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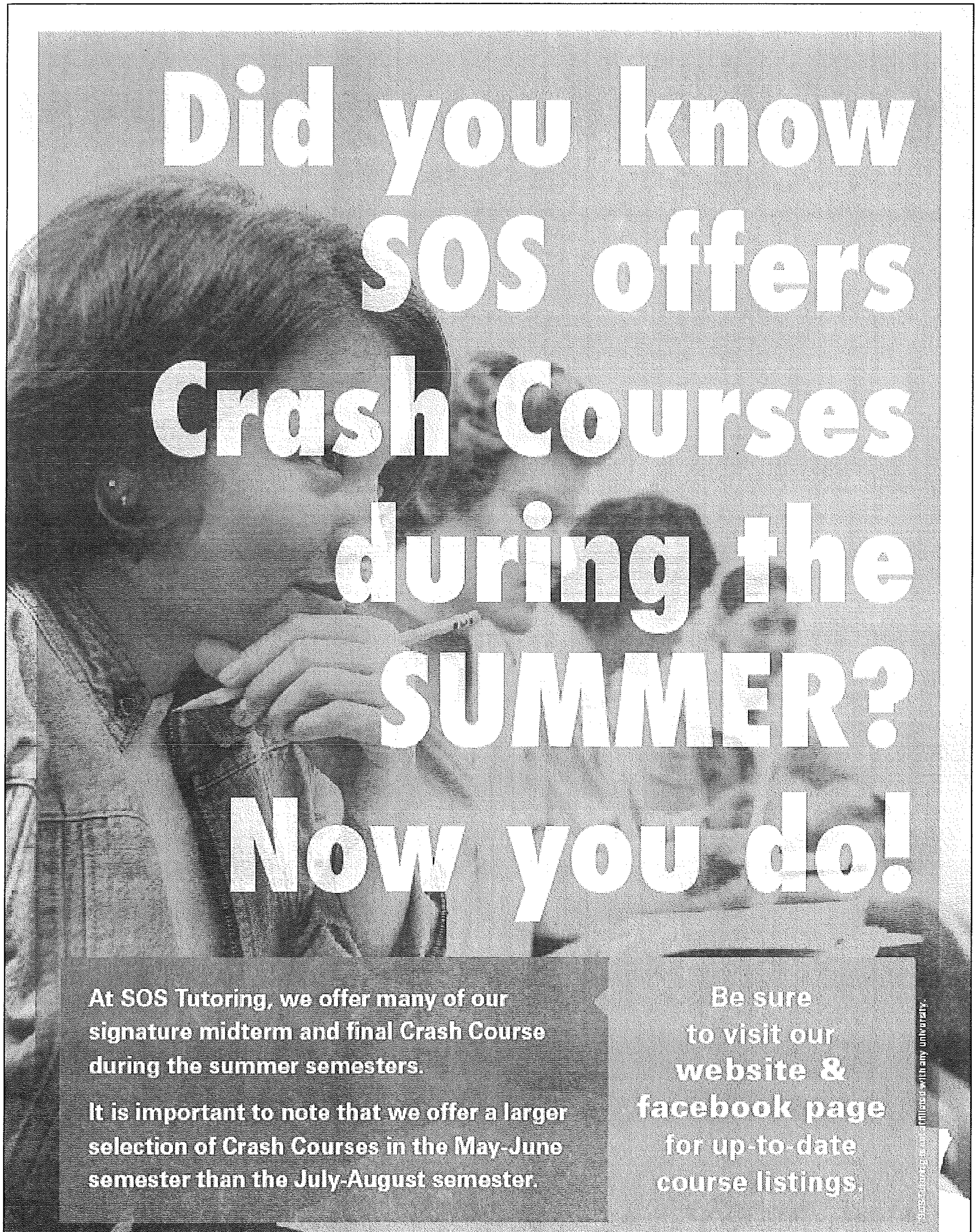
COMM 215

BUSINESS STATISTICS

MOCK FINAL
WINTER 2014

MOCK
EXAM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WELCOME!

Before you begin this mock exam, please read the following instructions:

1. This is a simulated exam. The questions are based on our instructors review of past exams, experience working with students, and assessment of those topics students have the most troubles with.

2. You have 48 hours to review and attempt the SOS Mock Exam at your own pace.

3. You are free to finish as little or as much as you would like. We recommend you attempt each question to the best of your ability.

4. On the day of the mock exam review, the instructor will work through the solutions for the group.

To make your stay with us as enjoyable as possible we please ask that you abide by the following policies:

1. Turn cell phones off or on vibrate.

2. Ensure your area is clean at the end of the day.

SOS POINTS!

- Please remember to fill out the evaluation form found in the back of your package before leaving the exam and drop it off (face down) in the designated area!

