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Process Scheduling: FCFS & SJF

There may be more than one way to implement an algorithm!

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

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Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Sorted Arrival time

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Sorted Arrival time

No sorting algorithm is needed

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

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OS has to decide which process to run next?

First-come, first-served (FCFS)

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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Input

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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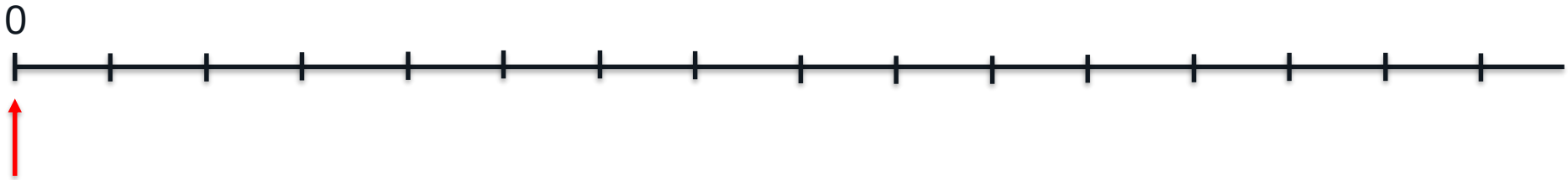
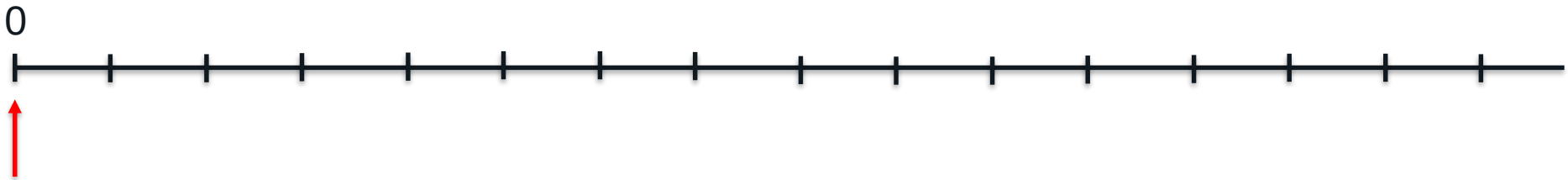
Input



P1 arrives

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



P1 arrives

System status

P1 - 4

Running time

Indicating process

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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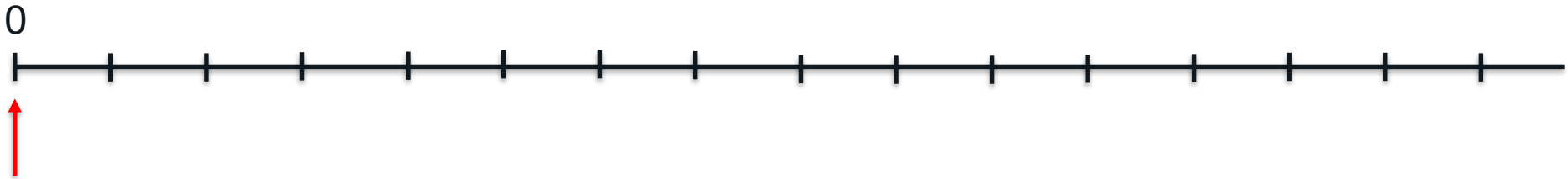
Input

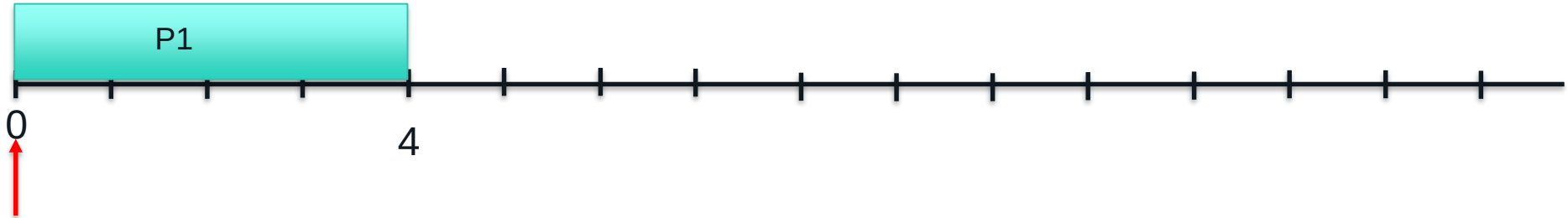


P1 arrives

P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

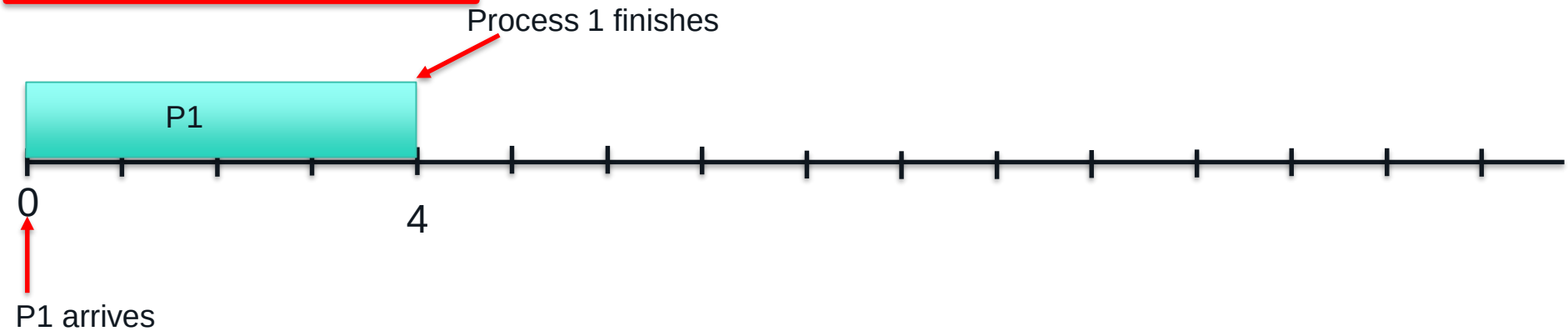


P1 arrives

P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

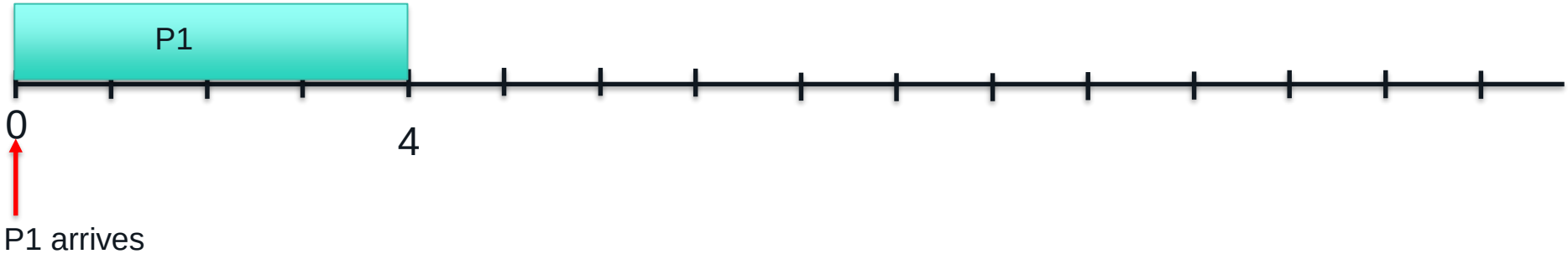


P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

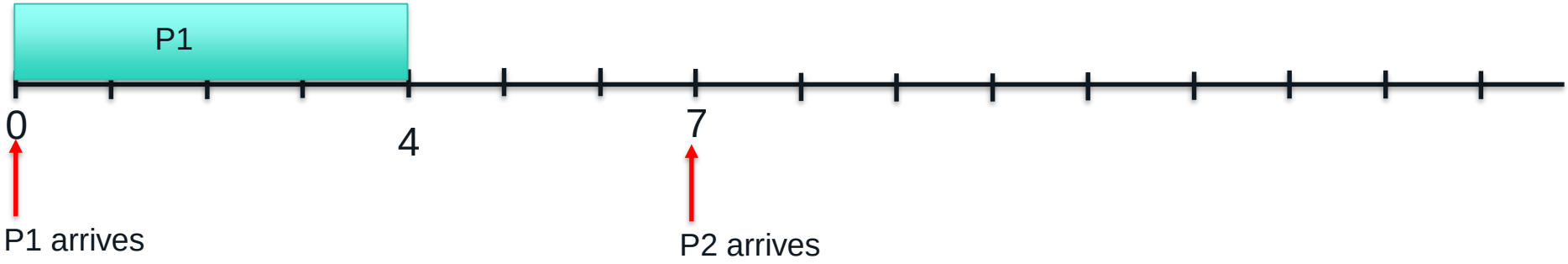
Process 1 started at time 0 and finished at time 4



P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



P1 - 4

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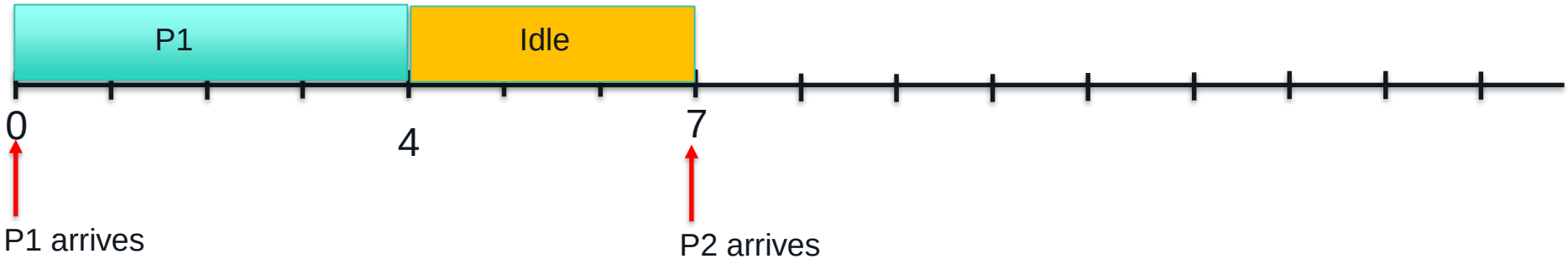
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

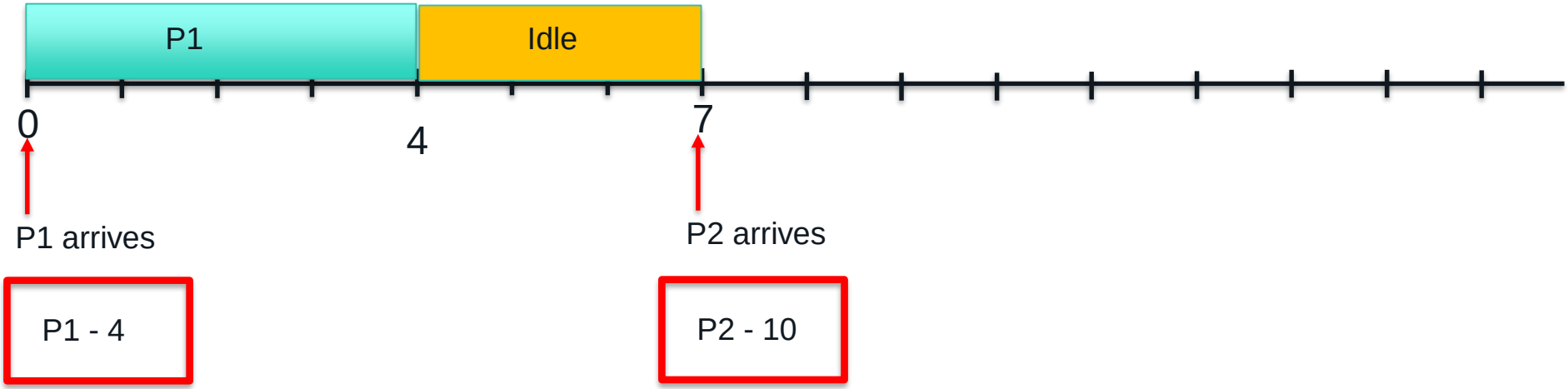
Input



P1 - 4

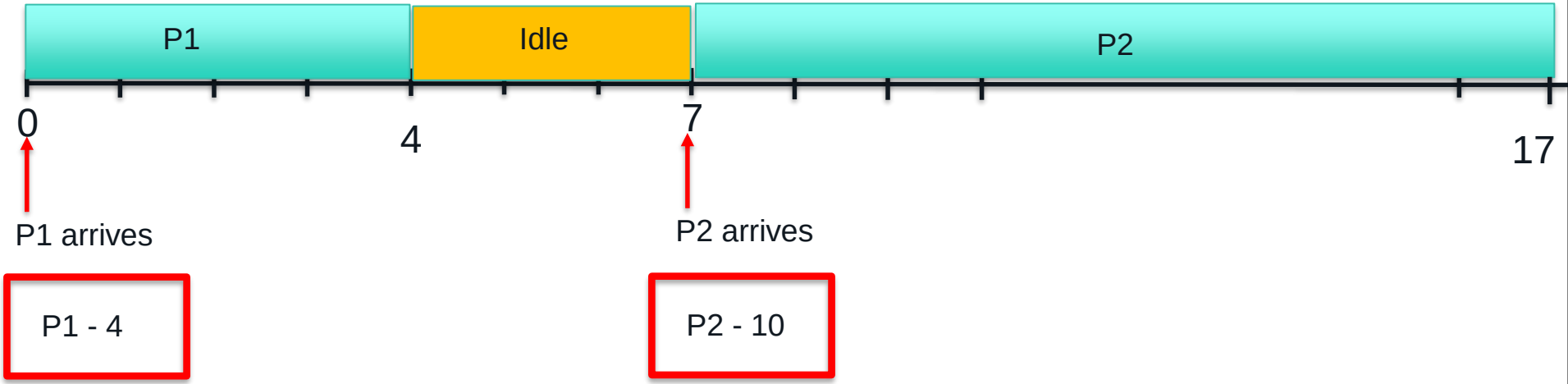
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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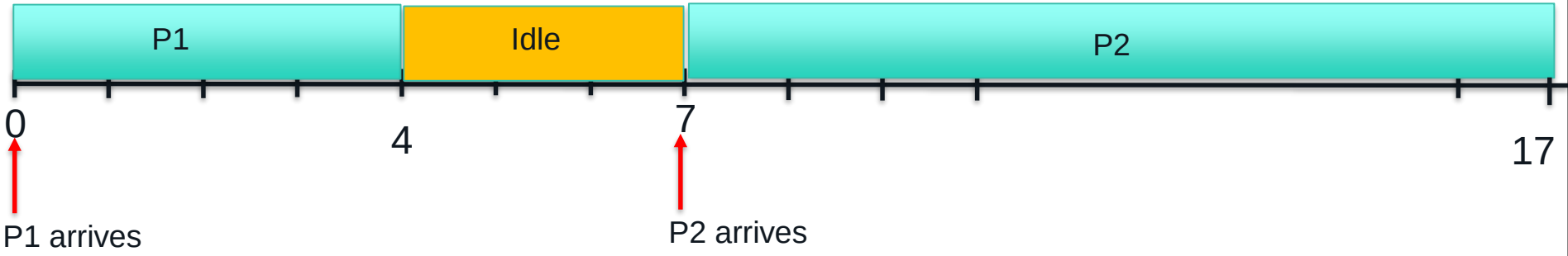
Input

P2 finishes



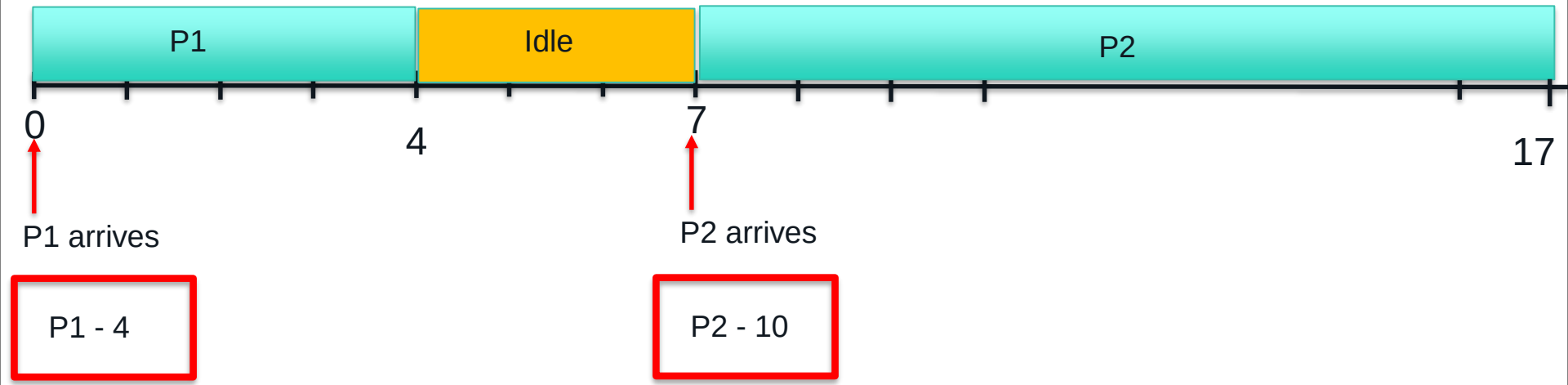
P1 - 4

P2 - 10

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



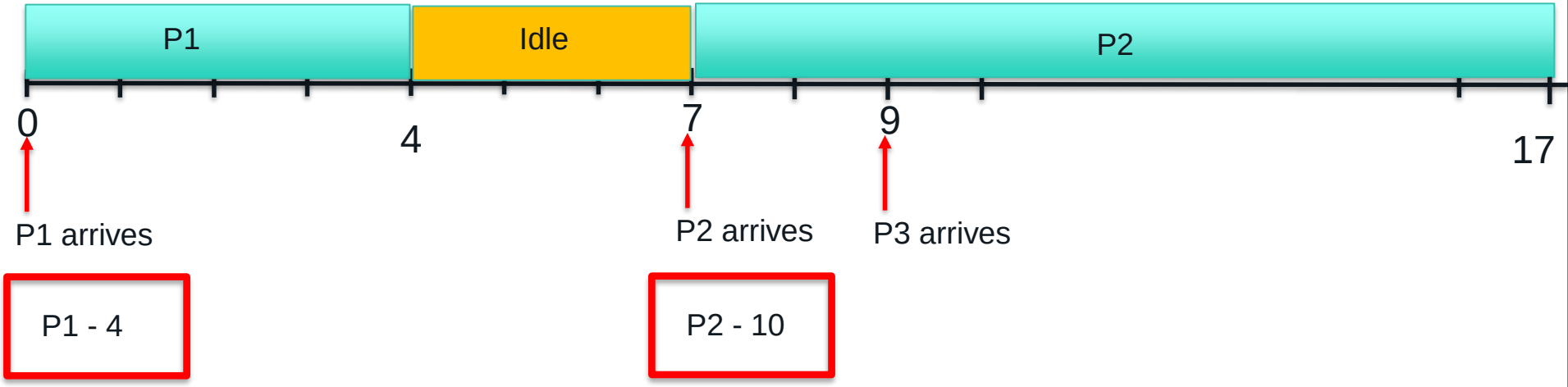
P1 - 4

P2 - 10

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



P1 - 4

P2 - 10

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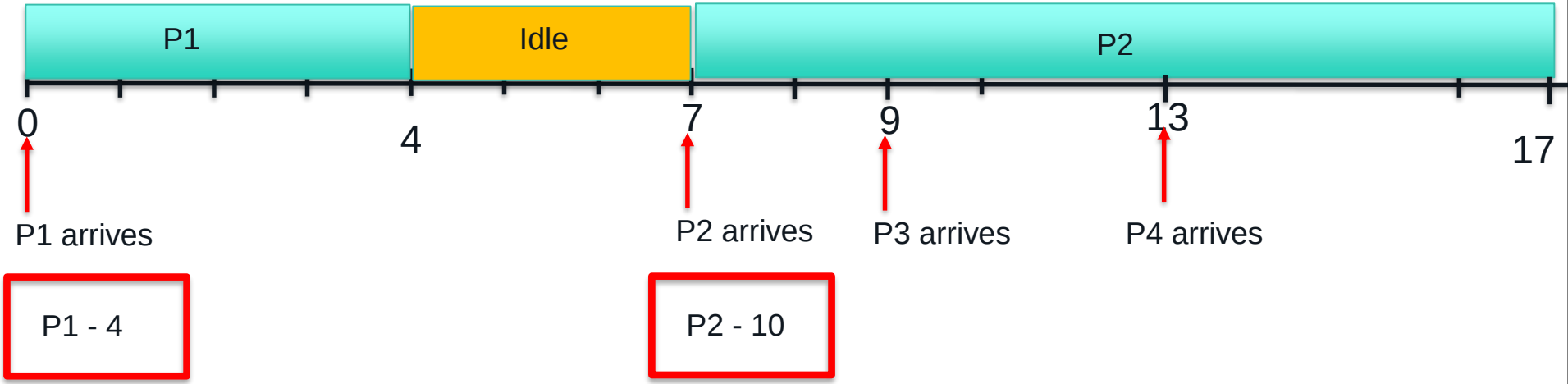
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



