

Name: _____

Test 1

This test is graded out of 48 marks. No books, notes, graphing calculators or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work. If you need more space for your answer use the back of the page.

Question 1. Below are the final grades of a Calculus II class:

82	34	64	69	92	67	10
38	71	11	70	74	53	99
83	40	56	79	75	67	66
71	53	14	75	75	60	61
80	70	59	46	70	85	70

- (1 mark) Describe the type of data and the level of measurement. (i.e. numerical data, categorical data, continuous data, discrete data, nominal data, etc).
- (1 mark) If the above data is from a class that was offered at Dawson College, would it be a random sample of the student population taking Calculus II during that semester? Justify.
- (1 mark) If the above data was used for a study would it be an observational study or experimental study? Justify.
- (1 mark) Would it be appropriate to draw any causal conclusions based on the data? Justify.
- (2 marks) Compute the sample mean and standard deviation (*use your calculator to save time.*).
- (1 mark) Suppose there is a mistake in the above data, that the student with a grade of 10 actually had a grade of 99. Recompute the sample mean and standard deviation (*use your calculator to save time.*) with the correction.

Question 1. *continued* Below are the final grades of a Calculus II class:(*same data*)

82	34	64	69	92	67	10
38	71	11	70	74	53	99
83	40	56	79	75	67	66
71	53	14	75	75	60	61
80	70	59	46	70	85	70

g. (2 marks) Sort the data (*you can use a stem and leaf display*).

h. (3 marks) Determine the 25th, 50th, and 75th percentile.

i. (4 marks) Sketch a box plot representing the above data. Which grades are possible outliers?

Question 1. *continued* Below are the final grades of a Calculus II class: (*same data*)

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j. (4 marks) Sketch a histogram representing the above data (use $\sqrt{n}$ to determine the number of classes). Describe the histogram?

Question 2. Given A, B and C are events belonging to a sample space S .

a. (3 marks) Sketch the Venn diagrams of $(A \cup B) \cap C$ and $(A \cap C) \cup (B \cap C)$. What conclusion can you draw from the two Venn diagrams?

b. (2 marks) Prove: $P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$. *Hint: You may use the theorem that $P(X \cup Y) = P(X) + P(Y) - P(X \cap Y)$ and part a.*

Question 3. On a legacy system a password can be generated by using 26 lower case letters, 26 upper case letters, 10 digits $\{0, 1, 2, 3, 4, 5, 6, 7, 8, 9\}$ and the following 22 special character $\{!, ", \#, \$, \%, \&, ', (*, +, -, ., /, :, ;, <, =, >, ?, @, [,], | \}$. The password must be of length exactly eight.

- (1 mark) How many different passwords are possible?
- (2 marks) How many different passwords are possible with the additional condition that the password cannot begin or end with a special character.
- (2 marks) How many different passwords are possible with the additional condition that the password must contain at least one upper case letter, one digit, one special character and the password must contain 8 distinct characters(lower case, upper case, digit, special character)?
- (2 marks) If a password is selected at random what is the probability that the password is a rearrangement of the following eight letters Passwords (the letter O is not included).

Question 4. At a bookclub meeting, 3 Marxist-Leninists, 5 Trotskists, 7 NDP members, and 11 Anarchists are present.

- a. (1 mark) How many committees of 5 people can be formed?
- b. (2 marks) How many committees of 5 people can be formed if the committee must include at least 1 Marxist-Leninist, 1 Trotskyist, 1 NDP member, 1 Anarchist?
- c. (2 marks) If a committee of 5 people is selected at random, what is the probability that the committee includes no Marxist-Leninist?
- d. (3 marks) Given that the meeting is in a room with 30 chairs arranged in a circle how many ways can the individual sit such that the Marxist-Leninist sit together with no empty chairs between them?

Question 5. Consider the following fictional data: the percentage of students at Dawson College who use the following modes of transportation at least once a week: 11% walking (W), 10% cycling (B), 68% taking the metro (M), 2% walking and cycling, 4% cycling and walking, 3% walking and taking the metro, 1% walking, cycling and taking the metro.

- a. (2 marks) If a Dawson student is selected at random what is the probability that the student walks, metros or cycles at least once a week.
- b. (2 marks) Describe and compute the probability of event B' . Draw a Venn diagram.
- c. (4 marks) Describe and compute the probability of events $(W \cap B)'$ and $W' \cap B'$. Draw a Venn diagram for both cases.

Bonus Question. (3 marks)

Prove: $P(A' \cap B') = 1 + P(A \cap B) - P(A) - P(B)$