Exercise Sheet 8

Exercise 1 (Scheduling Strategies)

1. Why exists a system idle process in some operating systems?
2. Explain the difference between preemptive and non-preemptive scheduling.
3. Name one drawback of preemptive scheduling.
4. Name one drawback of non-preemptive scheduling.
5. How does multilevel feedback scheduling work?
6. Which scheduling strategies are fair?

   A scheduling method is „fair“ when each process gets the CPU assigned at some point.

   ☐ Priority-driven scheduling
   ☐ First Come First Served
   ☐ Round Robin with time quantum
   ☐ Earliest Deadline First
   ☐ Fair share

7. Which scheduling strategies operate preemptive?

   ☐ First Come First Served
   ☐ Round Robin with time quantum
   ☐ Fair share
   ☐ Multilevel feedback scheduling

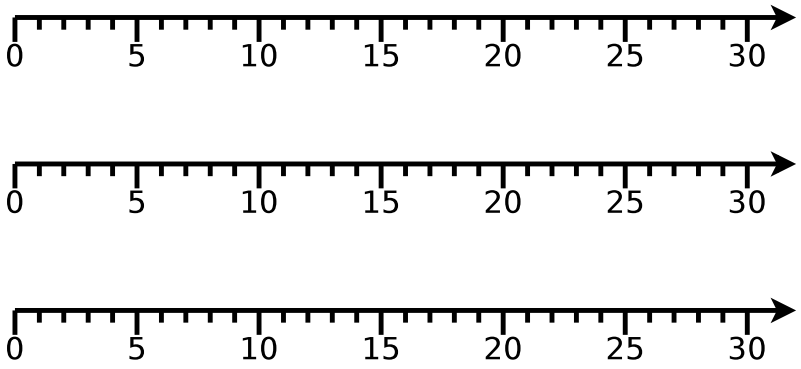
Exercise 2 (Scheduling)

Process	CPU time	Priority
A	5 ms	15
B	10 ms	5
C	3 ms	4
D	6 ms	12
E	8 ms	7

Five processes shall be processed on a single CPU/core system. All processes are at time point 0 in state `ready`. High priorities are characterized by high values.

Draw the execution order of the processes with a Gantt chart (timeline) for **Round Robin** (time quantum $q = 1\,\text{ms}$), **FCFS** and **priority-driven scheduling**.

Calculate the average runtimes and average waiting times of the processes.



The CPU time is the time that the process needs to access the CPU to complete its execution.

Runtime = „lifetime“ = time period between the creation and the termination of a process = (CPU time + waiting time).

Runtime	**A**	**B**	**C**	**D**	**E**
RR					
FCFS					
Priority-driven scheduling					

Waiting time = time of a process being in state `ready`.

Waiting time = runtime - CPU time.

Waiting time	**A**	**B**	**C**	**D**	**E**
RR					
FCFS					
Priority-driven scheduling					

Exercise 3 (Shell Scripts)

1. Program a shell script, which requests the user to select one of the four basic arithmetic operations. After selecting a basic arithmetic operation, the user is requested to enter two operands. Both operands are combined with each other via the previously selected basic arithmetic operation and the result is printed out in the following form:

   ```
   <Operand1> <Operator> <Operand2> = <Result>
   ```

2. Modify the shell script from subtask 1 in a way that for each basic arithmetic operation a separate function exists. These functions should be relocated into an external function library and used for the calculations.

3. Program a shell script, which prints out a certain number of random numbers up to a certain maximum value. After starting the shell script, it should interactively query the values of these parameters:

   - Maximum value, which must be in the number range from 10 to 32767.
   - Desired number of random numbers.

4. Program a shell script, which creates the following empty files:

   `image0000.jpg`, `image0001.jpg`, `image0002.jpg`, `...`, `image9999.jpg`

5. Program a shell script, which renames the files from subtask 4 according to this scheme:

```
BTS_Exercise_<YEAR>_<MONTH>_<DAY>_0000.jpg
BTS_Exercise_<YEAR>_<MONTH>_<DAY>_0001.jpg
BTS_Exercise_<YEAR>_<MONTH>_<DAY>_0002.jpg
...
BTS_Exercise_<YEAR>_<MONTH>_<DAY>_9999.jpg
```