بِسۡمِ اللَّهِ الرَّحۡمَٰنِ الرَّحِيمِ

Lecture: 05

Random Number Generator

LCM (Linear Congruential Method)

X_{i+1}= (a. X_i + C) mod m

or,

X_i = (a. X_{i-1} + C) mod m

$R_i = \frac{Xi}{m}$

X_0 = Seed element

a= multiplier

C= increment

m= Module

if C=0 => multiplicative LCM

C ≠ 0 => mixed LCM

Problem 2 (Homework): Using LCM generate a sequence of random number with X_0 = 27, a= 17, C=43 and m= 100

Solution:

Seed X_0 = **27**; R1 = 27/100 = 0.27

X_1 = (17*27+43) mod 100= 502 mod 100= 2; R2 = 2/100=0.002

X_2 = (17*2+43) mod 100=77 mod 100 = 77; R3 = 77/100=0.77

X_3 = (17*77+43) mod 100=1352 mod 100 = 52; R4 =52/100=0.52

X_4 = (17*52+43) mod 100=927 mod 100 = **27**; R5= 27/100= 0.27

Random Sequence 27,2,77,52,27

Random Number 0.27, 0.002, 0.77, 0.52

Created by
Shahadat Hossain
Lecturer, Dept of CSE
City University

Review of Probability & Statistics Basic

Experiments -> means, a process whose outcome is not known with certainty or occurrence.

Sample Space -> means, the set of all outcomes of an experiment is called the sample space and denoted by **'S'.**

Sample Point -> means, the outcomes themselves called sample points in the sample space.

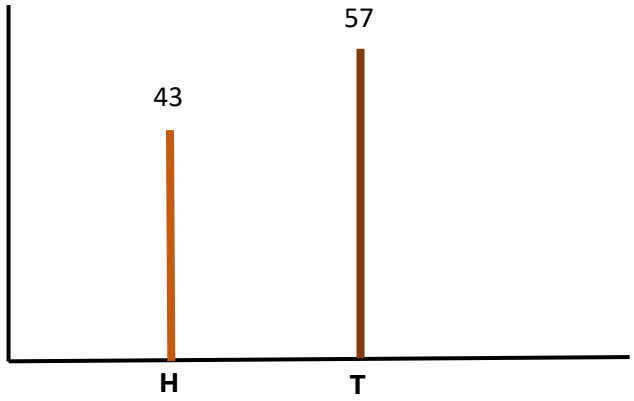
Example-1:

Experiment- flip a coin

Sample Space- S= {H, T}; **'{}' means "the set consist of"**

Sample Point- $\frac{H}{T}$

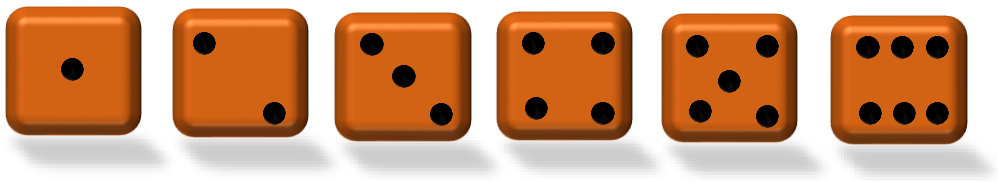
If we take 100 times sample experiments then we will get the nearby result of head or tail occurrence. The more we do experiment the more we will get accurate and nearby result.



Example-2:

