70068 Scheduling and Resource Allocation CW

Ali Abbas

November 27, 2024

1 Question 1

Everything in this section will use 0-based indexing.

1.1 LCL Proof

The Least Cost Last (LCL) rule solves the scheduling problem $1|prec|f_{max}$ optimally, in $O(n^2)$ time, by constructing an optimal schedule from back to front.

Definitions

- $N = \{1, 2, \dots, n\}$ is the index set of all jobs
- $L \subseteq N$ is the subset of jobs without successors (which can be scheduled last)
- $p(S) = \sum_{j \in S} p_j$ is the total processing time of a subset S
- $f_{\text{max}}^*(S)$ is the cost of the optimal schedule for subset S
- f_{max} denotes the maximum (not necessarly optimal) cost across all jobs in a schedule
- $f_j(p(N))$ is a cost function which assigns a penalty/cost depending on job j and the time at which the machine has finished processing, p(N)
 - In the notation of the coursework specification $g_i(\cdot) = f_i(\cdot)$
 - In the next section we'll use $g_j(C_j) = T_j = \max(0, C_j d_j)$ (tardiness)

Proof and Discussion

1. One job in L must be scheduled last. A job can be selected for the final job which minimises $f_j(p(N))$, but it can never result in a cost lower than the cost of the optimal schedule, otherwise that would be the optimal schedule. This is expressed as such:

$$f_{\max}^*(N) \ge \min_{j \in L} f_j(p(N))$$

2. And removing a job $j \in N$ can't increase the optimal cost any more, since the cost of scheduling a job last is ≥ 0 , so omitting it cannot result in a more expensive schedule:

$$f_{\max}^*(N) \ge f_{\max}^*(N - \{j\}), \ \forall j \in N$$

3. We can then select a $J_l \in L$ that minimises $f_j(p(N))$:

$$f_l(p(N)) = \min_{j \in L} f_j(p(N))$$

Which gives us:

$$f_{\max}^*(N) \ge \max\{f_l(p(N)), f_{\max}^*(N-\{l\})\}\$$

- 4. The right hand side of the above inequality is the cost of an optimal schedule, where J_l is processed last, so you can recursively apply the LCL rule to $N \{J_l\}$ and construct a schedule in reverse order
 - Since J_l is found in O(n) time, then with n, repeated applications of the LCL rule yields the optimal schedule in $O(n^2)$ time

You can also show that LCL is optimal by using the adjacent pairwise interchange argument:

 $\bullet\,$ You take an optimal schedule S and assume it isn't an LCL schedule

- Since it's not an LCL schedule, there must exist at least one pair where a lower cost job precedes a higher cost one
- It can then be shown that swapping these jobs yields a lower cost schedule, which is a contradiction since we took an optimal schedule
- So by virtue of the fact that a lower cost job can precede a higher cost one leads to a contradiction
- ullet And so such pairs cannot exist for an optimal schedule, so we can reject the assumption that this isn't an LCL schedule
- And by contradiction then we have that LCL is optimal for $1|prec|f_{max}$

Small Example

Example Setup:

Jobs: J0, J1, J2, J3, J4

Processing Times: p=[2,3,1,2,3]

Dude Dates: d=[6,5,7,4,9]

Precedence Constraints (DAG): J0 \rightarrow J1, J0 \rightarrow J2, J3 \rightarrow J4

Cost Function: $f_i(C_i) = T_i = max(0, C_i - d_i)$

Iterations We can schedule jobs in reverse order using the *Least Cost Last (LCL)* rule:

0. Available jobs: $V = \{1, 2, 4\}$ (no successors)

$$p(N) = 11$$

$$f_1(p(N)) = \max(0, 11 - 5) = 6, \quad f_2(p(N)) = \max(0, 11 - 4) = 7, \quad f_4(p(N)) = \max(0, 11 - 9) = 2$$

Select J_4 (minimises $f_i(p(N))$)

Partial schedule cost: 2

Updated schedule: [4]