Multiple Choice Questions

1. Consider a multiple regression analysis attempting to predict the price of a car from several variables. One variable of interest is the season during which the car is being sold. How many dummy variables would we need to include in this model in order to account for the season? ↳ 2 possible values, 0 or 1. there are 4 seasons.

   a) 1
   b) 4
   c) 2
   d) 3

   Summer, fall, winter
   1 0 0
   0 1 0.
   0 0 1
   0 0 0

2. *SSE* represents that part of the total variation in the *y* data values that is __________.

   a) explained by our linear regression model
   b) incorporated in the regression model via the use of dummy variables SSR & SST is explained
   c) not explained by our linear regression model
   d) none of the above

3. For an *F* test with the following values: *p*-value = 0.0087, $R^2 = 0.77$, $s = 0.123$. The null hypothesis, should be _________, at the 1% level of significance.

   a) rejected p value < α reject Ho.
   b) accepted
   c) not rejected
   d) can not be determined

4. Which of the following is *NOT* an assumption for the multiple regression model?

   a) Normality of error terms
   b) Constant variation of error terms
   c) Independence of error terms
   d) Positive autocorrelation of error terms

5. The range of feasible values for the multiple coefficient of determination is from:

   a) -1 to 1 R^2 : 0 and 1
   b) -0.5 to 0.5
   c) 0 to 1
   d) 0 to 2

Ho: $\beta_1 = \beta_2 = \beta_3 = 0$
Ha: At least 1 $\beta_i \neq 0$
whole model

6. If we reject the null hypothesis in the F-test then we can conclude that __________.
   a) none of our independent variables makes a significant contribution in predicting y in our model and thus our overall model is not a good one
   b) at least one of our independent variables makes a significant contribution in predicting y in our model and thus our overall model is a good one
   c) all of our independent variables make a significant contribution in predicting y in our model
   d) none of the above

7. A simple linear regression gave the following results:

$$\hat{y} = 123.45 + 6.88x,\ n = 15,\ MSE = 23.45,\ SS_{XX} = 9.81$$

What is the value of the test statistic required to test the significance of the slope?
   a) 16.04
   b) 1.55
   c) 4.45
   d) 1.34

$$t_{obs} = \frac{b_1}{S_{b_1}} = \frac{6.88}{\frac{S_\varepsilon}{\sqrt{SS_{XX}}}} = \frac{6.88}{\frac{S_\varepsilon}{\sqrt{9.81}}} = \frac{6.88}{\frac{\sqrt{MSE}}{\sqrt{9.81}}} = \frac{6.88}{1.5461} = 4.45$$

8. In a sample of 40 observations, the sample correlation found to be -0.85. The least squares regression line was computed to be $\hat{y} = 11 - 2x$. This means that the proportion of the variation in y explained by a linear relationship with x is _____.
   a) 0.7225
   b) -0.85
   c) 0.9220
   d) -0.7225

looking for $R^2 = r^2$ $\quad r = -0.85$

9. If the simple coefficient of determination $R^2 = 0.64$ and the regression model estimates $b_0 = 87.6$ and $b_1 = -3.69$, then the correlation coefficient is _____.
   a) 0.64
   b) -0.80
   c) 0.80
   d) -0.64

$r =$ sign of b_1 $\sqrt{R^2}$

$r = -\sqrt{0.64} = -0.8$

10. Which of the following is *NOT* an assumption for the simple regression model?
   a) Normality of error terms
   b) Constant variance of error terms
   c) Mean of zero of error terms
   d) Variance of one of error terms

11. A simple regression model developed for $n = 10$ resulted in a sum of squares of error, $SSE =$ 164. The standard error of the estimate is _____.

a) 16.4
b) 4.53
c) 20.5
d) 4.05

$S_\varepsilon = \sqrt{\frac{SSE}{n-2}} = \sqrt{\frac{164}{8}} = 4,53$

12. A simple linear regression gave the following results:

$$\hat{y} = 123.45 + 6.88x,\ n = 15,\ r^2 = 0.6744,\ s^2 = 0.2934$$

For each unit change in the independent variable x, the estimated change in the mean value of the dependent variable y is equal to:

a) 0.6744
b) 6.88
c) 0.2934
d) 123.45

13. The _________ measures the strength and direction of the linear relationship between the dependent and the independent variable.

a) Coefficient of correlation
b) Coefficient of determination
c) Y intercept
d) Distance value

14. Assume that you are working with a sample $n = 50$ distributed over 8 categories. A chi-square test for goodness-of-fit will be used. How many degrees of freedom will be used in determining the chi-square test statistic?

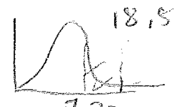
a) 50
b) 8
c) 49
d) 7

$\boxed{C-1}$

1) **15.** If H_0: $p_1 = p_2 = p_3 = p_4 = p_5 = 0.20$. You take a sample of size 1000 and compute your test
2) X^2 statistic to be $x^2 = 18.52$. At $\alpha = 0.10$, what conclusion would you reach?

a) Reject H_0 Conclude that at least one of p_1, p_2, p_3, p_4 and p_5 is not equal to 0.20
b) Reject H_0. Conclude that p_1, p_2, p_3, p_4 and p_5 all exceed 0.20
c) Reject H_0. Conclude that p_1, p_2, p_3, p_4 and p_5 are all less than 0.20
d) Do not reject H_0. Conclude that $p_1 = p_2 = p_3 = p_4 = p_5 = 0.20$

3) C,V: X^2_α (C-1) (5-1)
$X^2_{0,10}$, 4 = df. 7,7794


18,52 reject Ho.
7,77

16. The degrees of freedom for a Test of Independence of 10X10 table is_____.

a) 99
b) 100
c) 98
d) 81

17. What would be the best test to determine if beer preference is really independent of the color of hair?

a) Simple regression
b) Chi square Contingency test
c) Chi square Goodness of fit
d) Multiple Regression

2 variable.

