

RPW

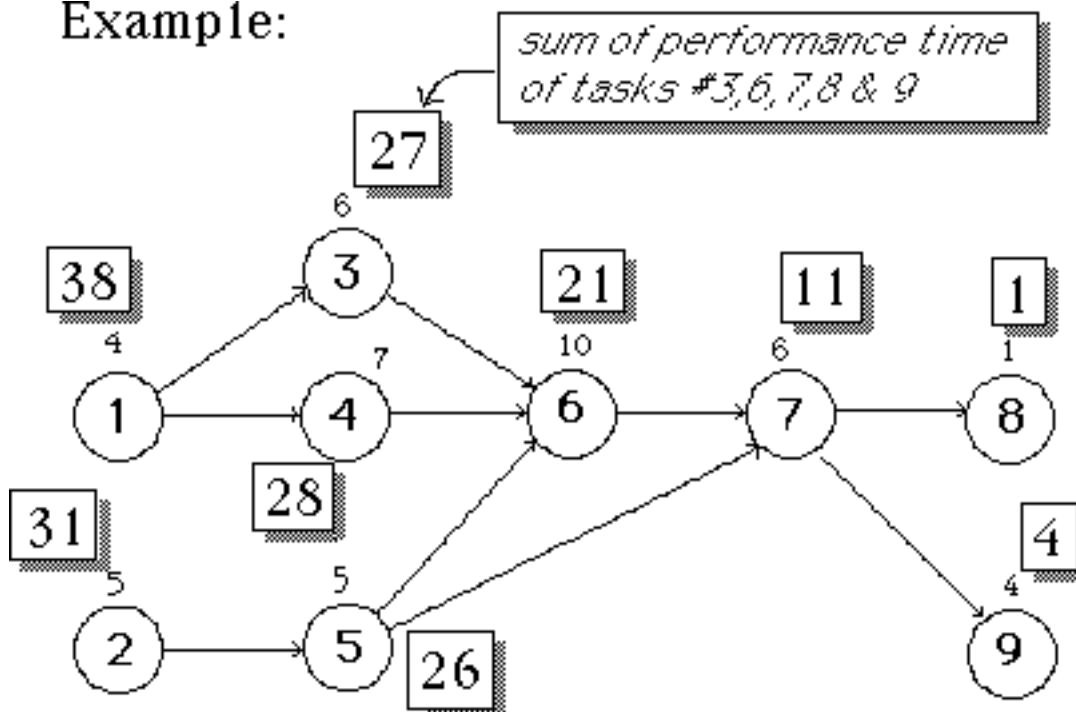
Ranked Positional Weight Method

The **Positional Weight** of a task is the sum of the performance times of this task and all tasks which must follow it.



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Example:



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These POSITIONAL WEIGHTS are then sorted into descending order.

At each step, the next task assigned to a station is the task with

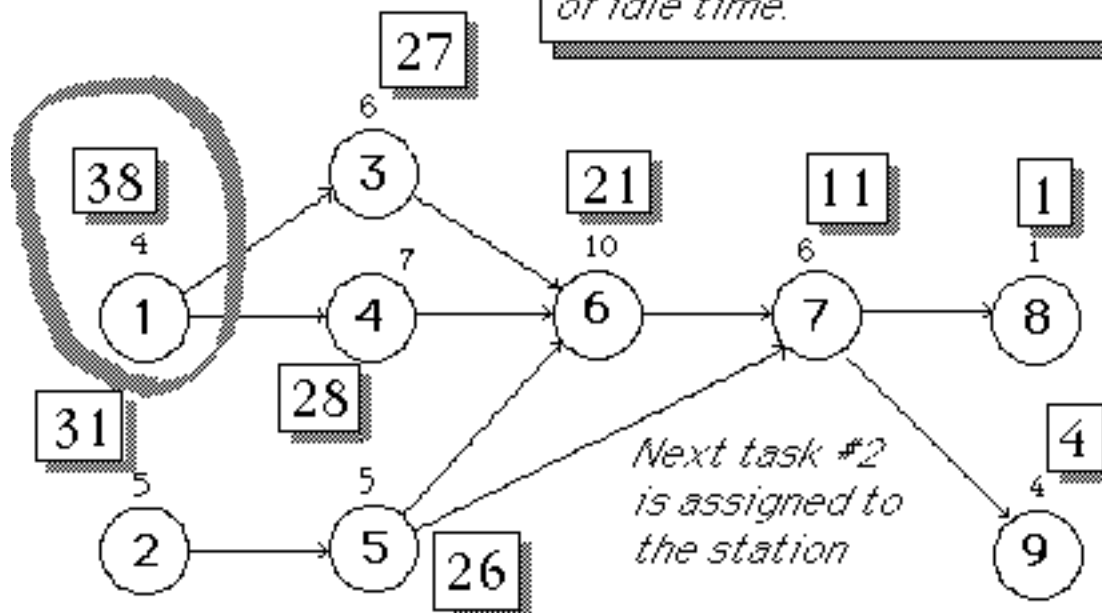
- the highest positional weight
- performance time \leq idle time remaining at the station
- all predecessors already assigned

