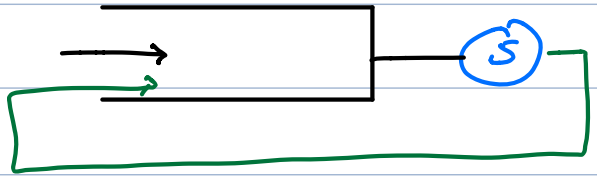
5 Round Robin

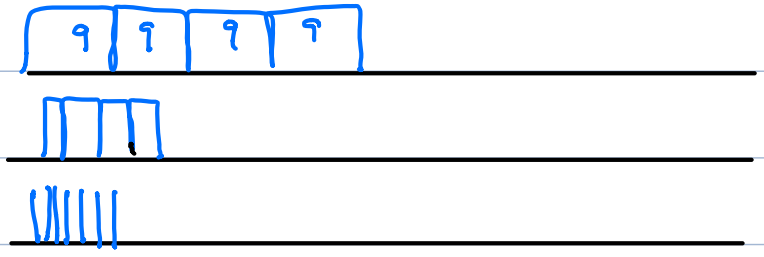


n process

q quantum

maximum waiting time = $(n-1)q$

Each process takes $\frac{1}{n}$ of the CPU time



Generalized Processor Sharing

If q is very small, and no cost for context switching
→ each process has it's own CPU ($\frac{1}{n}$ the speed of the CPU)

80% of the CPU burst to be shorter then q.

6 Priority Scheduling [Preemptive / non-preemptive]

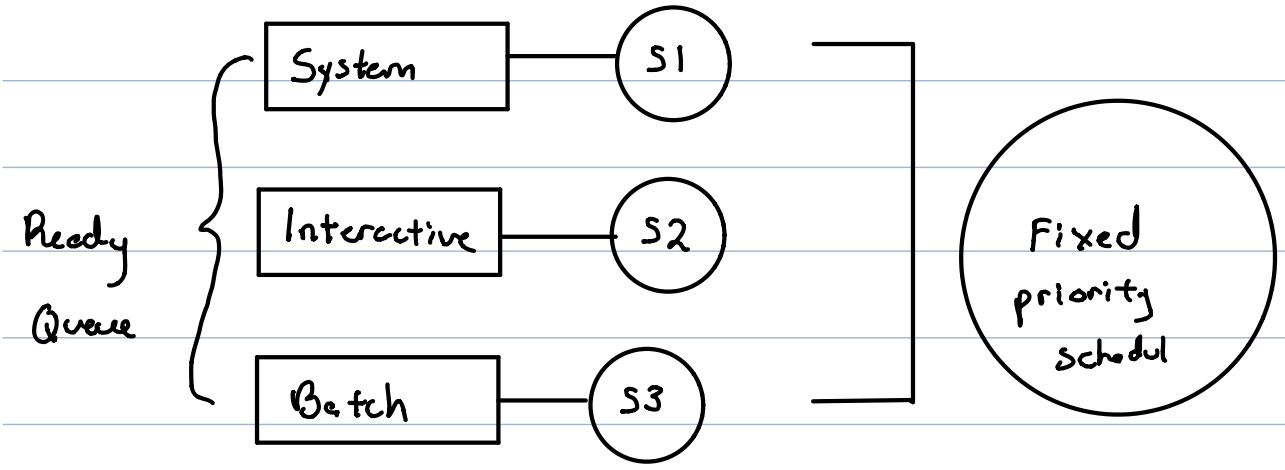
select process w/ highest priority

- Could be external or internal.

0 would be the higher prority

- Starvation can happen.
- Aging = Increasing priority over time as processes wait.