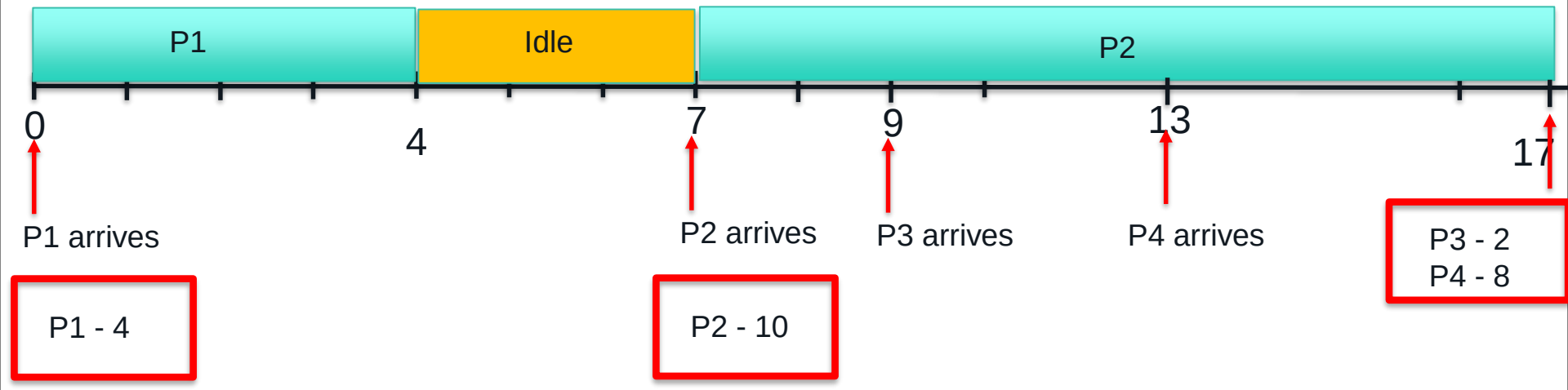
P1 - 4

P2 - 10

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



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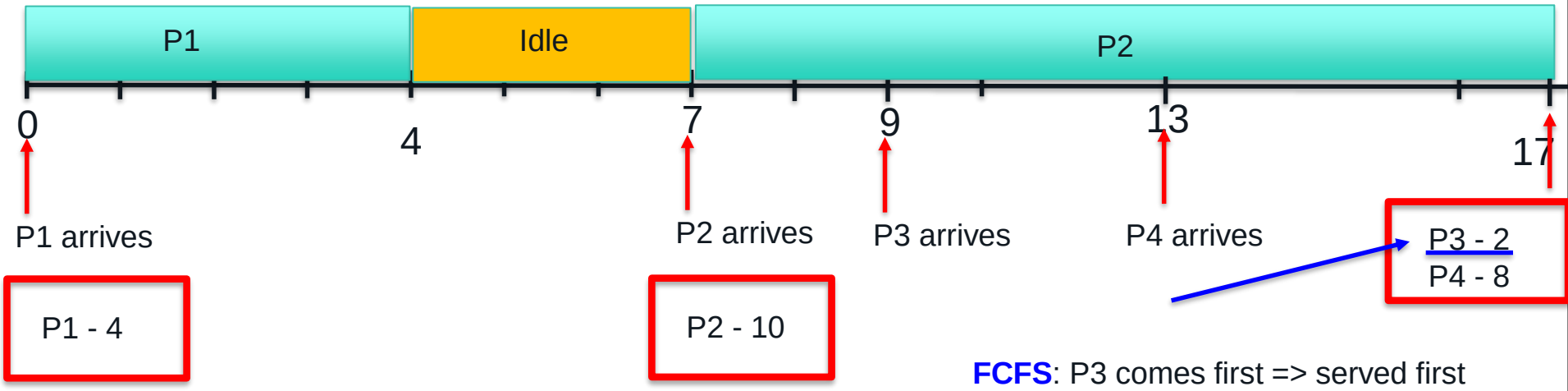
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

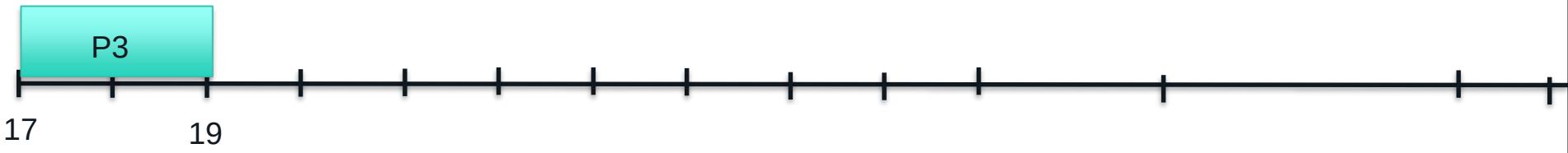
Process 2 started at time 7 and finished at time 17



FCFS: P3 comes first => served first

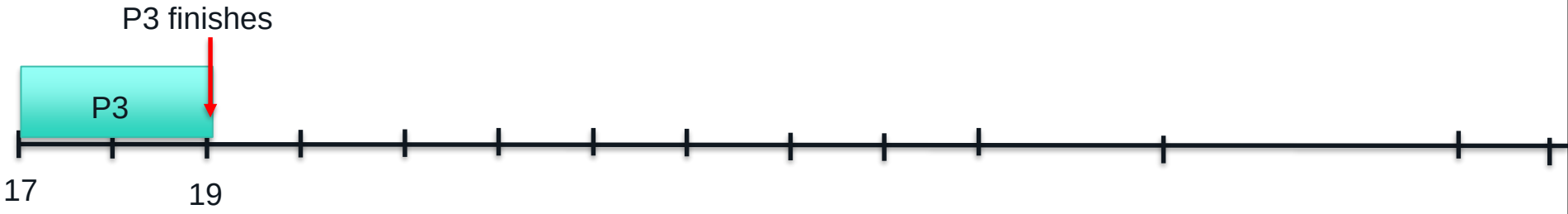
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



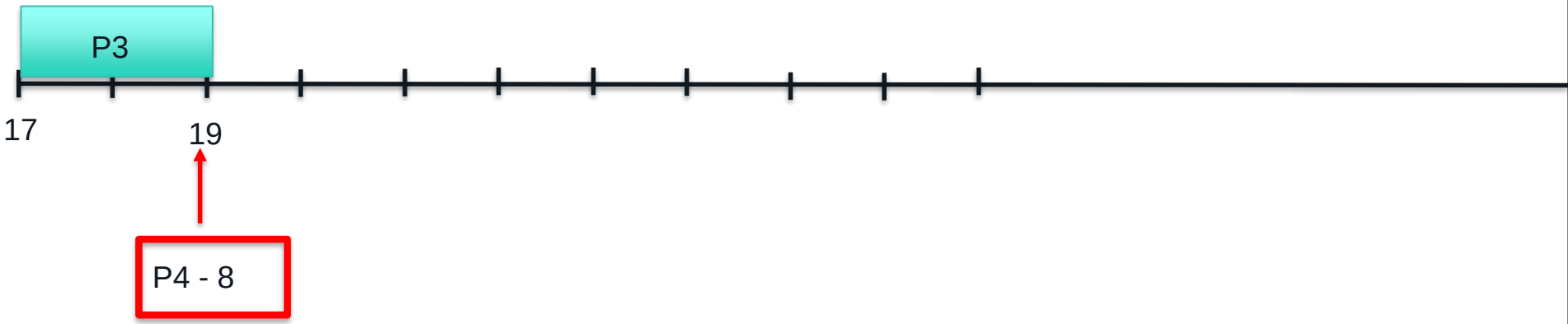
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

P3 started at time 17 and finished at time 19

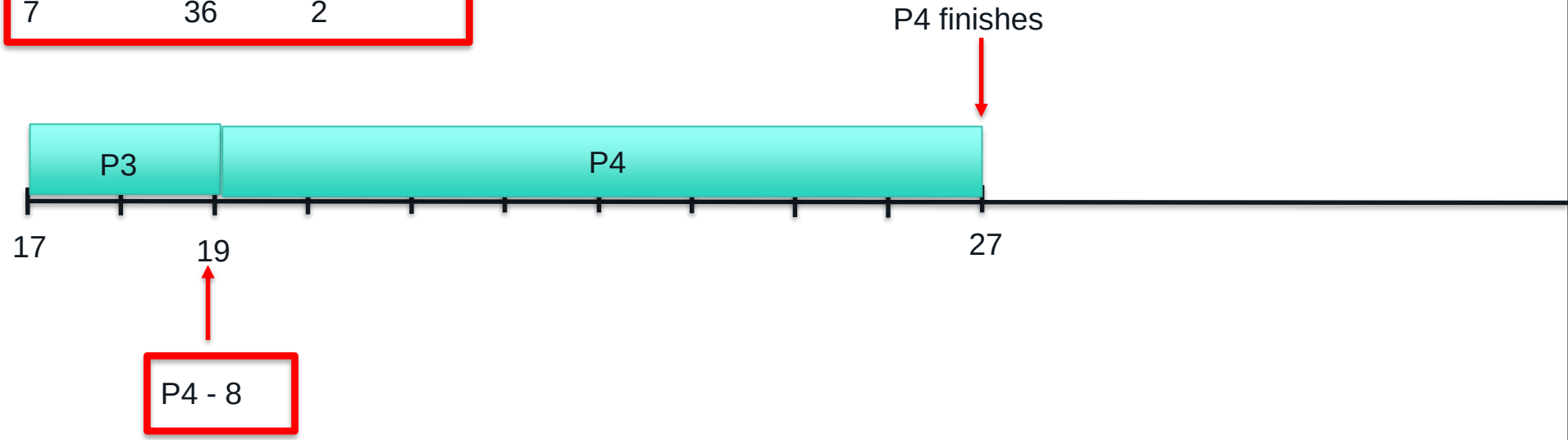
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

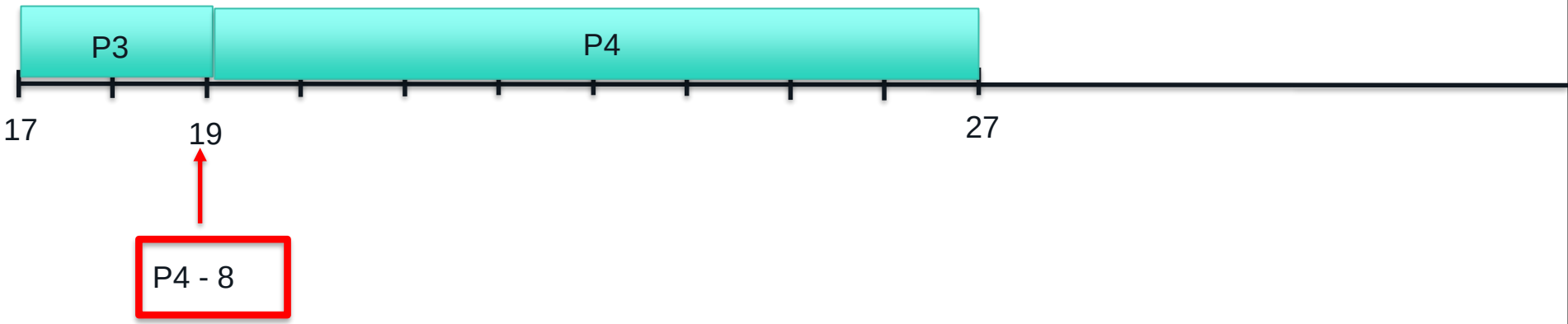
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

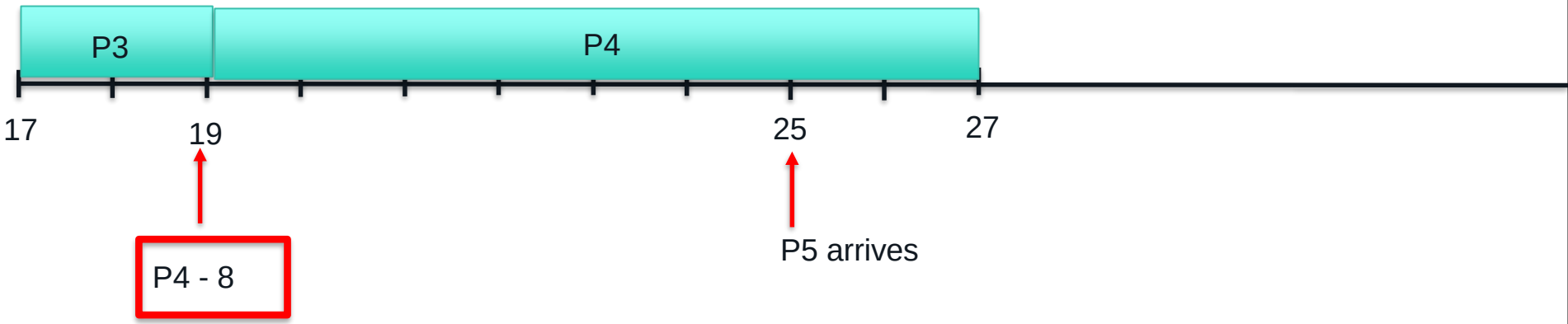
Input

P4 started at time 19 and finished at time 27



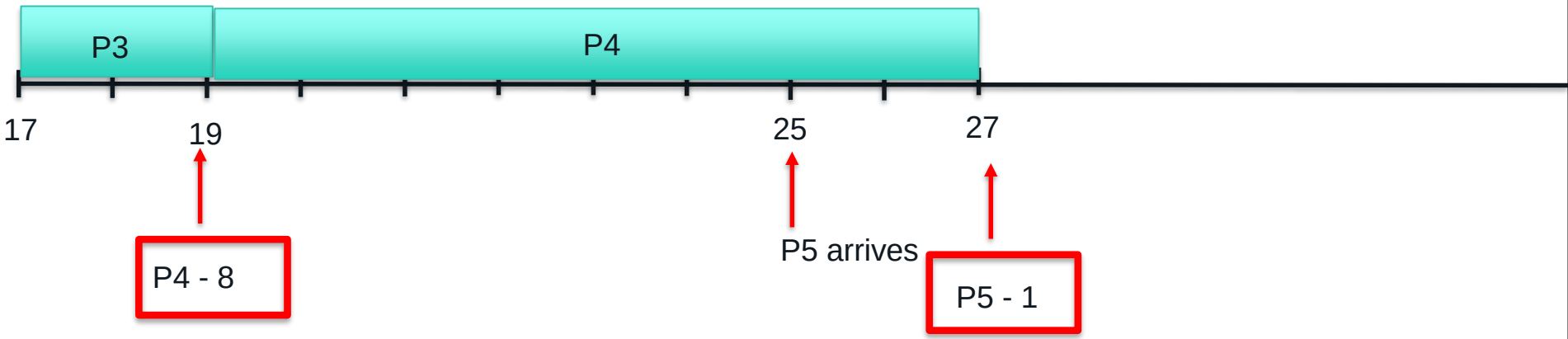
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



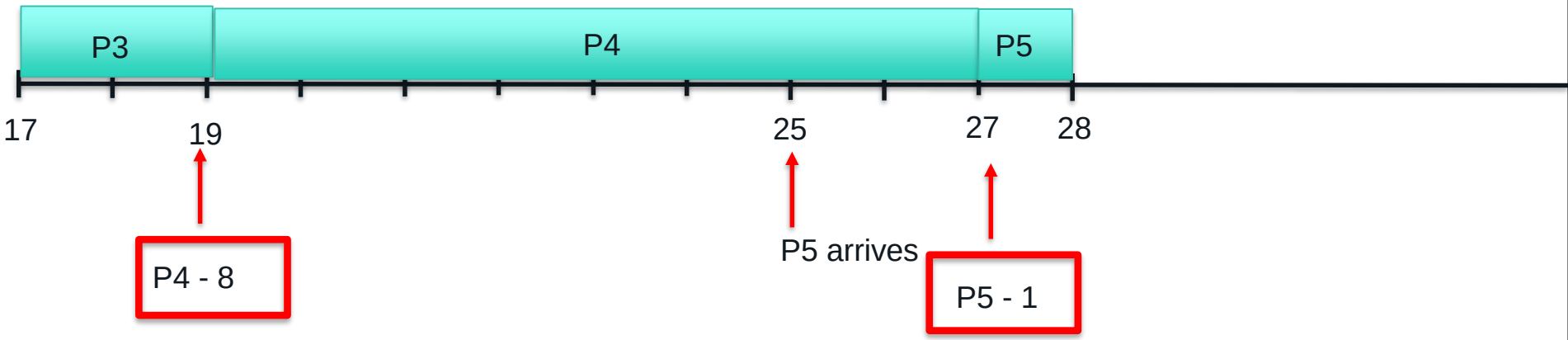
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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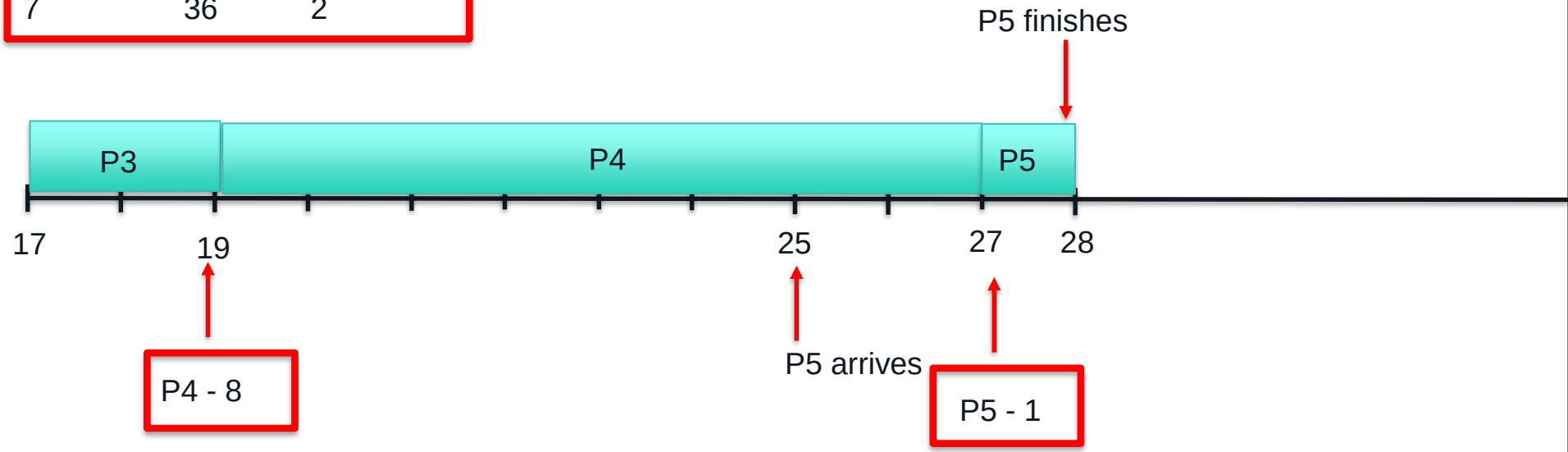
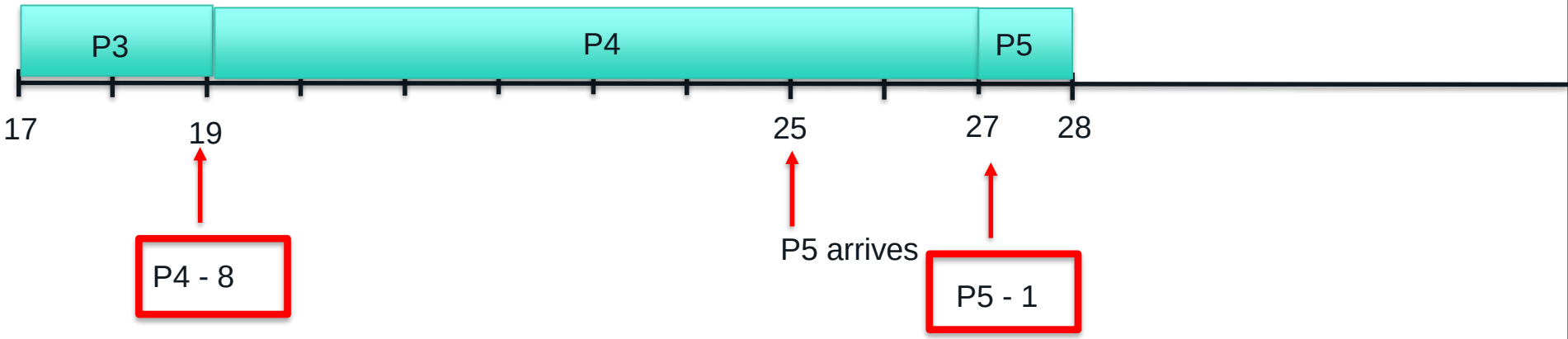
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

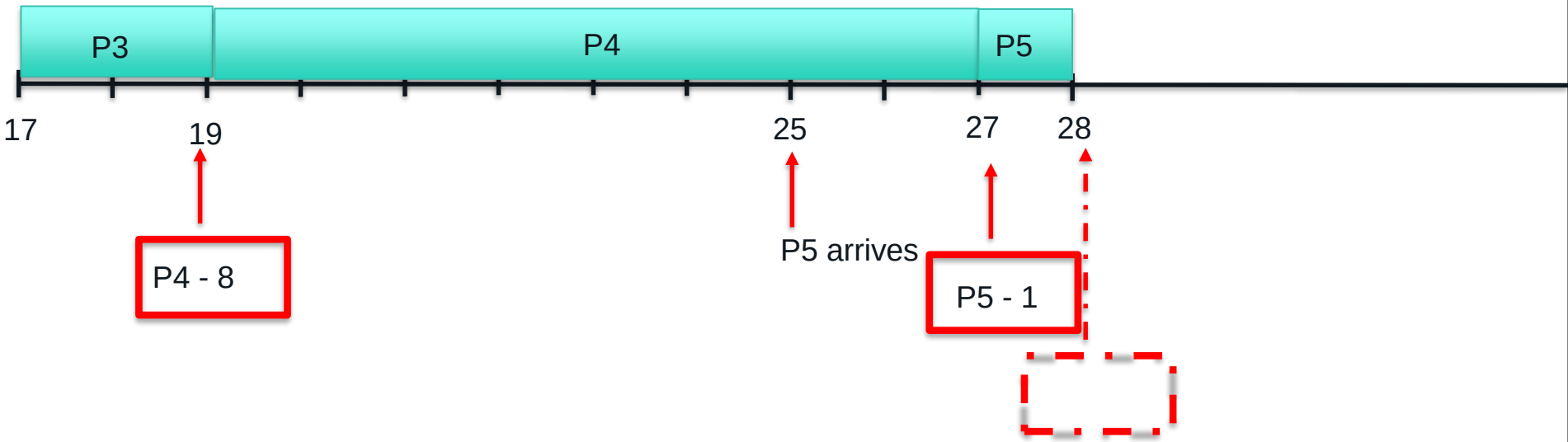
P5 started at time 27 and finished at time 28



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

P5 started at time 27 and finished at time 28



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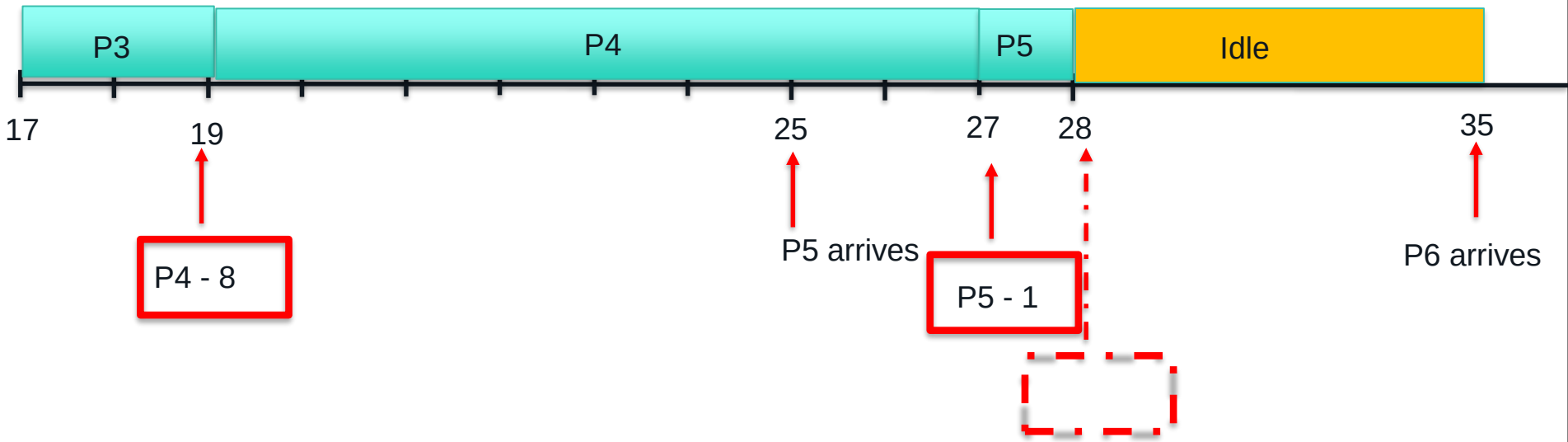
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