18. If the population mean is \$87.60, what is the expected value of the sampling distribution?

a) \$87.60
b) Less than \$87.60
c) More than \$87.60
d) Can not be determined

19. The sampling distribution of the sample means must contain _______ possible samples of a given size.

a) all
b) most
c) some
d) none of the above

20. According to the central limit theorem, if samples of size 100 are drawn from a population with a mean of 85 and standard deviation of 25, the mean of all sample means would equal _____.

a) 0.85
b) 85
c) 8.5
d) 2.5

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

if asked $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$

21. According to the central limit theorem, if samples of size 100 are drawn from a population with a mean of 85 and standard deviation of 25, the variance of all sample means would equal _____.

a) 2.5
b) 6.25
c) 62.5
d) 225

$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = 2,5 = s.$

$s^2 = (2,5)^2 = 6,25$

22. As the n increases, the sampling distribution of the sample mean approaches a __________

a) Normal distribution
b) Binomial distribution
c) Discrete distribution
d) Poisson distribution

23. NAYA measures the amount of water in bottles before shipping them to the customers. If the water amounts in bottles have a population mean and standard deviation of 500 ml and 20 ml, respectively then, based on a sample size of 25 bottles, the probability that the sum will be between 12,425 ml and 12,625 ml is _______.

a) 0.1583
b) 0.3322
c) 0.8417
d) 0.6678

$\frac{12,425}{25}$ $\frac{12,625}{25}$

$\mu = 500\ mL$
$\sigma = 20\ mL.$
$n = 25$

$z_1 + z_2$

$Z_1 : 0,2734$
$Z_2 : 0,3944$

z_1 z_2 497 0 505

24. Assuming that the speed of cars travelling on the 520 is normally distributed with a mean of 105 km/h and a standard deviation of 4 km/h, what is the probability that a car is going less than 113 km/h given that is going above the posted speed limit of 100 km/h?

a) 0.8944
b) 0.9772
c) 0.9745
d) 0.8716

① ② ③

$\mu = 105\ km/h$
$\sigma = 4\ km/h.$

$P(X < 113 \mid X > 100)$

$\frac{P(100 < X < 113)}{P(X > 100)}$

0,3944 0,4772 0,8716

100 113 $\mu = 105$ −1,25 0 2

0,3944 0,5 100 0 −1,25 0 → 0,8944

$\frac{0,8716}{0,8944}$ = c)

$Z_1 = \frac{100-105}{4} = -1,25$

$Z_2 = \frac{113-105}{4} = 2.$

25. Andrew has determined that the grades of the assignments are normally distributed with a mean of 80% and a standard deviation of 4%. What is the minimum number of students he needs enrolled in the two classes if he wants a maximum error of 1% with a 98% confidence level?

a) 87
b) 8687
c) 62
d) 133

$n = \left(\frac{2,33 \times 4}{1}\right)^2 = 86,86 = 87$ student.

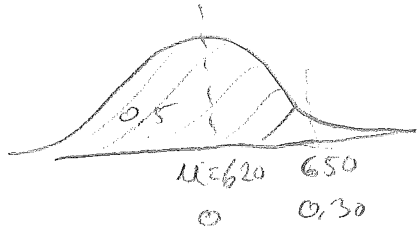
Long Answer Questions

1. The scores of all applicants taking a GMAT test required by a graduate business school follow a normal distribution with mean 620 and standard deviation 100.

chap 6-7

a) What is the probability that a randomly selected applicant will score less than 650 in this test?

$\mu = 620$
$\sigma = 100.$



X
Z

eq: $z = \frac{X - \mu}{\sigma} = \frac{650-620}{100}$

$z = 0,3$

area = 0,1179

$0,5 + 0,1179 = 0,6179$

6-7

b) What is the probability that two randomly (and independently) selected applicants will both score less than 650 in this test?

0,6179 × 0,6179 = 0,3818

1st way

c) What is the probability that out of two randomly (and independently) selected applicants, at least one will score less than 650 in this test?

Combinations:

Less than, more than = (0,6179)(0,3821) +
M , L = (0,3821 , 0,6179) +
L , L = (0,6179)(0,6179)

0,8540.

Or.
2nd way

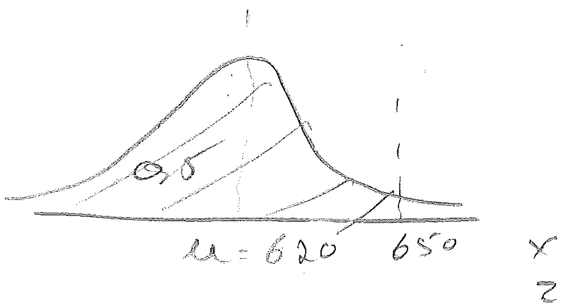
1 − MM: 1 − [(0,3821)(0,3821)]

1 − 0,1460 = 0,8540

6-7

d) A random sample of 16 scores is taken. What is the probability that the mean score of this sample of 16 applicants is less than 650?

n = 16 :



$$z = \frac{650 - 620}{\frac{100}{\sqrt{16}}} = 1,2$$

area : $\boxed{0,3849}$ + 0,5

Ans : 0,8849

$6-7$

e) If a sample of 25 applicants had been taken (instead of 16), would the probability of a sample mean being less than 650 be smaller than, larger than, or the same as the correct answer to part (d) above?

