STAT 463 - Assignment 1

Due Date: February 10th, 2023

Suppose one rolls two, fair six-sided dice (say a red and a blue die) and records the outcome of this experiment as the numbers that are showing on topside of the die once they come to rest. Consequently, the outcomes of this random experiment can be viewed as an ordered pair (B, R) where B and R are the values of the blue and red die roll respectively with $B, R \in \{1, 2, 3, 4, 5, 6\}$.

Further assume that the outcomes of the two die are probabilistically independent (that is the value of one die roll has no bearing on that of the other die). Consequently, each ordered pair representing an outcome is equally likely. Define the following random variables on this sample space:

S = the sum of the two die roll, i.e. $S = B + R$.

P = the product of the two die roll, i.e. $P = B \times R$

Work out the following:

1) Consider the bivariate random variable (S, P). Explicitly write out the joint *pmf* for (S, P). – 4 points
2) Explicitly write out the marginal *pmf* of S. – 2 points
3) Explicitly write out the marginal *pmf* of P. – 2 points
4) Calculate $E[S]$. – ½ point
5) Calculate $E[P]$. – ½ point
6) Calculate $Cov[S, P]$. – 1 point
7) Calculate $Var[P]$. – ½ point
8) Explicitly write out the conditional *pmf* of P given $S = 7$. – 1.5 points
9) Calculate $E[P|S = 7]$. – ½ point
10) Calculate $Var[P|S = 7]$. – ½ point