Math 210 – Final Exam – Practice Problems

Use the given degree of confidence and sample data to construct a confidence interval for the population mean μ. Assume that the population has a normal distribution.

1) The principal randomly selected six students to take an aptitude test. Their scores were:
78.2 81.3 86.1 84.2 72.8 85.2
Determine a 90 percent confidence interval for the mean score for all students.

A) $85.57 < \mu < 77.03$
B) $77.13 < \mu < 85.47$
C) $77.03 < \mu < 85.57$
D) $85.47 < \mu < 77.13$

put the data in L_1

STAT/TESTS/ #8

(77.129, 85.471)

Use the given degree of confidence and sample data to construct a confidence interval for the population proportion p.

2) Of 346 items tested, 12 are found to be defective. Construct the 98% confidence interval for the proportion of all such items that are defective.

A) $0.0345 < p < 0.0349$
B) $0.0154 < p < 0.0540$
C) $0.0118 < p < 0.0576$
D) $0.0110 < p < 0.0584$

STAT/TESTS/ A

$x = 12$

$n = 346$

(0.0118, 0.05757)

Use the Poisson Distribution to find the indicated probability.

3) The Columbia Power Company experiences power failures with a mean of $\mu = 0.210$ per day. Find the probability that there are exactly two power failures in a particular day.

A) 0.036 B) 0.027 C) 0.085 D) 0.018

poissonpdf(0.210, 2) = 0.0179

Solve the problem.

4) The annual precipitation amounts in a certain mountain range are normally distributed with a mean of 99 inches, and a standard deviation of 14 inches. What is the probability that the mean annual precipitation during 49 randomly picked years will be less than 101.8 inches?

A) 0.4192 B) 0.9192 C) 0.0808 D) 0.5808

$\bar{x}$

$\mu = 99, \quad \sigma = 14, \quad n = 49$

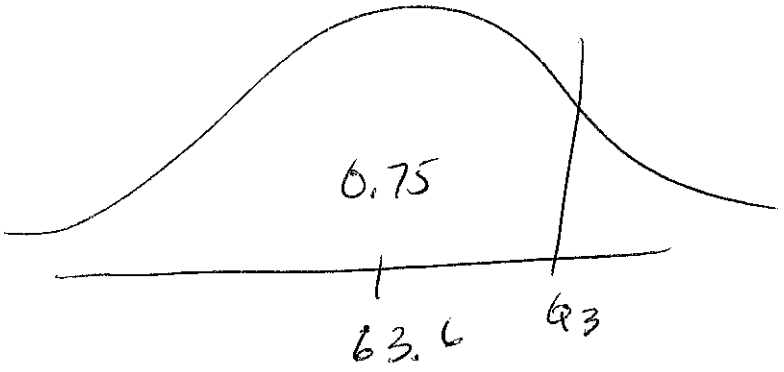
$P(\bar{x} < 101.8) = \text{normalcdf}(-1E99, 101.8, 99, \frac{2}{\frac{\sigma}{\sqrt{n}}})$

$= 0.9192$

5) Assume that women have heights that are normally distributed with a mean of 63.6 inches and a standard deviation of 2.5 inches. Find the value of the quartile Q_3.

A) 65.3 inches B) 66.1 inches C) 64.3 inches D) 67.8 inches

$Q_3 = 75^{th}$ percentile



$Q_3 = \text{invNorm}(0.75, 63.6, 2.5) = 65.286$

6) On a multiple choice test with 21 questions, each question has four possible answers, one of which is correct. For students who guess at all answers, find the mean for the number of correct answers.

