Assignment 4
Probability and Random Variables

Swati Mohanty (EE20RESCH11007)

I. Problem

Find the probability distribution of
(i) number of heads in two tosses of a coin.
(ii) number of tails in the simultaneous tosses of three coins.
(iii) number of heads in four tosses of a coin.

II. Solution

(i)Let the event be defined as
X = Number of heads when a coin is tossed twice
Outcomes ={HH,HT,TH,TT}
Hence the probability distribution of X is:

X	0	1	2
P(X)	1/4	1/2	1/4

(ii)Let the event be defined as
X = Number of tails in the simultaneous tosses of three coins.
Outcomes ={ HHH,HHT,HTH,HTT,THH,THH,TTH, TTT}
Hence the probability distribution of X is:

X	0	1	2	3
P(X)	1/8	3/8	3/8	1/8

(iii)Let the event be defined as
X = Number of heads in four tosses of a coin.
Outcomes ={ HHHH,HHHT,HHTH,HHTT,HTHH, HTHH,HTTH,HTTT,THHH,THHT,THTH,THTT, TTHH, TTHH,TTTH,TTTT}
Hence the probability distribution of X is:

X	0	1	2	3	4
P(X)	1/16	1/4	3/8	1/4	1/16

The probabilities were simulated using the python code.

Download python code from here

https://github.com/Swati-Mohanty/AI5002/blob/main/Assignment_4/codes/cointoss.py

```
Probability distribution of heads in two tosses of a coin
0 Heads:  0.2476
1 Head:  0.5
2 Heads:  0.2524
```

Figure 1: Simulation for tossing a fair coin twice

```
Probability distribution of tails in three tosses of a coin
0 Tails:  0.1237
1 Tail:  0.37585
2 Tails:  0.37585
3 Tails:  0.1246
```

Figure 2: Simulation for tossing a fair coin thrice

```
Probability distribution of heads in four tosses of a coin
0 Heads:  0.0589
1 Head:  0.12
2 Heads:  0.7578
3 Heads:  0.12
4 Heads:  0.0633
```

Figure 3: Simulation for tossing a fair coin 4 times

Download latex code from here-

https://github.com/Swati-Mohanty/AI5002/blob/main/Assignment_4/codes/assignment4.tex