CSc 217 – Probability and Statistics for Computer Science

Problem Set №1

by

Alex Washburn

Due at 23:59 on

2023 – 09 – 05

Problem 1:

You flip a fair coin 4 times.
All flips are mutually independent and have outcomes $\Omega = \{ \mathtt{H}, \mathtt{T} \}$.
Determine the probability of the events below.

Hint: Draw a table enumerating the all possible outcomes of 4 flips.

1 (a): " Four heads: $(\mathtt{H}, \mathtt{H}, \mathtt{H}, \mathtt{H})$ **"**

1 (b): " The sequence: $(\mathtt{H}, \mathtt{T}, \mathtt{H}, \mathtt{T})$ **"**

1 (c): " Any sequence with $3\ \mathtt{H}$ **and** $1\ \mathtt{T}$ **"**

1 (d): " Any sequence where the number of $\mathtt{H}$ **is greater than or equal to** $\mathtt{T}$ **"**

Problem 2:

You throw two fair, 6-faced dice, one green and one blue, called $\mathbf{D}_1$ & $\mathbf{D}_2$.
The result of each die is independent of the other.
$\mathbf{D}_1$ has outcomes $\Omega_{\mathbf{D}_1} = \left\{ \overline{1}, \overline{2}, \overline{3}, \overline{4}, \overline{5}, \overline{6} \right\}$.
$\mathbf{D}_2$ has outcomes $\Omega_{\mathbf{D}_2} = \left\{ \underline{1}, \underline{2}, \underline{3}, \underline{4}, \underline{5}, \underline{6} \right\}$.
Determine the probability of the events below.

Hint: Draw a 6×6 grid enumerating the all possible rolls of the dice.

2 (a): " At least one 3 occurs; $P\left(\mathbf{D}_1 = \overline{3} \right)$ or $P\left(\mathbf{D}_2 = \underline{3} \right)$ "

2 (b): " The larger of the two dice is greater than 4; $P\left(\max\left(\mathbf{D}_1, \mathbf{D}_2 \right) > 4 \right)$ "

2 (c): " The faces of the dice match; $P\left(\mathbf{D}_1 = \mathbf{D}_2 \right)$ "

2 (d): " The sum of the dice is 7; $P\left(\mathbf{D}_1 + \mathbf{D}_2 = 7 \right)$ "

Problem 3:

You the same $\mathbf{D}_1$ and $\mathbf{D}_2$ from Problem 2. However, this time you are using $\mathbf{D}_1$ and $\mathbf{D}_2$ as the dice to play the game of Monopoly. In the game of Monopoly, if you "roll doubles," meaning that the faces of the dice are the same number, then you get to roll the dice again. You can roll the dice a maximum of three times, if you happen to "roll doubles" on both the first and second rolls. The number of spaces you move is the sum of all dice rolls.

What is the probability that you move *at least* 12 spaces?

Hint: Draw a 6×6 ***grid enumerating the all possible rolls of the dice. Then sub-divide the cells where you "roll doubles" into another, smaller*** 6×6 ***grid within that cell. Each cell, no matter how small, is one possible outcome.***

Extra Credit 4:

Which is the most preferable from these mutually exclusive options?

- ♡ **Pursue your passion**
- $ **Take the money**