A) 10.5 B) 5.25 C) 15.8 D) 7

p = prob of guessing correct = $\frac{1}{4}$

$np = 21\left(\frac{1}{4}\right) = 5.25$

7) Find the variance for the given probability distribution.

x	P(x)
0	0.05
2	0.17
4	0.43
6	0.35

A) 1.56 (B) 2.85 C) 1.69 D) 2.44

X in L_1

P(X) in L_2

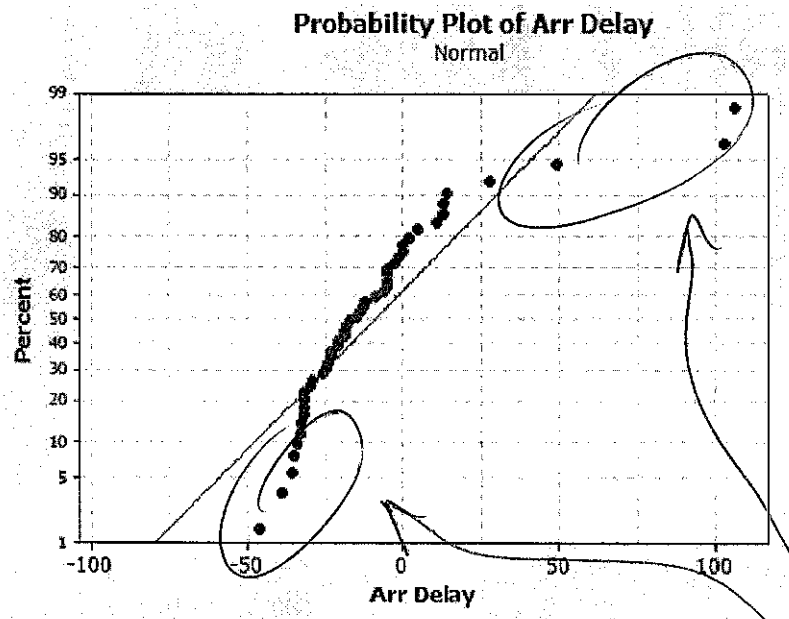
1-var Stats L_1, L_2

$\sigma_x = 1.689$ is the std dev

so the variance is $1.689^2 = 2.853$

Answer the question about the normal probability plot.

8) A normal probability plot of arrival delay times is given below. Is it reasonable to conclude that arrival delays are from a population that is normally distributed?



A) Yes, since the plot is not a straight-line pattern.
B) No, since the plot is not a straight-line pattern.
C) Yes, since the plot is a straight-line pattern.
D) No, since the plot is a straight-line pattern.

There are big deviations from the straight-line pattern.

Use the confidence level and sample data to find a confidence interval for estimating the population μ.

9) A group of 52 randomly selected students have a mean score of 20.2 with a standard deviation of 4.6 on a placement test. What is the 90 percent confidence interval for the mean score, μ, of all students taking the test?

A) $19.0 < \mu < 21.5$ B) $18.6 < \mu < 21.8$ C) $18.7 < \mu < 21.7$ D) $19.1 < \mu < 21.3$

STAT/TESTS/8

$\bar{x} = 20.2$

$s = 4.6$

$n = 52$

(19.131, 21.269)

Find the indicated probability.

10) Find the probability of at least 2 girls in 9 births. Assume that male and female births are equally likely and that the births are independent events.

A) 0.910 B) 0.070 C) 0.020 D) 0.980

$p = 0.5$

X = # of girls in 9 births is binomial with $n = 9$, $p = 0.5$.

X	0	1	2	3	----	9
P(X)						

All P(X) add to 1. The only ones we don't want are P(0) and P(1).

So, P(at least 2) = $1 - P(0) - P(1)$

$= 1 - \text{binompdf}(n, p, 0) - \text{binompdf}(n, p, 1)$

$= 0.9804$

11) The diameters of pencils produced by a certain machine are normally distributed with a mean of 0.30 inches and a standard deviation of 0.01 inches. What is the probability that the diameter of a randomly selected pencil will be less than 0.285 inches?

A) 0.0668 B) 0.9332 C) 0.0596 D) 0.4332

normalcdf(-1E99, 0.285, 0.3, 0.01)

12) Find the probability of correctly answering the first 2 questions on a multiple choice test if random guesses are made and each question has 3 possible answers.