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Example:

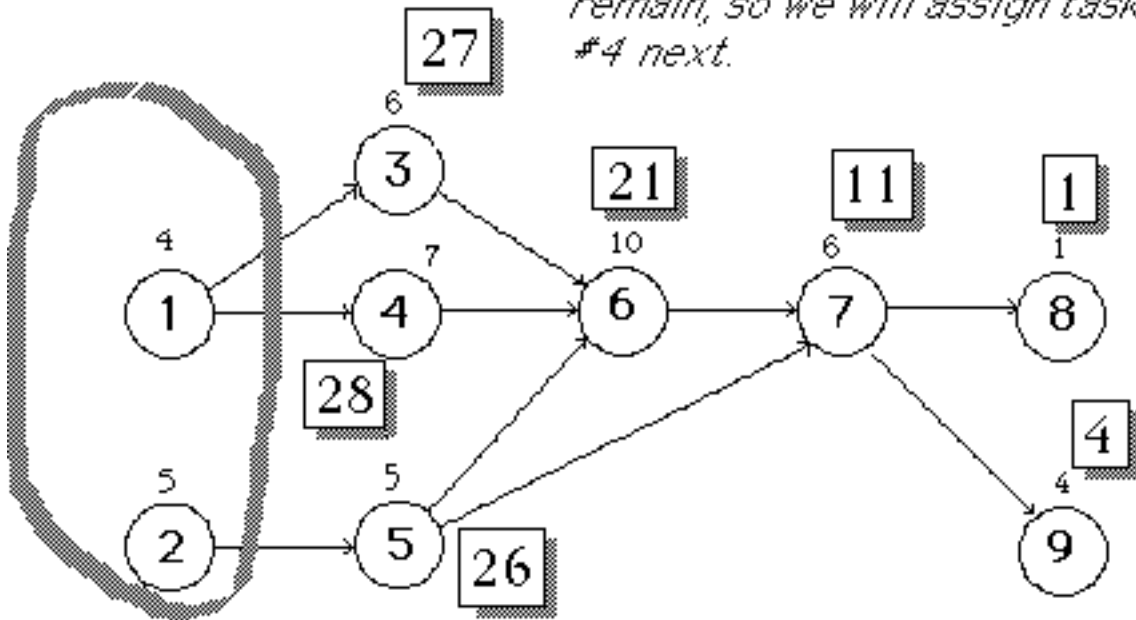
Cycle time=16

Task #1 is first assigned to the first station, leaving 12 minutes of idle time.



