

## BIOMETRY, H19, TEST 1

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

Student number \_\_\_\_\_

- (1) (3.5 marks) To gather information on the migration patterns of Common Mergansers you have ringed some of the birds nesting in an area north of Lac Saint-Jean. The travel time to their nesting destination from their winter habitat was recorded for eight such Mergansers (in days)

5 11 9 6 10 6 11 10

Compute the mean, the standard deviation and the coefficient of variation of the travel times.

- (2) (2.5 marks) Data for the clutch sizes of Common Mergansers is collected in the frequency table below.

Clutch size	Frequency
[6, 8]	24
[9, 11]	39
[12, 14]	57
[15, 17]	40

Compute the sample mean clutch size.

- (3) (4 marks) The lengths (in cm) of 27 Common Merganser eggs are recorded below:

6.5 6.6 5.9 6.5 6.9 6.6 7.0 6.3 6.3

6.5 6.1 5.9 6.8 5.9 7.2 7.0 7.3 6.8

6.4 6.2 6.4 7.0 6.9 7.0 6.6 7.1 6.7

Organize the data into a frequency table with five classes. Draw a histogram based on this frequency table.

- (4) (2.5 marks) In the last four years the number of nesting female (the males abandon the nest during incubation) Common Mergansers in the area of Lac Rioux has experienced growth of 6%, 6%, 12% and 21% respectively. If initially there were 15 nesting females in this area, how many nesting females were there after one year, after two years, after three years and after four years (round to integers)? What is the average yearly growth rate over the four years?

- (5) (5 marks) You are managing a forest as part of a wildlife reserve and are interested in whether the mix of tree species in the forest is likely to change in the future. One way to get at this issue is to collect data on the mix of tree species in the understory and compare it to the mix of tree species in the canopy layer. Species that are under-represented in the understory may become less common in the future. The data from a random sample of trees on the reserve are shown in the following table

Species	Canopy trees	Understory trees
Beech	22	79
Maple	30	110
Pine	9	32
Oak	6	22

Consider selecting a tree from this sample at random. Then, consider the following events:  $B = \{\text{Beech}\}$ ,  $M = \{\text{Maple}\}$ ,  $I = \{\text{Pine}\}$ ,  $S = \{\text{Oak}\}$ ,  $C = \{\text{Canopy tree}\}$ ,  $U = \{\text{Understory tree}\}$ . Compute the following probabilities.

- a)  $p(M)$ , b)  $p(C^c)$ , c)  $p(B \cap C)$ , d)  $p(B \cup C)$ , e)  $p(M|C)$ , f)  $p(M|C^c)$ .

By comparing unconditional with conditional probabilities for each tree species argue that the distributions of tree species in the canopy and in the understory are not all that different.

- (6) (2.5 marks) River otters are highly sensitive to pollution and readily accumulate high levels of organochloride compounds and other chemicals. The species are often used as bioindicators for the status of the environment. It is known that 40% of the small tributaries of the Ottawa river carry elevated levels of pesticides in their flow. If an otter lives in such a polluted river, with probability of 0.95 it has elevated levels of pesticides in its bloodstream. An otter which does not live on a polluted river has with probability 0.10 elevated pesticide levels. In an environmental study an otter caught in a small Ottawa river tributary has elevated pesticide levels. What is the probability that this small tributary is polluted?