Question 1:

a.

```
for 1000 jobs
   average interarrival time =   9.87
   average service time .... =   7.12
   average delay ..... =  18.59
   average wait ..... =  25.72
   Max delay ..... = 118.76
   Number of jobs in the service ..... = 277
   the proportion of jobs delay ..... = 723
```

b. For the max delay situation. The reason is ai>ci-1. The previous job still processes at server. The next job has arrived. This situation indicates multiple jobs stack in the queue. When multiple jobs wait in the queue, this will be wait long time to process, and delay a lot.

c.

```
average interarrival time =   9.87
average service time .... =   7.12
average delay ..... =  18.59
average wait ..... =  25.72
Max delay ..... = 118.76
Number of jobs in the service ..... = 277
the proportion of jobs delay ..... = 723
Number of jobs in the service at t = 400..... = 6
```

This number is the service node jobs. Sum how much jobs int eh services node is equal to how long jobs process at service node.

d.

```
for 1000 jobs
   average interarrival time =   9.87
   average service time .... =   7.12
   average delay ..... =  18.59
   average wait ..... =  25.72
   Max delay ..... = 118.76
   Number of jobs in the service ..... = 277
   the proportion of jobs delay ..... = 723
   Number of jobs in the service at t = 400..... = 7
   The proportion of jobs delay..... = 72.30%
```

According to the experiment result. I can find that there are 723 of 1000 jobs. The proportion of jobs where delays is 72.30%.

The proportion of utilization:

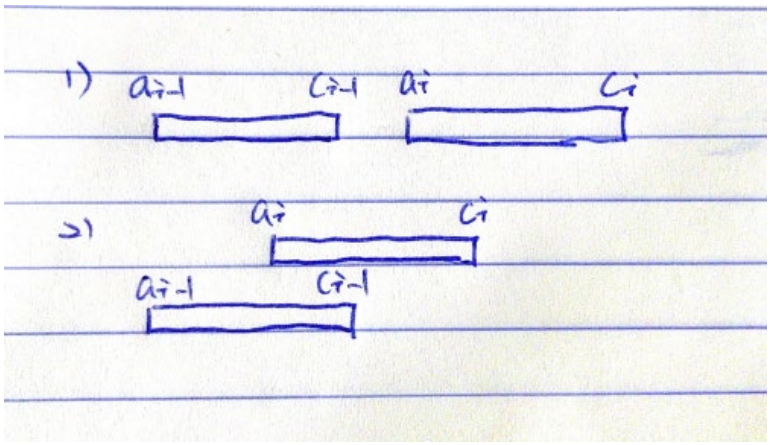
```
for 1000 jobs
   average interarrival time =   9.87
   average service time .... =   7.12
   average delay ..... =  18.59
   average wait ..... =  25.72
   Max delay ..... = 118.76
   Number of jobs in the service ..... = 277
   the proportion of jobs delay ..... = 723
   Number of jobs in the service at t = 400..... = 7
   The proportion of jobs delay..... = 72.30%
   The proportion of utilization..... = 72.17%
```

Question 2

a.

```
for 500 jobs
   average interarrival time =   4.08
   average service time .... =   3.03
   The server utilization..... = 74.31%
   The traffic intensity..... = 74.67%
```

b.



Question 3

a.

```
Enter a positive integer seed (9 digits or less) >> 88

based on 10000 replications the estimated probabilities are:0.098
```

```
 Enter a positive integer seed (9 digits or less) >> 234235

 based on 10000 replications the estimated probabilities are:0.096
```

```
Enter a positive integer seed (9 digits or less) >> 7698

based on 10000 replications the estimated probabilities are:0.098
```