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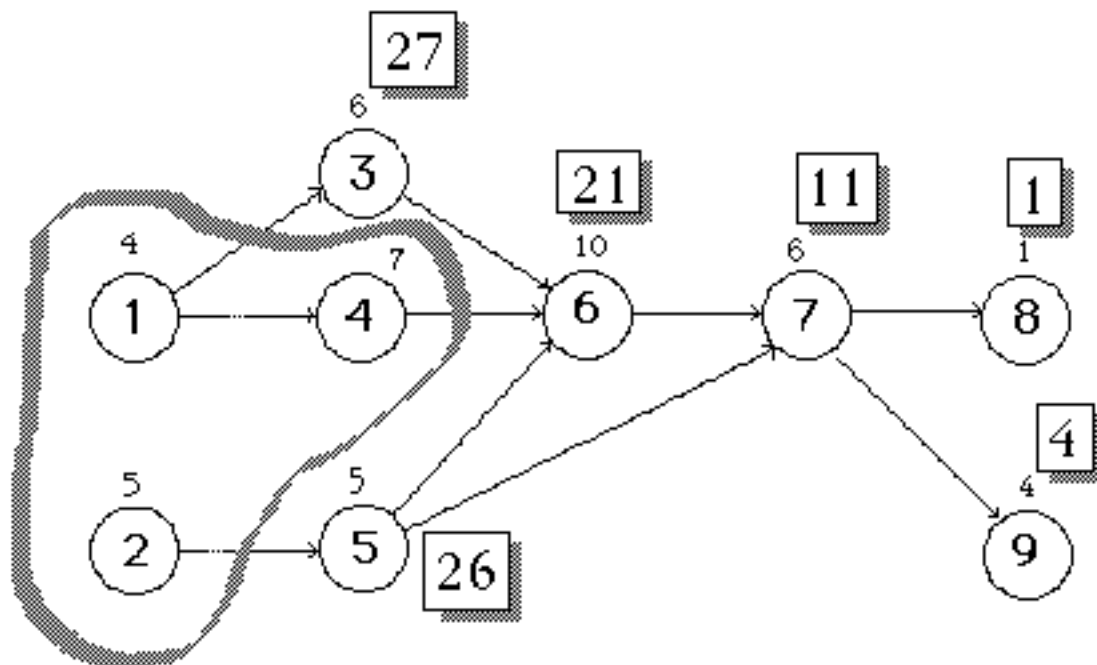
After assigning task #2 to the station, 7 minutes of idle time remain, so we will assign task #4 next.



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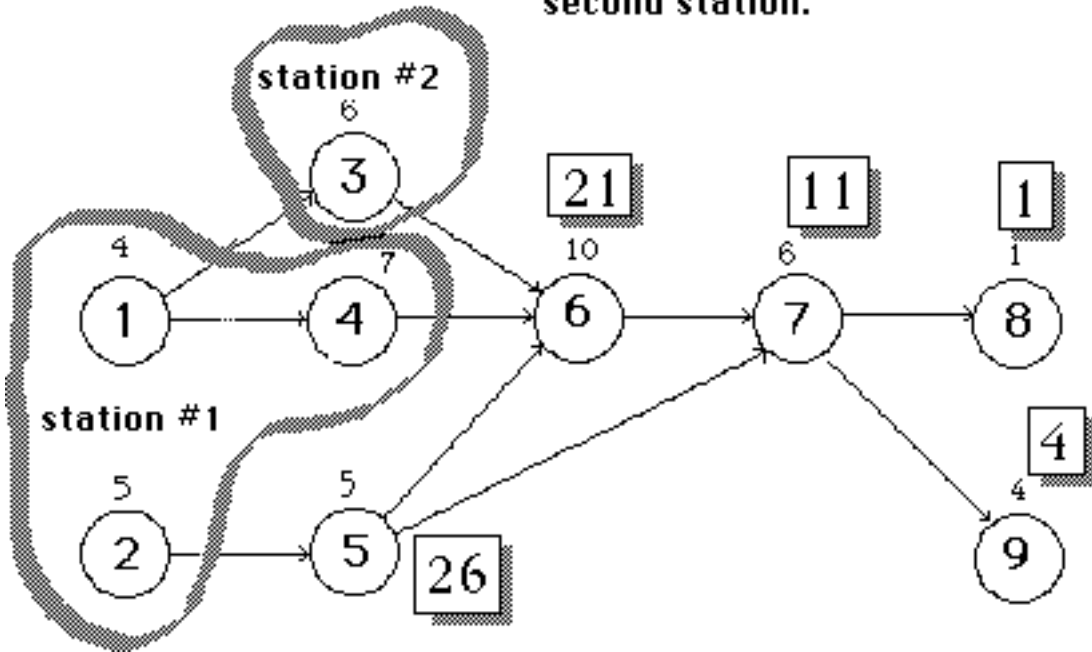
Idle time at the first station is now zero, so we begin assigning to the second station.

Assign task #3 to station 2.