A) $\frac{1}{9}$ B) $\frac{1}{8}$ C) $\frac{3}{2}$ D) $\frac{2}{3}$

independence

P(Q #1 correct and Q #2 correct)

= P(Q #1 correct) × P(Q #2 correct)

= $\frac{1}{3} \times \frac{1}{3}$

= $\frac{1}{9}$

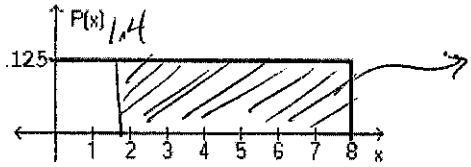
If Z is a standard normal variable, find the probability.

13) The probability that Z lies between -1.10 and -0.36

A) 0.4951 B) 0.2237 C) -0.2237 D) 0.2239

normalcdf(-1.1, -0.36, 0, 1)

Using the following uniform density curve, answer the question.



Find this area

14) What is the probability that the random variable has a value greater than 1.4?

A) 0.8250 B) 0.9500 C) 0.7750 D) 0.7000

= length × width

= (8 - 1.4) × (0.125)

= 0.825

Find the value of the linear correlation coefficient r.

15)

x	57	53	59	61	53	56	60
y	156	164	163	177	159	175	151

A) 0.109 B) −0.078 C) −0.054 D) 0.214

x in L_1

y in L_2

STAT / CALC / #4

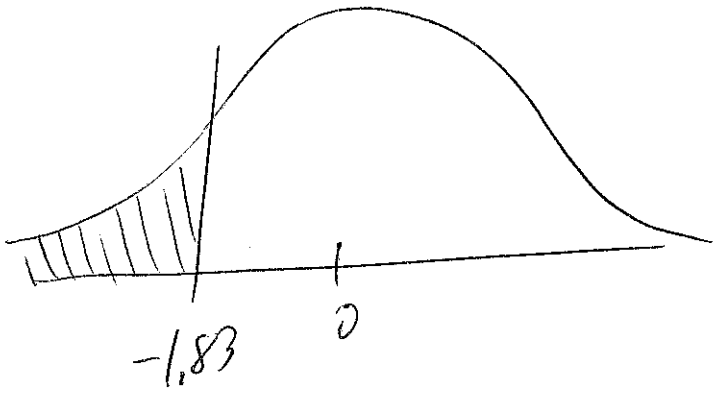
Use the given information to find the P-value.

16) The test statistic in a left-tailed test is z = −1.83.

A) 0.4326 B) 0.4232 C) 0.0443 D) 0.0336

Use the flowchart. Since this is a left-tailed test, p-value = area to the left of −1.83.

Since the test statistic is "z =", use normalcdf.



normalcdf(−1E99, −1.83, 0, 1)

Find the mean of the given probability distribution.

17)

x	P(x)
0	0.19
1	0.11
2	0.30
3	0.06
4	0.34

A) 2.34 B) 2.25 C) 2.15 D) 2.44

X in L_1

P(X) in L_2

1-Var Stats L_1, L_2

Perform the indicated goodness-of-fit test.

18) In studying the occurrence of genetic characteristics, the following sample data were obtained. Find the test statistic to test the claim that the characteristics occur with the same frequency.

$n = 28+30+45+48+38+39$

$= 228$

Characteristic	A	B	C	D	E	F
Frequency	28	30	45	48	38	39
Expected	38	38	38	38	38	38

A) 7.012 B) 8.718 C) 8.263 D) 9.113

If the char occurred with the same freq, we would expect $228/6 = 38$ for each

Put obs in L_1

Put Exp in L_2 $\Rightarrow$ Sum$((L_1 - L_2)^2/L_2)$

2nd STAT

#5: Sum

19) A company manager wishes to test a union leader's claim that absences occur on the different week days with the same frequencies. What is the critical value needed to test this claim at the 0.05 level of significance if the following sample data have been compiled?

Day	Mon	Tue	Wed	Thur	Fri
Absences	37	15	12	23	43

A) 11.071 B) 11.143 C) 12.833 D) 9.488

critical values are table lookups

$d.f. = k - 1 = 5 - 1 = 4$

use Table A-4

Compute the test statistic used to test the null hypothesis that $p_1 = p_2$.