1. Available jobs: $V = \{1, 2, 3\}$ (no successors)

$$p(N) = 8$$

$$f_1(p(N)) = \max(0, 8-5) = 3, \quad f_2(p(N)) = \max(0, 8-4) = 4, \quad f_3(p(N)) = \max(0, 8-7) = 1$$

Select J_3 (minimises $f_i(p(N))$)

Partial schedule cost: 2

Updated schedule: [3,4]

2. Available jobs: $V = \{1, 2\}$ (no successors)

$$p(N) = 6$$

$$f_1(p(N)) = \max(0, 6-5) = 1, \quad f_2(p(N)) = \max(0, 6-4) = 2$$

Select J_1 (minimises $f_j(p(N))$)

Partial schedule cost: 2

Updated schedule: [1, 3, 4]

3. Available jobs: $V = \{2\}$ (no successors) p(N) = 3

$$f_2(p(N)) = \max(0, 3-4) = 0$$

Select J_2

Partial schedule cost: 2

Updated schedule: [2, 1, 3, 4]

4. Available jobs: $V = \{0\}$ (no successors)

$$p(N) = 2$$

$$f_0(p(N)) = \max(0, 2 - 6) = 0$$

Select J_0

Partial schedule cost: 2

Updated schedule: [0, 2, 1, 3, 4]

Results

- Final schedule: $[J_0, J_2, J_1, J_3, J_4]$
- Completion times:

$$C_0 = 2$$
, $C_2 = 3$, $C_1 = 6$, $C_3 = 8$, $C_4 = 11$

• Tardiness:

$$T_0 = 0, T_2 = 0, T_1 = 1, T_3 = 1, T_4 = 2$$

• Maximum cost:

$$f_{\text{max}} = \max(T_0, T_2, T_1, T_3, T_4) = 2$$

1.2 LCL Implementation

Iterations

0. Available jobs: $V = \{0, 30\}$ (no successors) p(N) = 170

$$f_0(p(N)) = \max(0, 170 - 172) = 0, \quad f_{30}(p(N)) = \max(0, 170 - 269) = 0$$

Select J_{30} (minimises $f_i(p(N))$)

Partial schedule cost: 0

Updated schedule: [30]

1. Available jobs: $V = \{0, 1, 10\}$ (no successors)

$$p(N) = 160$$

$$f_0(p(N)) = \max(0, 160 - 172) = 0, \quad f_1(p(N)) = \max(0, 160 - 82) = 78, \quad f_{10}(p(N)) = \max(0, 160 - 253) = 0$$

Select J_0 (minimises $f_j(p(N))$)

Partial schedule cost: 0

Updated schedule: [0, 30]

..

4. Available jobs: $V = \{1, 4\}$ (no successors)

$$p(N) = 147$$

$$f_1(p(N)) = \max(0, 147 - 82) = 65, \quad f_4(p(N)) = \max(0, 147 - 93) = 54$$

Select J_1 (minimises $f_i(p(N))$) Partial schedule cost: 65

Updated schedule: [1, 14, 10, 0, 30]

This iteration was noteable since it incurred the maximum tardiness incurred for this problem.

...

17. Available jobs: $V = \{17, 18, 20, 5\}$ (no successors)

$$p(N) = 68$$

$$f_{17}(p(N)) = \max(0.68 - 77) = 0, \quad f_{18}(p(N)) = \max(0.68 - 88) = 0,$$

$$f_{20}(p(N)) = \max(0, 68 - 71) = 0, \quad f_5(p(N)) = \max(0, 68 - 71) = 0$$

Select J_{17} (arbitrarily breaking the tie)

Partial schedule cost: 65

Updated schedule: [17, 16, 15, 13, 28, 12, 27, 26, 25, 24, 23, 11, 4, 1, 14, 10, 0, 30]

..