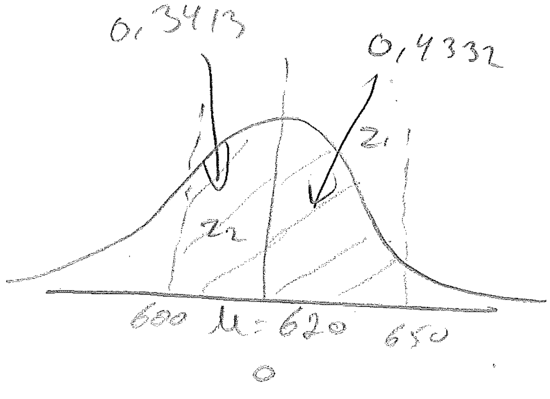
$$z = \frac{650-620}{\frac{100}{\sqrt{n}}}$$

$n \uparrow \quad \sigma_{\bar{x}} \downarrow$

$\frac{\sigma_x}{\sqrt{n}} \downarrow \quad \underline{z \uparrow}$

6-7

f) What is the probability that the mean score of a sample of 25 applicants will be between 600 and 650?



$$z_1 = \frac{650-620}{\frac{100}{\sqrt{25}}} = 1,5$$

$\text{Area}_1 = 0,4332$

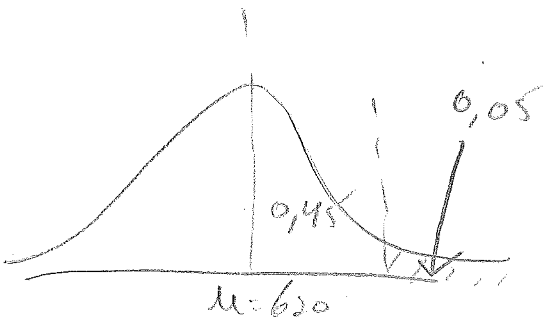
$$z_2 = \frac{600-620}{\frac{100}{\sqrt{25}}} = -1$$

$\text{Area} = 0,3413$

prob: $0,3413 + 0,4332$

$= \boxed{0,7745}$

g) There is a 5% probability that the mean score of a random sample of 25 applicants is higher than what number?



x

z

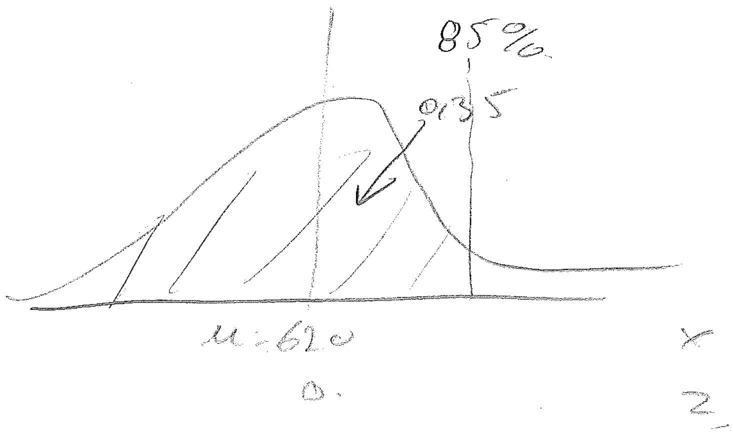
$$\boxed{x = 652{,}9}$$

$$z_{0,45} = 1{,}645.$$

$$1{,}645 = \frac{x - 620}{\frac{100}{\sqrt{25}}}$$

$$32{,}9 + 620 = x$$

h) There is a 85% probability that the mean score of a random sample of 25 applicants is less than what number?



$$Z_{0,35} = 1,04$$

$$1,04 = \frac{X - 620}{\frac{100}{\sqrt{25}}}$$

$$\boxed{X = 640,8}$$

Multiple regression

2. The regional manager for Pizza Domino's Canada is investigating why some restaurants in the region are performing better than others. His consultants, being statisticians, found that three factors may be related to total sales: x_1, the number of competitors in the region; x_2, the population in the surrounding area (in millions); and x_3, the amount spent on advertising (in thousands of dollars). A random sample of 30 restaurants in the region was selected and the following multiple regression equation was obtained:

$$Y = 14.0 - 1.0x_1 + 30.0x_2 + 0.2x_3$$

Where y=total sales last year in thousands of dollars. Additional information obtained included the estimated standard errors of the sample regression coefficients that are $S_{b_1} = 0.70, S_{b_2} = 5.20, and\ S_{b_3} = 0.20$, as well as SST = 5420 and MSE = 64.82.

a) What are the estimated sales for the Pizza Domino's that has 3 competitors, a regional population of 500,000, and an advertising expense of $25,000.

