

singleserver

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Single Server Queuing Model.

The function queue is as follows:

q -> average interarrival time

a -> average service time

numarrivals -> number of persons entering the queue.

```
queue <- function(a, p, numarrivals) {  
  
  wait_time <- 0;  
  total_wait_time <- 0;  
  total_idle_time <- 0;  
  total_arrival_time <- 0;  
  for (i in 1:numarrivals) {  
  
    service_time <- rexp(1, 1/p);  
    interarrival_time <- rexp(1, 1/a);  
  
    total_arrival_time <- total_arrival_time + interarrival_time;  
    wait_time <- wait_time - interarrival_time + service_time;  
    if (wait_time >= 0)  
      total_wait_time <- total_wait_time + wait_time  
    else {  
      total_idle_time <- total_idle_time - wait_time;  
      wait_time <- 0;  
    }  
  }  
  
  result <- data.frame(Utilization=1-total_idle_time/total_arrival_time,  
                        TimeInQueue=total_wait_time/numarrivals,  
                        TimeInSystem=total_wait_time/numarrivals+p,  
                        NumberInQueue=total_wait_time/total_arrival_time,  
                        NumberInSystem=total_wait_time/total_arrival_time+p/a);  
  
  return(result)  
}
```

Now,

For Arrival Rate=1, Service Rate=.5 and 20 customers enter the queue.

The Output Statistics will be as follow.

```
queue(1,0.5,20)
```

```
##   Utilization TimeInQueue TimeInSystem NumberInQueue NumberInSystem  
## 1    0.5180349    0.6802669    1.180267    0.8223104    1.32231
```