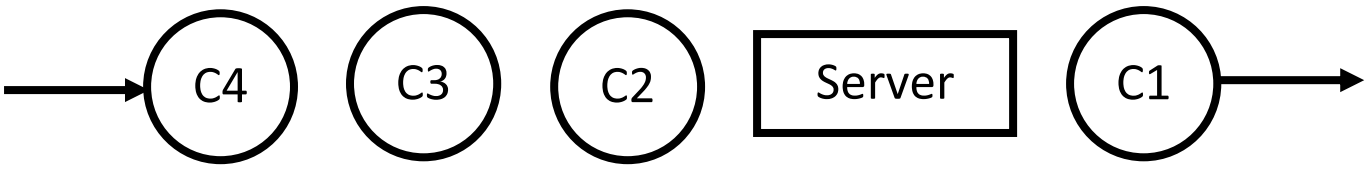
Simulation of Single Server Queue Example



- Customer arrive at the server at random from 1 to 8 minutes apart. Each possible value of inter arrival time has the same probability of occurrence.
- The service time vary from 1 to 6 minutes with the probability of 0.10, 0.20, 0.30, 0.25, 0.10, 0.05 respectably.

- The problem is to analyze the system by simulating the arrival and service of 20 customers.
- Random value for time between arrivals - 913, 727, 015, 948, 309, 922, 753, 235, 302, 109, 093, 607, 738, 359, 888, 106, 212, 493, 535.
- Random value for Service time - 84, 10, 74, 53, 17, 79, 91, 67, 89, 38, 32, 94, 79, 05, 79, 84, 52, 55, 30, 50.

Questions	
1.	Show the graph of Q(t) vs t. where Q(t) indicates queue length at time t.
2.	Show the graph of B(t) vs t, where B(t) indicates server busy at time t.
3.	Average Interval (Inter Arrival) Time
4.	Average Waiting Time of Those Who Wait
5.	Average Delay in Queue or, Average Waiting Time
6.	Average Service Time
7.	Average Time Spend in the Server
8.	Average number of Customer in Queue or, Probability of Customer in Queue
9.	Probability of Idle Server
10.	Utilization of the Server

- Customer arrive at the server at random from 1 to 8 minutes apart. Each possible value of inter arrival time has the same probability of occurrence.

Distribution of time between arrivals			
Time Between Arrival	Probability	Cumulative Probability	Random Digit Assignment
1	1/8= 0.125	0.125	001 - 125
2	1/8= 0.125	0.250	126 - 250
3	1/8= 0.125	0.375	251 – 375
4	1/8= 0.125	0.500	376 - 500
8	1/8= 0.125	1.000	876 - 000

- The service time vary from 1 to 6 minutes with the probability of 0.10, 0.20, 0.30, 0.25, 0.10, 0.05 respectably.

Distribution of service time			
Service Time	Probability	Cumulative Probability	Random Digit Assignment
1	0.10	0.10	01 – 10
2	0.20	0.30	11 – 30
3	0.30	0.60	31 – 60
6	0.05	1.00	96 – 00

The problem is to analyze the system by simulating the arrival and service of 20 customers.

- Random value for time between arrivals - 913, 727, 015, 948, 309, 922, 753, 235, 302, 109, 093, 607, 738, 359, 888, 106, 212, 493, 535.

Time Between Arrival Determination		
Customer	Random Digit	Time Between Arrival
1		
2	913	8
3	727	6
4	015	1
5	948	8
6	309	3
7	922	8
8	753	7
20	535	5

- Random value for Service time - 84, 10, 74, 53, 17, 79, 91, 67, 89, 38, 32, 94, 79, 05, 79, 84, 52, 55, 30, 50.

Time Between Service Time Determination		
Customer	Random Digit	Service Time
1	84	4
2	10	1
3	74	4
4	53	3
5	17	2
6	79	4
7	91	5
8	67	4
20	50	3

Now Simulation

Customer No	Time between Arrival	Arrival Time	Service Time	Service Start Time	Service End Time	Waiting time	Idle Time for server
1		0	4	0	4	0	0
2	8	8	1	8	9	0	4
3	6	14	4	14	18	0	5
4	1	15	3	18	21	3	0
5	8	23	2	23	25	0	2
6	3	26	4	26	30	0	1
7	8	34	5	34	39	0	4
8	7	41	4	41	45	0	2
20	5		3				