30. Available jobs: $V = \{29\}$ (no successors)

$$p(N) = 2$$

$$f_{29}(p(N)) = \max(0, 2 - 329) = 0$$

Select J_{29} (minimises $f_j(p(N))$)

Final schedule cost: 65

 $Final\ schedule:\ [29, 9, 8, 3, 2, 7, 6, 22, 21, 5, 20, 19, 18, 17, 16, 15, 13, 28, 12, 27, 26, 25, 24, 23, 11, 4, 1, 14, 10, 0, 30]$

Note: the tie breaking doesn't specify any ordering in the current implementation (since the set of available jobs is backed by a hash table).

2 Question 2

2.1 Tabu Search

Tabu list: { (17, 25) } Best cost so far: 331 Tabu list used?: No

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 25, 24, 16, 14, 5, 23, 15, 4, 10, 1, 0, 30]

Selected neighbour cost: 331

 $\begin{array}{l} \textbf{1. Candidate schedule costs:} \ [331,\ 331,\$

Tabu list: { (17, 25), (5, 14) }

Best cost so far: 326 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 25, 24, 16, 5, 14, 23, 15, 4, 10, 1, 0, 30]

Selected neighbour cost: 326

Tabu list: { (17, 25), (5, 14), (5, 16) }

Best cost so far: 320 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 25, 24, 5, 16, 14, 23, 15, 4, 10, 1, 0, 30]

Selected neighbour cost: 320

3. Candidate schedule costs: [320, 320, 320, 320, 320, 320, 317, 322, 320, 320, 320, 318, 330, 302, 326, 320, 315, 325, 315]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24) }

Best cost so far: 302 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 25, 5, 24, 16, 14, 23, 15, 4, 10, 1, 0, 30]

Selected neighbour cost: 302

4. Candidate schedule costs: [302, 302, 302, 302, 302, 302, 299, 304, 302, 302, 302, 300, 312, 292, 320, 302, 302, 297, 307, 297]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25) }

Best cost so far: 292 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 5, 25, 24, 16, 14, 23, 15, 4, 10, 1, 0, 30]

Selected neighbour cost: 292

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23) }

Best cost so far: 287 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 5, 25, 24, 16, 14, 15, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 287

6. Candidate schedule costs: [287, 287, 287, 287, 287, 287, 284, 289, 287, 287, 287, 285, 283, 297, 287, 282, 292, 292, 282]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15) }

Best cost so far: 282 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 5, 25, 24, 16, 15, 14, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 282

7. Candidate schedule costs: [282, 282, 282, 282, 282, 282, 279, 284, 282, 282, 282, 280, 278, 292, 282, 287, 282, 287, 277]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10) }

Best cost so far: 277 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 17, 5, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 277

8. Candidate schedule costs: [277, 277, 277, 277, 277, 274, 279, 277, 277, 277, 275, 273, 287, 277, 282, 277, 282]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17) }

Best cost so far: 273 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 21, 2, 26, 27, 7, 6, 18, 20, 5, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 273

9. Candidate schedule costs: [273, 273, 273, 273, 273, 273, 270, 275, 273, 273, 273, 271, 273, 277, 283, 273, 278, 273, 278]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21) }

Best cost so far: 270 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 19, 2, 21, 26, 27, 7, 6, 18, 20, 5, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 270

 $10. \ \, \textbf{Candidate schedule costs}; \ [270,\ 270,\$

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19) }

Best cost so far: 267 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 6, 18, 20, 5, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 267

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20) }

Best cost so far: 265 Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 6, 20, 18, 5, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 265

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20) }

Best cost so far: 259

Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 18, 5, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 259

13. Candidate schedule costs: [259, 259, 259, 259, 262, 259, 259, 259, 259, 259, 265, 259, 267, 263, 269, 259, 264, 259, 264]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18) }

Best cost so far: 257

Tabu list used?: Yes

Selected neighbour: [29, 28, 22, 9, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

14. Candidate schedule costs: [257, 257, 257, 257, 260, 257, 257, 257, 257, 257, 263, 259, 267, 257, 262, 257, 262] Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20),

(6, 20), (5, 18), (22, 28)

Best cost so far: 257

Tabu list used?: Yes

Selected neighbour: [29, 22, 28, 9, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

