MDM4U Review Day

Communication forms 25% of your mark!	
• Follow proper mathematical form in every solution; • Give detail and **be clear** in every explanation; • Conclude with a statement to answer a question;	• Write organized and easy to follow solutions; • Show all necessary logical steps to reach a well justified solution; you have no gaps in reasoning.

Problem Set: 12 Questions Total, only 8 will appear on your test, you will pick 5 to do

For all solutions you give: marks will be awarded for correct usage of the functions n( ) and P( ) to communicate count and probability of Events. You should use Let Statements to define Events. Level 5 and 6 are awarded to students that not only use notations correctly but excel at breaking problems down into short, clear steps that may make use of diagrams, formulas, or reasoning to demonstrate how to count the size of Events. Consistent Level 5 work is considered for a Level 6.

1. Let S be the set of "months in a year".

    a. Using symbols or letter combinations, write all 12 elements of S in a set using { }.

    b. Define and write out all elements for the sets: "Spring Months", "Summer Months", "Autumn Months", and "Winter Months".

    c. Write out all elements for the sets: ("Spring Months" ∪ "Summer Months") and ("Fall Months" ∩ "Winter Months").

    d. Write a set for the complement of "Winter Months".

    e. Demonstrate how these two sets can intersect using sets or visual/diagram. List or write all the elements of both sets in order to demonstrate this intersection.
    "Summer Months" and "Months beginning with the letter J".

    f. Assume **every** month has 30 days. A new Sample Space, S_D, is described as {JA-01, JA-02, JA-03, ..., DE-29, DE-30}.
    What is n("Month beginning with the letter J" and "day has a 3 in the number")?

2. Solve each probability or counting problem.
    Write let statements for any letters you use to name Events and focus on using n() and P() as functions to communicate counts and probabilities.

    a. After tossing 4 coins in a row, what is the probability that an Outcome has at least **two tails** in a row?

    b. Two D6 dice are rolled. How many ways are there to sum to a total that is a Perfect Square **or** a Prime Number?

    c. One card is drawn from a standard deck. What is the probability that it is **not** a face card **and** its suit is black?

3. A certain provincial park has 220 campsites. A total of 80 sites have electricity. Of the 52 sites on the lakeshore, 22 of them have electricity. If a site is selected at random, what is the probability that:
    a. It will be on the lakeshore?

    b. It will have electricity?

    c. It will either have electricity or be on the lakeshore?

    d. It will be on the lakeshore and not have electricity?

4. The four main blood types are A, B, AB, and O. The letters A and B indicate whether two factors are present. Thus, type AB blood has both factors while type O has neither. Roughly 42% of the population have type A blood, 10% have type B, 3% have type AB, and 45% have type O. Let A be the event "a person has blood factor A in their blood type" (hint: factor not type). Let B be the event "a person has blood factor B in their blood type".

    a. Draw a Venn Diagram to represent the sample space, S, of blood factors.

    b. Are Events A and B mutually exclusive? Explain how you know.

    c. State two disjoint Events in S.

    d. Determine P(A) and $P(B^C)$.

    e. Determine $P(A \cup B)$. Explain what the compound event "$A \cup B$" means using the context of this problem.

5. a. Explain the fundamental counting principle in your own words and give an example of how you could apply it.

    b. Are there situations where the fundamental counting principle does not apply? If so, give one example.

    c. The final score of a soccer game is 6 to 3. How many different scores were possible at half-time?

6. Braedan's Brunch and Luncheon is a high end restaurant with the following menu that changes throughout the week. Braedon frequently sees customers return all three days of the week to sample the menu options. All meals have an equal chance of being selected by returning customers.

Day	Meal Options
Tuesday	Chicken, Vegetarian
Thursday	Duck, Fish, Vegetarian
Sunday	Turkey, Beef

    a. Draw a complete tree diagram to represent the sample space, ***S***, of all possible 3 meal combinations. Give an example of what one Outcome looks like in this set ***S***.

    b. Determine the probability that a returning customer selects poultry (chicken **C**, duck **D**, or

turkey **T**) for all three meals. This is equivalent to finding $P(C \cap D \cap T)$.

c. Determine the probability a returning customer selects a vegetarian option only once.

7. Using a standard deck of 52 cards:

   a. Give an example of two events that are mutually exclusive.

   b. Give an example of two events that are dependent.

   c. Give an example of two events that are independent and **not** mutually exclusive.

8. Before the invention of the telephone, Samuel Morse developed an efficient system for sending messages as a string of dots and dashes (short or long pulses) called Morse Code. An example of one such string of four "pulses" is this ". – . ." which is 3 dots and 1 dash.

   a. How many different characters can Morse Code represent with four pulses?

   b. How many pulses would be necessary to represent the 72 letters of the Cambodian alphabet using a system like Morse Code?

9. The Toronto Maple Leafs are three games into a five game tournament. All five games will be played. After three games, the odds in favour of the Leafs winning are now 1:2 (wins:losses). The odds will change based on the result of game four but no change is necessary after game five because it ends the tournament.

   a. What is the probability that the Leafs win the next two games? Hint: Not odds.

   b. What is the probability that "the Leafs lose at least one more game"?

   c. Are the events "Game 4 Win" and "Game 5 Lose" independent or dependent? Explain how you know.

10. How many 5-digit numbers are there that include the digit 5 and exclude the digit 8? Explain your solution.

11. What is the probability of not throwing 7 nor a doubles for six consecutive throws with a pair of dice?

12. A best-of-five tennis tournament is played between Mackenzie and Connor meaning the first player to three wins will end the tournament. A winner could be declared after 3, 4, or 5 games played. Mackenzie is very confident in her tennis skills and estimates her probability of winning any one game to be 2/3. What is the probability that Mackenzie wins the entire tournament?

Student Evaluation Rubric

Use this rubric to reflect on your progress through this activity. Use the success criteria to write complete solutions demonstrating each level. Accuracy is also a measure of level but 100% accuracy can still earn you a level 3. Communication forms 25% of your mark and how you demonstrate thinking also forms 25% of your mark.

Lvl		5	4	3	
SUCCESS CRITERIA		☐ Proves thinking by devising a clear plan of steps to solve the problem. ☐ Solves the problem by carrying out a plan organized by course concepts, skills, and strategies. You find opportunities to explain and show your work.	☐ Communicates using course vocab, symbols, tools, and representations. ☐ Verifies the final step by using related course concepts and an alternative plan to solve. You are confident using many of our learned math tools and skills.	☐ Connects course concepts, skills, tools, or strategies to solve the problem independently. ☐ Explains problem in their own words, when asked ☐ Determines information needed to solve the problem ☐ Identifies the format of a potential answer (final step) to the problem ☐ Identifies some potential first steps into a problem ☐ Interprets the answer (final step) in context of the problem You understand the math well independently but do ask questions and learn from your mistakes.	
		Areas of Strength		**Areas for Improvement**	
LEARNING GOALS					