Summary output

Summary output

$R^2 = \frac{SSR}{SST} = 0,689$

$S_\varepsilon = 8,05 : \sqrt{MSE}$

$n = 30$

Predictor	Coeff		St Dev	T obs
Intercep.	14			
x_1	-1	÷	0,70	-1,42
x_2	30	÷	5,20	5,77
x_3	0,2	÷	0,20	1,00

ANOVA

Source	df	SS	MS	F obs.
R	3	3734,68	1244,89	19,21
E	26	1685,32	64,82	
T	29	5420		

X_1 : Nbr competitor

X_2: Population (millions)

X_3: $ spent on advertising in thousand of $

Y = sales in thousand of $

$$\hat{Y} = 14,0 - 1,0(3) + 30,0(0,5) + 0,2(25)$$

$$\boxed{\hat{Y} = 31\ 000\ \$}$$

b) Compute the value of the standard error of the estimate.

$S_\varepsilon = 8{,}05 = \sqrt{MSE}$

c) Compute the value of the coefficient of determination. Explain the meaning in the context of the problem.

$R^2 = 0,689$

68,9% of the variation of sales can be explained by competitors, advertising expense and population

d) Is there sufficient evidence, at the 5% level of significance, to conclude that the model is significant?

$\alpha = 0,05$

$H_0: \beta_1 = \beta_2 = \beta_3 = 0.$

$H_a:$ at least one $\beta \neq 0$. (claim).

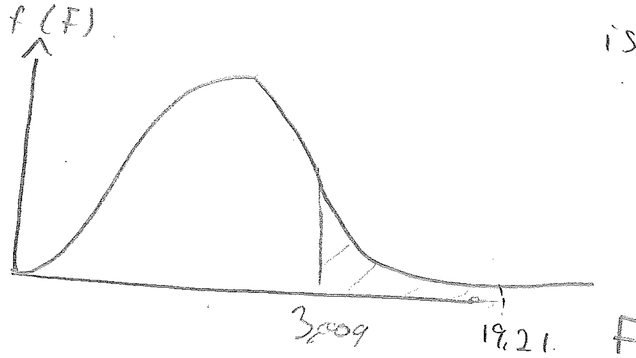
CV: F-test.

df_1 , df_2

3 26.

(depend on the F table)

CV = 2,98 ≈ 3,009.



is it shaded yes

reject ? yes

enough evi. yes

F_{obs}:

Since 19,21 > 3,009 we reject Ho, there is enough evidence at $\alpha = 0,05$ to say that the model is good

e) Is there sufficient evidence, at the 5% level of significance, to conclude that the number of competitors in the region is related to sales? What is the approximate p-value?

X_1 o/s Y.

H_0: $\beta_2 = 0$

$\beta_2 \neq 0$ (claim)

CV

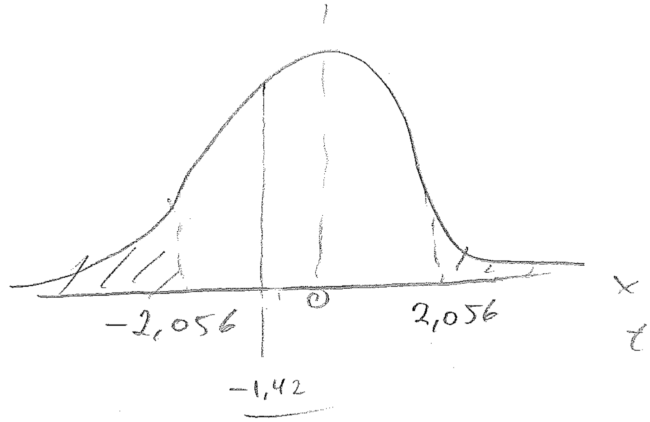
$t_{crit} \pm t_{\alpha/2}$

CV: $\pm 2{,}056$

$\alpha = 0{,}05$

$\alpha/2 : 0{,}025$

$df_2 : 26$



$t_{obs} : -1{,}42$

Since $-2{,}056 < -1{,}42 < 2{,}056$, we do not reject Ho, there is not enough evidence at $\alpha = 0{,}05$ to say that competitors is usefull at predicting sales.

p-value:

obs: 1,42 between: 0,05 and 0,10.

p-value [0,05 , 0,10] × 2

p-value [0,1 , 0,20]

hypothesis test - chap 9

3. A consumer agency that proposes that lawyer rates are too high wanted to estimate the mean hourly rate for all lawyers in Montreal. A sample of 70 lawyers taken from the Montreal area showed that the mean hourly rate charged by them is \$203 with a standard deviation of \$55.

   a) At the 10% significance level, can it be concluded that that the mean hourly rate of lawyers is higher than \$200? Compute the p-value.

