Université d'Ottawa · University of Ottawa

Faculté des sciences
Mathématiques et de statistique

Faculty of Science
Mathematics and Statistics

Midterm examination for MAT 2379 3X (Spring 2013)
Introduction to biostatistics ✓
Professor: Gilles Lamothe

Time: 80 minutes

Name: _____

Student Number: _____

Calculators are permitted. It is a closed book exam.
A (double sided) sheet is permitted.
There are 2 short answer questions and 6 multiple choice questions.
The exam will be marked on a total of 14 points.

Submit your answers for the multiple choice questions in the following table.

Question	Answer
1	
2	
3	
4	
5	
6	

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Short Answer Questions

[4] 1. A researcher uses 4 types of seeds in his lab. Under certain conditions, some of these seeds are affected by a particular disease. Let X be the random variable which gives the number of types of seeds which are affected by this disease. The following table gives the probability mass function of X.

x	0	1	2	3	4
$f(x)$	0.805	0.113	0.057	0.0087	k

(a) Find the value for k.

(b) Compute the expected number of types of seeds that are affected by this disease.

(c) Compute $P(X \geq \mu_X + 3\,\sigma_X)$, where μ_X is the mean number of types of seeds that are affected by this disease and σ_X is the standard deviation for the number of types of seeds that are affected by this disease.

Answers to Question 1:

(Question 1 cont.)

[4] 2. Police report that 97% of drivers stopped on suspicion of drunk driving are given a breath test, 13% a blood test, and 10% both tests. Consider the next driver stopped on suspicion of drunk driving.

(a) What is the probability that at least one of the tests is given?

(b) What is the probability that a blood test is given but not a breath test?

(c) What is the probability a blood test or a breath test is given but not both?

(d) Consider the two events "given a blood test" and "given a breath test". Are the events independent?

Answers to Question 2:

(Question 2 cont.)

Multiple Choice Questions

Submit your answers for the multiple choice questions in the table found on the front page.

[**1**] 1. It is estimated that the weight of an adult male grizzly bear from the Alaska Peninsula region has a mean of 357 kg and a standard deviation of 21 kg. Assume that the weight of an adult grizzly bear is normally distributed. Compute the probability that an adult male grizzly bear from the Alaska Peninsula region weighs more than 375 kg.

(A) 0.8051 (B) 0.8571 (C) 0.1429 (D) 0.3570 (E) 0.1949

[**1**] 2. Refer to the Multiple Choice Question 1. Suppose that we select 4 of these bears at random. Compute the probability that at least 3 would weigh less than 357 kg.

(A) 0.1250 (B) 0.3125 (C) 0.8750 (D) 0.2745 (E) 0.6875

[**1**] 3. A lab is attempting to stain many cells. Young cells stain properly 90% of the time, and old cells stain properly 70% of the time. If 60% of the cells are young, what is the probability that a cell stains properly.

(A) 0.85 (B) 0.80 (C) 0.82 (D) 0.75 (E) 0.78

[**1**] 4. Tuberculosis (TB) is now a fairly uncommon disease in Canada. There are about 5 cases per 10,000 Canadians. Suppose that an individual is tested for TB. The nurse states that the test has a false positive rate of 1%. The false-negative rate is slightly lower at 0.1%. If the test result is positive, what is the probability that this individual actually has TB?

(A) 0.0476 (B) 0.3342 (C) 0.6658 (D) 0.0050 (E) 0.9945

[**1**] 5. Let A_1, A_2 and A_3 be independent events such that $P(A_1) = 0.1$, $P(A_2) = 0.2$ and $P(A_3) = 0.75$. Compute the probability that at least one of these three events will occur.

(A) 0.820 (B) 0.180 (C) 0.985 (D) 0.015 (E) 0.350

[**1**] 6. A study is conducted to determine the clinical symptoms that aid in the identification of whooping cough. One symptom investigated is an acute cough of any duration. Data obtained from 250 children studied are shown in the following table.

acute cough is present	No whooping cough	Whooping cough present	Total
Yes	91	125	216
No	31	3	34
Total	122	128	250

We will choose one of the 250 children at random. What is the probability that whooping cough is present given that an acute cough is present?

A) 0.5787 B) 0.4808 C) 0.5000 D) 0.0882 E) 0.8640