

## BA 240 Practice Exam 2 - Statistics

Name: \_\_\_\_\_

**FOR FULL POINTS SHOW ALL FORMULAE AND CALCULATIONS.  
UNLESS OTHERWISE NOTED, CALCULATE TO 3 DECIMAL PLACES.**

1. In a destructive test of product quality, a briefcase manufacturer measures how much weight it takes to crush the briefcase. 45 cases were randomly sampled and the confidence interval at 99% was from 335.74 to 352.26.

Calculate the mean and standard deviation. (5 points)

n	45	
Mean	344	
Std	21.5	
Standard Error	3.2050308	
Confidence Level	99%	Z=2.575829
Alpha	1%	
Alpha/2	0.005	
Sampling Error	8.2556122	
Interval	335.74439	352.2556

### Hypothesis Test

Null	$H_0 \geq 350$	$H_a < 350$
z-test	-1.872057	
p-value - one tail	0.0305994	
p-value - two tail	0.0611987	

Mean 344 Standard deviation 21.5

What is the sampling error or margin of error at 95%? (3 points)

Sampling error at 95%  $z * SE = 1.96 * 3.205 = 6.282$

The company advertises that it takes an average of 350 pounds to crush the briefcase. Based on this sample can it stand by this claim? (2 points)

At .01 significance no. At .05 significance yes.

### Hypothesis Test

Null	$H_0 \geq 350$	$H_a < 350$
z-test	-1.872057	
p-value - one tail	0.0305994	

The company wants to be the margin of error to be within 5 pounds at 95% confidence interval. What specific action should it take and include all calculations. (3 points)

Increase sample size.  $n=(1.96^2*21.5^2)/5^2=71.03$  round up to 72

Is this more accurate than the interval presented above? Explain why or why not. (1 point)

Yes, increasing sample size increases accuracy.

2. The Puget Sound area is cited as the worst for traffic congestion. Local authorities question this conclusion. The Puget Sound Transit Authority did a study of commuting patterns in King County. They randomly sampled people on their one-way commuting time to work and found the following (in minutes):

21.7 26.8 33.1 27.9 23.5  
39 28 24.7 28.4 28.9  
30 33.6 33.3 34.1 35.1

Calculate the mean and the standard deviation (3 points)

Mean 29.873

Standard Deviation 4.771

Calculate the 90% confidence interval for the mean commuting time. Assume the underlying population is normal. (5 points)

n	15	
Mean	29.87333333	
STD	4.771113477	
Standard Error	1.231896203	
Confidence Level	90%	T= 1.76131
Alpha	10%	
Sampling Error	2.169751242	
Interval	27.70358209	32.04308

Interpret the results. (2 points)

90% of the time the true mean of one-way commuting time to work in King County will be between 27.704 to 32.043 minutes.

What is the margin of error (sampling error) at 99%? (3 points)

Margin of error 3.66716126  
T=2.976843

If the average commuting time for people in equivalent cities is 27 minutes. Would you say that King County is better or worse? (2 points)

At .05 significance level, King County is the same. At .01 significance level it is worse.

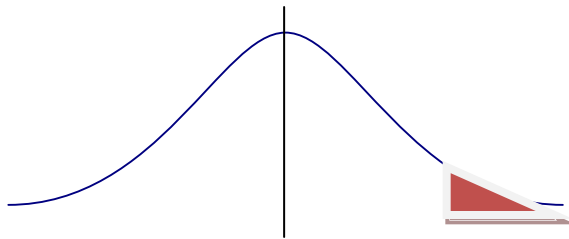
Ho mean<=27	Ha mean>27
t-test	2.332447594
p-value	0.017558928

The King County Council requested more accuracy on the survey. They want a margin of error of 1.5 minutes at the 99% confidence level. What specific changes would you make to the sampling process (show all calculations). (3 points)

N=64

3. Clinton is running against Obama for the Democratic nomination for President of the United States. Their campaigns are trying to determine if either will get the majority (51%) of the popular vote (vote of the people). The latest poll of 1142 people shows that 600 would vote for Obama.

- a) Draw the distribution of sample proportions showing up to plus and minus three standard errors (3):



P=0.5

x	600	Obama	x	600	Obama
n	1142		n	1142	
p hat	0.525394		p hat	0.525394	
q hat	0.474606		q hat	0.474606	
Standard Error	0.014777		Standard Error	0.014777	
Confidence Level	95%	1.959964	Confidence Level	80%	1.281552
Alpha	5%		Alpha	20%	
Alpha/2	0.025		Alpha/2	0.1	
Sampling Error	0.028962		Sampling Error	0.018937	
Interval	.496432	.554356	Interval	0.506457	0.544331

b) Determine the 80% confidence interval. (3 points)

0.506457 to 0.544331

c) At the 95% confidence interval, what is the margin of error? (2)

.496432 To .554356

d) Interpret the results at 95% so that it can be published in the newspapers and read by the general public. (2 points)

95% of the time, the true proportion of people who will vote for Obama falls between 49.6% and 55.4%

e) According to this poll, would Obama win 51% of the vote? Explain why or why not. (4)

It is uncertain as the true proportion could be 49.6%

f) If the pollsters want to increase accuracy so that they would be more confident whether or not Obama would win 51% of the vote. Assuming the proportion remains the same and at the 95% confidence level, what sample size would be required to increase the accuracy of the estimate? Show calculations and explain your reasoning. (4)