20) $n_1 = 179$ $n_2 = 173$

$x_1 = 65$ $x_2 = 59$

A) 0.358 B) 10.986 C) 0.434 D) 5.915

STAT/TESTS/#6

Find the indicated measure.

21) The test scores of 32 students are listed below. Find P_{46}.

32 37 41 44 46 48 53 55
56 57 59 63 65 66 68 69
70 71 74 74 75 77 78 79
80 82 83 86 89 92 95 99

A) 67 B) 14.72 C) 68 D) 15

$32(0.46) = 14.72$

Since 14.72 is not an integer, go up to 15.

The 15th integer starting with the smallest is 68

22) Six college friends bought each other Christmas gifts. They spent:

$261.12 $120.52 $186.23 $298.97 $171.55 $263.96

What was the mean amount spent? Round your answer to the nearest cent.

A) $325.59 B) $260.47 C) $217.06 D) $248.47

add and divide by 6

23) Find the smallest sample size required to have a confidence interval for a mean with a margin of error of \$133, confidence level: 99%, σ = \$533

A) 107 B) 62 C) 0 D) 54

$$n = \left(\frac{2.576\,(533)}{133} \right)^2 = 106.57$$

Always round up $\Rightarrow$ 107

Solve the problem. Round results to the nearest hundredth.

24) The mean of a set of data is 3.76 and its standard deviation is 4.97. Find the z score for a value of 13.84.

A) 2.03 B) 2.33 C) 2.23 D) 1.83

$$z = \frac{x - \bar{x}}{s} = \frac{13.84 - 3.76}{4.97} = 2.028$$

Identify the null hypothesis H_0 and the alternative hypothesis H_1. Use μ for a claim about a mean, p for a claim about a proportion, and σ for a claim about variation.

25) An entomologist writes an article in a scientific journal which claims that fewer than 21 in ten thousand male fireflies are unable to produce light due to a genetic mutation. Use the parameter p, the true proportion of fireflies unable to produce light.

A) H_0: $p = 0.0021$ ($\leq$)
H_1: $p > 0.0021$

B) H_0: $p > 0.0021$
H_1: $p \leq 0.0021$

C) H_0: $p < 0.0021$
H_1: $p \geq 0.0021$

D) H_0: $p = 0.0021$ ($\geq$)
H_1: $p < 0.0021$

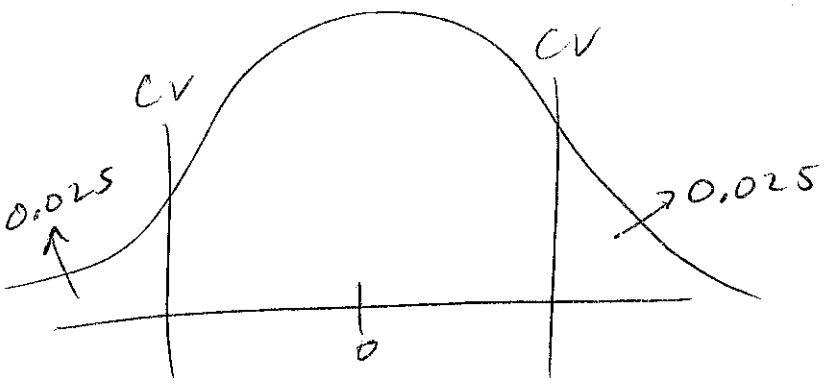
fewer than $\Rightarrow$ $p < 0.0021$
this is H_1

Determine the decision criterion for rejecting the null hypothesis in the given hypothesis test; i.e., describe the values of the test statistic that would result in rejection of the null hypothesis. $H_1: \mu_d \neq 0$

26) Suppose you wish to test the claim that μ_d, the mean value of the differences d for a population of paired data, is different from 0. Given a sample of n = 23 and a significance level of $\alpha = 0.05$, what criterion would be used for rejecting the null hypothesis?

A) Reject null hypothesis if test statistic > 2.069 or < –2.069.
B) Reject null hypothesis if test statistic > 1.717.
C) Reject null hypothesis if test statistic > 2.074 or < –2.074.
D) Reject null hypothesis if test statistic > 1.717 or < –1.717.