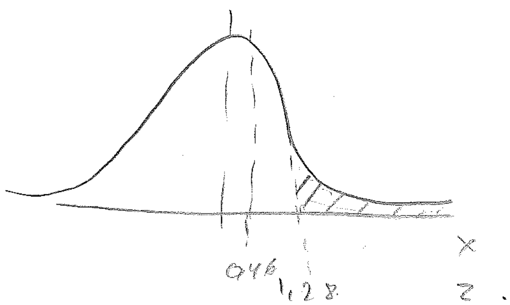
H_0 $\mu \leq 200$

H_a $\mu > 200$ (claim)

$n \geq 30$? Yes

z-test

$\alpha = 0,10$



C.V: $+Z_\alpha = +Z_{0,10}$

$0,5 - 0,1 = 0,40$

$Z = 1,28$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{203 - 200}{55/\sqrt{70}} = 0,46$$

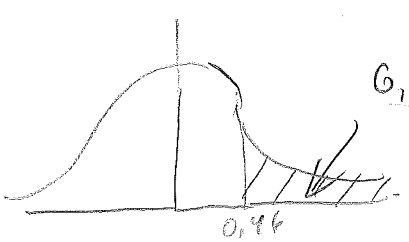
Since $0,46 < 1,28$ we do not reject H_0,

There is not enough evidence at $\alpha = 0,10$ to say that the claim is true

p value: $0,46 \rightarrow 0,1772$

$0,5 - 0,1772 \ldots$

$0,3228$



Chap 8

b) Construct a 90% confidence interval for the mean hourly rate for all lawyers in the Montreal area. Interpret your result.

$n \geq 30 \rightarrow Z$-dist.

$1 - 0,9$

$\alpha = 0,10$

$\alpha/2 = 0,05$

$\bar{X} \pm z \frac{\sigma}{\sqrt{n}}$

$Z_{0,05}: 0,5 - 0,05 = 0,45$

$203 \pm 1,645 \times \frac{55}{\sqrt{70}}$

$z = 1,645$

$203 \pm 10,81$

90% CI [192,19 , 213,81]

We are 90% confidence that the true average hourly rate is between 192,19 and 213,81.

n: Chap 8

c) How many more lawyers would have to be sampled if we want a 99% confidence interval with the same margin of error as the margin of error of part b)?

margin of error is 10,81 at a 90% CI

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2 =$$

$\alpha = 1 - 0,99 = 0,01$

$\alpha/2 = 0,005$

$0,5 - 0,005 = 0,495$

$Z = 2,575$

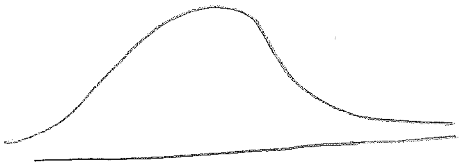
$$n = \left(\frac{2,575 \cdot 55}{10,81}\right)^2$$

$n = 171,6 \approx 172$

$n = 172 - 70 = \boxed{102}$ additional lawyers

d) How large should you take a sample to ensure that the upper limit of the 95% confidence interval of the mean hourly rate does not exceed $210?

203 210



Margin of error = 7.

95% CI [203, 210]

$$n = \left(\frac{Z_{\alpha/2} \cdot \sigma}{E}\right)^2$$

$\alpha = 1 - 0{,}95$
$= 0{,}05$
$\alpha/2 = 0{,}025$
$0{,}5 - 0{,}025 = 0{,}475$

$Z = 1{,}96$.

$$n = \left(\frac{1{,}96 \cdot 55}{7}\right)^2$$

$n = 237{,}16 \approx \underline{238}$ lawyers.

Chi squared

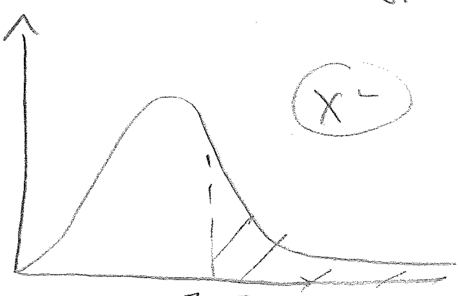
4. The results of a sample of the participants who have filled out a questionnaire regarding their access to personal computers are summarized in the following table.

	North America	Europe	Asia	total
No Access	21 (16,5)	18 (16,5)	16 (22)	55
Home Access	12 (15)	17 (15)	21 (20)	50
Other Access	27 (28,5)	25 (28,5)	43 (38)	95
total	60	60	80	200

a) Test, using a 10 percent level of significance, whether the type of access to personal computers depends significantly on where the person lives.

H_0 : Type of Access & Location are indep

H_a : Type of Access & location are dep.



χ^2

7,779

$CV = +\chi^2$, $df (3-1)(3-1)$

$CV = 7{,}77944$ $df: 4$.

Obs

$$\sum \frac{(o-e)^2}{e_i} = \frac{(21-16{,}5)^2}{16{,}5} + \frac{(12-15)^2}{15} + \frac{(27-28{,}5)^2}{28{,}5} + \frac{(18-16{,}5)^2}{16{,}5} + \frac{(17-15)^2}{15}$$

$$+ \frac{(16-22)^2}{22} + \frac{(21-20)^2}{20} + \frac{(43-38)^2}{38} =$$

$\chi^2 = 5{,}1$

Since $5{,}1 < 7{,}77944$ we do not reject Ho, There is not enough evidence at $\alpha = 0{,}1$ to say that type of access and location, are related.

b) The manager claims that fewer than 30% of all participants are from Europe. Test the manager's claim.

wherever claim is Ha → try to prove it true

H_0 : $p \geq 0,30$.