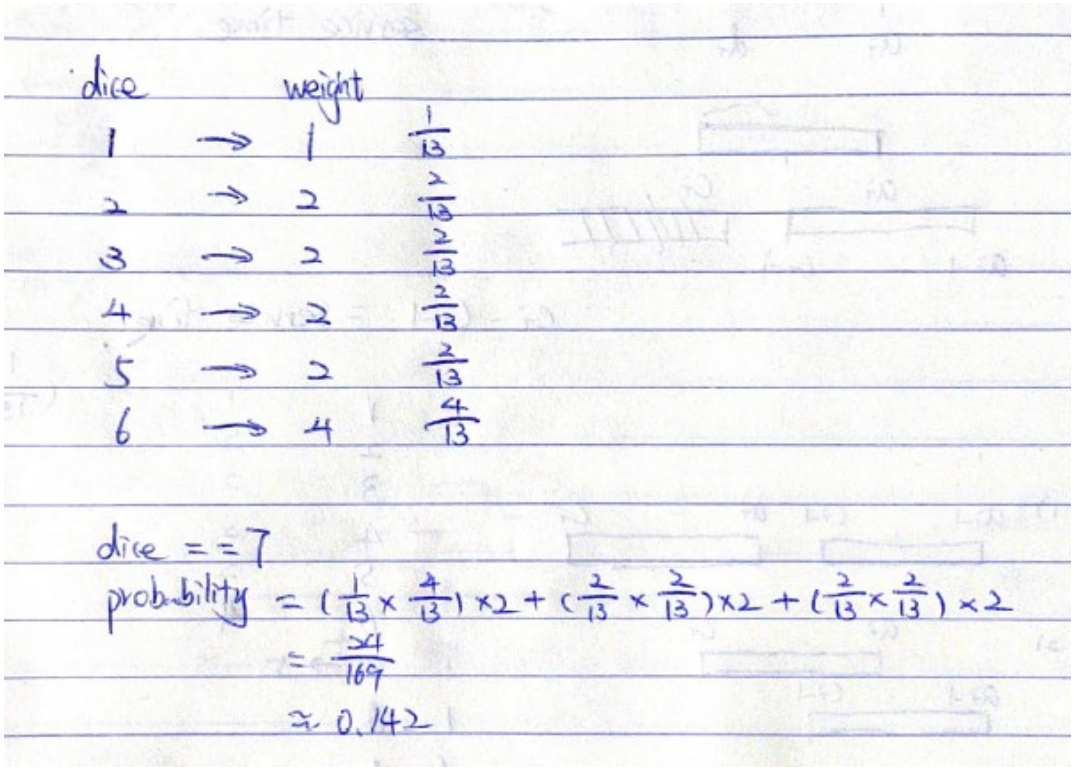
```
Enter a positive integer seed (9 digits or less) >> 124

based on 10000 replications the estimated probabilities are:0.097
```

```
Enter a positive integer seed (9 digits or less) >> 12

based on 10000 replications the estimated probabilities are:0.092
```

b.



Question 4

a.

```
Enter a positive integer seed (9 digits or less) >> 436

based on 10000 replications the estimated probabilities are:0.671
```

```
Enter a positive integer seed (9 digits or less) >> 34

based on 10000 replications the estimated probabilities are:0.683
```

```
Enter a positive integer seed (9 digits or less) >> 346468

based on 10000 replications the estimated probabilities are:0.682
```

```
Enter a positive integer seed (9 digits or less) >> 23454378

based on 10000 replications the estimated probabilities are:0.673
```

```
Enter a positive integer seed (9 digits or less) >> 9

based on 10000 replications the estimated probabilities are:0.676
```

b.

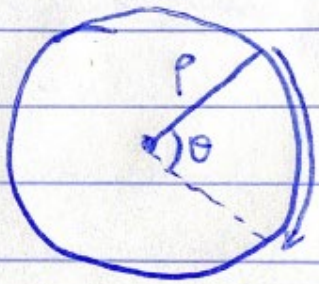
The probability doesn't depend on radium p. The probability only have relative with angle.

Option 1

$\frac{\theta}{360} \cdot 2\pi r > r$

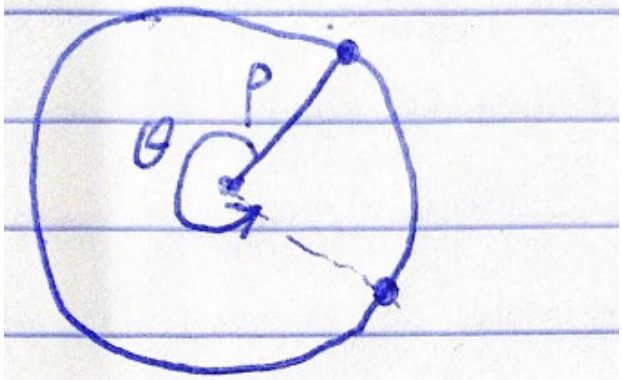
$\frac{\theta}{180}$

$= \frac{\theta\pi}{180} > 1$



$\frac{\theta}{360} \cdot 2\pi r$

Option 2



$\frac{360-\theta}{360} \cdot 2\pi r > r$

$\left(1 - \frac{\theta}{360}\right) \cdot 2\pi > 1$

$\theta < 302^\circ$