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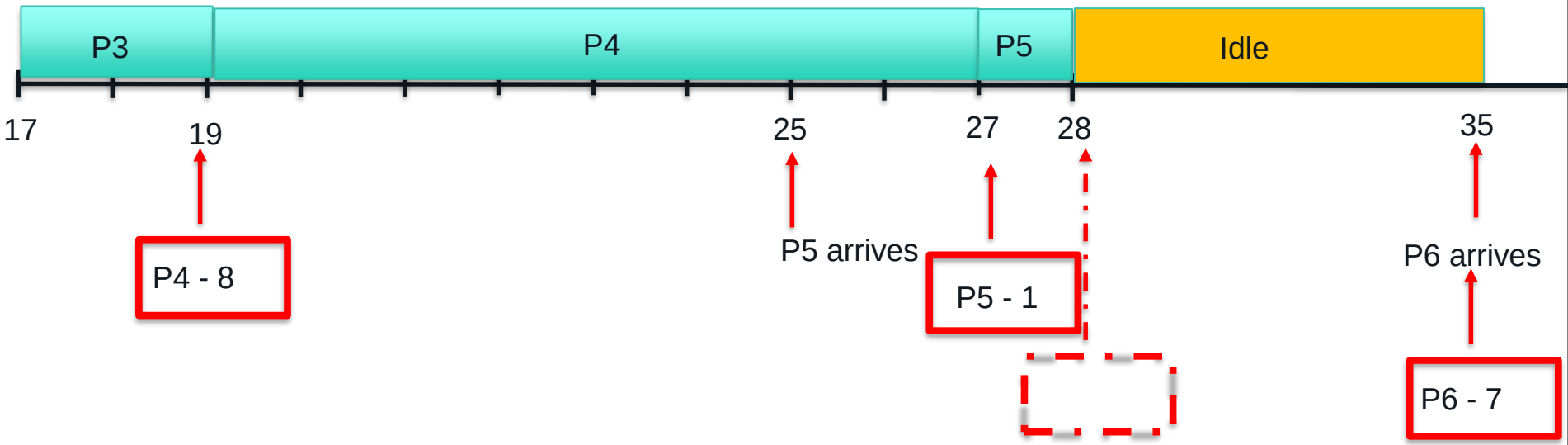
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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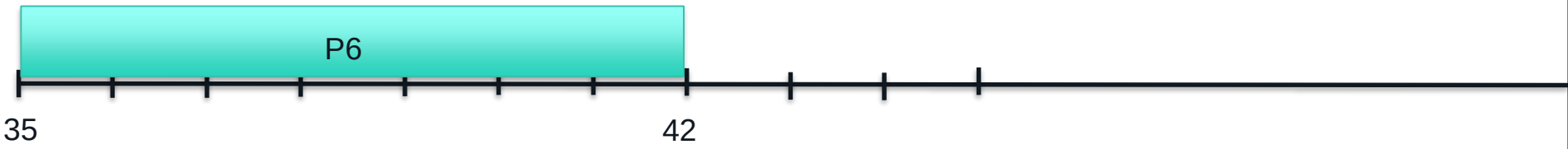
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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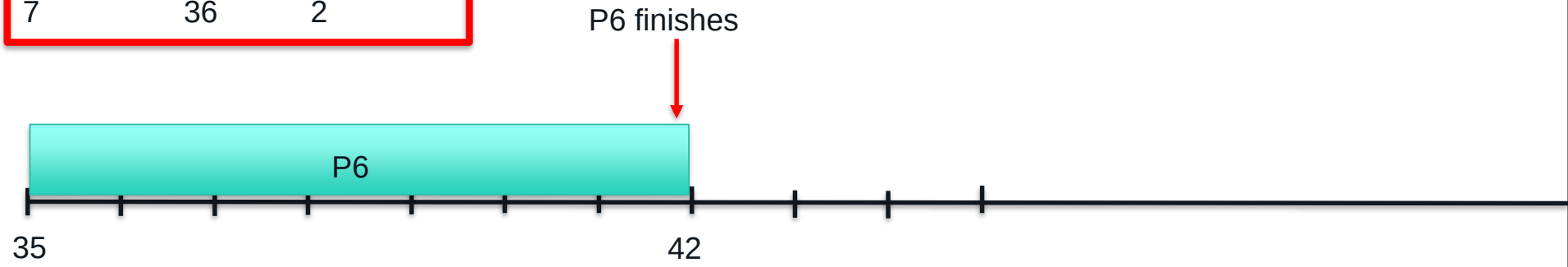
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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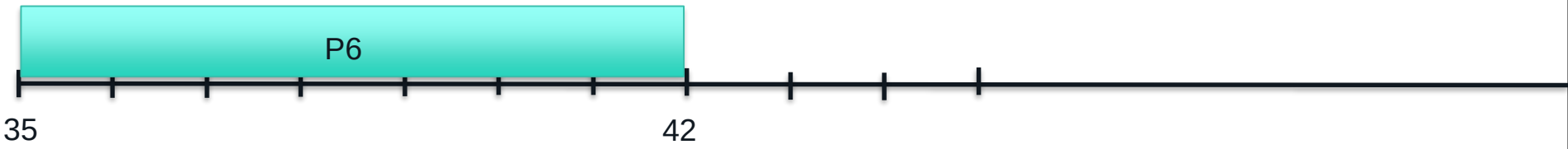
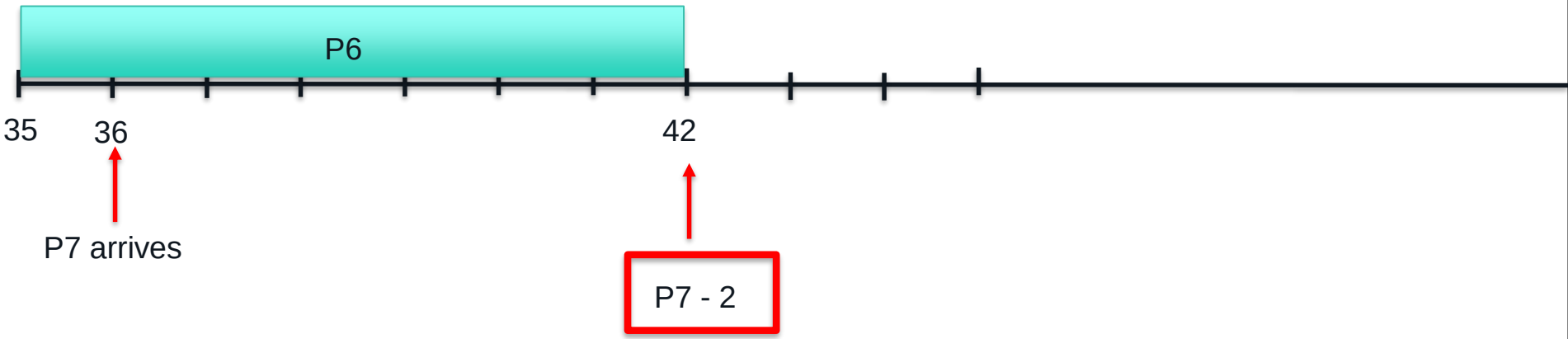
Input

P6 started at time 35 and finished at time 42



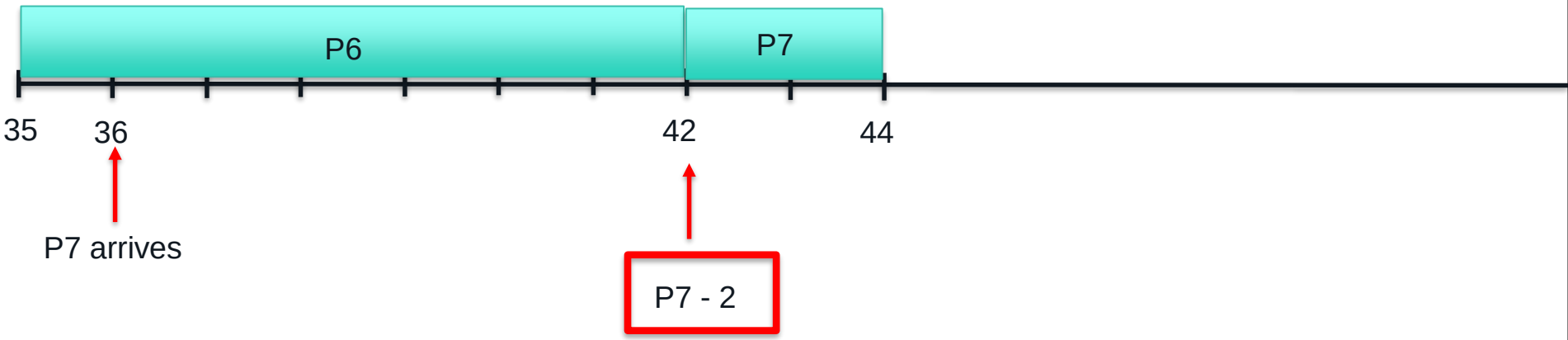
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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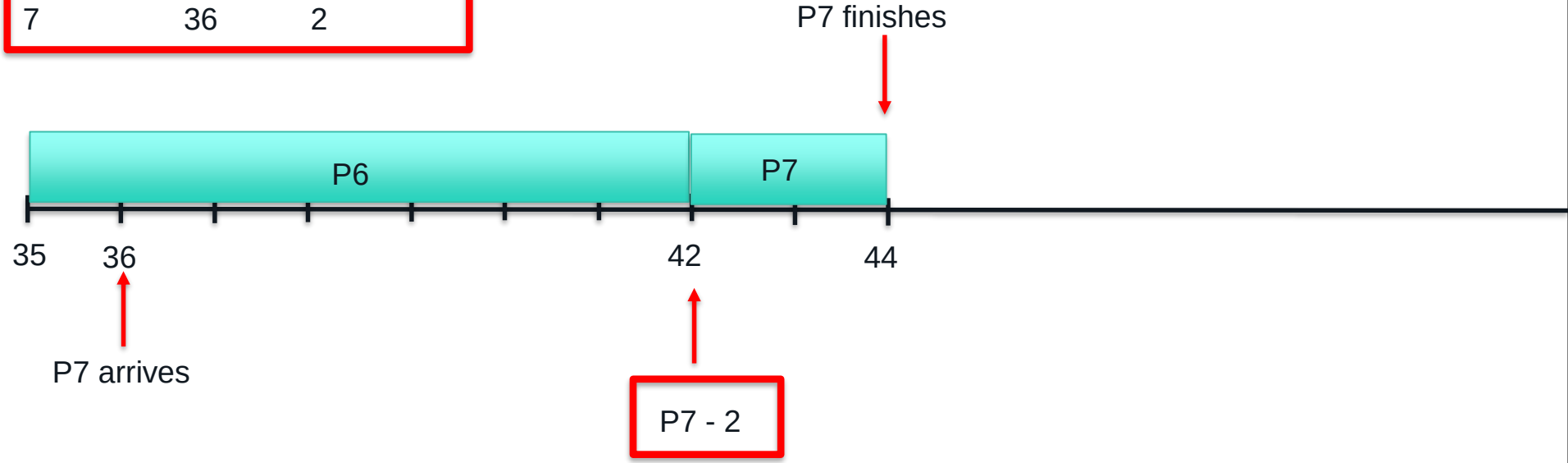
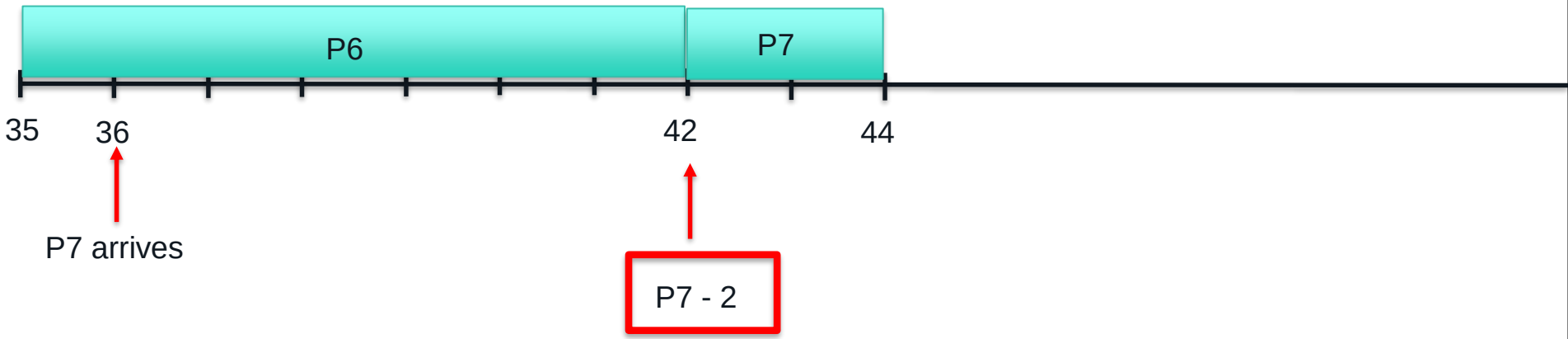
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

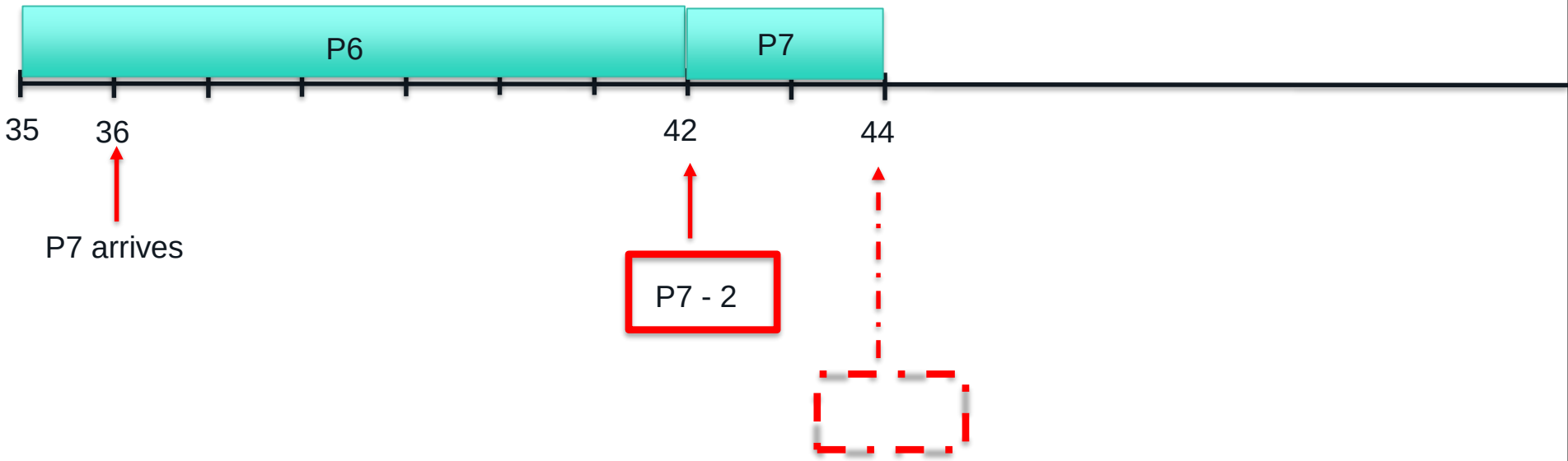
P7 started at time 42 and finished at time 44



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

P7 started at time 42 and finished at time 44

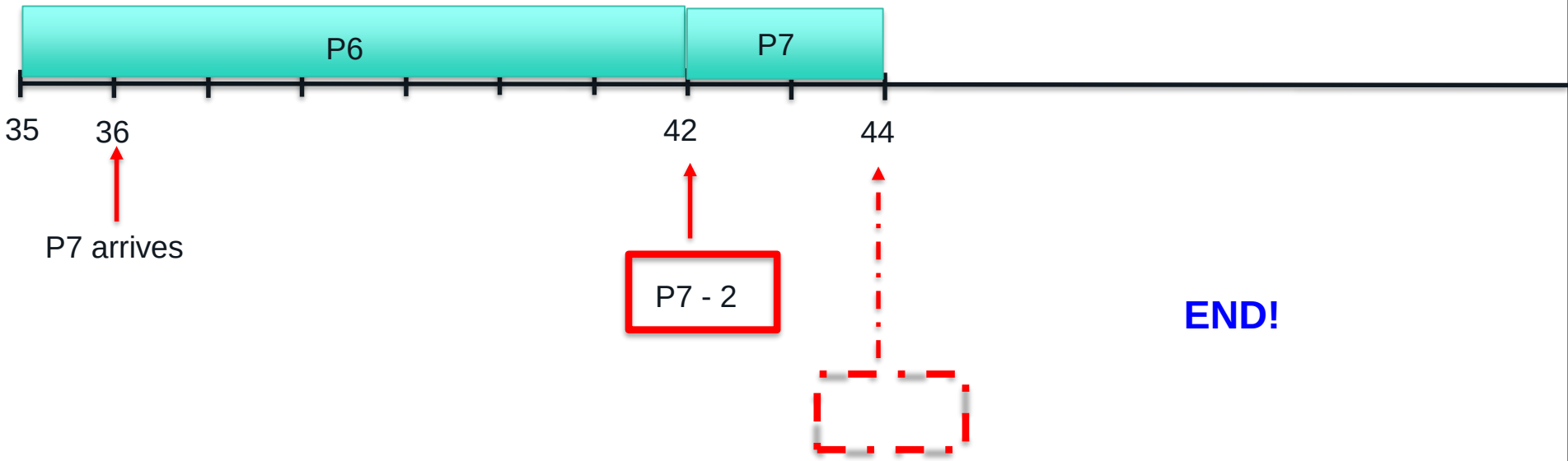


Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Østfold University College

Input

P7 started at time 42 and finished at time 44



END!

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Shortest Job First (SJF)

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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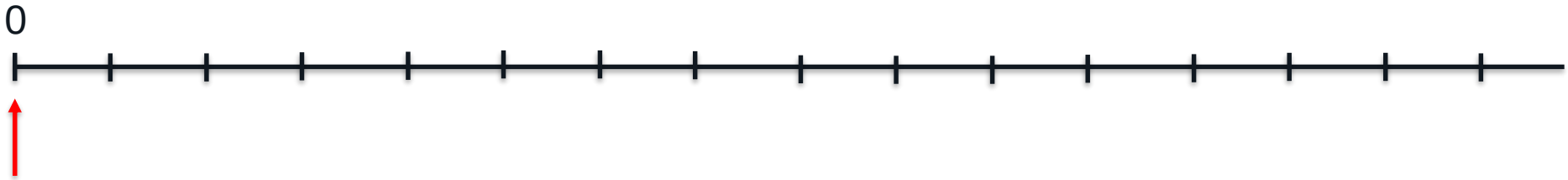
Input

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Østfold University College

Input



P1 arrives

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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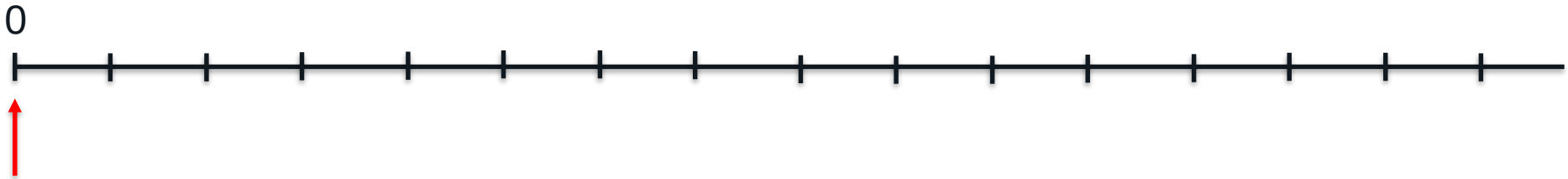
Input

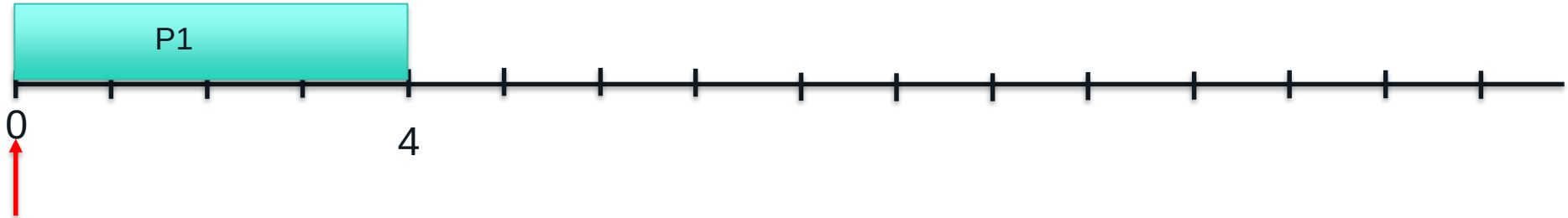


P1 arrives

P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

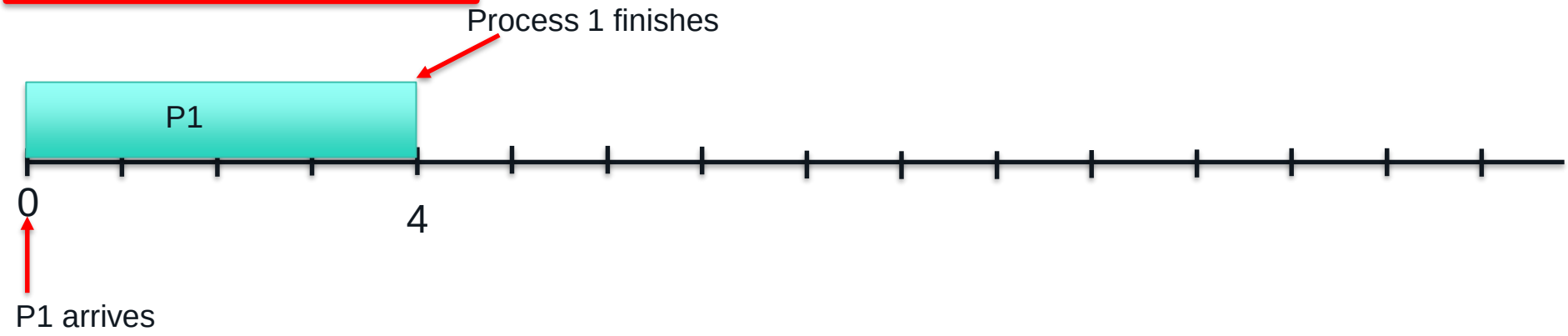


P1 arrives

P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

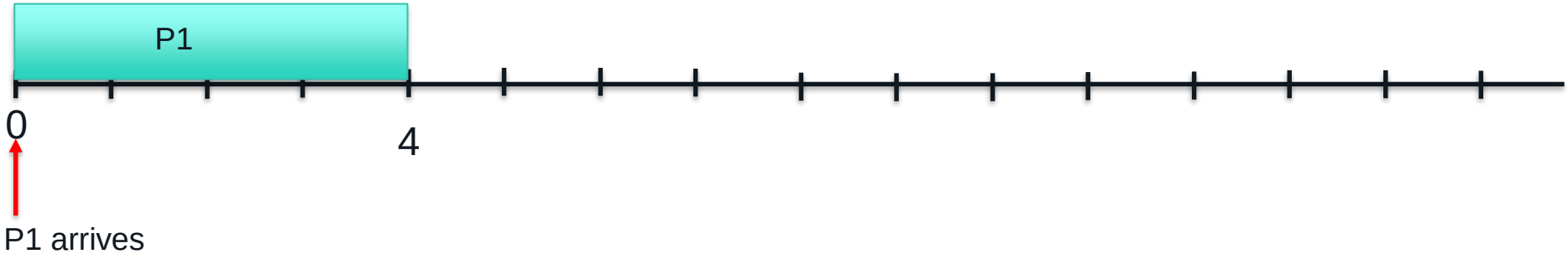


P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

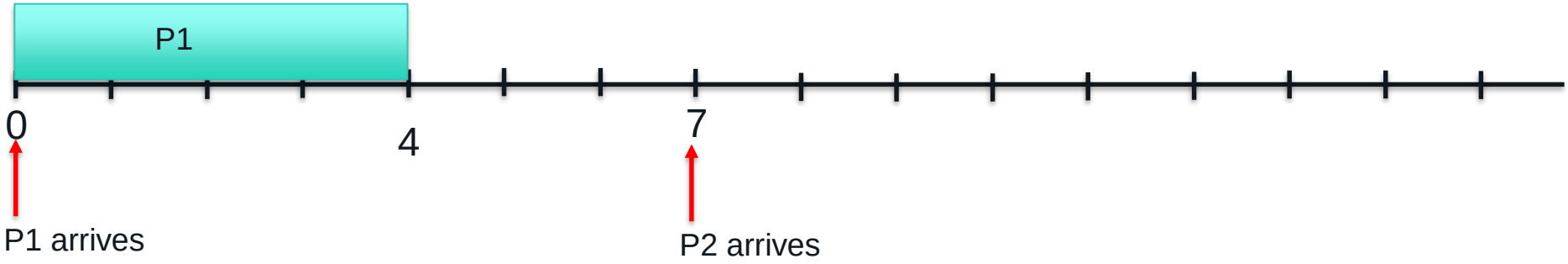
Process 1 started at time 0 and finished at time 4