H_a : $p < 0,30$ (claim)

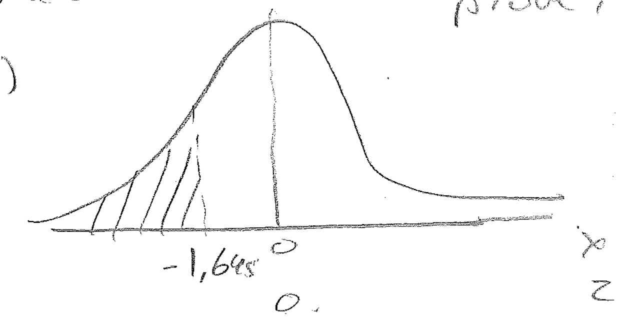
Test : Z-test.

CV : $-Z$, $\alpha = 0,05$

$-Z_{0,05}$

$0,5 - 0,05 = 0,45$

$Z_{0,45} = -1,645$



$\bar{p}$: 60 european out of 200.

$\bar{p} = 0,30$.

$p = 0,30$.

$$Z_{obs} = \frac{\bar{p} - p}{\sqrt{\frac{p(1-p)}{n}}} = \frac{0,30 - 0,30}{\sqrt{\frac{0,30(1-0,70)}{200}}} = \frac{0}{\text{Ans}} = \boxed{0}$$

Since $0 > -1,645$ we do not reject Ho, their is not enough evidence at $\alpha = 0,05$ to say that the claim is true.

c) How large a sample would have to be taken in order to establish a 98% confidence interval for the true proportion of those with home computer access if the margin of error is 0.024?

$E = 0,024$

$$n = \frac{(Z_{\alpha/2})^2 \cdot \bar{p}(1-p)}{E^2} \qquad \bar{p} = \frac{50}{200} =$$

$CL = 98\%$

$\alpha = 1 - 0,98 = 0,02$

$\alpha/2 = 0,01$

$0,5 - 0,01$

$= 0,49$

$Z_{0,49} = 2,33$

$$n = \frac{(2,33)^2 \cdot (0,25(1-0,25))}{0,024^2}$$

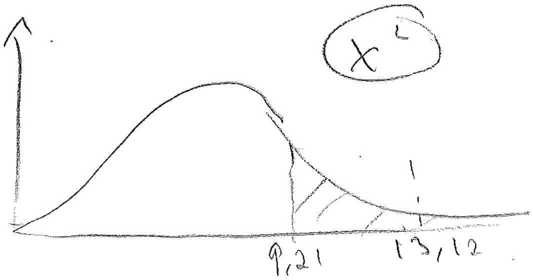
$n = 1767,22 \approx \underline{1768}$

d) The manager said he believes that 40%, 20%, and 40% of participants have no access, home access, and other access respectively. Test his claim using alpha=0.01

(claim) H_0: $P_1 = 0{,}40$, $P_2 = 0{,}20$ $P_3 = 0{,}40$

H_a At least $P \neq$ spec value.

Access	observe	expected
No	55	80
Home	50	40
Other	95	80



CV: $+X^2_{\alpha,\, C-1}$

$\alpha = 0{,}01$ $C-1 = 3-1 = 2$.

CV: 9.21034

$$X^2_{obs} = \frac{(55-80)^2}{80} + \frac{(50-40)^2}{80} + \frac{(95-80)^2}{80} = 13{,}12$$

Since $13{,}12 > 9{,}21$, We reject H_0, there is enough evidence at $\alpha = 0{,}01$ to say that the claim is <u>False</u>

e) Construct the 99% confidence interval for the true proportion of Europeans.

$\alpha : 1 - 0{,}99 = 0{,}01$.

$0{,}5 - 0{,}005 = 0{,}495$.

$\alpha = 0{,}01$

$z_{0{,}495} = 2{,}575$.

$\alpha/2 = 0{,}005$

$\bar{p} \pm z_{\alpha/2}\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$

$0{,}30 \pm 2{,}575\sqrt{\frac{0{,}30(1-0{,}30}{200}}$.

99% CI = [0,217 , 0,383]

5. The following table shows nine months of data on the price charged for an exotic fruit and its sales volume.

$n = 9$

X Price ($)	Y Sales (hundreds of cases)
0.51	4.2
0.46	5.4
0.36	7.2
0.35	9.1
0.35	8.9
0.40	9.0
0.41	8.5
0.46	7.7
0.56	4.4

Calculations for the above data are provided:

$\sum x = 3.86$ $\quad \sum y = 64.4$ $\quad \sum xy = 26.609$

$\sum x^2 = 1.6996$ $\quad \sum y^2 = 492.56$

a) Test at the 5% level whether price is a significant predictor of sales volume.