4249  
SE=.015  
p hat=.525  
q hat=.475  
z=1.96

4. Some people are concerned that the new tougher standards and high stakes tests adopted by many states may drive up the high school drop-out rate. Washington state reports a high school completion rate of 67%. One school district, whose rates have always been very close to the state average, reports that 167 of their 267 students completed high school. Does this sample show that the completion rate may be decreasing?

x	167
n	267
p hat	0.625468
q hat	0.374532

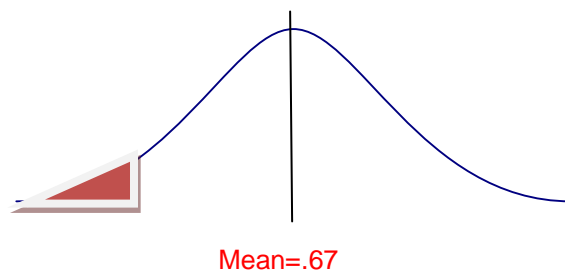
Standard Error 0.02962

- a) What is the null hypothesis (1)
- b) What is the alternative hypothesis (1)
- c) Explain the cost of Type I and Type II error in this situation.(2)

If you say it is dropping when it is not, will not intervene with programs. If you say it is not dropping when it is, then will spend money unnecessarily.

- d) Sketch the curve and show the regions of acceptance and rejection (4)

Lower tail test using p-value to evaluate



- e) What is your decision rule? (1)

Evaluate at alpha=.01 and alpha=.05

- f) Compute your test statistic (3)

Hypothesis Test	$H_a < 0.67$
Null	$H_o \geq 0.67$
z-test	-1.50342
p-value - one tail	0.066366

- g) What is your conclusion? Explain your conclusion in simple nontechnical terms. (2)

At alpha =.05, there is insufficient (p value > alpha) evidence to show that the drop-out rate is lower

- h) Find the p-value. (3)

At what level of alpha would you change your conclusions? .07 or higher (2)

- i) Parents have launched complaints and protest against the school district claiming

that graduation rates have dropped due to standardized testing. Federal authorities are claiming that the data doesn't support this. Which side does the data support and why? (2 points)

This data supports the Federal authorities in showing that drop-out rates have not changed. See two-tail test.

5. For the past few years, the number of customers of a drive-up OceanFirst bank averaged 20 per hour. This year another bank opened a drive-up window less than one mile away. The manager of OceanFirst believes that his customers have decreased. The number of customers arriving in randomly chosen hours is listed below.

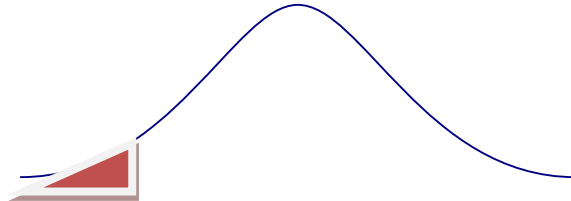
17	23	22	15	18
16	21	21	15	19
20	17	15	22	16

Can we conclude at the 5% significance level that the manager is right?

a) What is the null hypothesis (1)

b) What is the alternative hypothesis (1)

c) Sketch the curve and show the regions of acceptance and rejection (4)



Mean= 20

n	15
Mean	18.46666667
STD	2.850229732
StError	0.735926152
Hypothesis	
Null	Ho: Mean<=20    Ha: Mean>20
t-test	-2.08354239
p-value - one	0.028005464

d) What is your decision rule? (1)

If  $\alpha .05 > p\text{-value}$  reject  $H_0$ .

e) Compute your test statistic (3)

f) What is your conclusion? Explain your conclusion in simple nontechnical terms. (2)

At .05 significance level, the number of customers is less than 20.

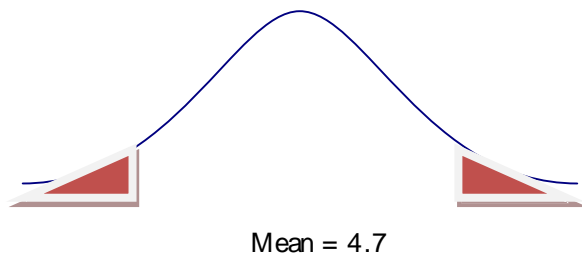
g) Calculate the p-value (3).

6. A sample of 142 of people over 60 showed a mean memory score of 5 and a standard deviation of 2. The general population has a score of 4.7. At the .05 significance level, is there any difference between the people over 60 and the general population?

a) What is the null hypothesis (1)

b) What is the alternative hypothesis (1)

c) Sketch the curve and show the regions of acceptance and rejection (4)



d) What is your decision rule? (1)

If  $\alpha .05 > p\text{-value}$  reject  $H_0$ .

e) Compute your test statistic (3)

n

142

Mean	5
Std	2
Standard Error	0.1678363

Hypothesis Test

		Ha Mean ne
Null	Mean= 4.7	4.7
z-test	1.7874563	

p-value - two tail	0.0738638
--------------------	-----------

f) What is your conclusion? Explain your conclusion in simple nontechnical terms. (2)

At .05 significance level, there is no difference between people over 60 and the general population.

g) Calculate the p-value (2).