P1 - 4

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



P1 - 4

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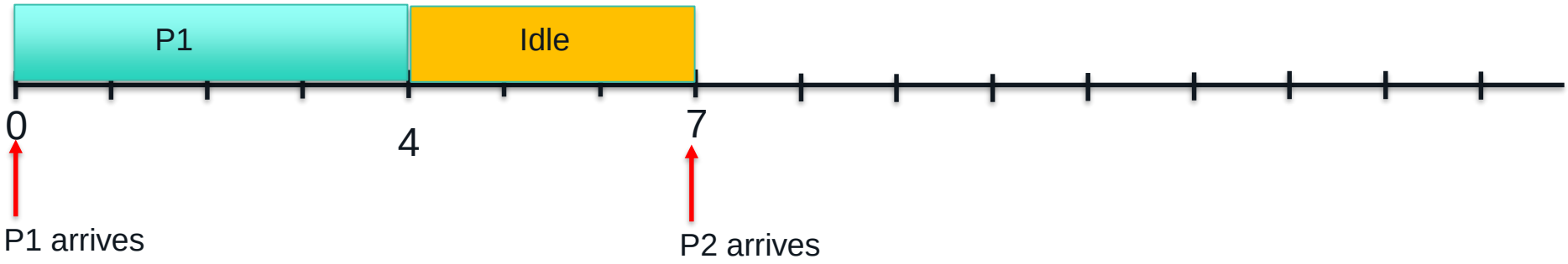
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

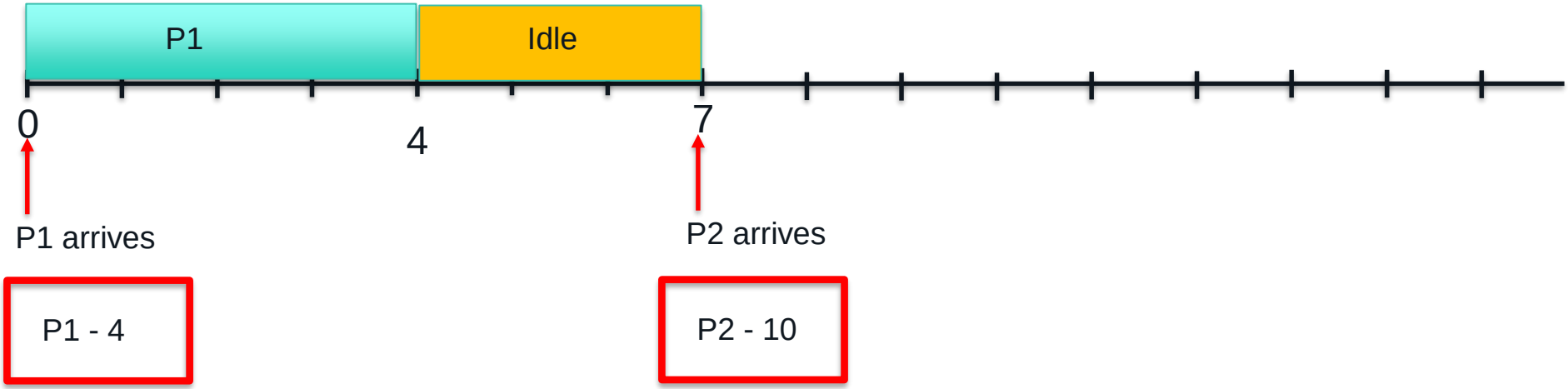
Input



P1 - 4

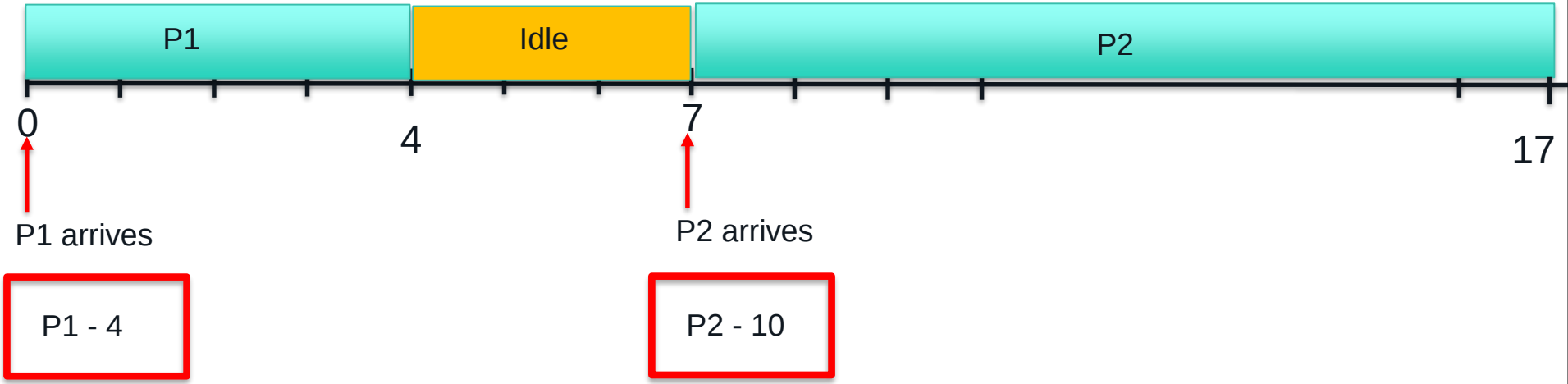
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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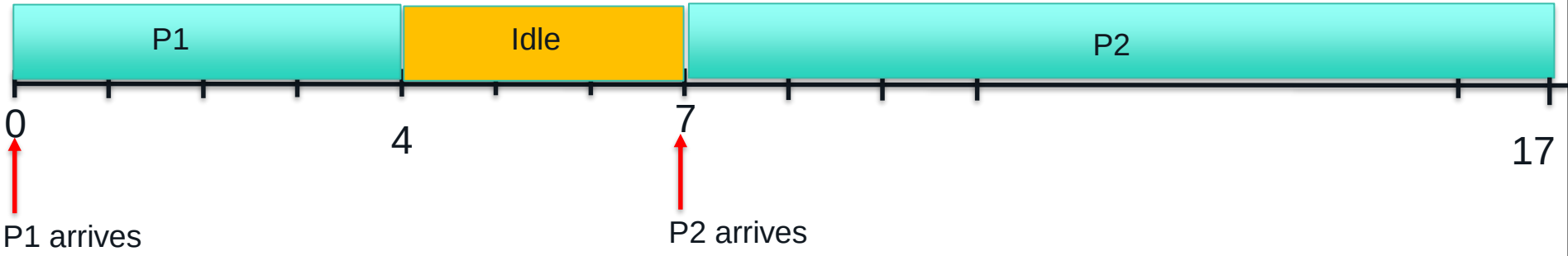
Input

P2 finishes



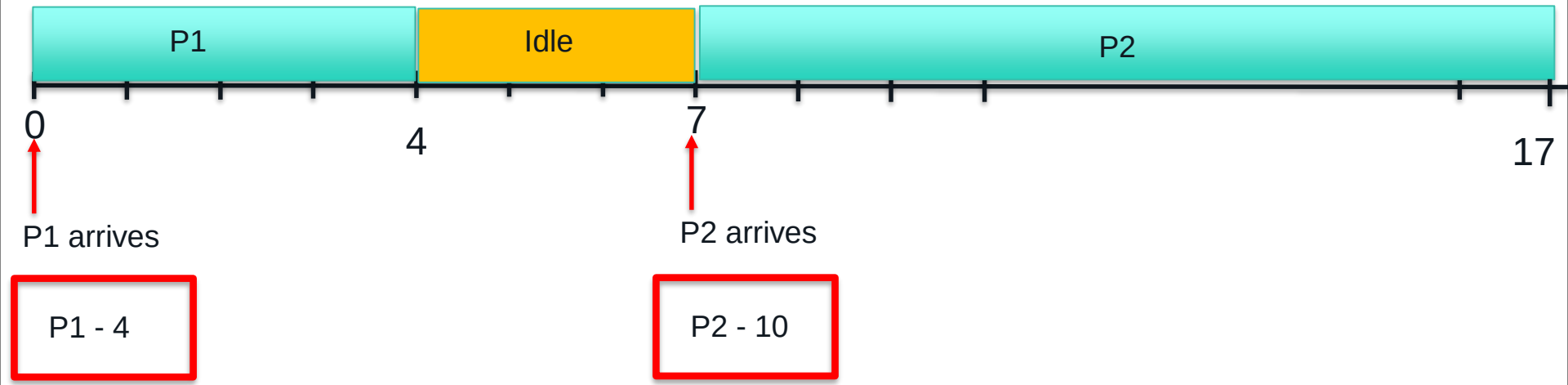
P1 - 4

P2 - 10

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



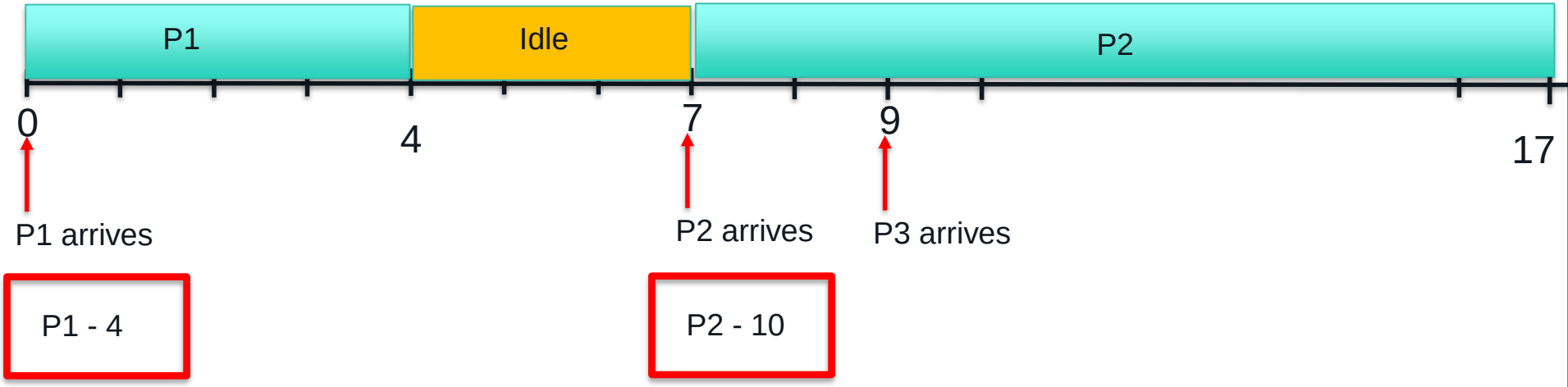
P1 - 4

P2 - 10

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



P1 - 4

P2 - 10

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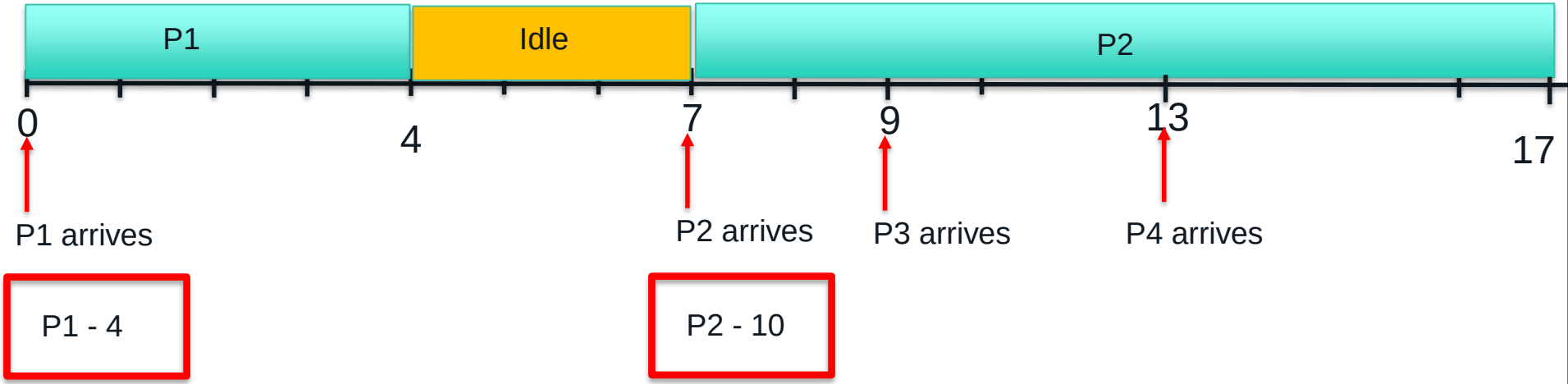
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



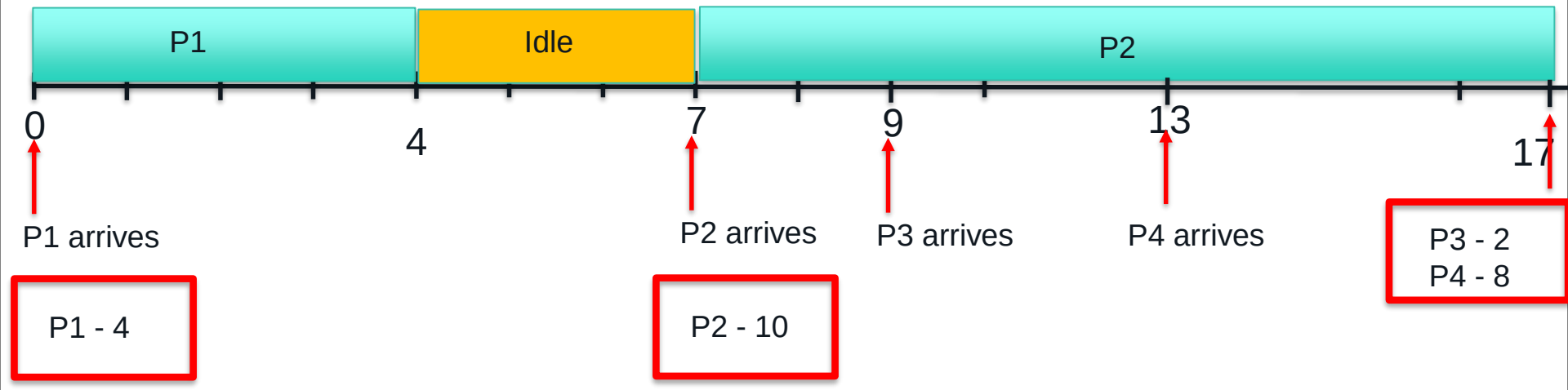
P1 - 4

P2 - 10

Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

Process 2 started at time 7 and finished at time 17



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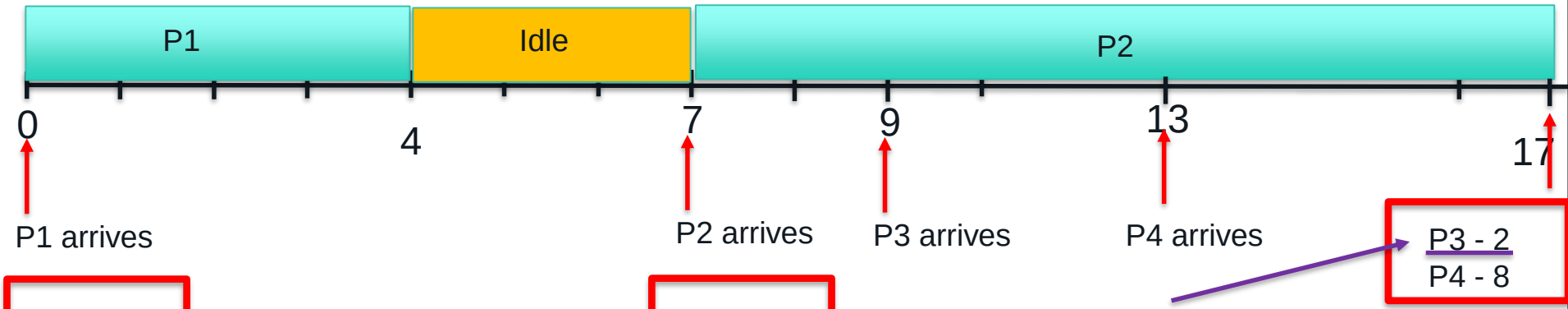
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

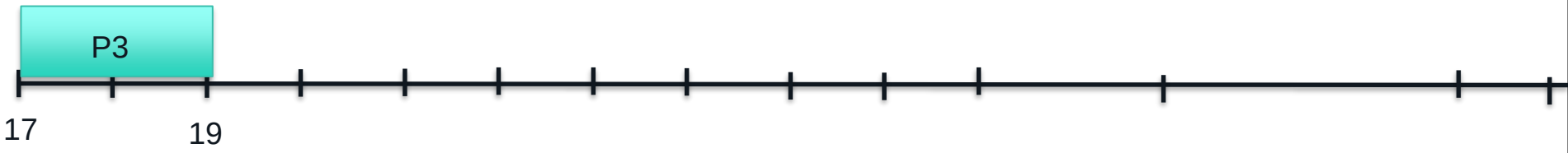
Process 2 started at time 7 and finished at time 17



SJF: P3 has the shortest running time

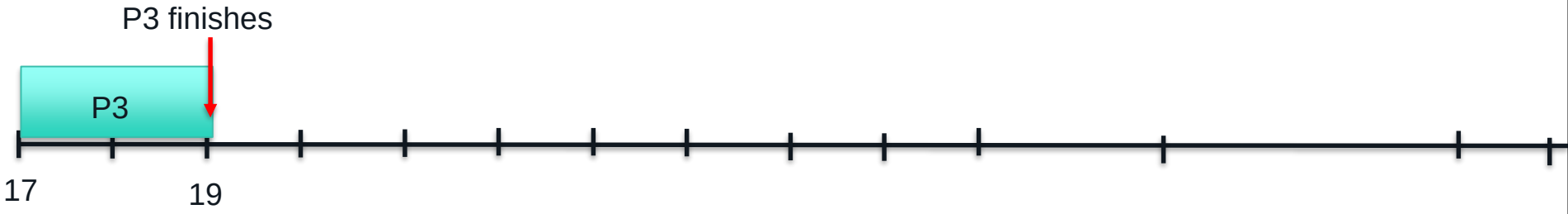
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



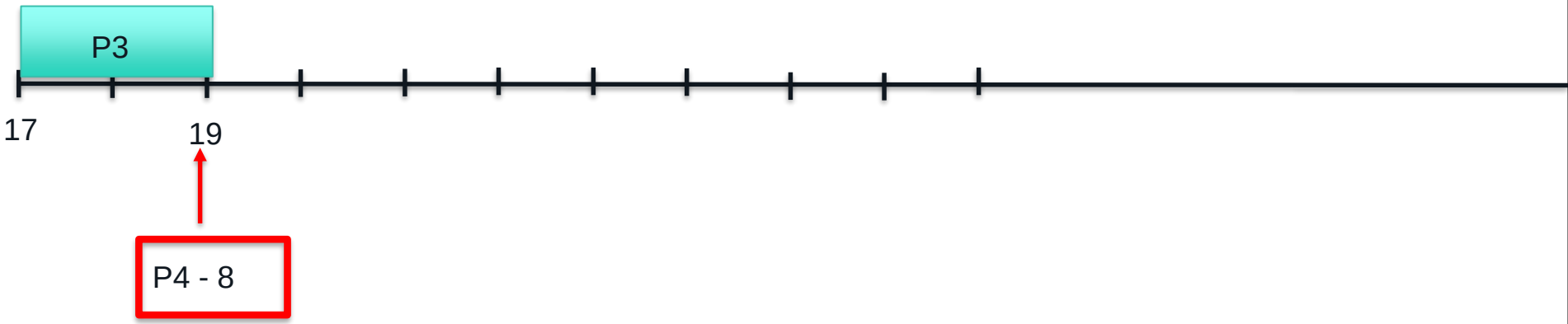
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