Find the critical value.



$df = n - 1 = 22$
area in one tail $= 0.025$
Table A-3 gives
2.074
one CV is -2.074
and the other is $+2.074$

Find the minimum sample size you should use to assure that your estimate of $\hat{p}$ will be within the required margin of error around the population p.

27) Margin of error: 0.023; confidence level: 95%; $\hat{p}$ and $\hat{q}$ are unknown

A) 39 B) 21 C) 1816 D) 1670

$$n = \left(\frac{1.96}{0.023}\right)^2 0.25$$

$$= 1815.501$$

round up

Use a χ^2 test to test the claim that in the given contingency table, the row variable and the column variable are independent.

28) Responses to a survey question are broken down according to employment status and the sample results are given below. What is the expected count for the cell **Employed and Undecided** needed to test the claim that response and employment status are independent.

	Yes	No	Undecided
Employed	30	15	5
Unemployed	20	25	10

A) 5.006 B) 6.427 C) 8.993 D) 7.142

option 1:

$$\frac{(\text{row total}) \times (\text{column total})}{\text{grand total}}$$

$$= \frac{50 \times 15}{105}$$

$$= 7.143$$

option 2

create a 2x3 matrix

run STAT/TESTS/C

open matrix [B]

this value

$$B = \begin{bmatrix} \bigcirc & \bigcirc & \bigcirc \\ \bigcirc & \bigcirc & \bigcirc \end{bmatrix}$$

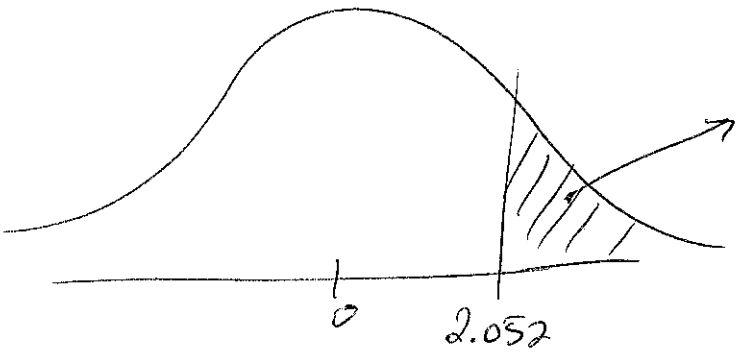
right sided test

Find the p-value.

29) Determine the p-value when testing $H_1: \mu > 45$ if the test statistic is $t = 2.052$, $n = 16$ and the level of significance is 0.05.

A) 0.0285 B) 0.0290 C) 0.0200 D) 0.0580

Use the flowchart. Since this is a right sided test, p-value = area to the right of the T.S. Since the test statistic is "t", use tcdf.



p-value = tcdf(2.052, 1E99, 15)

d.f. = n − 1

Find the variance for the given data. Round your answer to one more decimal place than the original data.

30) 6.9, 2.7, 1.1, 5.9, and 6.5

A) 6.51 B) 5.29 C) 6.61 D) 11.06

put the data in a list

STAT/CALC/1-Var Stats

$S_x = 2.5713$

So

$S^2 = 2.5713^2 = 6.6116$

Assume that a hypothesis test of the given claim will be conducted. Identify the type I or type II error for the test.

31) The manufacturer of a refrigerator system for beer kegs produces refrigerators that are supposed to maintain a true mean temperature, μ, of 45°F, ideal for a certain type of German pilsner. The owner of the brewery does not agree with the refrigerator manufacturer, and claims he can prove that the true mean temperature is incorrect. Identify the type I error for the test.

A) The error of failing to reject the claim that the mean temperature equals 45°F when it is really does equal 45°F.

B) The error of failing to reject the claim that the mean temperature equals 45°F when it is really different from 45°F.

C) The error of rejecting the claim that the mean temperature equals 45°F when it really does equal 45°F.

D) The error of rejecting the claim that the mean temperature equals 45°F when it is really different from 45°F.