15. Candidate schedule costs: [257, 257, 257, 257, 260, 257, 257, 257, 257, 257, 263, 259, 267, 257, 262, 257, 262] Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 22, 9, 28, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 9, 22, 28, 8, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 9, 22, 8, 28, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

18. Candidate schedule costs: [257, 257, 257, 257, 257, 260, 257, 257, 257, 257, 257, 257, 263, 259, 267, 257, 262, 257, 262]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 22, 28, 13, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

19. Candidate schedule costs: [257, 257, 257, 257, 260, 257, 257, 257, 257, 257, 263, 259, 267, 257, 262, 257, 262] Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 22, 13, 28, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 13, 22, 28, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

```
Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13) }
```

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 9, 13, 8, 22, 28, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 9, 8, 22, 28, 12, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 9, 8, 22, 12, 28, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 9, 8, 12, 22, 28, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12) }

Best cost so far: 257

Tabu list used?: Yes Selected neighbour: [29, 13, 9, 12, 8, 22, 28, 1

 $\begin{array}{l} \textbf{Selected neighbour} : \ [29,\ 13,\ 9,\ 12,\ 8,\ 22,\ 28,\ 11,\ 3,\ 2,\ 19,\ 21,\ 26,\ 27,\ 7,\ 20,\ 6,\ 5,\ 18,\ 17,\ 25,\ 24,\ 16,\ 15,\ 14,\ 23,\ 4,\ 1,\ 10,\ 0,\ 30] \end{array}$

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12) }

Best cost so far: 257

Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 9, 8, 22, 28, 11, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

27. Candidate schedule costs: [257, 257, 257, 257, 257, 260, 257, 257, 257, 257, 257, 257, 263, 259, 267, 257, 262, 257, 262]

Best cost so far: 257

Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 9, 8, 22, 11, 28, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 9, 8, 11, 22, 28, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

 $\textbf{29. Candidate schedule costs:} \ [257,\ 257$

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 9, 11, 8, 22, 28, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 8, 22, 28, 3, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

31. Candidate schedule costs: [257, 257, 257, 257, 260, 257, 257, 257, 257, 257, 263, 259, 267, 257, 262, 257, 262] **Tabu list**: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28) }

Best cost so far: 257 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 8, 22, 3, 28, 2, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 257

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28) }

Best cost so far: 251 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 8, 22, 3, 2, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 251

Best cost so far: 251 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 8, 3, 22, 2, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4,

1, 10, 0, 30]

Selected neighbour cost: 251

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22) }

Best cost so far: 237 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 8, 3, 2, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 237

35. Candidate schedule costs: [237, 237, 251, 237, 237, 237, 237, 237, 237, 237, 243, 239, 247, 237, 242, 237, 242] **Tabu list**: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8) }

Best cost so far: 237 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 3, 8, 2, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 237

36. Candidate schedule costs: [237, 237, 237, 231, 251, 237, 237, 237, 237, 237, 237, 237, 243, 239, 247, 237, 242, 237, 242]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8) }

Best cost so far: 231 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 9, 3, 2, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 231

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9) }

Best cost so far: 231 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 3, 9, 2, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 231

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9) }

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 11, 3, 2, 9, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

39. Candidate schedule costs: [230, 231, 230, 230, 230, 230, 230, 230, 230, 236, 232, 240, 230, 235, 230, 235] Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11) }

Best cost so far: 230

Tabu list used?: Yes

Selected neighbour: [29, 13, 12, 3, 11, 2, 9, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12) }

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 13, 3, 12, 11, 2, 9, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 13, 12, 11, 2, 9, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11) }

Best cost so far: 230

Tabu list used?: Yes

 $\begin{array}{l} \textbf{Selected neighbour} : \ [29,\ 3,\ 13,\ 12,\ 2,\ 11,\ 9,\ 8,\ 22,\ 28,\ 19,\ 21,\ 26,\ 27,\ 7,\ 20,\ 6,\ 5,\ 18,\ 17,\ 25,\ 24,\ 16,\ 15,\ 14,\ 23,\ 4,\ 1,\ 10,\ 0,\ 30] \end{array}$