P3 started at time 17 and finished at time 19

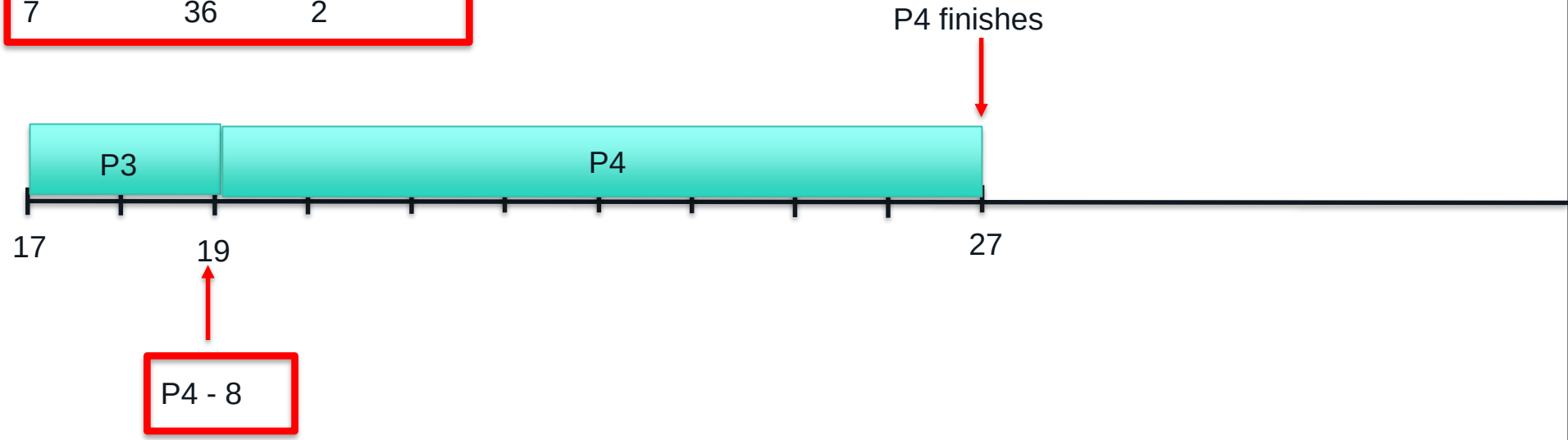
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

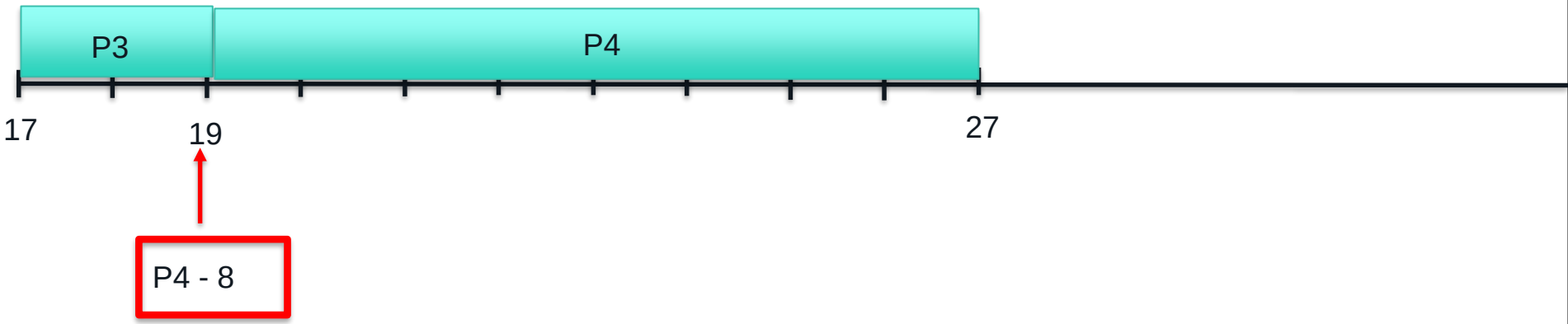
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

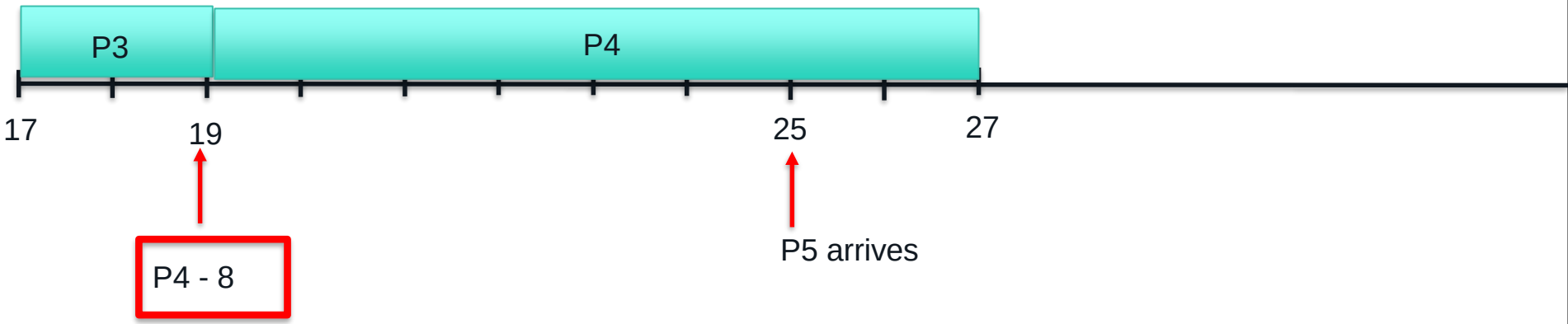
Input

P4 started at time 19 and finished at time 27



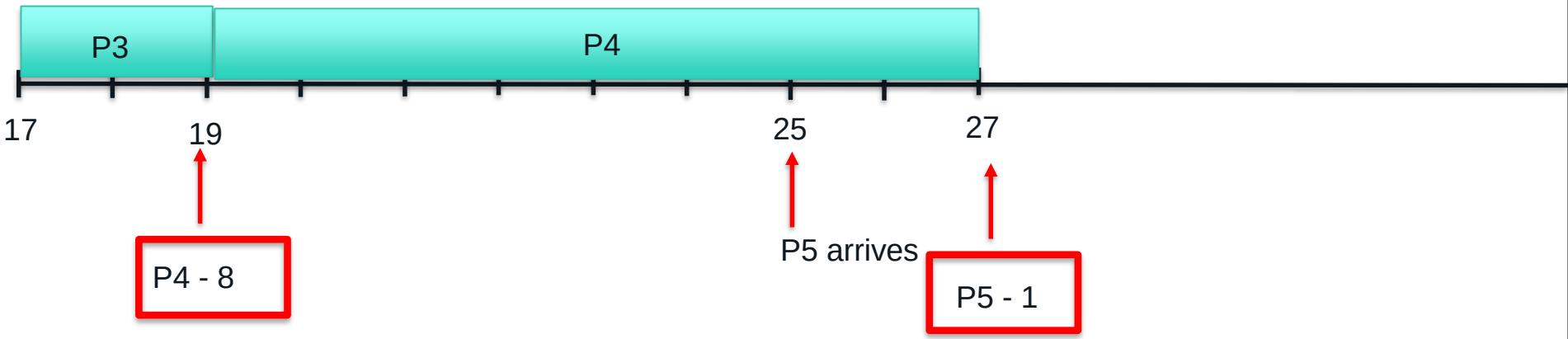
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



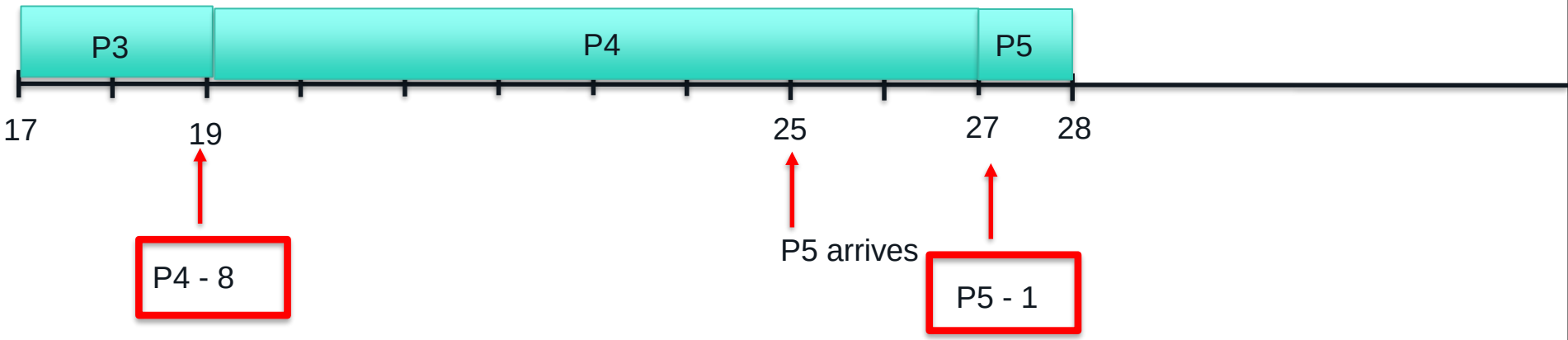
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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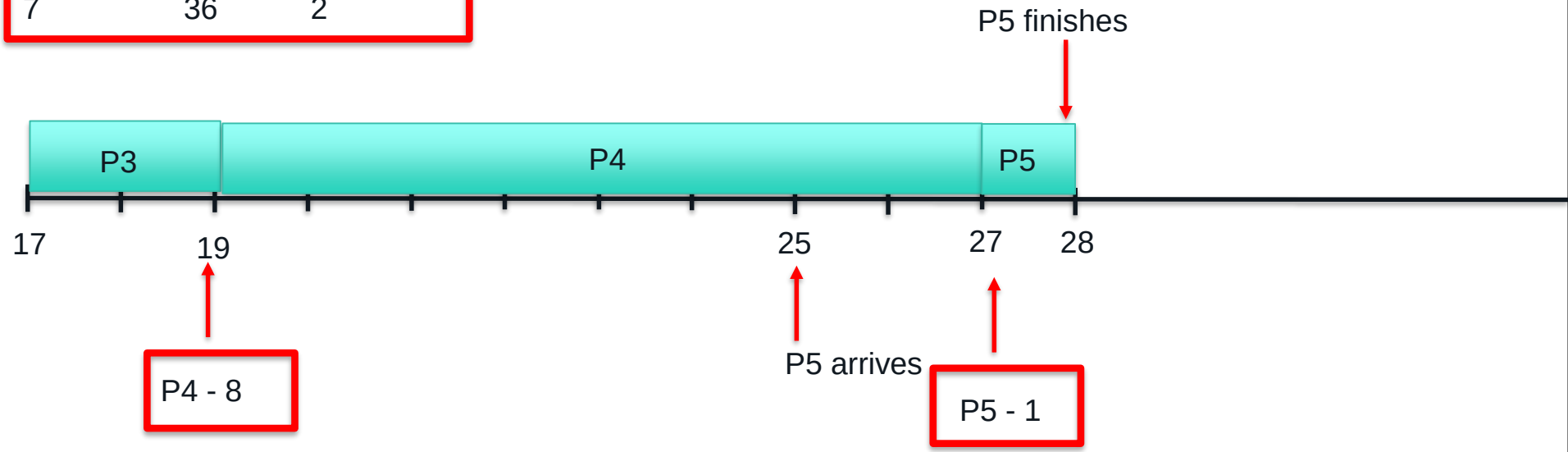
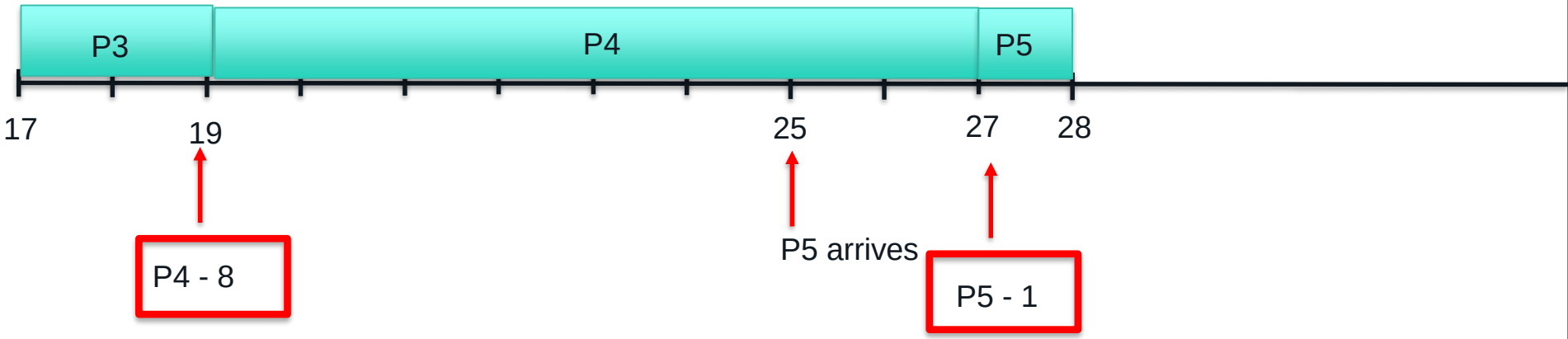
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

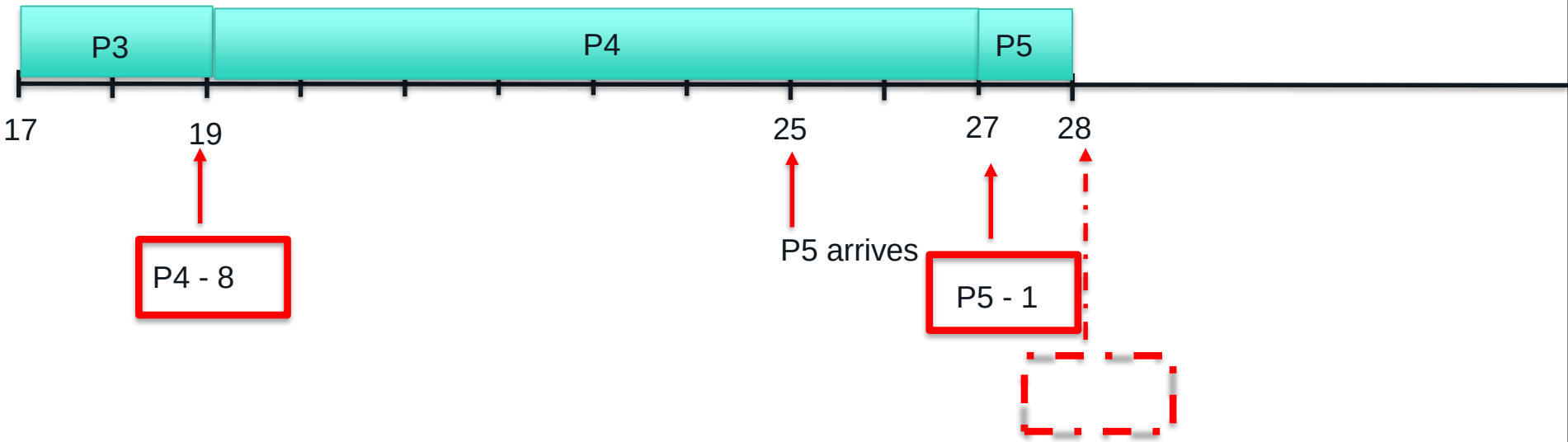
P5 started at time 27 and finished at time 28



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

P5 started at time 27 and finished at time 28



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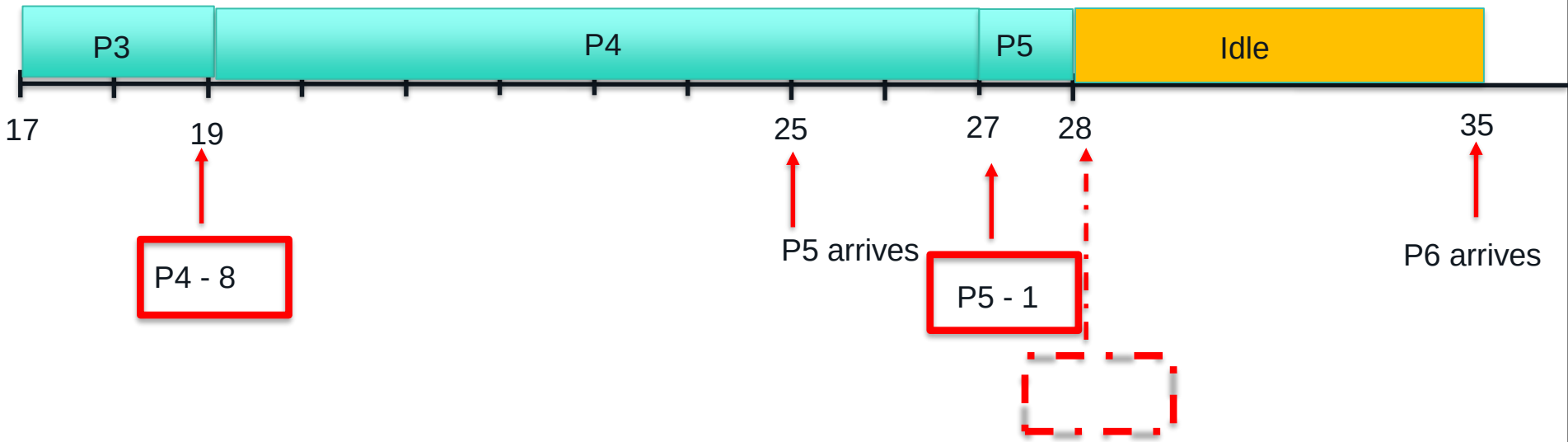
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



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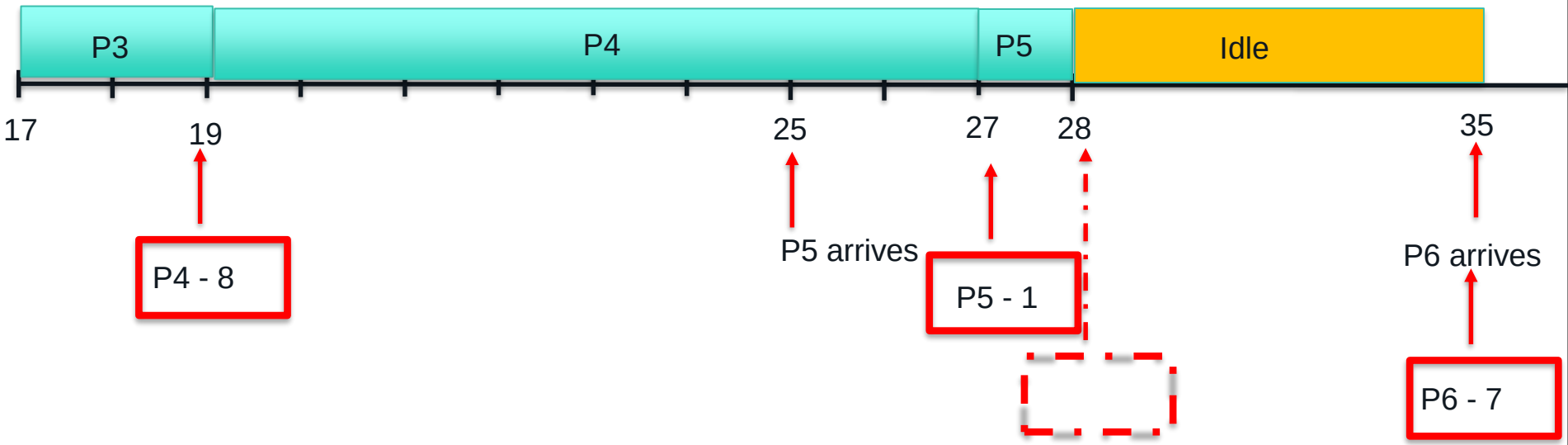
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

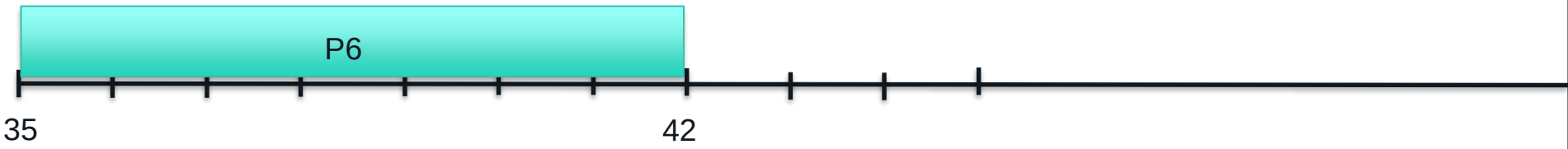
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Østfold University College

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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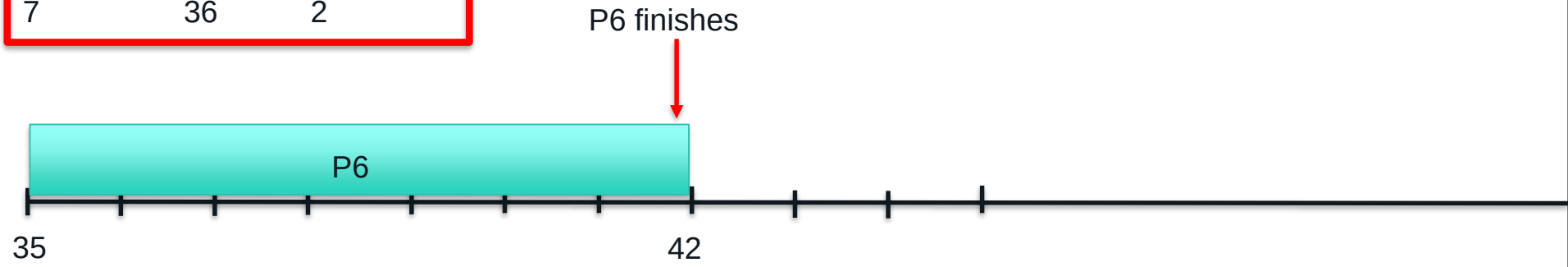
Input