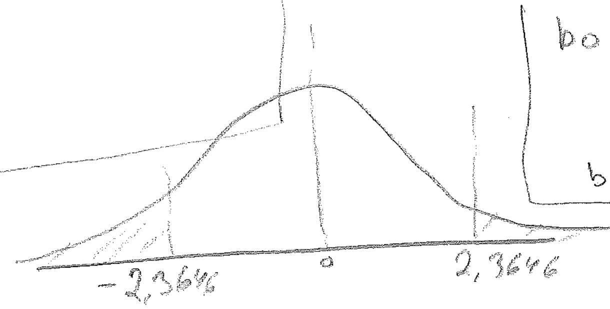
1) $H_0: B_1 = 0$

$H_a: B_1 \neq 0$

$b_0 = \bar{y} - b_1 \bar{x}$

$= \frac{64{,}4}{9} - (-22{,}94)\frac{(3{,}86)}{9}$

$b_0 = 16{,}9943$



2) T-test

2-tail

3) C.V. $\pm t_{\alpha/2, n-2}$: $t_{0{,}025}$, $7 = df$

$\alpha = 0{,}05$

$\alpha/2 = 0{,}025$

$CV = \pm 2{,}3646$

$$\left.\frac{26{,}609 - \frac{3{,}86 \cdot 64{,}4}{9}}{1{,}6996 - \frac{(3{,}86)^2}{9}}\right\} = -22{,}94$$

4) $$T_{obs} = \frac{b_1}{S_{b_1}} = \frac{\dfrac{\sum xy - \frac{\sum x \sum y}{9}}{\sum x^2 - \frac{(\sum x)^2}{n}}}{\dfrac{S_\varepsilon}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{9}}}}$$

$$\frac{\sqrt{\frac{SSE}{9-2}}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{9}}}$$

WTV : ANS = $\boxed{-4{,}36}$ (o)

Since $-4{,}36 < -2{,}36$ we Rej H_0. There is enough evidence at $\alpha = 0{,}05$ to say that the model is good.

b) Find a 95% prediction interval for the sales volume if price is 55 cents.

$$\hat{y} \pm t_{\alpha/2,\, n-2}\, S_\varepsilon \sqrt{1 + \frac{1}{9} + \frac{(x_p - \bar{x})^2}{\Sigma(x-\bar{x})^2}} =$$

$\alpha = 0,05$

$\alpha/2 = 0,025$

$n-2 = 7$

$CV = 2,3646$

$\hat{y} = 16,9943 - 22,94\, x$, with $x = 0,55$

$\hat{y} = 4,3773$

$$4,3773 \pm 2,3646\,(1,1045) \sqrt{1 + \frac{1}{9} + \frac{\left(0,55 - \frac{3,86}{9}\right)^2}{SSxx\,(0,0441)}}$$

$4,3773 \pm 3,1381$

95% PI = [1,2392 , 7,5154]

We are 95% confident that the true sales when price is 55 cents, is between 123,92$ and 751,54 cases.

c) On the average, how does the sales volume change with a 5-cent price increase?

$b_1 = \frac{\Delta Y}{\Delta X} = \frac{?}{5\text{cent}} = b_1$

$\Delta Y = b_1 \Delta X$

$= -22{,}94 * 0{,}05 = -1{,}147$

decrease of 114,7 cases

d) What proportion of the variation of sales volume is explained by the linear regression model?

$$R^2 = \frac{SSR}{SST}$$

$$SST = SS_{yy} = \Sigma y^2 - \frac{(\Sigma y)^2}{9} = 31{,}722$$

$$SST = SSE + SSR$$

$$SSR = SST - SSE$$

$$SSR = 31{,}722 - 8{,}5897$$

$$= 23{,}2025$$

$$R^2 = \frac{23{,}2025}{31{,}7422} = 0{,}731$$

proportion

Evaluation Form

Please rate the tutor on a scale of 10 to 1:
10 = completely agree, **9** = strongly agree, **8** = agree, **7** = somewhat agree, **6** = neutral, **5** = somewhat disagree, **4** = disagree, **3** = strongly disagree, **2** = completely disagree, **N/A** = not applicable

Date: ____________________ Professor: ________________________

This evaluation will help us improve our product so please be as straightforward as possible!!

MOCK Exam	Answer (10 to 1)
1. The Mock Exam teaching format was helpful to understand the material.	________
2. The Mock Exam covered all the course material.	________
3. The Mock Exam questions were challenging enough.	________
4. The solutions for the Mock Exam were complete.	________
5. I was satisfied with the overall performance of the tutor.	________
6. I enjoyed the mock exam format of tutoring.	________
7. I would consider using SOS Tutoring again.	________

Please evaluate the following question separate from actual course — **Answer (A, B, C)**

8. What is the ideal format to teaching a Mock Exam? ________
   a. Students being given 20-30 minutes to solve a certain number of questions alone, followed by a tutor-lead review of the answers to those questions. This process is repeated until the completion of the entire questions in the Mock Exam.
   b. Students being given 2 hours to solve all the questions in the Mock Exam, followed by a 3 hour tutor-lead review of the answers to those questions.
   c. Students given the Mock Exam to solve at home before the class. During the class, tutor reviews the questions and solutions to the Mock Exam with the students for the full 3 hours.
   d. Other formats? Please write here: ____
   ____
   ____

9. Is there anything you would like to see added, removed or modified with regards to the Mock Exam format? (Please leave as much detail as possible! It's really appreciated ☺)

____

____

We appreciate your business and hope you consider SOS Tutoring for all your tutoring needs!