Project 3 Simulator: Process Scheduler (30 points)

1. Compute the response time and turnaround time when running three jobs of length 200 with the SJF and FIFO schedulers. (FIFO works the same way as FCFS.)

 a Job 0:

   i Response: 0.00, Turnaround: 9.00

 b Job 1:

   i Response: 9.00, Turnaround: 17.00

 c Job 2:

   i Response: 17.00, Turnaround: 22.00

 d

2. Now do the same but with jobs of different lengths: 100, 200, and 300.

 a Job 0:

   i Response: 0.00, Turnaround: 100.00

 b Job 1:

   i Response: 100.00, Turnaround: 300.00

 c Job 2:

   i Response: 300.00, Turnaround: 600.00

 d

3. Now do the same, but also with the RR scheduler and a time slice of 1.

 a Job 0:

        i Response: 0.00, Turnaround: 298.00

   b Job 1:

        i Response: 1.00, Turnaround: 499.00

   c Job 2:

        i Response: 2.00, Turnaround: 600.00

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[ time 597 ] Run job    2 for 1.00 secs
[ time 598 ] Run job    2 for 1.00 secs
[ time 599 ] Run job    2 for 1.00 secs ( DONE at 600.00 )

Final statistics:
  Job   0 -- Response: 0.00  Turnaround 298.00  Wait 198.00
  Job   1 -- Response: 1.00  Turnaround 499.00  Wait 299.00
  Job   2 -- Response: 2.00  Turnaround 600.00  Wait 300.00

  Average -- Response: 1.00  Turnaround 465.67  Wait 265.67
```
   d

4. For what types of workloads does SJF deliver the same turnaround times as FIFO?

   a FIFO will deliver the same turnaround time as SJF when the jobs all have the same length.

5. For what types of workloads and quantum lengths does SJF deliver the same response times as RR?

   a RR will deliver the same response times as SJF whenever the time quantum is larger than the longest job.

6. What happens to response time with SJF as job lengths increase? Can you use the simulator to demonstrate the trend?

   a The response time will increase linearly with the increase in job length. The two examples below will show how when the length of the jobs double, the average response time will also double.

   b 5, 10, 20

```
Here is the job list, with the run time of each job:
  Job 0 ( length = 5.0 )
  Job 1 ( length = 10.0 )
  Job 2 ( length = 20.0 )

** Solutions **

Execution trace:
  [ time    0 ] Run job 0 for 5.00 secs ( DONE at 5.00 )
  [ time    5 ] Run job 1 for 10.00 secs ( DONE at 15.00 )
  [ time   15 ] Run job 2 for 20.00 secs ( DONE at 35.00 )

Final statistics:
  Job   0 -- Response: 0.00  Turnaround 5.00  Wait 0.00
  Job   1 -- Response: 5.00  Turnaround 15.00  Wait 5.00
  Job   2 -- Response: 15.00  Turnaround 35.00  Wait 15.00

  Average -- Response: 6.67  Turnaround 18.33  Wait 6.67
```
        i

   c Below is a SJF run with the job lengths being double of what they were before. 10, 20, 40

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Here is the job list, with the run time of each job:
  Job 0 ( length = 10.0 )
  Job 1 ( length = 20.0 )
  Job 2 ( length = 40.0 )

** Solutions **

Execution trace:
  [ time   0 ] Run job 0 for 10.00 secs ( DONE at 10.00 )
  [ time  10 ] Run job 1 for 20.00 secs ( DONE at 30.00 )
  [ time  30 ] Run job 2 for 40.00 secs ( DONE at 70.00 )

Final statistics:
  Job   0 -- Response: 0.00   Turnaround 10.00  Wait 0.00
  Job   1 -- Response: 10.00  Turnaround 30.00  Wait 10.00
  Job   2 -- Response: 30.00  Turnaround 70.00  Wait 30.00

  Average -- Response: 13.33  Turnaround 36.67  Wait 13.33
```
      i

    d The Average response time went from 6.67 to 13.33, meaning that when the job lengths all doubled, the average response time also doubled.

7. What happens to response time with RR as quantum lengths increase? Can you write an equation that gives the worst-case response time, given N jobs?

      a R-Worst = (N-1)*Q

      b R-Avg = ((N-1)*Q)/2 is my equation for the average

      c N = 100, Q = 1

          i R-Worst = 99.00, R-Predicted-Avg = 49.50, R-Actual = 49.50

```
Average -- Response: 49.50  Turnaround 455.47  Wait 449.11
```
          ii

      d N = 100, Q = 2

          i R-Worst = 198, R-Predicted-Avg = 99.00, R-Actual-Avg = 94.04

```
Average -- Response: 97.04  Turnaround 451.77  Wait 445.41
```
          ii

      e N = 200, Q = 2

          i R-Worst = 398, R-Predicted-Avg = 199.00, R-Actual-Avg = 192.72

```
Average -- Response: 192.72  Turnaround 773.39  Wait 767.66
```
          ii