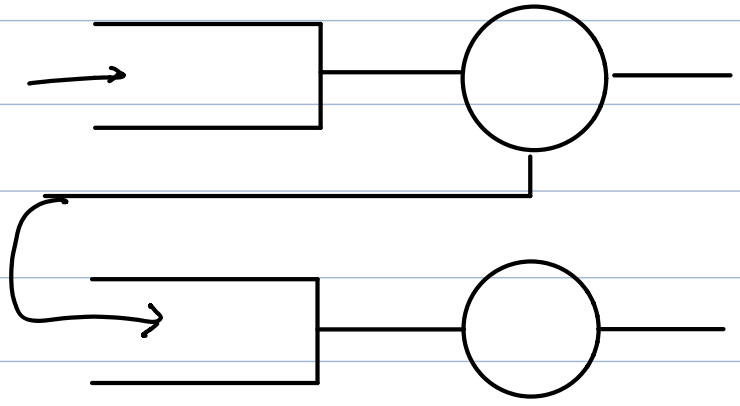
7 Multi-level queue Scheduling



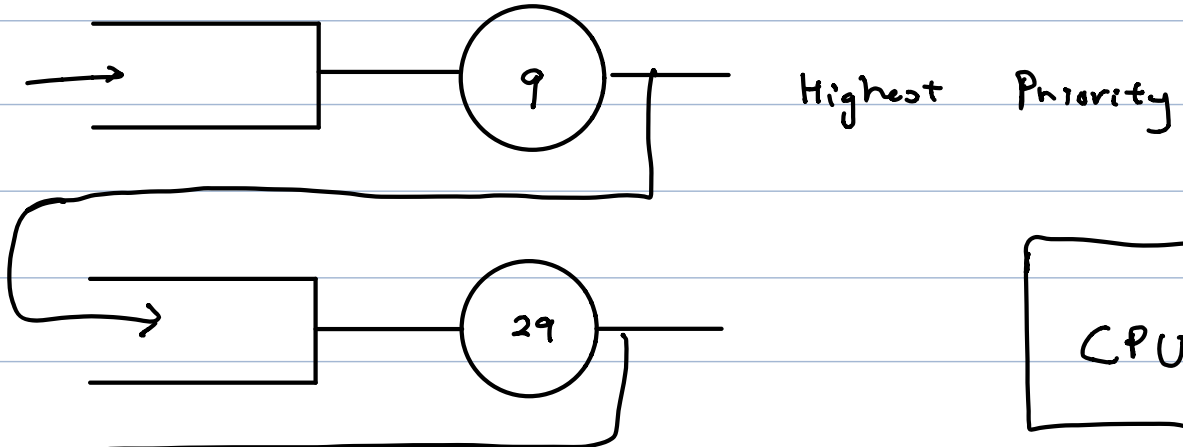
Classify processes into different groups

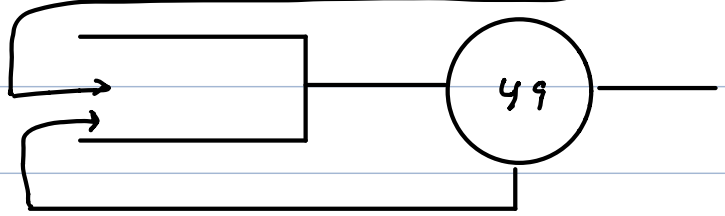
↳ Each group is assigned a ready queue.

8 Multi-level Feedback Queue Scheduling



Vs.