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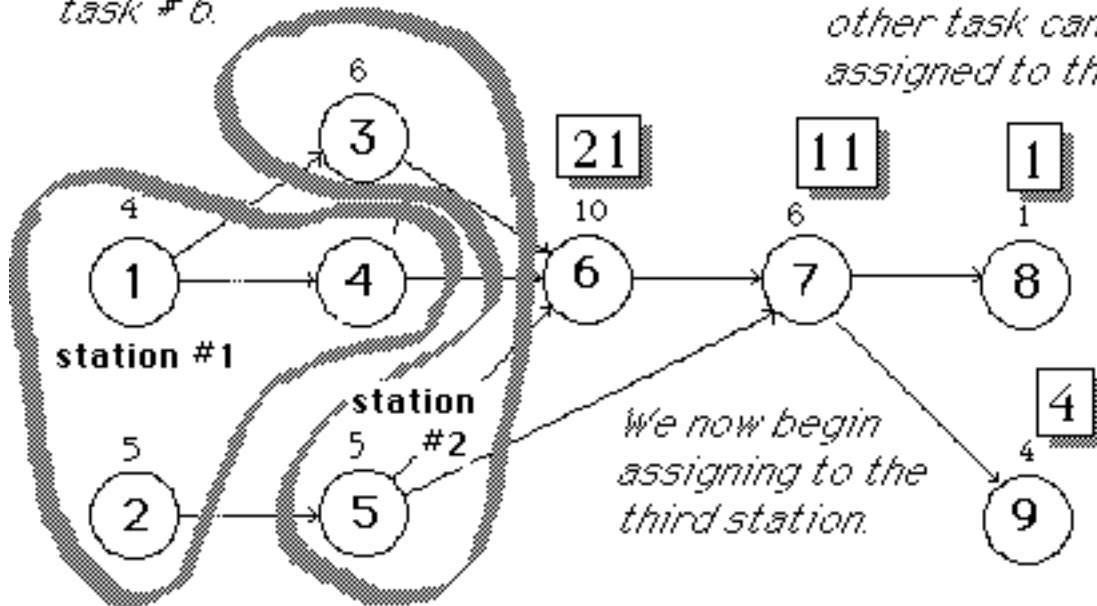
The next highest weighted task is task #5, so we add it to the second station.



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Only 5 minutes of idle time remain at station #2, which is not sufficient to assign task #6.

Because task 6 must precede each of the remaining tasks, no other task can be assigned to this station.

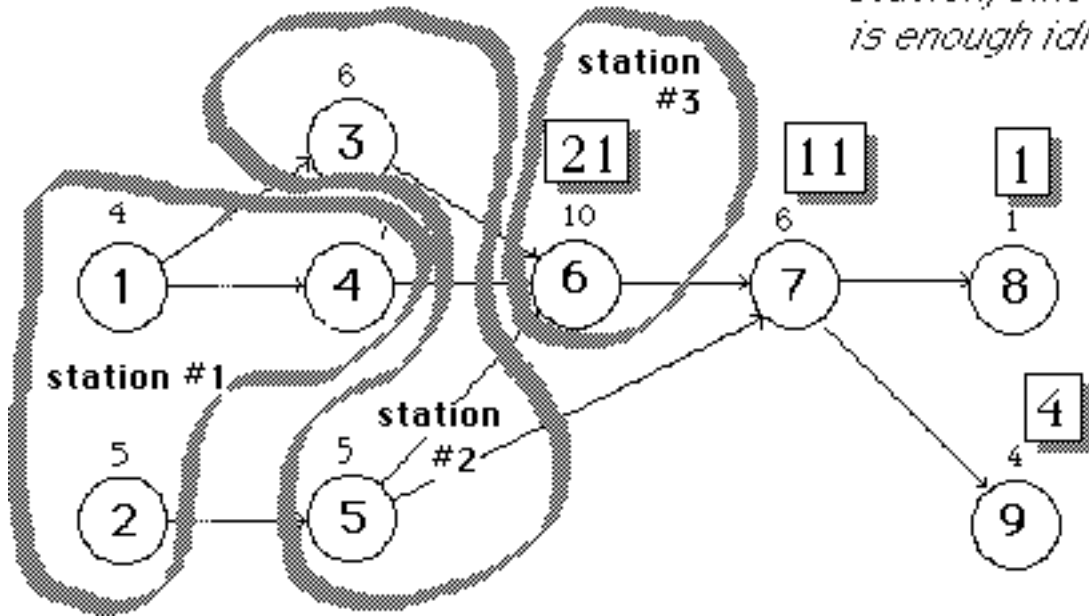


We now begin assigning to the third station.

