# PSFML Session 2 Homework

**Full Name:** _____

**Group No.:** ____

**Lecturer Name:** _____

**Submission date:** _/_/__ **Grade:** __/10

**Please write down all the steps not the final answer only**

## Questions (10 points):

1. (2 points) A men's soccer team plays soccer zero, one, or two days a week. The probability that they play zero days is 0.2, the probability that they play one day is 0.5, and the probability that they play two days is 0.3. Find the long-term average or expected value, *E(X)* or μ, of the number of days per week the men's soccer team plays soccer.

2. (2 points) Roll a **fair**, six-sided die **twice**. Let X = the number of faces that show an even number (total of two rolls). Calculate the mean μ and standard deviation σ of X.

3. (3 points) Let be a random variable $X$ with E[$X$] = 1 and $var(X)$ = 4. Find the following:
   (a) E[$2X - 4$],
   (b) E[$X^2$]
   (c) E[$(2X - 4)^2$].

4. (3 points) Let ($X$, $Y$) be the bivariate random variable with joint PMF (Probability Mass Function) given by:

$$P_{XY}(0,0) = 0.45, \quad P_{XY}(0,1) = 0.05$$

$$P_{XY}(1,0) = 0.1, \quad P_{XY}(1,1) = 0.4$$

   Find the following:
   i. Find the marginal PMF's of $X$ $and$ $Y$

ii. Are $X$ $and$ $Y$ independent?
iii. Find the mean and variance of $X$
iv. Find the mean and variance of $Y$

**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/