$H_0: \mu = 45$ $H_1: \mu \neq 45$

A Type I error is concluding H_0 is false when actually H_0 is true

---

concluding H_0 is false $\Rightarrow$ we reject H_0 so either C or D

Look at C $\Rightarrow$ when it really does equal 45 $\Rightarrow$ H_0 is true

Find the indicated probability.

32) The percentage of couples where both parties are in the labor force is 52.1%. A random sample of 5 couples is taken. Find the probability that 2 of the couples are in the labor force.

A) 0.461 B) 0.298 C) 0.055 D) 0.117

Binomial

binompdf(n, p, 2) = binompdf(5, 0.521, 2)

$= 0.2983$

$q = 1 - p$

Solve the problem.

33) It is reported that 77% of workers aged 16 and over drive to work alone. A random sample of 8 workers is taken. Find the standard deviation for the number of workers that drive to work alone.

A) 1.417 (B) 1.19 C) 1.906 D) 1.784

$\sqrt{npq} = \sqrt{8(0.77)(1-0.77)} = 1.1903$

34) A train yard consists of 4 tank cars, 12 boxcars, and 7 flatcars. How many ways can a train be made up consisting of 2 tank cars, 5 box cars, and 3 flat cars?

A) 148,973 B) 173,425 C) 151,800 (D) 166,320

Select 2 tank cars $\Rightarrow$ ${}_4C_2 = 6$

Select 5 box cars $\Rightarrow$ ${}_{12}C_5 = 792$

Select 3 flat cars $\Rightarrow$ ${}_7C_3 = 35$

$6 \times 792 \times 35 = 166320$

Find the best predicted value of y corresponding to the given value of x.

35) Eight pairs of data yield r = 0.708 and the regression equation $\hat{y} = 55.8 + 2.79x$. Also, $\bar{y} = 71.125$. What is the best predicted value of y for x = 7.3?

A) 237.15 B) 71.13 C) 57.80 (D) 76.17

$55.8 + 2.79(7.3) = 76.167$

Find the indicated probability.

36) Three cable channels have quiz shows, comedies, and dramas. The number of each is shown below. A show is selected at random. Find the probability the show is a comedy given that it is on channel 10.

Type of Show	Channel 6	Channel 8	Channel 10	Total
Quiz Show	5	2	1	8
Comedy	3	2	8	13
Drama	4	4	2	10
Total	12	8	11	31

A) 8/13 B) 13/31 C) 8/11 D) 8/31

There are 11 shows on Channel 10. Of these, 8 are comedies $\Rightarrow$ 8/11.

OR

$$P(\text{comedy} \mid \text{ch 10}) = \frac{P(\text{com and ch 10})}{P(\text{ch 10})} = \frac{8/31}{11/31}$$

$$= \frac{8}{31} \times \frac{31}{11} = \frac{8}{11}$$

Solve the problem.

37) A television news director wishes to use 3 news stories on an evening show. One will be the lead story, one will be the second story, and the last will be a closing story. If the director has a total of 8 stories to choose from, how many possible ways can the program be set up?

A) 320 B) 336 C) 348 D) 356

order is important

$8 \times 7 \times 6 = 336$

OR $\quad {}_8P_3$

Find the critical value.

38) Responses to a survey question are broken down according to gender and the sample results are given below. At the 0.05 significance level, find the critical value needed to test the claim that response and gender are independent.

	Yes	No	Undecided
Male	25	50	15
Female	20	30	10

↑ keyword

↳ table lookup

A) 5.991 B) 12.592 C) 4.605 D) 9.210

$r = 2 \quad c = 3 \Rightarrow d.f. = (r-1)(c-1) = (2-1)(3-1) = 2$

use Table A-4

Find the mean of the data summarized in the given frequency distribution.

39) A sample of 20 runners recorded the number of miles run during one week. Estimate the mean number of miles run.