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We assign task #6 to the third station, leaving 6 minutes of idle time.

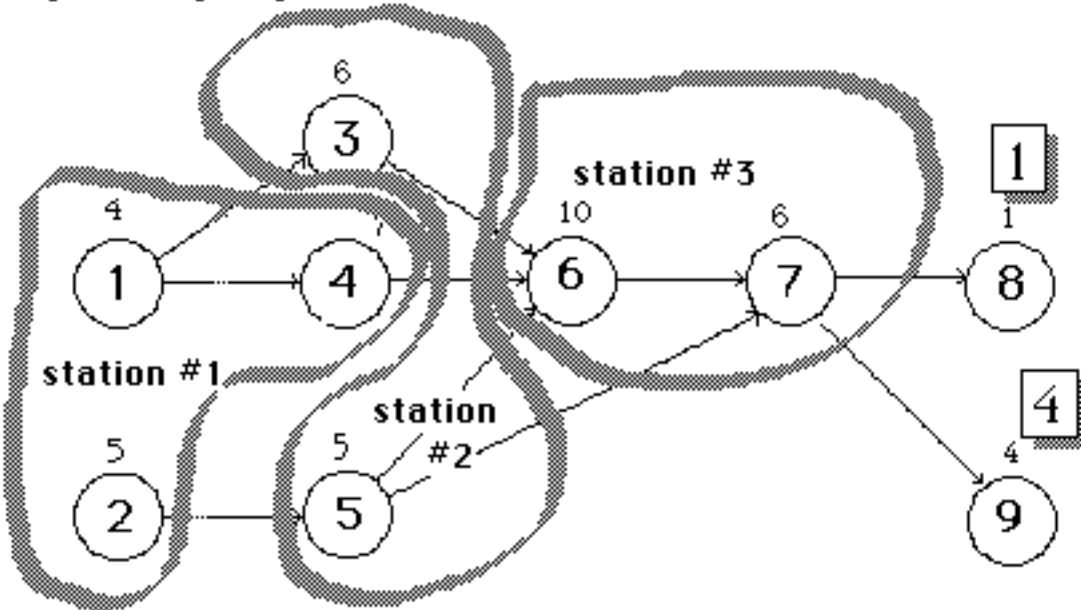
We will next assign task #7 to this station, since there is enough idle time.



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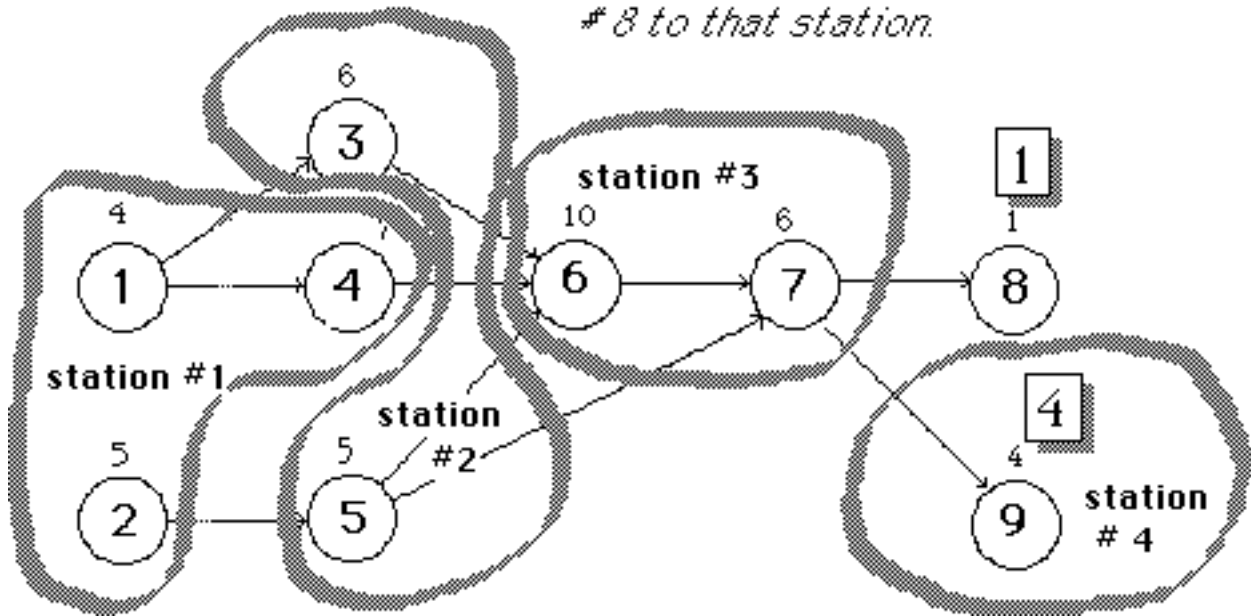
Since there is zero idle time remaining at station #3, we begin assigning to a new station.

