Grant MacEwan College

Dr. Karen Buro

Stat 151 (101) – Winter 2010

Midterm Exam – March 3, 2010

Name:	
Student ID:	

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Instructions:

- Print your name and student id on the heading of this page.
- This is a **50 minute** exam.
- This midterm exam is closed book. Only a calculator and the formula sheet is permitted.
- Write your answers **legibly** in the space below the question or the back of the paper. No other sheets are accepted.
- No conversations, please. Cheating is lame and may have some very unpleasant consequences.
- Show your work.

Good luck!

1. (4 marks – 1 mark each)
   Identify each variable as categorical, numerical discrete, or numerical continuous:

   (a) Distance a person runs in one minute.

   (b) Number of apples on a tree.

   (c) Rating of the performance of a candidate on a preelection debate.

   (d) Breed of dog.

2. The American Michelson set up many different trials to measure the velocity of light in air. For this work he later received the Nobel prize. One of his trials resulted in the following 18 sorted measurements in km/sec (299,000 km/s was subtracted from the measurements).

   650 740 760 810 850 850 880 900 930
   950 960 960 980 980 980 1000 1000 1070

   You may use the following information on the data to answer the questions:
   $\sum_{i=1}^{n} x_i = 16250$ and $\sum_{i=1}^{n} x_i^2 = 14869900$.

   (a) (4 marks)
   Find the sample mean $\bar{x}$ and the sample standard deviation s for those measurements.

   (b) (6 marks)
   Give the five number summary for the measurements by Michelson.

   (c) (6 marks)
   Draw a graph summarizing the measurements. Comment. (Use the reverse of the paper for your answer.)

3. The following table gives the probability distribution for a random variable x

x	1	2	4	8	16
p(x)	0.1	0.3	0.25	0.1	

(a) (1 marks) Find $P(x = 16)$.

(b) (3 marks) Find the mean of the distribution.

(c) (2 marks) Find P(3<x<16).

4. (4 marks) The average number of students in a first year course at Grant MacEwan College is 48.5 with a standard deviation of 6.3.

   Locate an interval that includes the number of students in approximately 95% of first year courses. Explain.

5. In 2005, the average marathon time in the U.S. was 4.5 hours for men with a standard deviation of 1.1 hours. Assume that marathon times are normally distributed.

   (a) (3 marks) Find the probability that a randomly chosen marathon runner in the U.S. (in 2008) had a time below 5 hours.

   (b) (4 marks) Give the 20% fastest marathon times of men in the U.S. in 2008 (according to this model).

6. Psychologists tend to believe that there is a relationship between aggressiveness and order of birth.

   The following table gives the outcome of a study of 500 students that were classified for their behaviour and their birth order

	Firstborn	Not Firstborn
Aggressive	75	75
Not Aggressive	125	225

   Consider the experiment of choosing one student at random.

   (a) (2 marks) What is the probability that the student is aggressive?

   (b) (3 marks) What is the probability that the student is aggressive given he/she is a firstborn?

   (c) (4 marks) Are the two events "aggressive" and "firstborn" independent? Justify your answer.

7. (a) (6 marks) In data description we have to distinguish between different types of variables/data and then choose the appropriate descriptive methods for each type. Give the different types of variables/data and for each type list which parts a proper data description should include.

   (b) (3 marks) Sketch a Venn diagram showing two events A and B. Show $A \cap B^c$ in the diagram.

(c) (3 marks) Sketch a histogram that shows a data distribution for which the mean and the standard deviation are NOT appropriate descriptive measures.

(d) (3 marks) In probability theory, what is a distribution?

(e) (3 marks) The following graph shows a probability density curve for a random variable X. Include $P(X > 20)$ in the diagram.