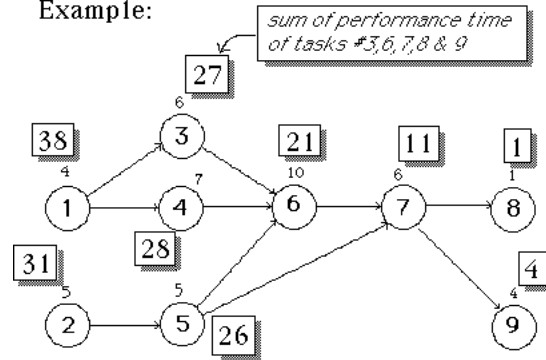# RPWM
Ranked Positional Weight Method

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

Example:

sum of performance time of tasks #3,6,7,8 & 9

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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
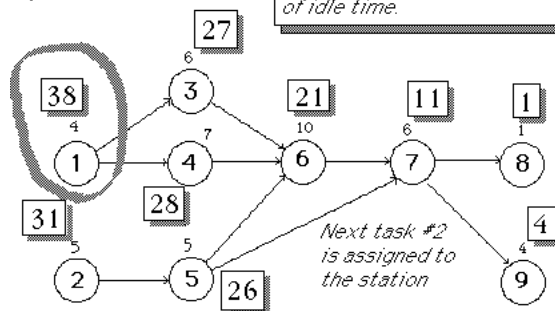- the highest positional weight
- performance time ≤ idle time remaining at the station
- all predecessors already assigned
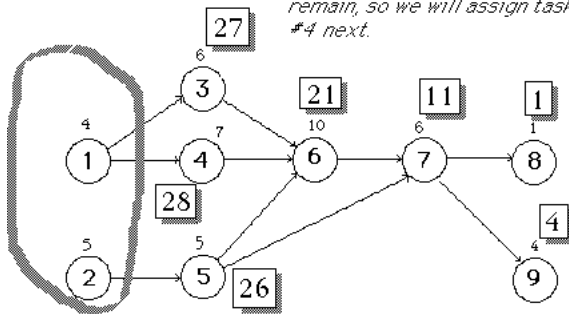
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Example:
Cycle time=16

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

Next task #2 is assigned to the station
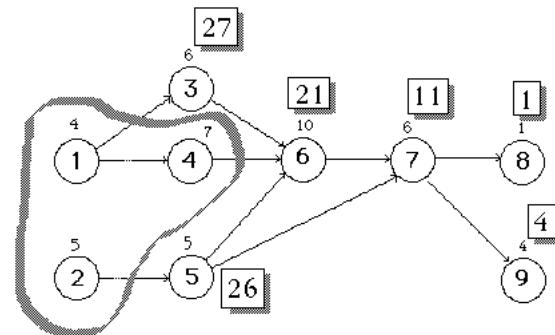

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After assigning task #2 to the station, 7 minutes of idle time remain, so we will assign task #4 next.

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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.
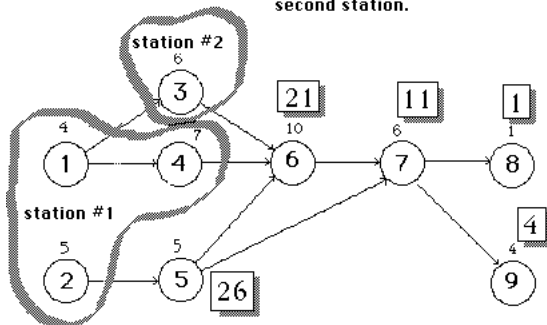
station #2

station #1

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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.

station #1

station #2

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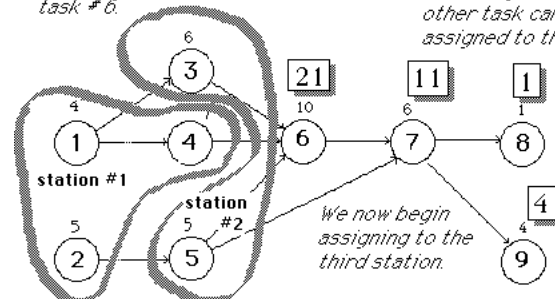
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We assign task #6 to the third station, leaving 6 minutes of idle time.

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

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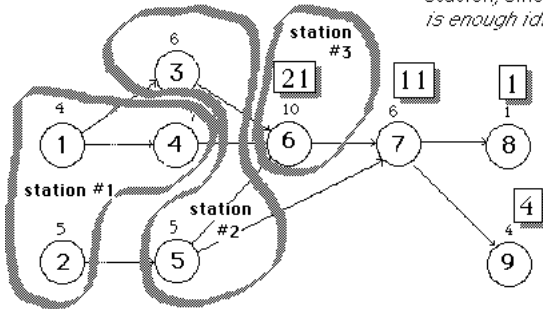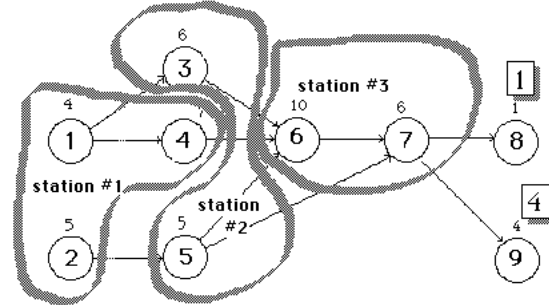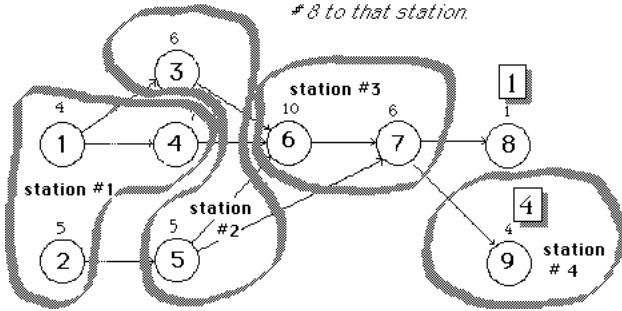*Since there is zero idle time remaining at station #3, we begin assigning to a new station.*

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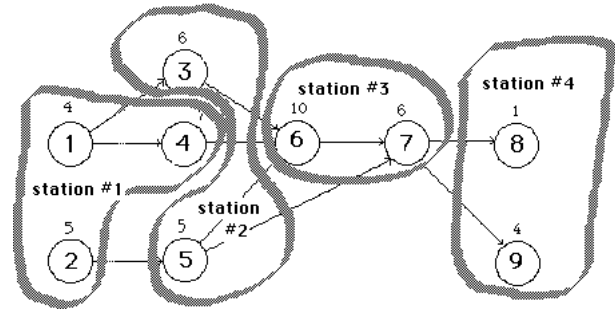

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Idle time remaining at station 4 is 12 minutes, so we will next add task #8 to that station.
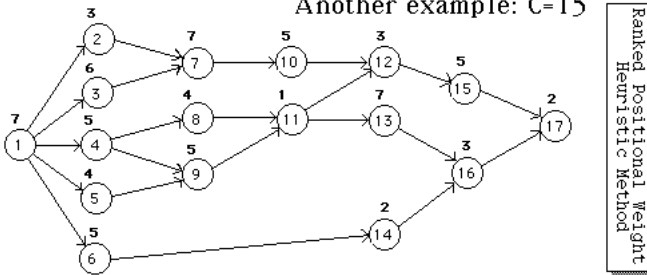

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The final balance:

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!))
Time at station 1 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 #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

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

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

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