We will next assign task #9 to the fourth station.



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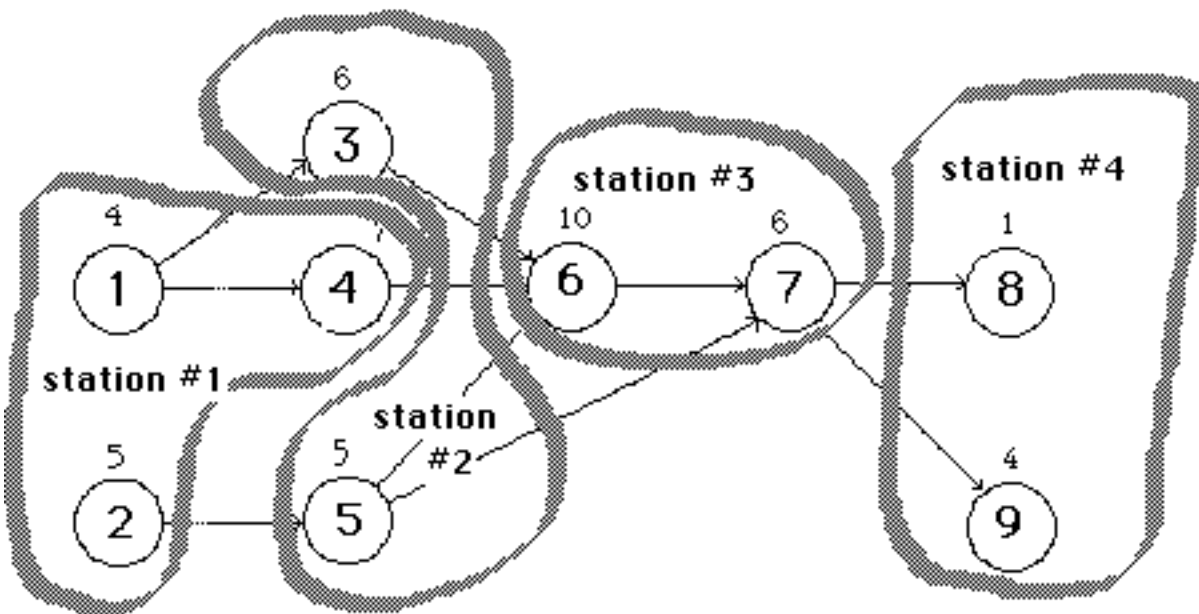
Idle time remaining at station 4 is 12 minutes, so we will next add task # 8 to that station.