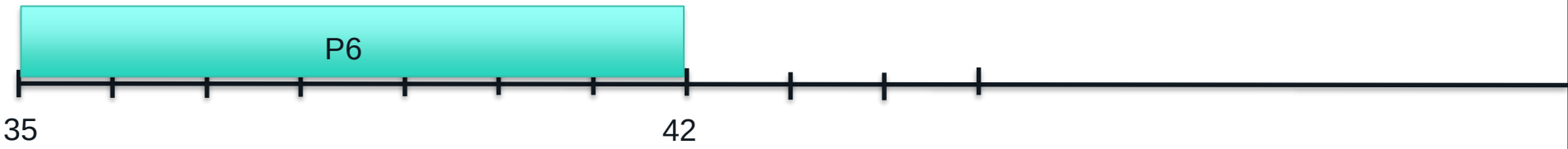


Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Østfold University College

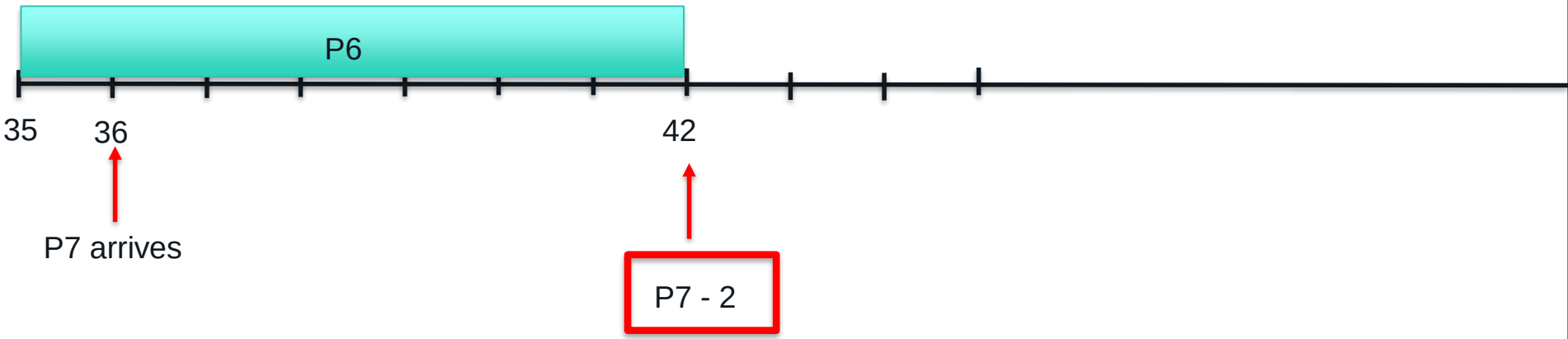
Input

P6 started at time 35 and finished at time 42



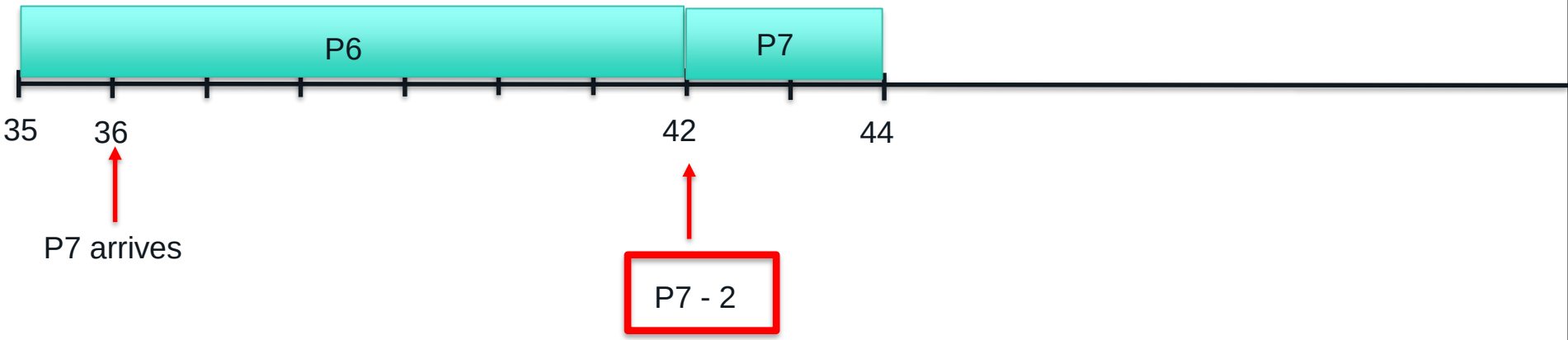
Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

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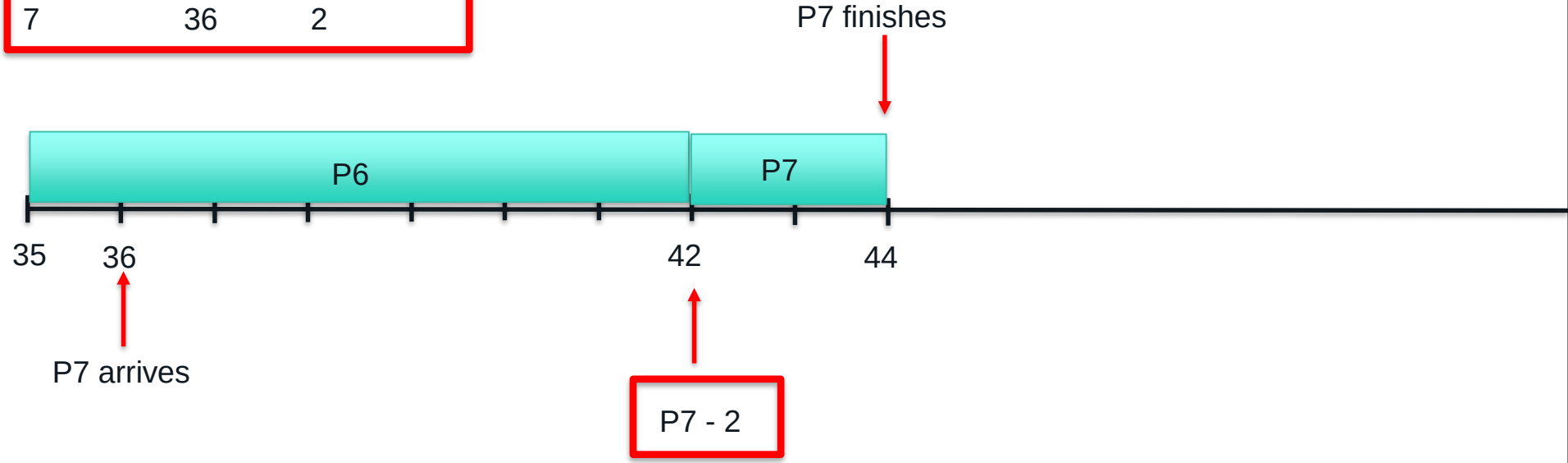
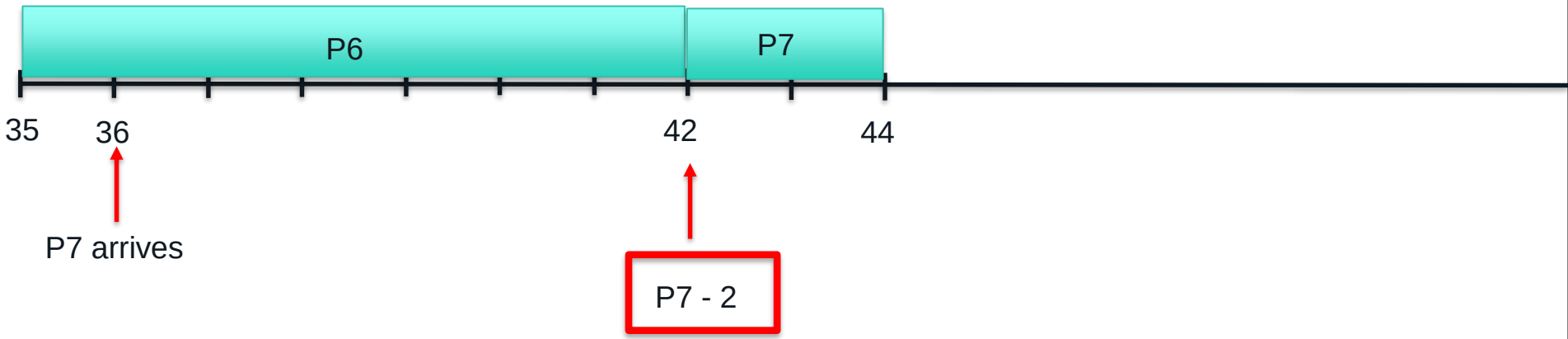
Input



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

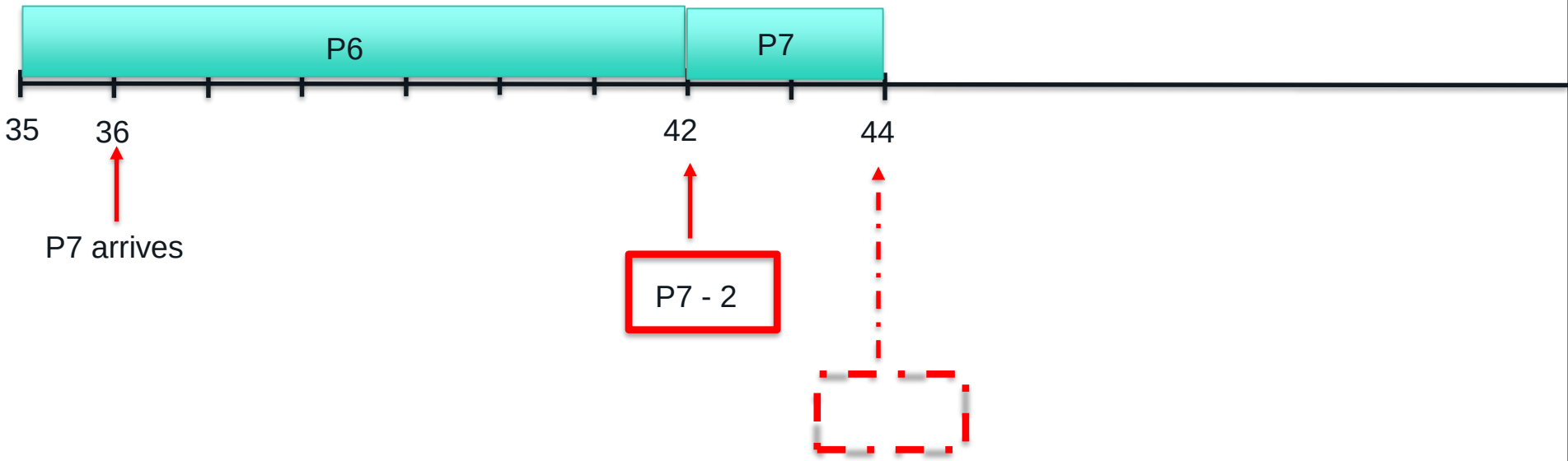
P7 started at time 42 and finished at time 44



Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Input

P7 started at time 42 and finished at time 44

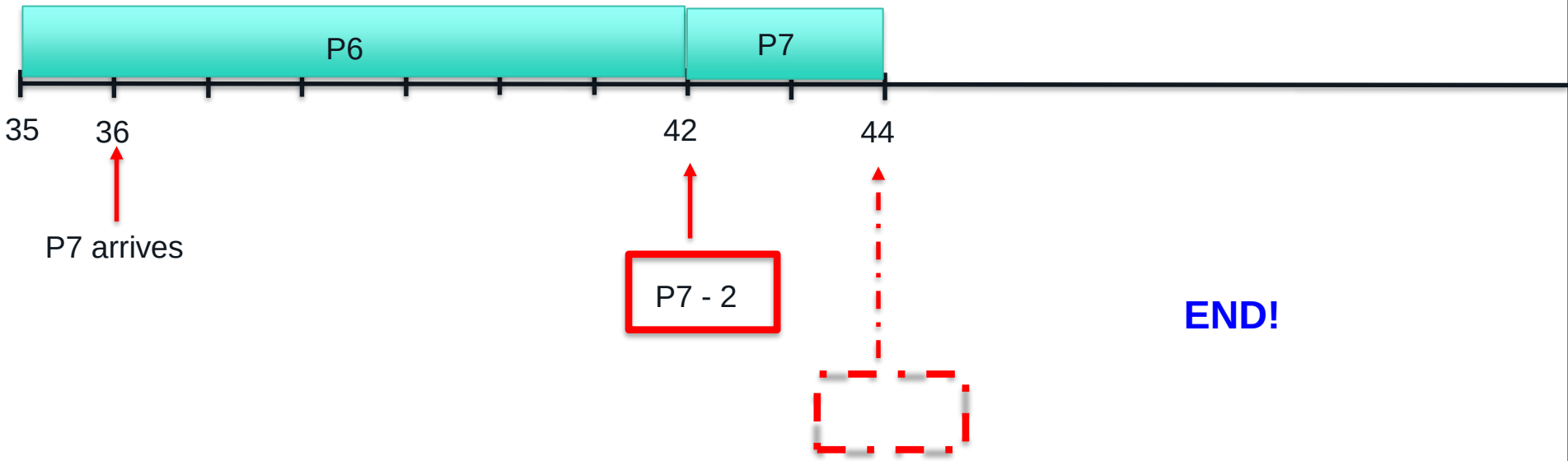


Process	Arrivial	RunTime
1	0	4
2	7	10
3	9	2
4	13	8
5	25	1
6	35	7
7	36	2

Østfold University College

Input

P7 started at time 42 and finished at time 44



END!

Another example of SJF

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

P1 arrives

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

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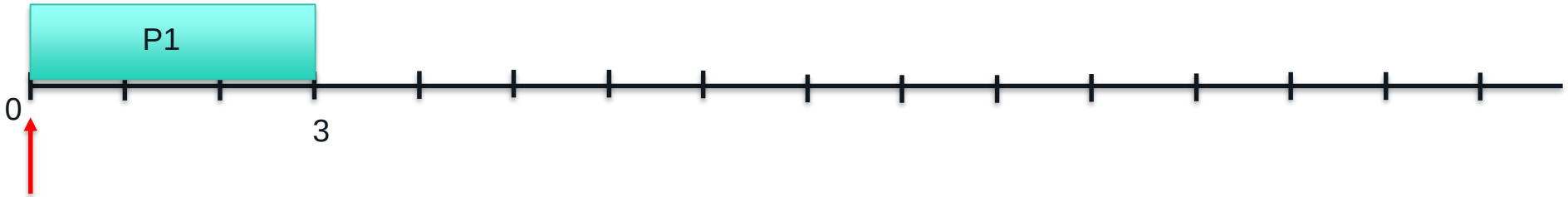
Input

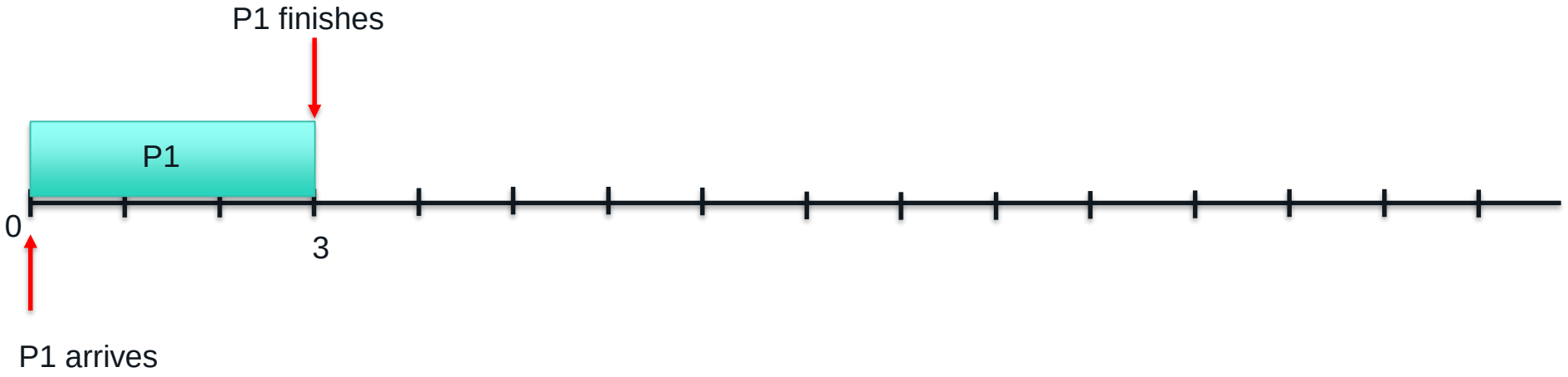


P1 arrives

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

Input

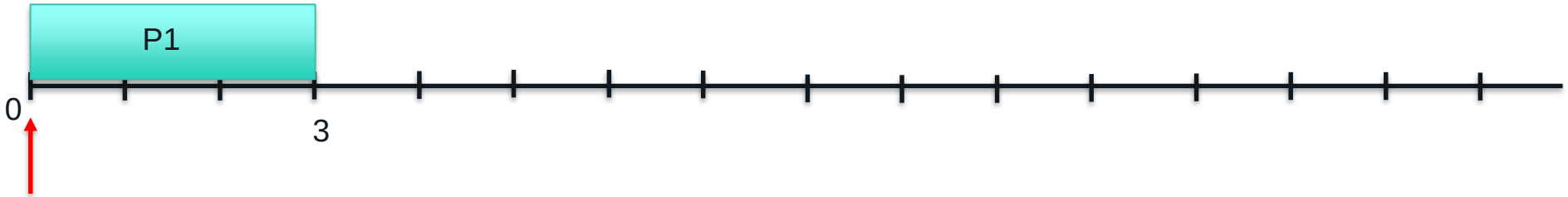


Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

Input

P1 started at time 0 and finished at time 3



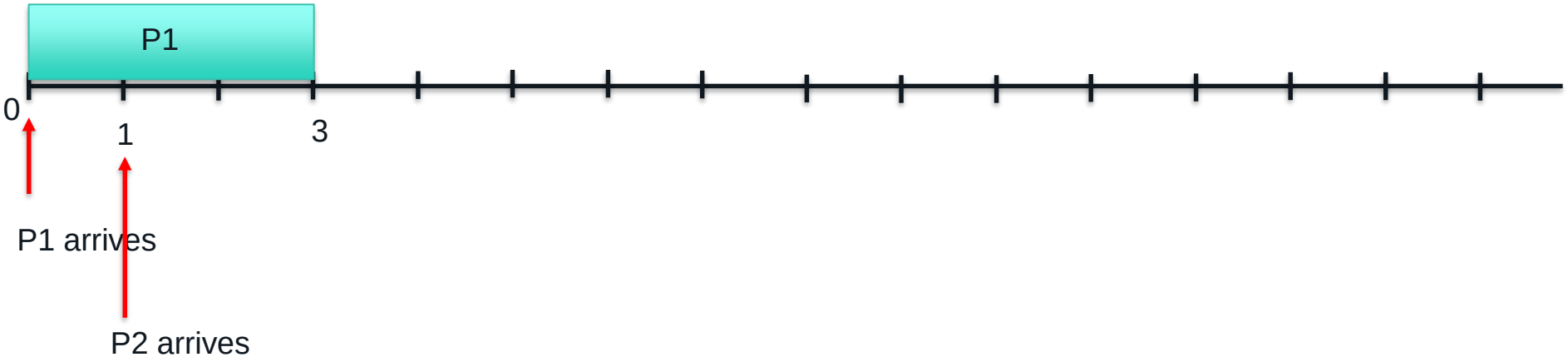
P1 arrives

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

Input

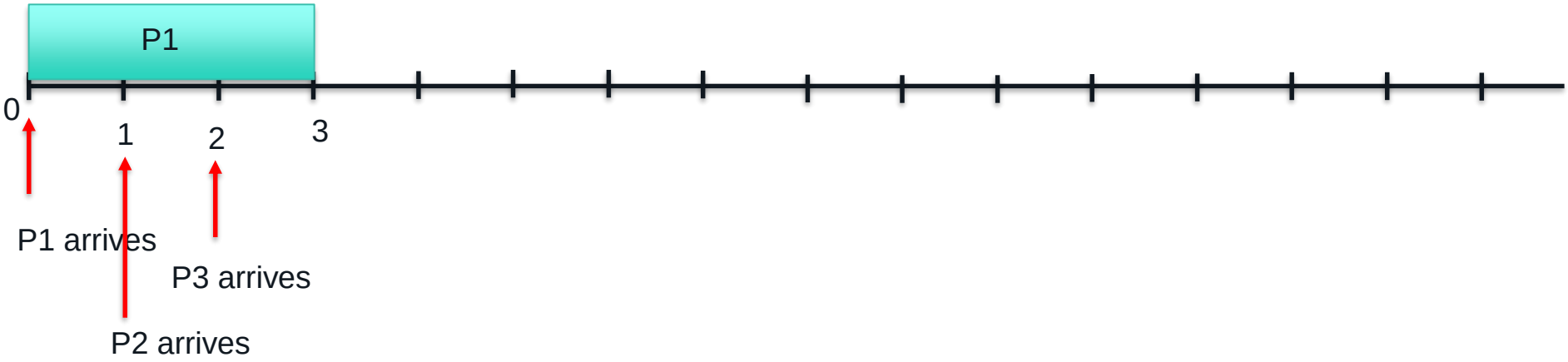
P1 started at time 0 and finished at time 3



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

P1 started at time 0 and finished at time 3



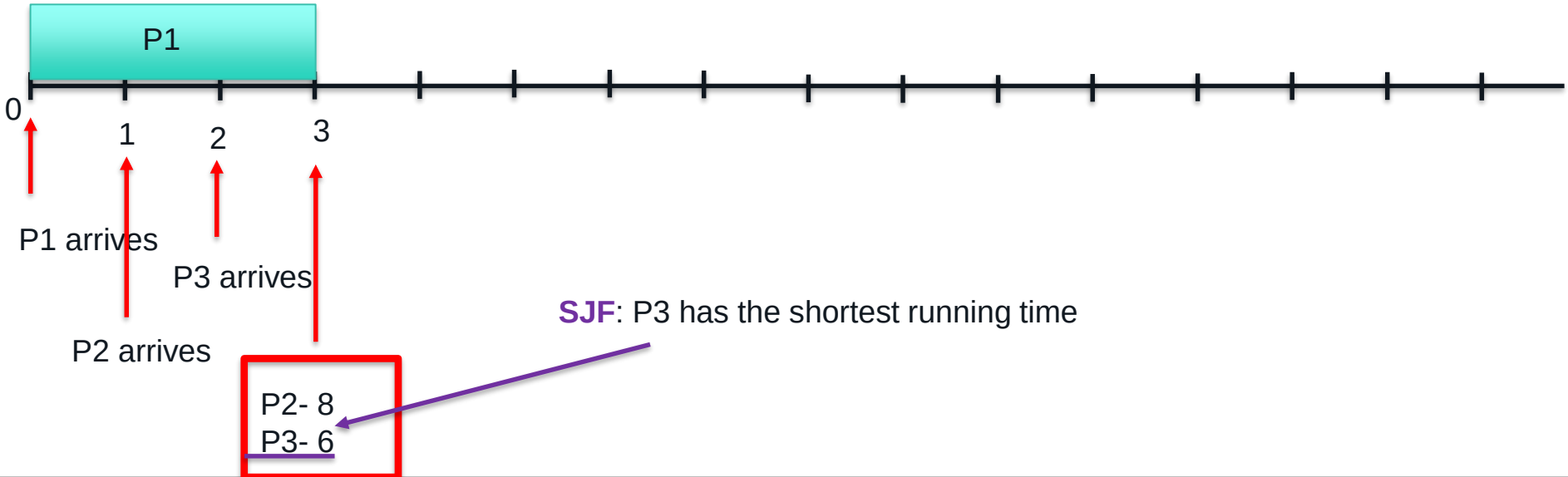
Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

