PSFML Sessions 1&2 Homework

Full Name: _____

Group No.: ____

Lecturer Name: _____

Submission date: _/_/__ **Grade: __/15**

Please write down all the steps not the final answer only

Questions (15 points):

1. (3 points) A fair coin is tossed, and a fair die is thrown. Write down sample spaces for
   (a) the toss of the coin;
   (b) the throw of the die;
   (c) Let A be the event that a head is tossed, and B be the event that an odd number is thrown. Directly from the sample space, calculate P(A ∩ B) and P(A ∪ B).

2. (5 points) M&M candy are of varying colours and the different colours occur in different proportions. The table below gives the probability that a randomly chosen M&M has each colour, but the value for tan candies is missing:

Colour	Brown	Red	Yellow	Green	Orange	Tan
Probability	0.3	0.2	0.2	0.1	0.1	?

   (a) What value must the missing probability be?
   (b) You draw an M&M at random from a packet. What is the probability of each of the following events?
      i. You get a brown one or a red one.
      ii. You don't get a yellow one.
      iii. You don't get either an orange one or a tan one.
      iv. You get one that is brown or red or yellow or green or orange or tan.

3. (2 point) Q and R are independent events. P(Q) = 0.4 and P(Q AND R) = 0.1. Find P(R).

4. If two events A and B can occur and Pr(A) is not zero and Pr(B) is not zero, what combinations of independent (I), not independent (NI), mutually exclusive (M), and not mutually exclusive (NM) are permissible? In other words, which of the four combinations (I, M), (NI, M), (I, NM), and (NI, NM) are permissible? Construct an example for those combinations that are permissible.

5. (4 points) The following table shows a random sample of musicians and how they learned to play their instruments.

Gender	Self-taught	Studied in School	Private Instruction	Total
Female	12	38	22	72
Male	19	24	15	58
Total	31	62	37	130

   i. Find P(musician is a female).
   ii. Find P(musician is a male AND had private instruction).
   iii. Find P(musician is a female OR is self-taught).
   iv. Are the events "being a female musician" and "learning music in school" mutually exclusive events?

Readings:

- Probability: https://www.mathsisfun.com/data/probability.html
- Further Concepts in Probability: https://www.wyzant.com/resources/lessons/math/statistics_and_probability/probability/further_concepts_in_probability
- Probability of events: https://www.mathplanet.com/education/pre-algebra/probability-and-statistic/probability-of-events
- Permutations & combinations: https://www.mathplanet.com/education/pre-algebra/probability-and-statistic/combinations-and-permutations
- Joint and marginal probability:
- https://www.statisticshowto.datasciencecentral.com/joint-probability-distribution/
- http://homepage.stat.uiowa.edu/~rdecook/stat2020/notes/ch5_pt1.pdf
- https://machinelearningmastery.com/how-to-calculate-joint-marginal-and-conditional-probability/

- Mean value/expected value/average E, Variance (Var), standard deviation (sigma)
- https://online.stat.psu.edu/stat500/lesson/3/3.2/3.2.1
- https://towardsdatascience.com/essential-statistics-for-data-science-ml-4595ff07a1fa
- Covariance (matrix) /correlation (matrix): https://machinelearningmastery.com/introduction-to-expected-value-variance-and-covariance/
- Covariance vs correlation: https://www.surveygizmo.com/resources/blog/variance-covariance-correlation/