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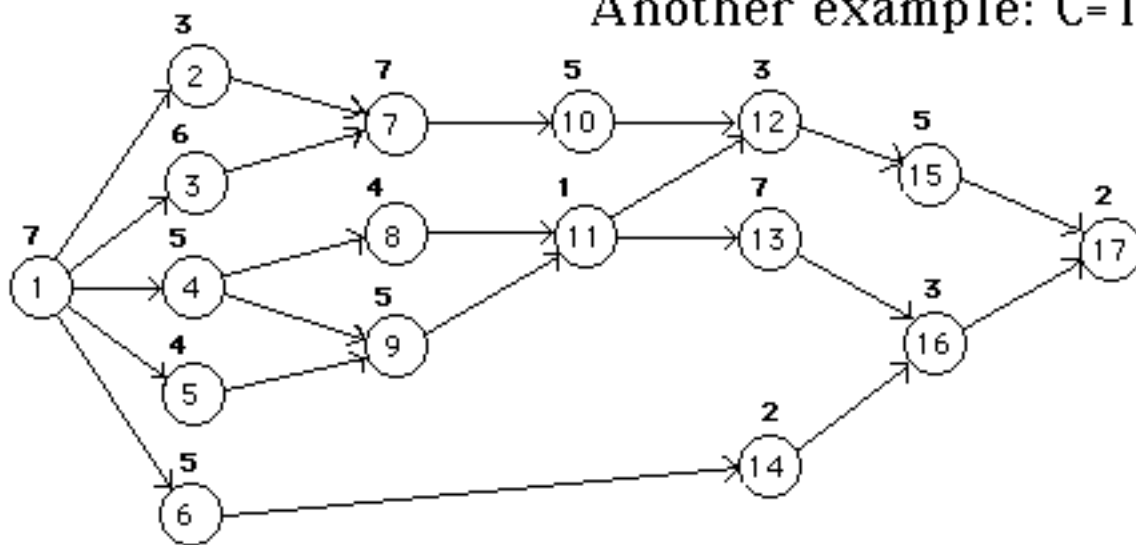
The final balance:

Idle time = 16, balance delay = 25%



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Another example: C=15



Ranked Positional Weight Heuristic Method

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Ranked Positional Weight Heuristic Method

Station #1

Add Task 1 to station 1 ← rank is # 1

Time at station 1 is now 7
(Idle time: 8)

Add Task 4 to station 1 ← rank is # 2

Time at station 1 is now 12
(Idle time: 3)

Add Task 2 to station 1 ← rank is # 6 (not enough idle time for tasks ranked # 3, 4, & 5!)

No additional tasks may be added to this station.

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Station #2

Add Task 5 to station 2 ← rank is #3
 Time at station 2 is now 4
 (Idle time: 11)
 Add Task 3 to station 2 ← rank is #4
 Time at station 2 is now 10
 (Idle time: 5)
 Add Task 9 to station 2 ← rank is #5
 Time at station 2 is now 15
 (Idle time: 0)
 No additional tasks may be added to this station.

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Station #3

Add Task 8 to station 3
 Time at station 3 is now 4
 (Idle time: 11)
 Add Task 7 to station 3
 Time at station 3 is now 11
 (Idle time: 4)
 Add Task 11 to station 3
 Time at station 3 is now 12
 (Idle time: 3)

ranks are
7, 8, & 9

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Station #4

Add Task 10 to station 4 ← rank is #10
 Time at station 4 is now 5
 (Idle time: 10)
 Add Task 6 to station 4 ← rank is #11
 Time at station 4 is now 10
 (Idle time: 5)
 Add Task 12 to station 4 ← task 13 is ranked #12, but
 Time at station 4 is now 13 there is insufficient idle
 (Idle time: 2) time remaining at the station
 Add Task 14 to station 4
 Time at station 4 is now 15
 (Idle time: 0)
 No additional tasks may be added to this station.

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Station #5

Add Task 13 to station 5
 Time at station 5 is now 7
 (Idle time: 8)
 Add Task 15 to station 5
 Time at station 5 is now 12
 (Idle time: 3)
 Add Task 16 to station 5
 Time at station 5 is now 15
 (Idle time: 0)
 No additional tasks may be added to this station.

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Ranked Positional Weight
Heuristic Method

Station #6

Add Task 17 to station 6
 Time at station 6 is now 2
 (Idle time: 13)
 No additional tasks may be added to this station.
 *** Line is now balanced.

Done

Task	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
P	7	3	6	5	4	5	7	4	5	5	1	3	7	2	5	3	2
Weight	74	25	28	35	30	12	22	25	26	15	21	10	12	7	7	5	2
Rank	1	6	4	2	3	11	8	7	5	10	9	13	12	14	15	16	17

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Ranked Positional Weight
Heuristic Method

Solution

Number of Stations: 6

Station	Idle time	Tasks
1	0	1 2 4
2	0	3 5 9
3	3	7 8 11
4	0	6 10 12 14
5	0	13 15 16
6	13	17

Balance delay: 0.177778



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