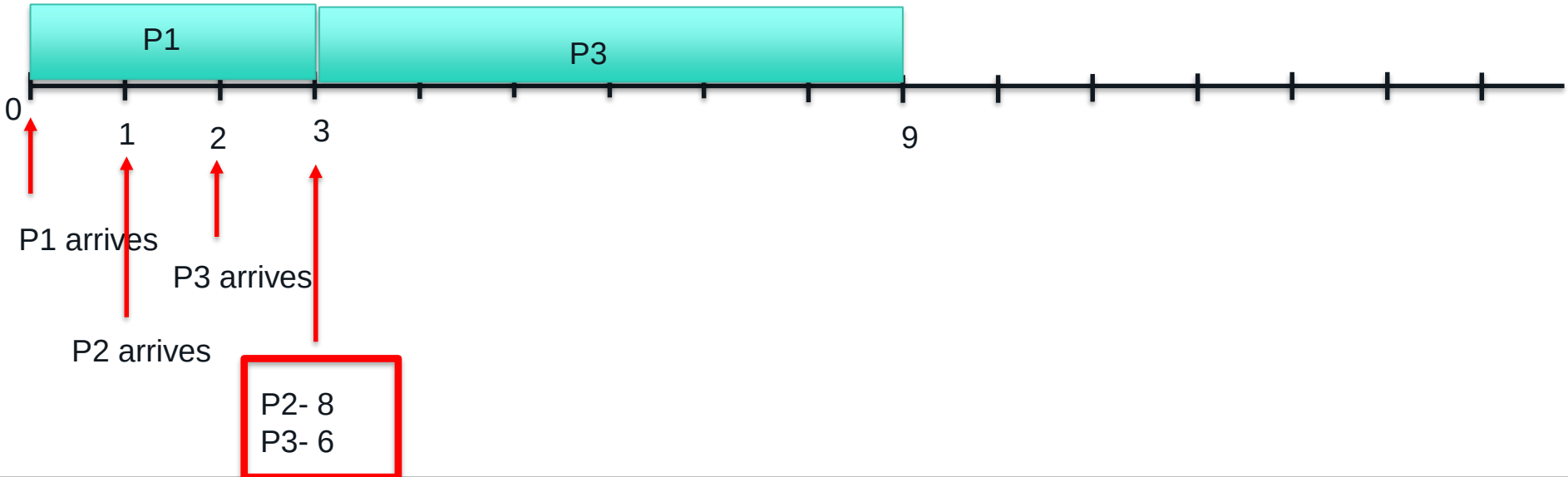


SJF: P3 has the shortest running time

Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

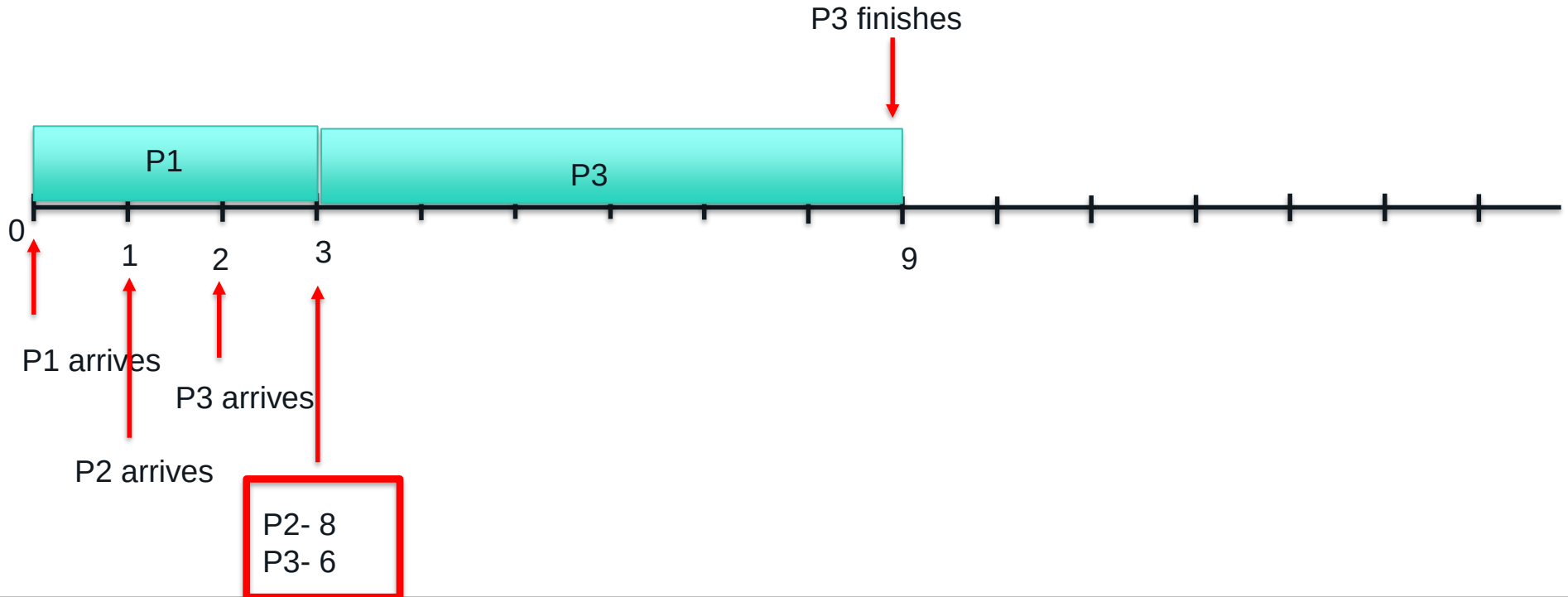
Input



Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

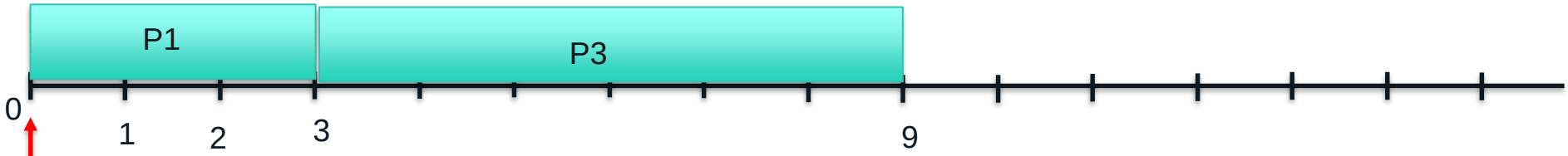


Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

Input

P3 started at time 3 and finished at time 9



P1 arrives

P2 arrives

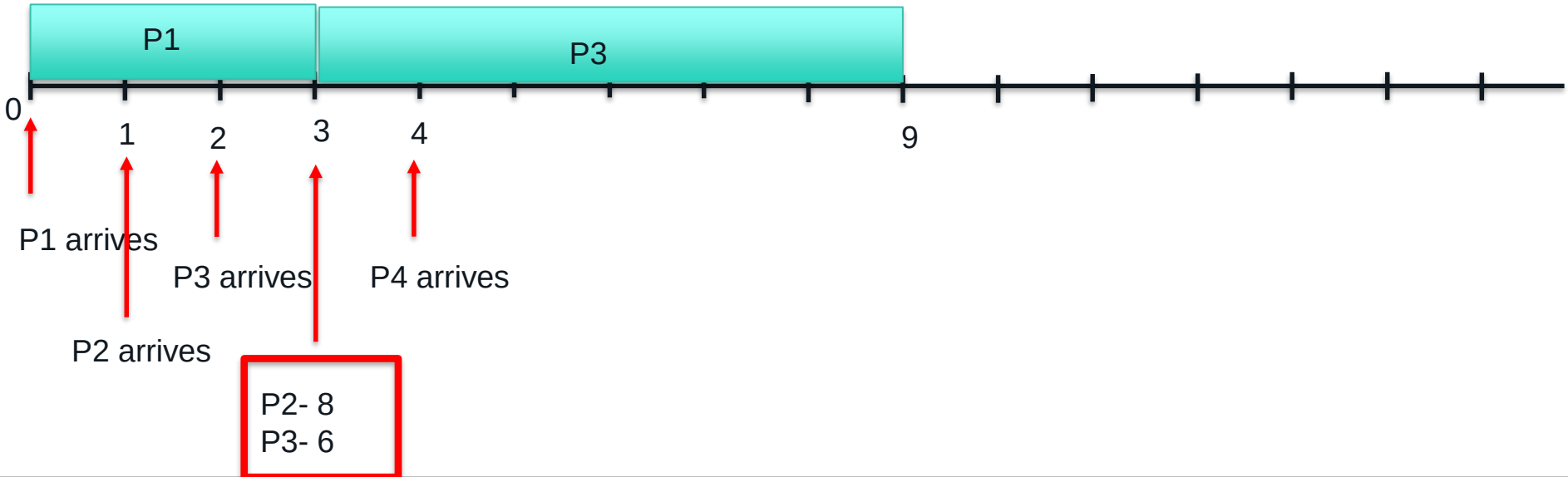
P3 arrives

P2- 8
P3- 6

Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

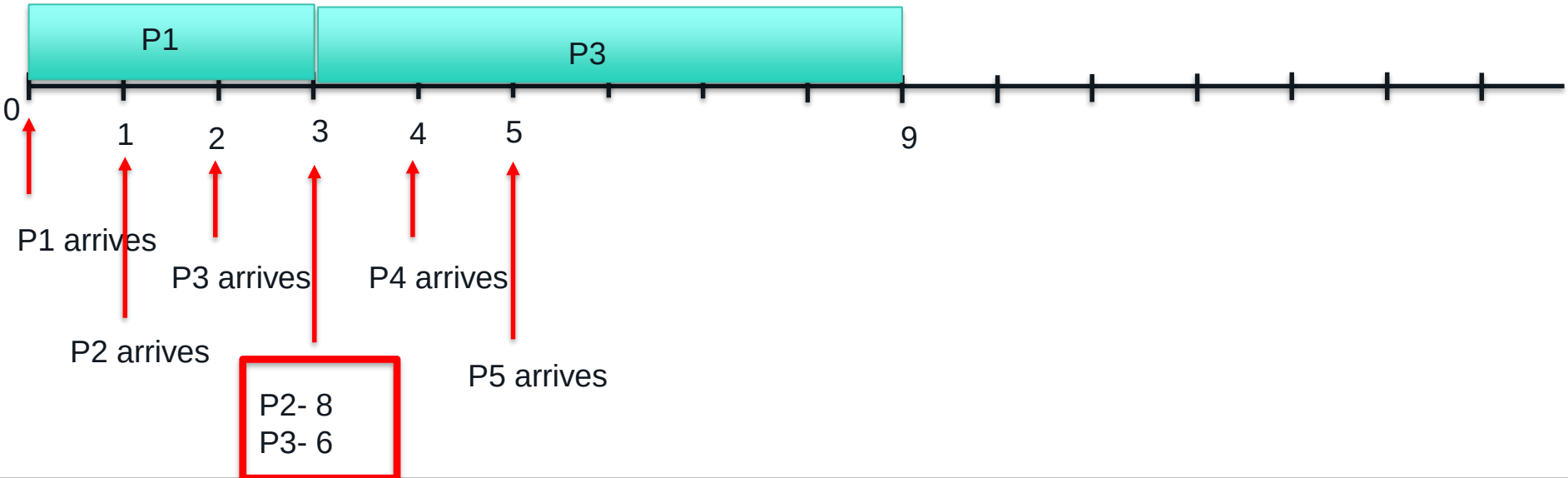
Input



Østfold University College

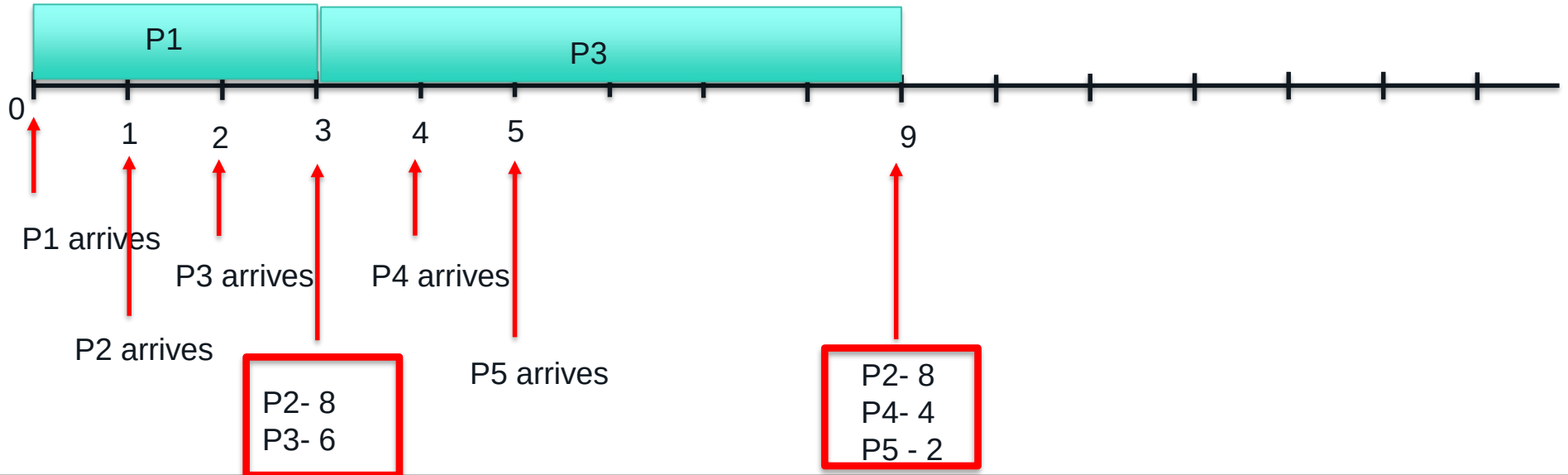
Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

