**Question 1**

Combinations and Permutations: From first principles, compute the following:

1. 5C2
2. 5P2
3. 4C0
4. 4C4
5. 6C1
6. 6P3
7. 6C2
8. 6C3

**Question 2**

Six horses are entered in a race. Larry picks two of the horses at random, and bets on them.

How many ways are there of picking two horses at random from six?

**Question 3**

Suppose a fair coin is tossed six times. The number of heads which can occur with their respective

probabilities are as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| ***xi*** | **0** | **1** | **2** | **3** | **4** | **5** | **6** |
| ***p(xi)*** | **1*/*64** | **6*/*64** | **15*/*64** | **20*/*64** | **15*/*64** | **6*/*64** | **1*/*64** |

1. Compute the expected value (i.e. expected number of heads).
2. Compute the variance of the number of heads.

**Question 4**

A player tosses two fair coins. He wins $2 if two heads occur, and $1 if one head occurs. On the other hand, he loses $3 if no heads occur.

Find the expected value *E(X)* of the game. Is the game fair?

(The game is fair, favourable, or unfavourable to the player if *E(X)* = 0,*E(X) >* 0 or *E(X) <* 0 respectively)

**Question 5**

Consider X to be the result of rolling a tampered die, for which the probability of obtaining the value ‘6’ is twice as large as the probability for each of the remaining five outcomes.

1. Tabulate the probability distribution of X ? occured?
2. Use the probability distribution of X to compute the probability that the outcome is an even number.
3. What is the expected value of X?

**Question 6**

A lottery with 500 tickets gives one prize of $100, three prizes of $50 each, and five prizes of $25 each.

1. Find the expected winnings of a ticket.
2. If a ticket costs $1, what is the expected value of the game?

**Question 7**

A random sample with replacement of size *n* = 2 is drawn from the set {1*,* 2*,* 3}, yielding the following

9-element sample space:

***S = {(1, 1), (1, 2), (1, 3), (2, 1), (2, 2), (2, 3), (3, 1), (3, 2), (3, 3)}***

Each pairing is equally probable. Let *X* denote the sum of the two numbers.

Construct a table that contains all the possible values of *X* and the probability of that outcome.

Compute the expected value *E(X)*.

**Question 8**

Suppose *X* is a random variable with mean 15 and standard deviation 5.

Compute the expected value of *X2*

(Recall: standard deviation is the square root of variance)