Lowest priority

Penalize process that have been running the longest

Examples

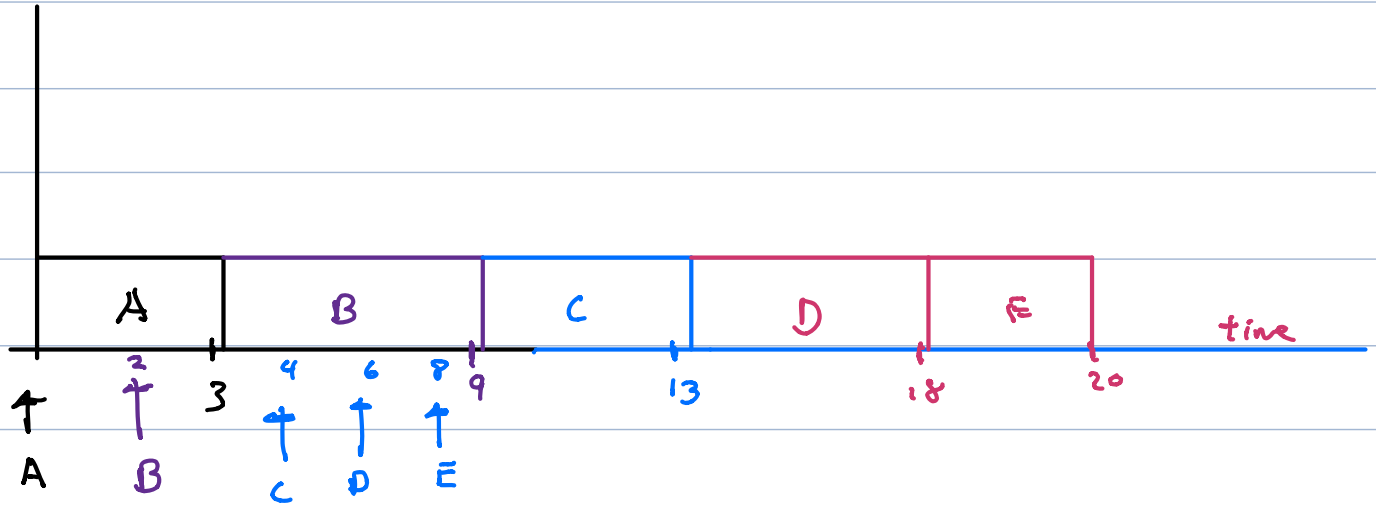
when it finished

	Arrival time	CPU burst	Finish time	Turn around
A	0	3	3	3
B	2	6	9	7
C	4	4	13	9
D	6	5	18	12
E	8	2	20	12

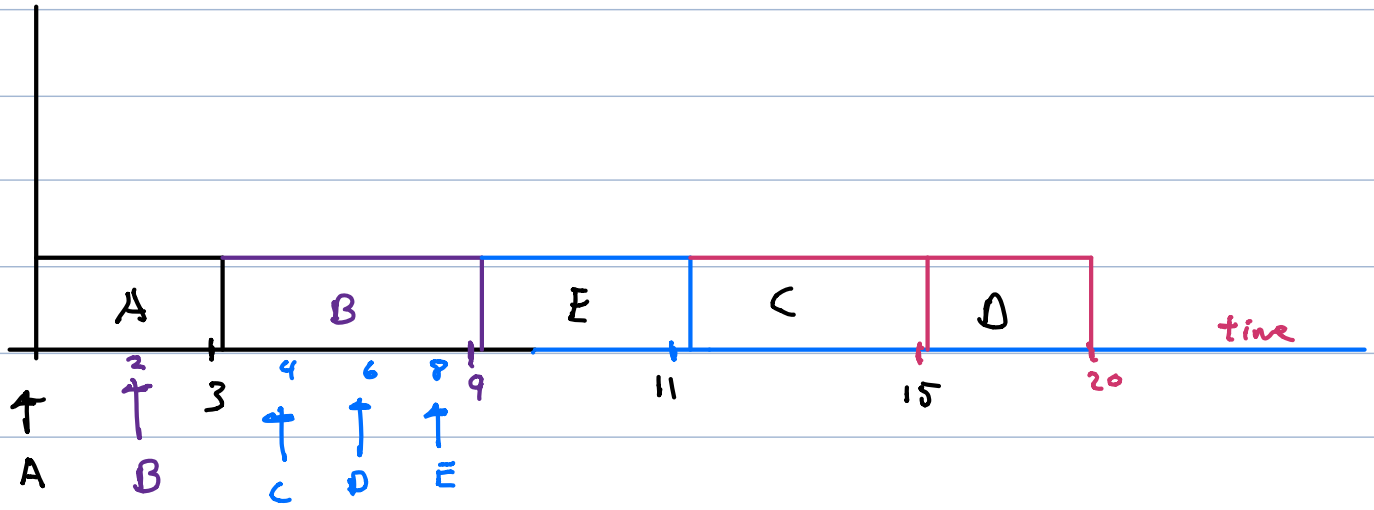
Finish time - Arrival =

FCFS (Non preemptive)

