = 1.96$



Reject H_0 so reject claim