Experiment- Roll a dice

Sample Space – S= {1,2,3,4,5,6}

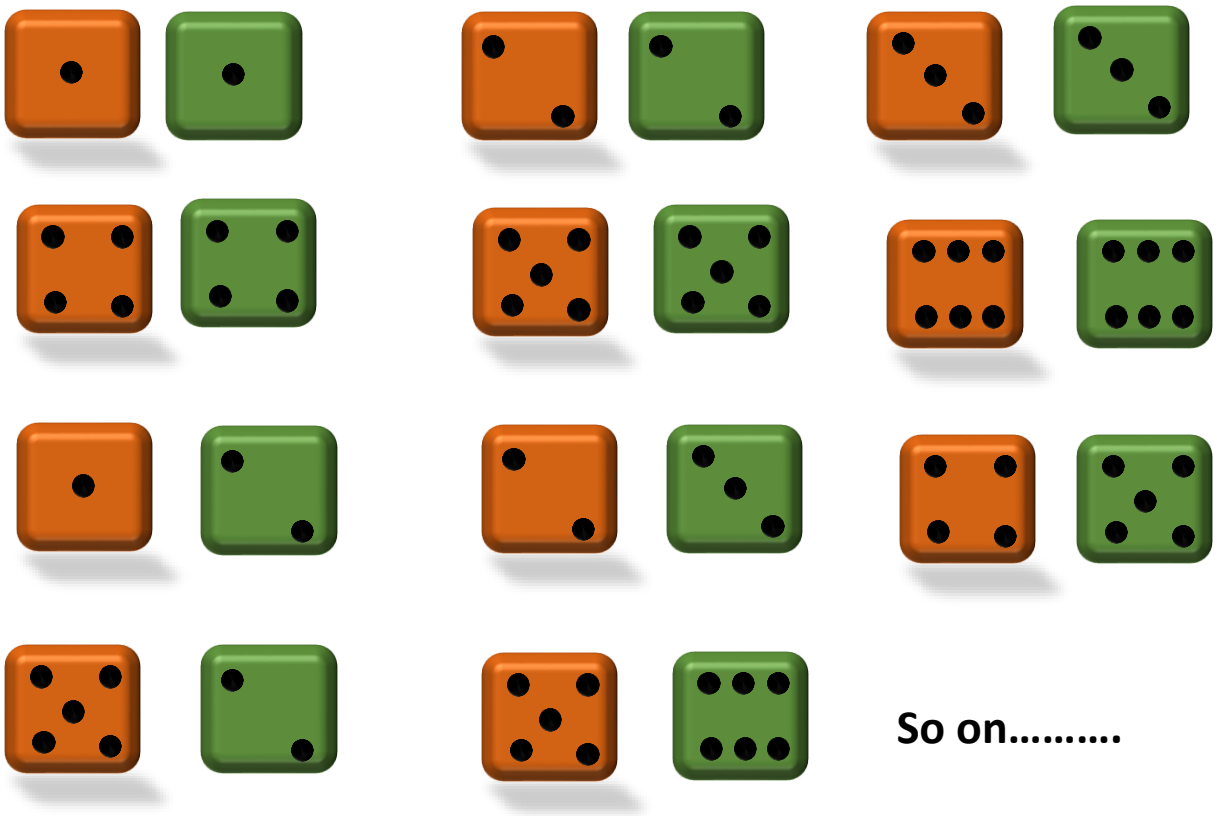


Created by
Shahadat Hossain
Lecturer, Dept of CSE
City University

Example- 3:

Experiment- Roll two dice

Sample Space- S= {2,3,4,5,6,7,8,9,10,11,12}



So on…….

Orange dice	Green dice	Sum of the black point
1	1	2
1	2	3
1	3	4
1	4	5
1	5	6
1	6	7
2	1	3
2	2	4
2	3	5
2	4	6
2	5	7
2	6	8
3	1	4

Total occurrences: 36

Created by
Shahadat Hossain
Lecturer, Dept of CSE
City University

3	2	5
3	3	6
3	4	7
3	5	8
3	6	9
4	1	5
4	2	6
4	3	7
4	4	8
4	5	9
4	6	10
5	1	6
5	2	7
5	3	8
5	4	9
5	5	10
5	6	11
6	1	7
6	2	8
6	3	9
6	4	10
6	5	11
6	6	12

Probability of Occurrence of **2 = 1/36 = 0.03**

Probability of Occurrence of **3 = 2/36 = 0.05**

Probability of Occurrence of **4 = 3/36 = 0.08**

Created by
Shahadat Hossain
Lecturer, Dept of CSE
City University

Probability of Occurrence of **5 = 4/36 = 0.11**

Probability of Occurrence of **6 = 5/36 = 0.14**

Probability of Occurrence of **7 = 6/36 = 0.17**

Probability of Occurrence of **8 = 5/36 = 0.14**

Probability of Occurrence of **9 = 4/36 = 0.11**

Probability of Occurrence of **10 = 3/36 = 0.08**

Probability of Occurrence of **11 = 2/36 = 0.05**

Probability of Occurrence of **12 = 1/36 = 0.03**

Created by
Shahadat Hossain
Lecturer, Dept of CSE
City University