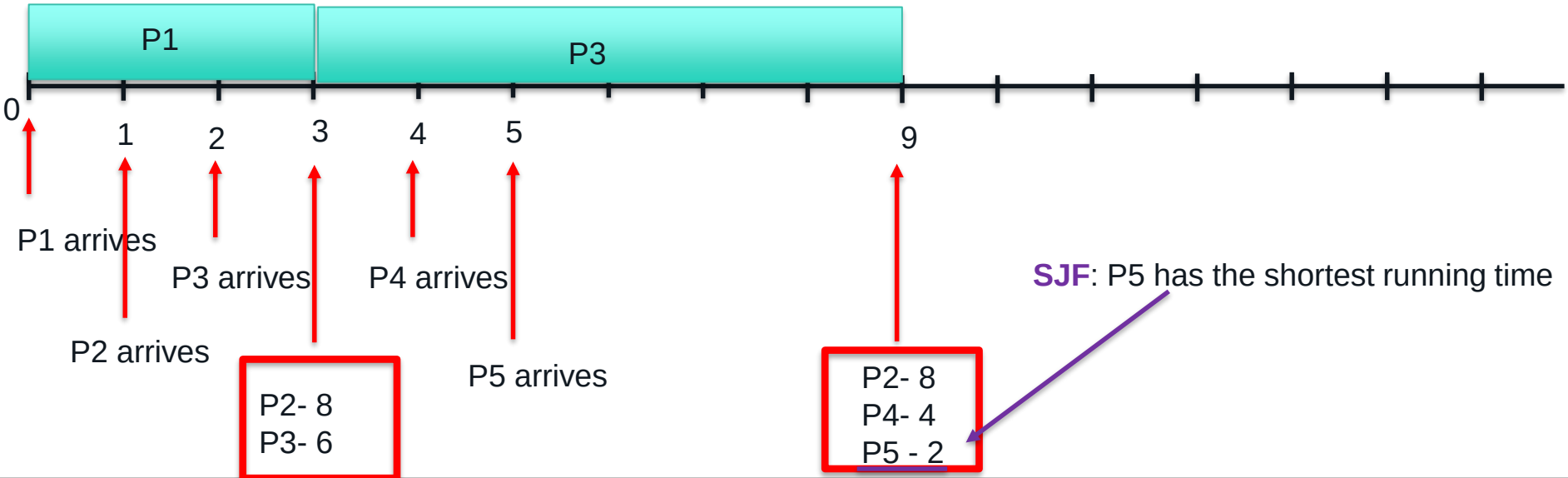
Input



Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

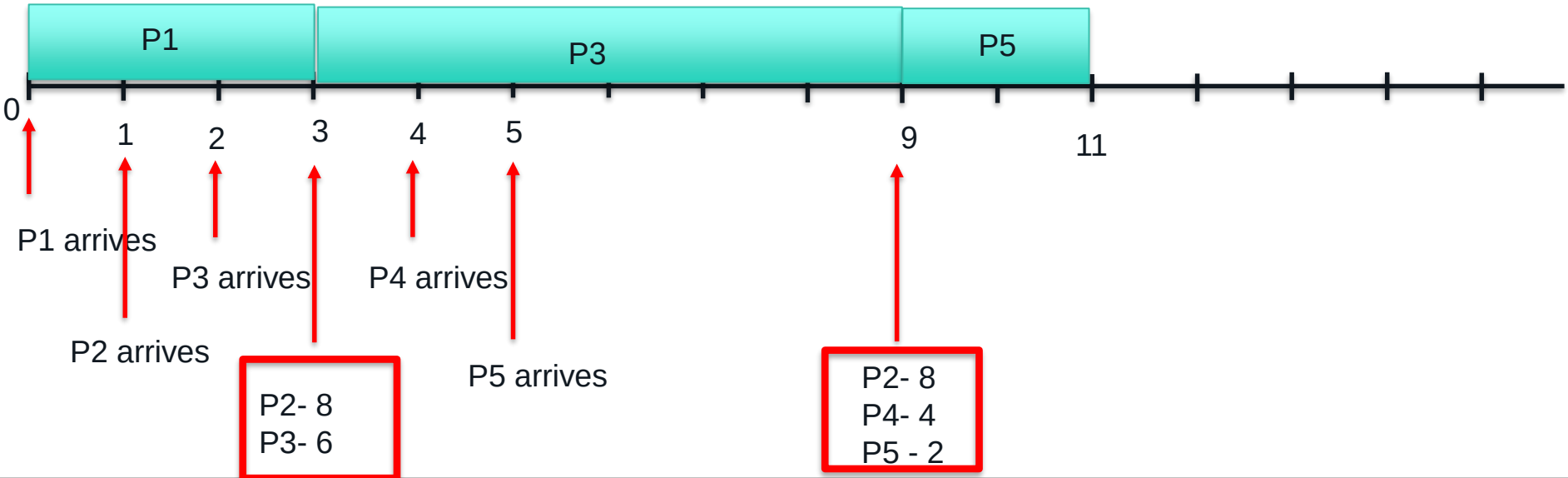
Input



Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

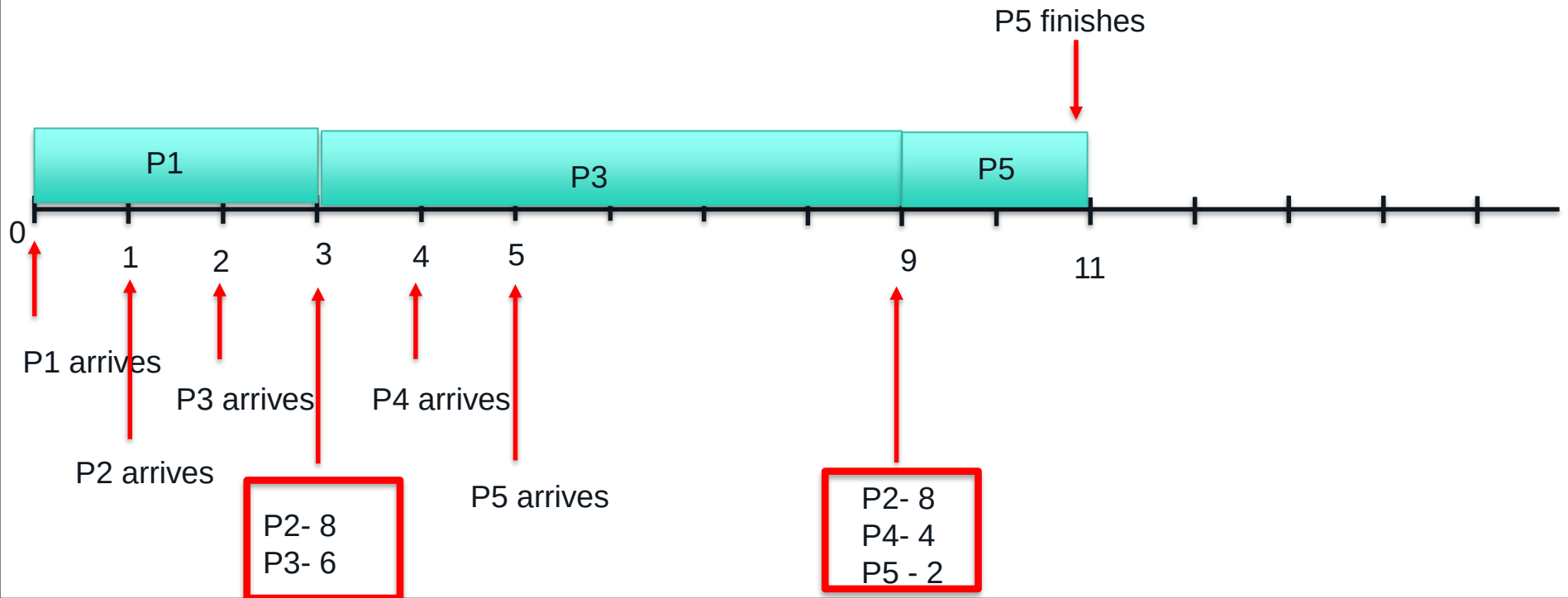
Input



Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

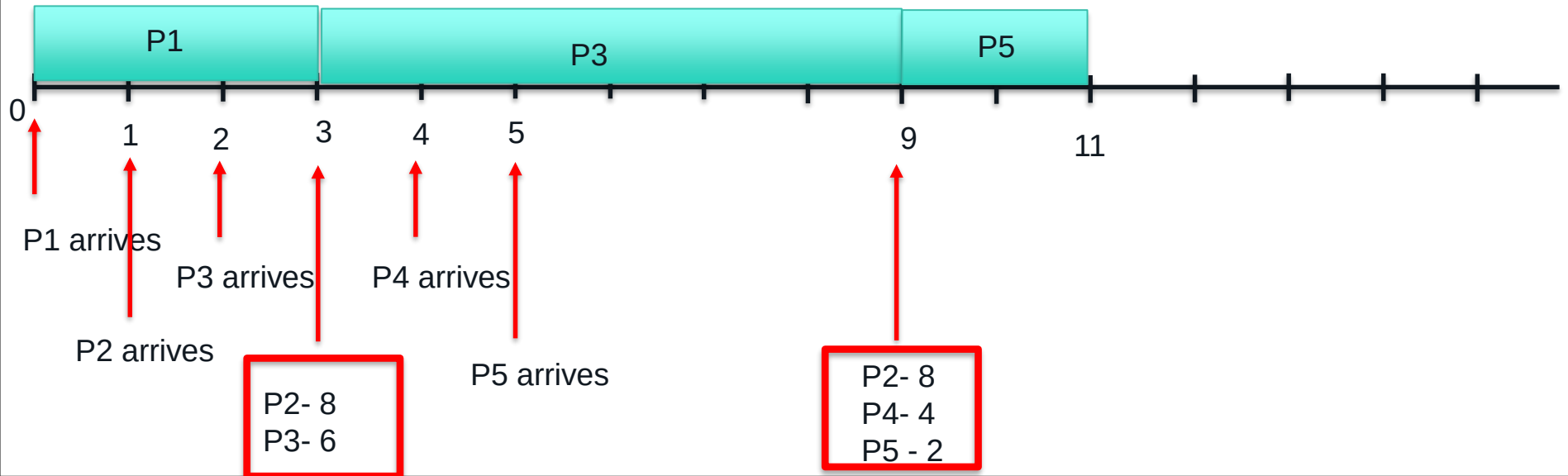
Input



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

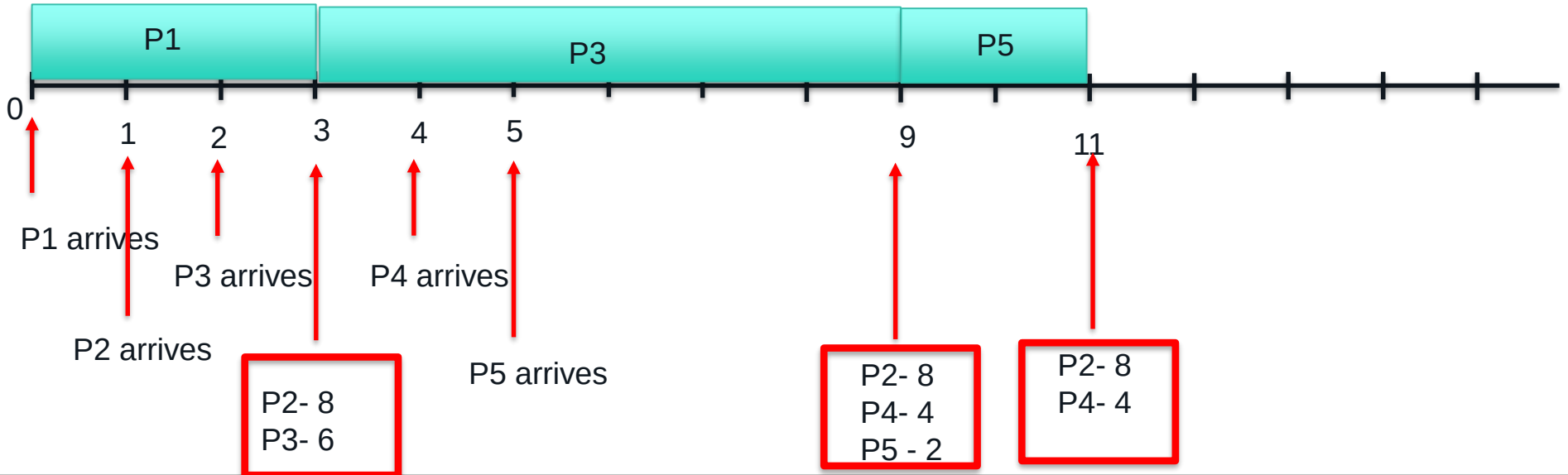
Input

P5 started at time 9 and finished at time 11



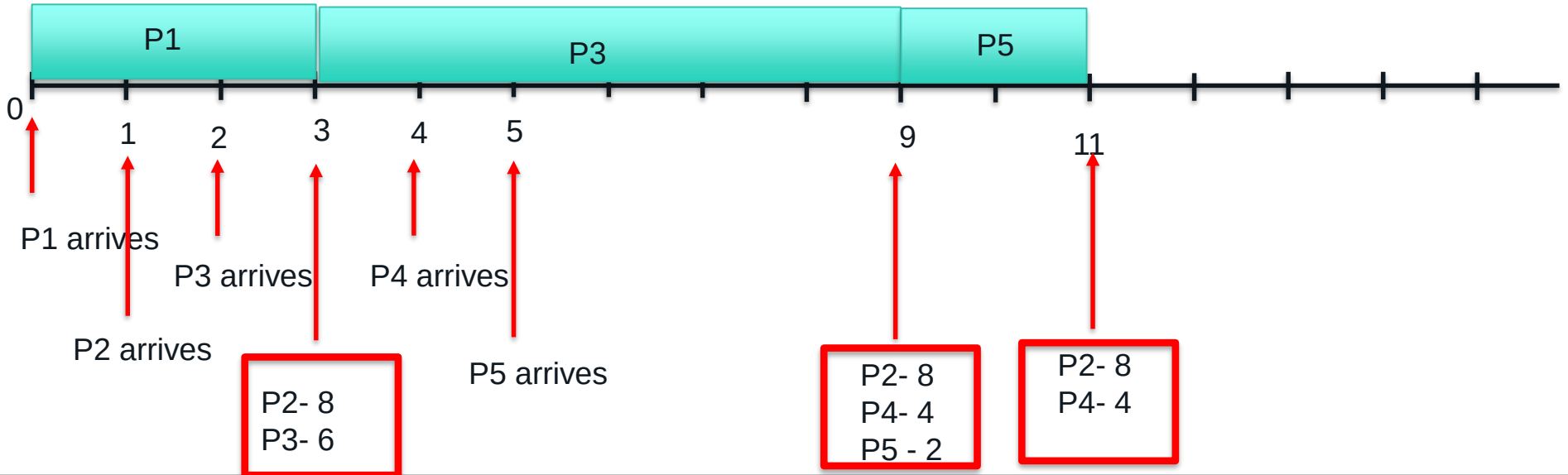
Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

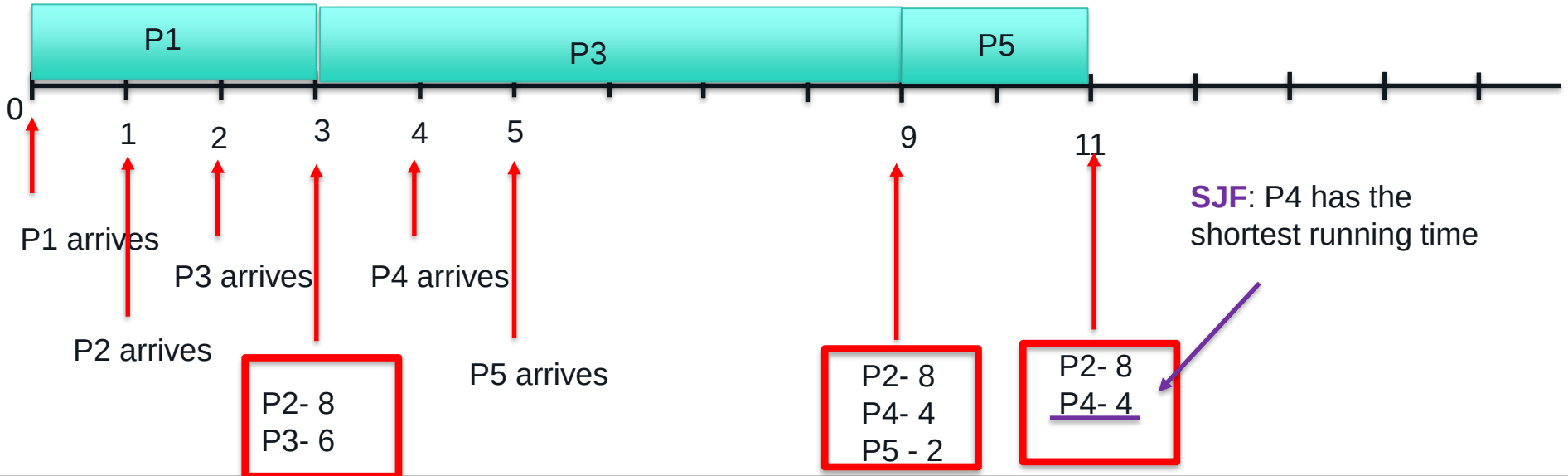
Input



Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

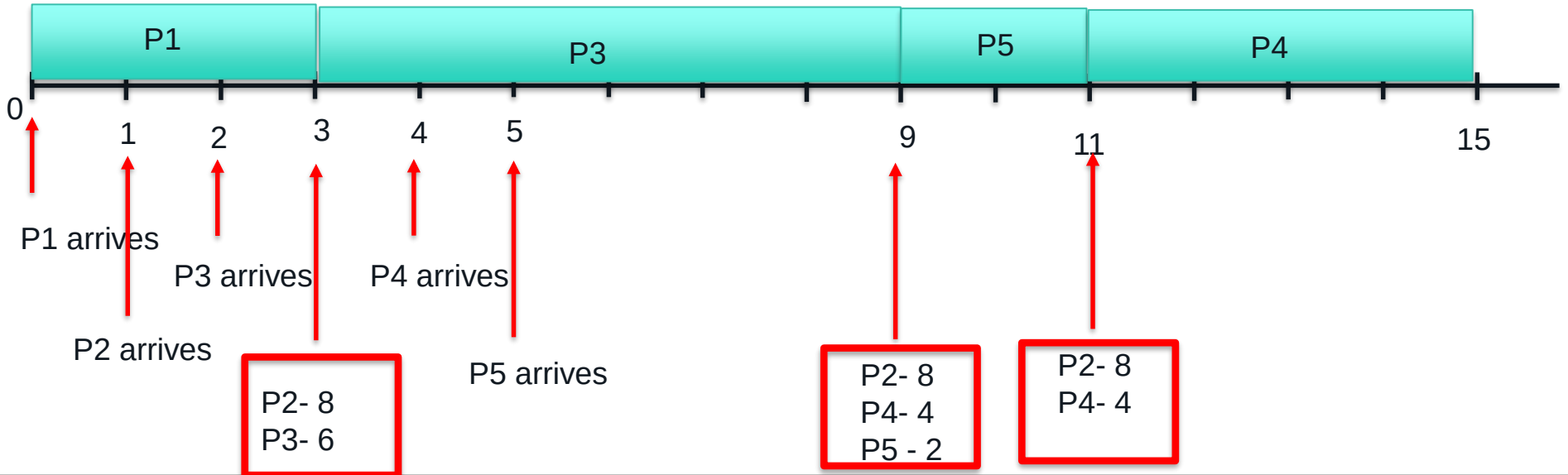
Input



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

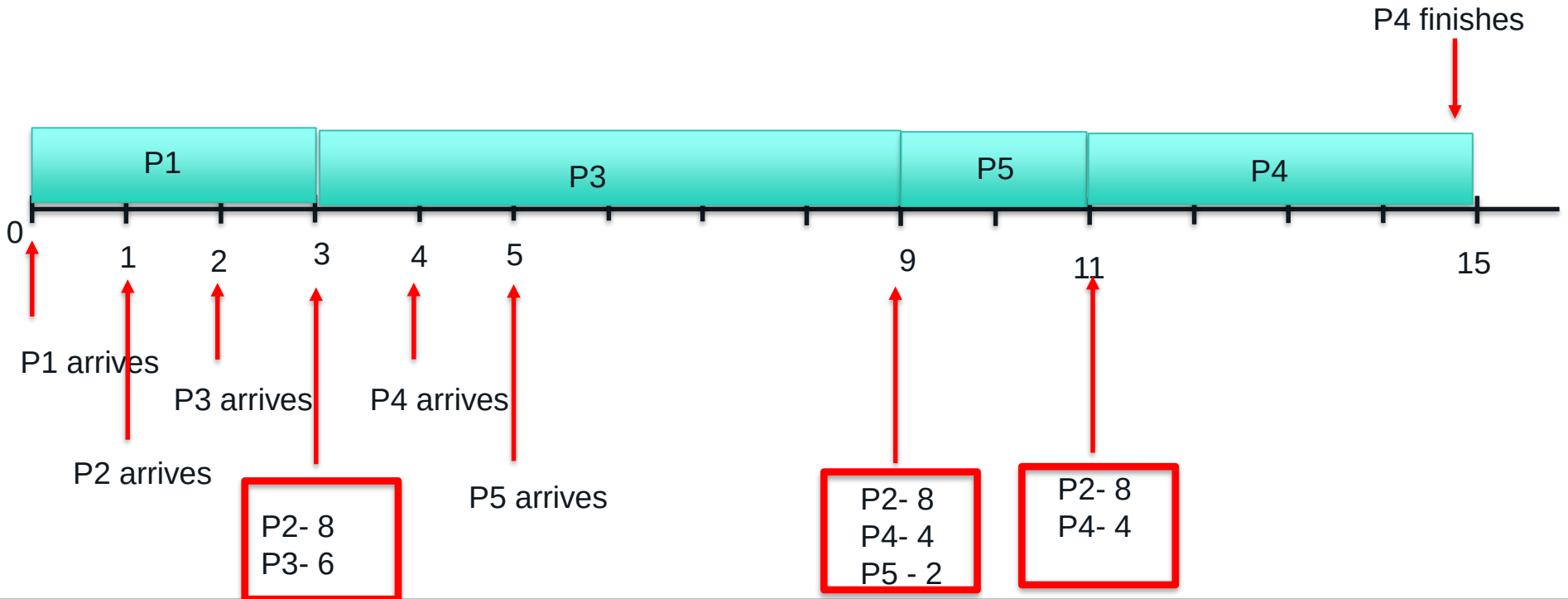
Input



Østfold University College

Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

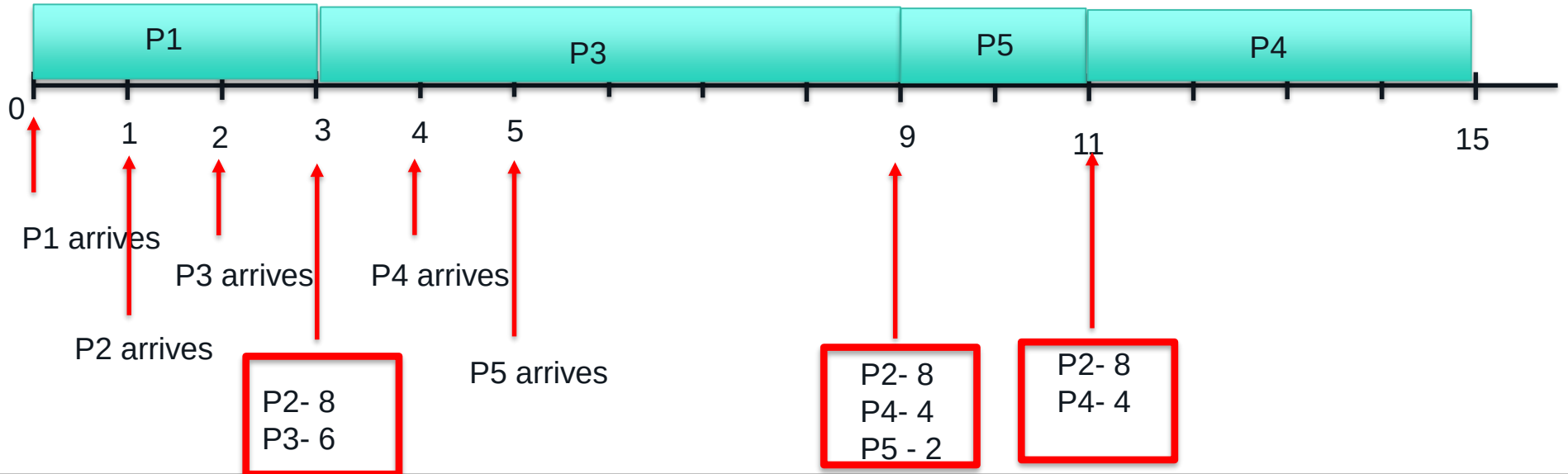


Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

Input

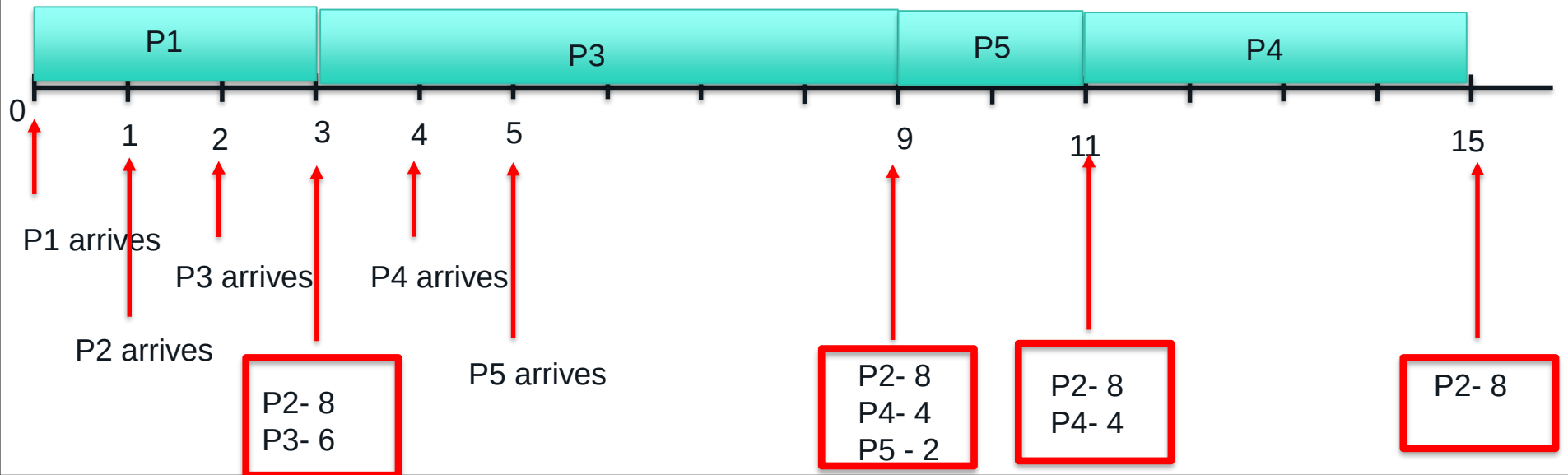
P4 started at time 11 and finished at time 15



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

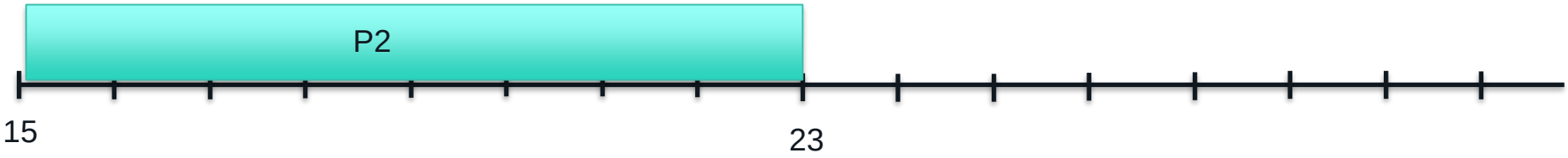
Input

P4 started at time 11 and finished at time 15



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

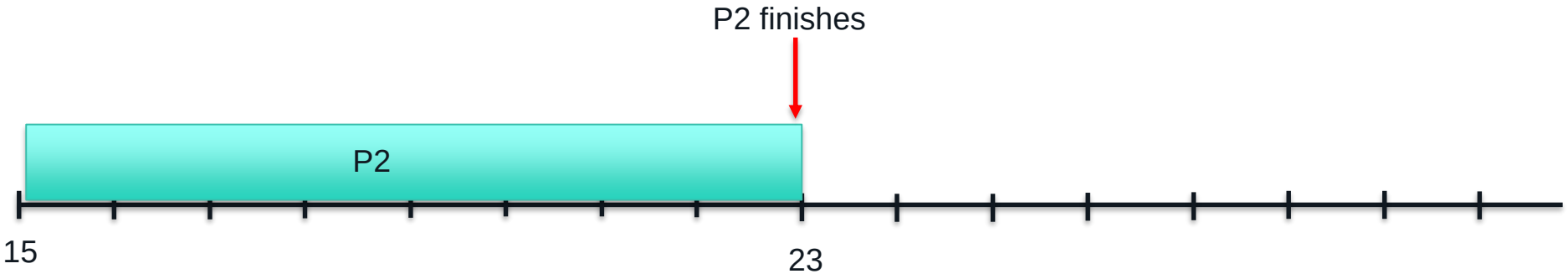
Input



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

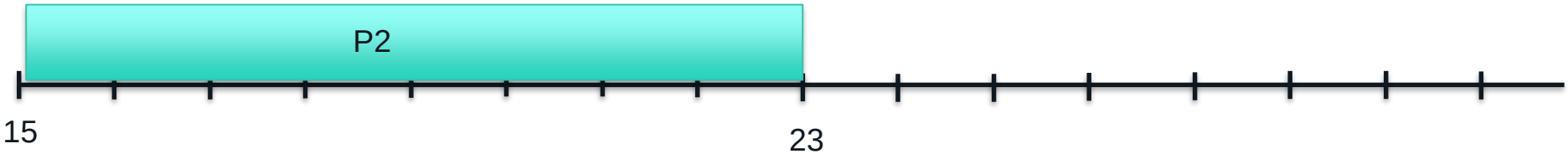
Input



Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Input

P2 started at time 15 and finished at time 23

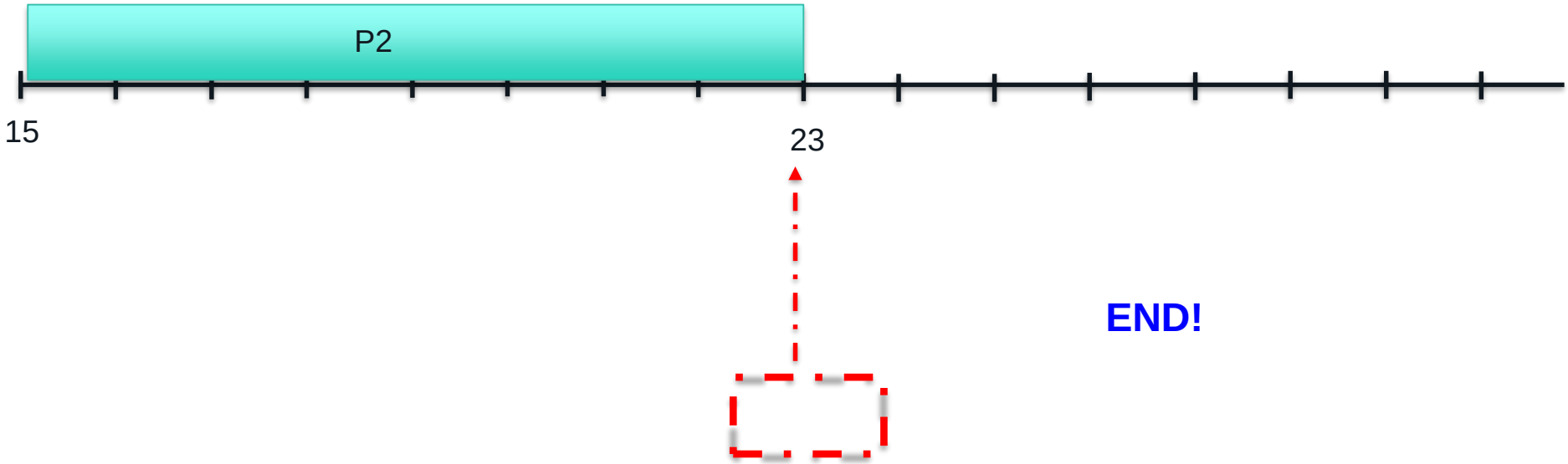


Process	Arrivial	RunTime
1	0	3
2	1	8
3	2	6
4	4	4
5	5	2

Østfold University College

Input

P2 started at time 15 and finished at time 23



END!

Q&A