Miles Run	Frequency	Midpoints
5.5 - 10.5	1	8
10.5 - 15.5	2	13
15.5 - 20.5	3	18
20.5 - 25.5	5	23
25.5 - 30.5	4	28
30.5 - 35.5	3	33
35.5 - 40.5	2	38

A) 23 B) 24.5 C) 23.5 D) 24

$\frac{5.5+10.5}{2} = 8$

$\frac{10.5+15.5}{2} = 13$

examples of midpoints

After you find the midpoints,
put midpoints in L_1,
put Freq in L_2
1-var Stats L_1, L_2

$\bar{x} = 24.5$

Find the indicated probability.

40) The random variable x is the number of houses sold by a realtor in a single month at the Sendsom's Real Estate office. Its probability distribution is as follows. Find the probability that there are at least 4 houses sold in a single month.

4 or more

Houses Sold (x)	Probability P(x)
0	0.24
1	0.01
2	0.12
3	0.16
4	0.01
5	0.14
6	0.11
7	0.21

A) 0.53 B) 0.46 C) 0.47 D) 0.54

$0.01 + 0.14 + 0.11 + 0.21 =$

Answer the question about the Minitab output below.

41) For the Minitab output below, some values have been replaced by a question mark (?). Determine the p-value.

it's a 2 sided test

Test of mu = 20 vs not = 20

Variable	N	Mean	StDev	SE Mean	95% CI	T	P
Taxi Out	22	?	?	1.33	(18.29, 23.66)	1.82	?

A) 0.0824 B) 0.0830 C) 0.0688 D) 0.0719

test statistic

By the flowchart,

$= 2 \times$ (area to the right of 1.82)

$= 2 \times tcdf(1.82, 1E99, 21)$

$= 0.08304$

d.f. $= n - 1 = 21$

Solve the problem.

42) To test the effectiveness of a new drug, a researcher gives one group of individuals the new drug and another group a placebo. Use the results in the table below to find the test statistic needed to test the claim that the row and column variables are independent.

	Effective	Not Effective
Drug	32	9
Placebo	12	18

A) 10.642 B) 12.057 C) 8.591 D) 11.008

Create a 2 x 2 matrix in [A]

STAT / TESTS / C

The test statistic is $\chi^2 = 10.642$.

Test the indicated claim about the means of two populations. Assume that the two samples are independent and that they have been randomly selected.

43) A random sample of drivers in both Miami and Baltimore is taken. Their commuting times is recorded. Find the test statistic to test the claim that the mean commuting time is longer for those living in Baltimore.

Miami	Baltimore
$n = 35$	$n = 40$
$\bar{x} = 28.5$	$\bar{x} = 35.2$
$s = 7.2$	$s = 9.1$

A) -3.555 B) -3.108 C) -4.213 D) -3.964

STAT / TESTS / #4

Choose pooled = No

The test statistic is $t = -3.555$

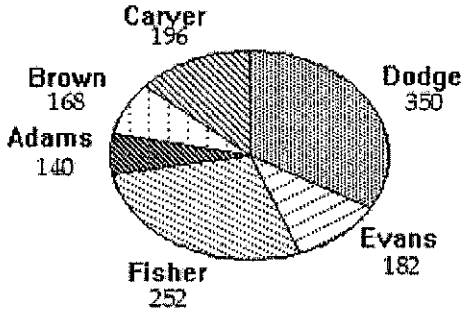
44) An advertising firm asked 92 customers at each of three local shopping malls if they were willing to take part in a market research survey. If we select one of the customers asked, what's the chance they will participate ?

	Mall A	Mall B	Mall C	Total
Will Participate	52	45	36	133
Will Not Participate	40	47	56	143
Total	92	92	92	276

A) 0.482 B) 0.133 C) 0.5 D) 0.304

$\frac{133}{276} = 0.4819$

45) The pie chart below gives the number of students in the residence halls at the state university. What percentage live in the Carver residence hall?



A) 19.6% B) 15.2% C) 22.3% D) 11.8%

$\frac{196}{196 + 350 + 182 + 252 + 140 + 168} = 0.15217$

Use the given information to find the P-value.

46) The test statistic in a two-tailed test is z = -1.93.

