

STA301 Assignment 2 Solution

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Question #1

If two dice are tossed together, find the probability of the same numbers appears on the face dice?

Solution

When two dice are tossed together, the sample space consists of 36 equally likely outcomes (each die has 6 possible outcomes). To find the probability of the same number appearing on both dice, we need to determine the favorable outcomes, which is when the same number appears on both dice.

There are six possible outcomes where the same number appears on both dice: (1, 1), (2, 2), (3, 3), (4, 4), (5, 5), and (6, 6). Therefore, there are 6 favorable outcomes.

The probability of an event is defined as the number of favorable outcomes divided by the total number of possible outcomes. In this case, the probability of the same number appearing on both dice is:

$$\text{Probability} = (\text{Number of favorable outcomes}) / (\text{Total number of possible outcomes}) = 6 / 36 = 1/6$$

Therefore, the probability of the same number appearing on both dice is $1/6$.

Question #2

If three coins are tossed together, what is the probability of getting at most one head?

Solution

When three coins are tossed together, the sample space consists of $2^3=8$ equally likely outcomes (each coin has 2 possible outcomes: heads or tails). To find the probability of getting at most one head, we need to determine the favorable outcomes, which is when we get either no heads or exactly one head.

There are four favorable outcomes:

No heads: (T, T, T)

One head: (H, T, T), (T, H, T), (T, T, H)

Therefore, there are 4 favorable outcomes.

The probability of an event is the number of favorable outcomes divided by the total number of possible outcomes. In this case, the probability of getting at most one head is:

$$\text{Probability} = (\text{Number of favorable outcomes}) / (\text{Total number of possible outcomes}) = 4 / 8 = 1/2$$

Therefore, the probability of getting at most one head when three coins are tossed together is $1/2$.

A bag contains 5 green balls and 3 red balls. If 2 balls are drawn from the bag randomly with replacement, find the probability distribution of the number of green balls drawn. Also, find the expected value of x .

Question #3

A bag contains 5 green balls and 3 red balls. If 2 balls are drawn from the bag randomly with replacement, find the probability distribution of the number of green balls drawn. Also, find the expected value of x .

Solution

When two balls are drawn from the bag randomly with replacement, the probability distribution of the number of green balls drawn can be determined as follows:

Let's denote: X = Number of green balls drawn (0, 1, or 2)

To find the probability distribution, we need to calculate the probability for each possible value of X .

$X = 0$ (No green balls drawn): In this case, both balls drawn must be red. Probability of drawing a red ball = (Number of red balls) / (Total number of balls) = $3 / 8$. Since we are drawing with replacement, the probability of drawing a second red ball is also $3 / 8$. Therefore, the probability of $X=0$ is: $P(X = 0) = (3/8) * (3/8) = 9/64$

$X = 1$ (One green ball drawn): There are two ways to draw one green ball: green-red or red-green. The probability of drawing a green ball = (Number of green balls) / (Total number of balls) = $5 / 8$. Probability of drawing a red ball = (Number of red balls) / (Total number of balls) = $3 / 8$. Therefore, the probability of $X = 1$ is: $P(X = 1) = (5/8) * (3/8) + (3/8) * (5/8) = 30/64 = 15/32$

$X = 2$ (Two green balls drawn): In this case, both balls drawn must be green. Probability of drawing a green ball = (Number of green balls) / (Total number of balls) = $5 / 8$. Since we are drawing with replacement, the probability of drawing a second green ball is also $5 / 8$. Therefore, the probability of $X = 2$ is: $P(X = 2) = (5/8) * (5/8) = 25/64$

Now that we have the probability distribution, we can calculate the expected value of X :

Expected value of X ($E[X]$) = Sum of (Probability of $X = x$) * x for all possible values of x

$$E[X] = (P(X = 0) * 0) + (P(X = 1) * 1) + (P(X = 2) * 2) = (9/64 * 0) + (15/32 * 1) + (25/64 * 2) = 15/32 + 50/64 = 30/64 + 50/64 = 80/64 = 5/4 = 1.25$$

Therefore, the expected value of X is 1.25.

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