↳ First come first serve

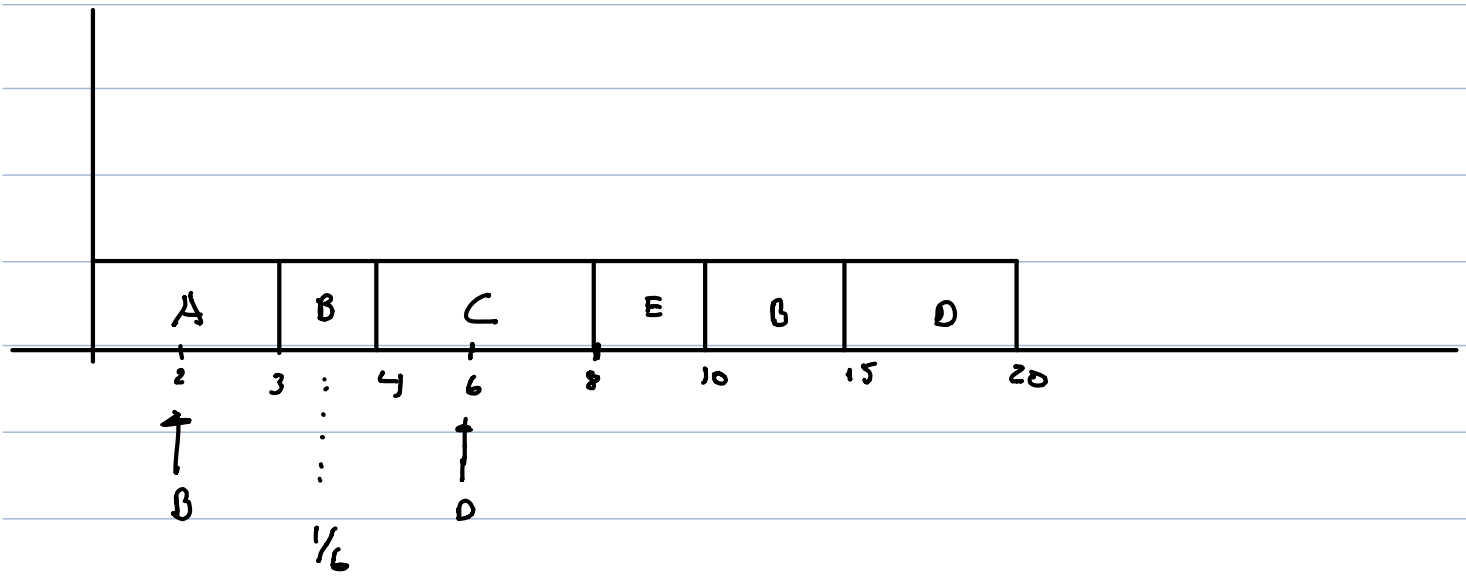


Shortest Job First [SJF]



	Arrival time	CPU burst	Finish time	Turn around
A	0	3	3	3
B	2	6	9	7
C	4	4	15	11
D	6	5	20	14
E	8	2	11	3

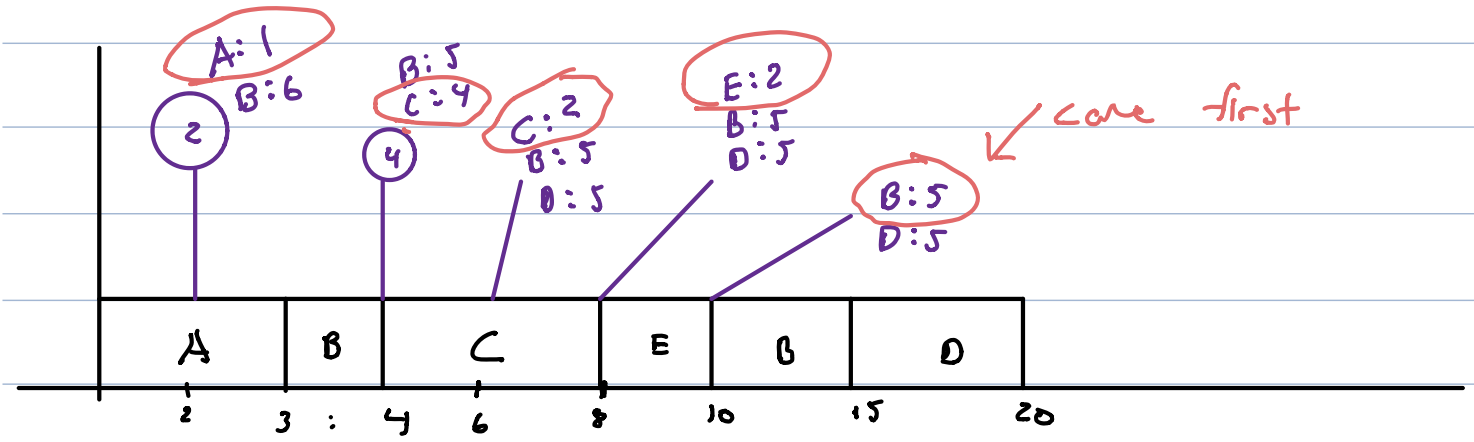
Shortest Remaining Time First (preemptive) [SRTF]



B: has 5 left

D: has 5 seconds left

• Create a ready queue.



