DEPARTMENT OF MATHEMATICS

FINAL EXAM

Fall 2015

ADVANCED QUANTITATIVE METHODS

201-301-RE
Version 2

INSTRUCTOR: M. Guindi

STUDENT NAME: _____

STUDENT NUMBER: _____

TEACHER'S NAME: _____

INSTRUCTIONS:

1. Write all of your solutions in this booklet and show your supporting work.
2. If the space provided is not sufficient, continue the solution on the opposite page.
3. Check that this exam contains **10** numbered pages, excluding the cover page.

(4) 1. A card game requires a hand of four cards be dealt from a standard deck of 52 cards. Find the probability that a hand contains

a) four aces.

b) four of the same number.

c) 3 aces and a card that is not an ace

d) Three cards of any one number and one card of another

(3) 2) Tina needs an intervention. In addition to Tina 5 other people will be invited. This group will consist of 2 friends and 4 family members. If Tina has 5 friends and 6 family members, how many possibly groups can be chosen for the intervention?

(8) 3) In a recent survey of pre-university students at a college, the following data were obtained in response to this question, "Do you know what you want to study?"

	Yes	**No**	**Have an idea**
First Year	25	10	0
Second Year	35	15	5

If a student is selected at random,

a) find the probability that the student is second year

b) find the probability that the student is a second-year student **and** answered yes.

c) find the probability that the student is a second-year student, given that he or she answered no.

d) Are the events "Second-Year student" and "no" dependent? Explain.

(5) 4) Five percent of the rugby team uses steroids. A manufacturer claims that its drug test will detect steroid use 92% of the time. What the company does not mention is that 10% of all steroid-free individuals also test positive. Your friend on the rugby team just tested positive. What is the probability that he uses steroids?

(5) 5) In the probability distribution below, let x = the number of pets per household in the city of Waco, Texas.

x	0	1	2	3	4
p(x)	0.25	0.5	0.1	?	0.05

a) Find the probability that a household in this town has exactly 3 pets.

b) Calculate the average number of pets per household in this city.

c) Calculate the standard deviation in the number of pets per household in this city.

(7) 6) The probability that a student from a certain group is accepted into dentistry is 0.08. If ten students from this group apply, what is the probability that

a) Exactly two are accepted?

b) At more than three are accepted?

c) How many of these ten do you expect to be accepted?

d) What is the standard deviation of the number of students accepted?

(5) 7) About 76% of the students taking Advanced Quantitative Methods pass. This year, 150 students will take the course. Find the **approximate** probability that at least 138 of these students pass this year.

(8) 8) Assuming the weights of newborn babies are normally distributed with mean 6.8 pounds and standard deviation 1.2 pounds,

a) What is the probability a baby is born weighing greater than 5 pounds?

b) What is the probability a baby is born weighing between 4 and 12 pounds?

c) What weight separates the heaviest 5% of the newborns from the others?

d) At a certain hospital, eight babies were born on a given day. What is the probability that their average weight is greater than 7.5 pounds?

(6) 9) A random sample of 90 students was interviewed and 52 said they drive into school regularly. Let p represent the proportion of all students at this college drive into school regularly

a) Find a 95% confidence interval for p.

b) How many students should be included in the sample to be 90% sure that the point estimate will be within 0.02 from p?

(4) 10) A random sample of 12 evenings at the O'Leary household showed the family watched an average of 7 shows each evening. The sample standard deviation was 0.4. Find a 90% confidence interval for the population mean number of shows watched each night. Assume the number of these shows watched has a normal distribution.

(5) 11) Long-term experience showed that after a concussion, recovery time without any treatment had a mean of 5.6 days. However, a random sample of 31 patients with a concussion was treated using a set of exercises. The sample mean recovery time was 4.5 days. Does this indicate that the mean recovery time for people with concussions was less for those that were treated with exercises? Use a 1% level of significance and assume σ=1.9 days.

a) State the null and the alternate hypotheses.

b) What is the value of the sample test statistic?

c) Find the rejection region.

d) State your conclusion in the context of the application.

(8) 12) The Hawaii Planters Association is thinking of planting a new type of sugar cane that is supposed to yield pulp with higher sugar content. To test the new type of sugar cane against the one now in use, they chose an acre in each of five localities where soil and general climatic conditions vary. Each acre was divided into two equal parts so that the soil and general conditions were essentially identical for each half acre. The old type of sugar cane was planted in one of the halves and the new cane was planted in the other half acre. After harvest, the average sugar content of the pulp was determined. The data is given in the accompanying table. Assuming that the sugar yield is normally distributed, test the claim that the new cane has a higher sugar yield. Use a 1% significance level.

Plot	**Old cane**	**New cane**
1	32	37
2	19	24
3	27	29
4	20	27
5	26	25

a) State the null and the alternate hypotheses.

b) What is the value of the sample test statistic?

c) Find the critical value.

d) State your conclusion in the context of the application.

e) For what level of significance would you get an opposite conclusion? (There are many correct answers .)

(5) 13) In one study, women science majors were divided into two groups, those who left their profession within a few months of graduation (leavers) and those who remained in their profession after they graduated (stayers). The researchers collected the data shown below on a self-esteem questionnaire.

Leavers	**Stayers**
Sample mean = 3.05	Sample mean = 2.96
$\sigma = 0.75$	$\sigma = 0.75$
n = 103	n = 225

a) Find a 95% confidence interval for the difference in mean scores.

b) Does this interval suggest a significant difference between the two groups? Justify.

(7) 14) Two hundred people were asked to rate the performance of a new electric car . The results were as indicated in the table below. You need to conduct a test to determine if gender and ratings of the car are independent. Use a 10% significance level.

	Poor	**Fair**	**Good**
Female	36	55	19
Male	34	45	11

a) State the null and the alternate hypotheses.

b) What is the value of the sample test statistic?

c) Find the critical value.

d) State your conclusion in the context of the application.