A) 0.0268 B) 0.1253 C) 0.0536 D) 0.4372

By the flowchart, the p-value is "twice the area to the left of -1.93". Since the test statistic is "z=", use normalcdf

p-value = 2(normalcdf(-1E99, -1.93, 0, 1))

= 0.0536

Express the null hypothesis H_0 and the alternative hypothesis H_1 in symbolic form. Use the correct symbol (μ, p, σ)for the indicated parameter.

47) The mean pulse rate of male marathon runners is less than 70 beats per minute.

A) H_0: $\mu < 70$
H_1: $\mu \geq 70$

B) H_0: $\mu = 70$ ($\geq$)
H_1: $\mu < 70$

C) H_0: $\mu = 70$
H_1: $\mu \neq 70$

D) H_0: $\mu = 70$ ($\leq$)
H_1: $\mu > 70$

mean ... less than 70 $\Rightarrow \mu < 70$

This is H_1 and H_0 is the opposite

$H_0: \mu \geq 70$

$H_1: \mu < 70$

48) What is the range of the data in the stem plot below?

Stem	Leaves
5	1 7
6	1 1 2 7
7	1 2 2 7 9
8	2 5

A) 308 B) 48 C) 34 D) 46

$85 - 51 = 34$

49) We are interested in conducting a test with the following hypothesis H_0: $\mu = 20$ ($\leq$) vs. H_1: $\mu > 20$. If the sample size is 15, s = 12 and the level of significance is 0.05, what is the rejection region for this test? Reject H_0 if :

A) $t > 1.753$ B) $t > 1.761$ C) $z > 1.96$ D) $z > 1.645$

t or z are test statistics

You compare the test statistic to critical values.

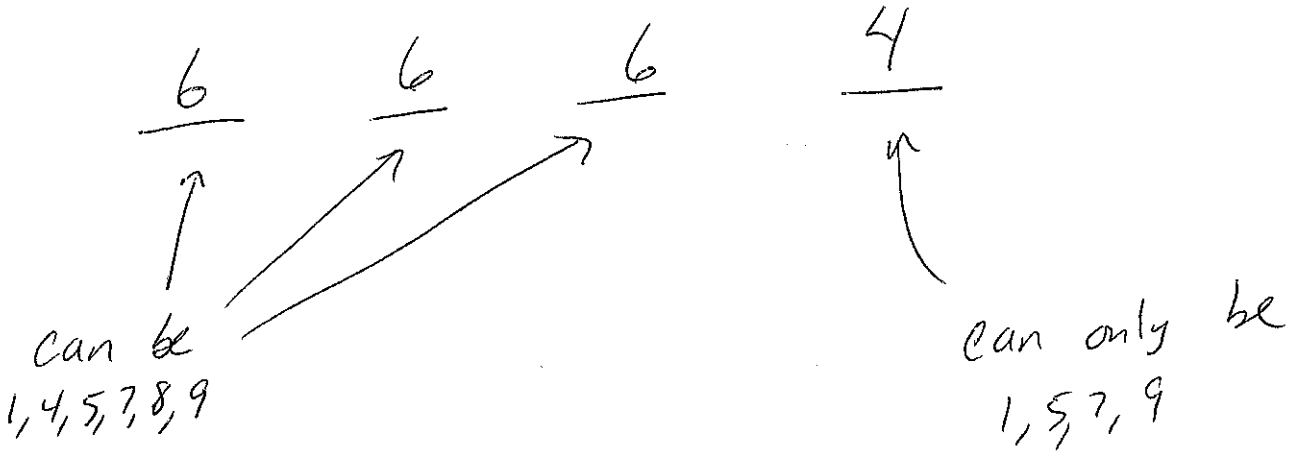
$\alpha = 0.05$
d.f. $= n - 1 = 14$
use Table A-3

1.761

50) Given the numbers 1,4,5,7,8, and 9, how many 4 digit numbers can be made that are NOT evenly divisible by two? Repetitions are allowed.

A) 246 B) 580 C) 432 D) 864

So, the 4 digit # must end in an odd # — 1, 5, 7, 9



$6 \times 6 \times 6 \times 4 = 864$