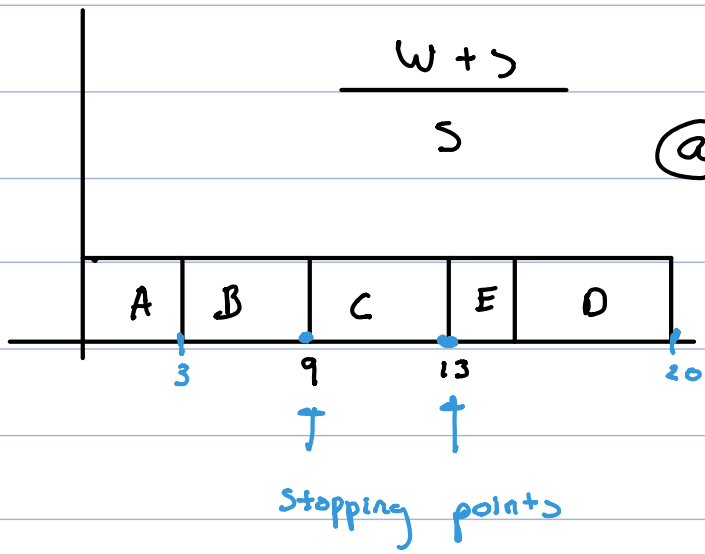
Highest Response ratio next [HRRN]

$$\frac{W + S}{S}$$

service time

$$C = \frac{5+4}{4} = \frac{9}{4}$$

@ 9 seconds



$$D = \frac{3+5}{5} = \frac{8}{5}$$

$$E = \frac{1+2}{2} = \frac{3}{2}$$

@ 13 seconds

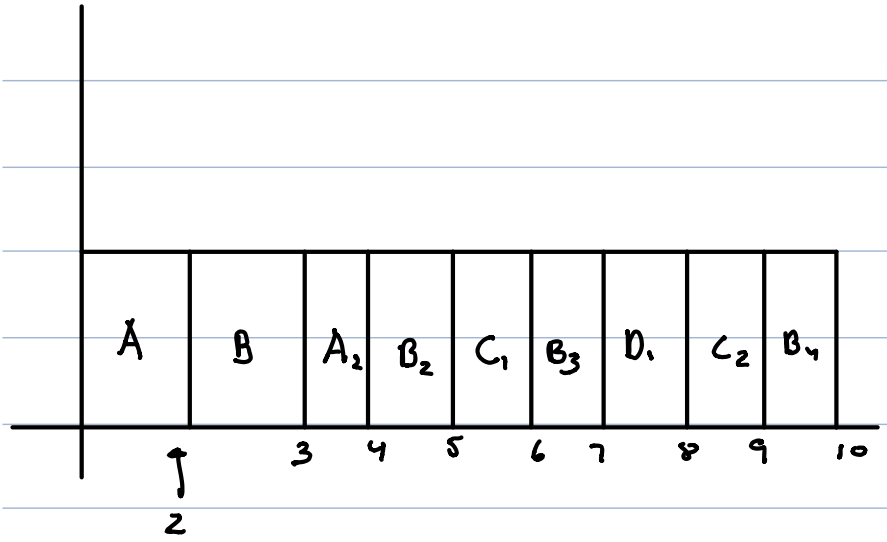
• Since C is the highest ratio it goes first

$$D = \frac{2+5}{5} = \frac{12}{5}$$

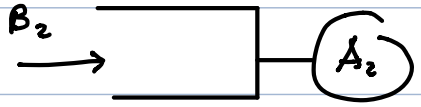
• Since E is the highest that goes first

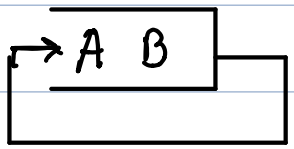
$$E = \frac{5+2}{2} = \frac{7}{2} \rightarrow 3.5$$

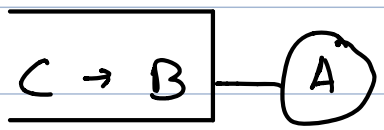
Round Robin



	Arrival time	CPU Burst
A	0	3
B	2	6
C	4	4
D	6	5
E	8	2

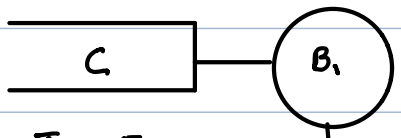




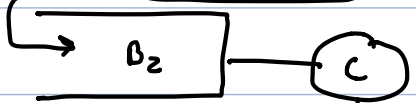


ACB

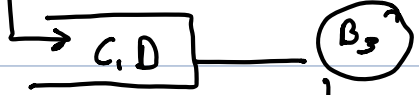
Time 4



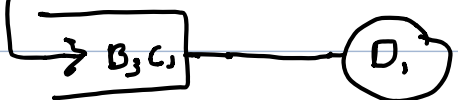
Time 5



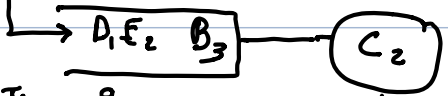
Time 6



Time 7



time 8



Time 9