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 13, 2, 12, 11, 9, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13) }

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 13, 12, 11, 9, 8, 22, 28, 19, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 13, 12, 11, 9, 8, 22, 19, 28, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 13, 12, 11, 9, 8, 19, 22, 28, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 13, 12, 11, 9, 19, 8, 22, 28, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230

Tabu list used?: Yes

 $\begin{array}{l} \textbf{Selected neighbour} : \ [29,\ 3,\ 2,\ 13,\ 12,\ 11,\ 19,\ 9,\ 8,\ 22,\ 28,\ 21,\ 26,\ 27,\ 7,\ 20,\ 6,\ 5,\ 18,\ 17,\ 25,\ 24,\ 16,\ 15,\ 14,\ 23,\ 4,\ 1,\ 10,\ 0,\ 30] \end{array}$

Selected neighbour cost: 230

Best cost so far: 230

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 13, 12, 19, 11, 9, 8, 22, 28, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19) }

Best cost so far: 230

Tabu list used?: Yes

 $\begin{array}{l} \textbf{Selected neighbour} \colon [29,\, 3,\, 2,\, 13,\, 19,\, 12,\, 11,\, 9,\, 8,\, 22,\, 28,\, 21,\, 26,\, 27,\, 7,\, 20,\, 6,\, 5,\, 18,\, 17,\, 25,\, 24,\, 16,\, 15,\, 14,\, 23,\, 4,\, 1,\, 10,\, 0,\, 30] \end{array}$

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 28), (12, 28), (12, 28), (13, 28), (13, 28), (13, 28), (13, 28), (13, 28), (12, 28), (12, 28), (12, 28), (12, 28), (12, 28), (13, 28)

12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19)

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 28, 21, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

 $\begin{array}{l} \textbf{52. Candidate schedule costs:} \ [230,\ 230,\ 230,\ 230,\ 230,\ 230,\ 230,\ 230,\ 230,\ 230,\ 236,\ 232,\ 240,\ 230,\ 235,\ 230,\ 235] \\ \textbf{Tabu list:} \ \left\{ \ (17,\ 25),\ (5,\ 14),\ (5,\ 16),\ (5,\ 24),\ (5,\ 25),\ (15,\ 23),\ (14,\ 15),\ (1,\ 10),\ (5,\ 17),\ (2,\ 21),\ (2,\ 19),\ (18,\ 20),\ (6,\ 20),\ (5,\ 18),\ (22,\ 28),\ (9,\ 28),\ (9,\ 22),\ (8,\ 22),\ (13,\ 28),\ (13,\ 22),\ (8,\ 13),\ (9,\ 13),\ (12,\ 28),\ (12,\ 22),\ (8,\ 12),\ (9,\ 12),\ (11,\ 28),\ (11,\ 22),\ (8,\ 11),\ (9,\ 11),\ (3,\ 28),\ (2,\ 28),\ (3,\ 22),\ (2,\ 22),\ (3,\ 8),\ (2,\ 8),\ (3,\ 9),\ (2,\ 9),\ (3,\ 11),\ (3,\ 12),\ (3,\ 13),\ (2,\ 11),\ (2,\ 12),\ (2,\ 13),\ (19,\ 28),\ (19,\ 22),\ (8,\ 19),\ (9,\ 19),\ (11,\ 19),\ (12,\ 19),\ (13,\ 19),\ (21,\ 28) \end{array} \right\}$

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 21, 28, 26, 27, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 21, 28, 27, 26, 7, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 21, 28, 27, 7, 26, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, <math>10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 21, 28, 7, 27, 26, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 21, 7, 28, 27, 26, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (17,\,25),\, (5,\,14),\, (5,\,16),\, (5,\,24),\, (5,\,25),\, (15,\,23),\, (14,\,15),\, (1,\,10),\, (5,\,17),\, (2,\,21),\, (2,\,19),\, (18,\,20),\, \\ (6,\,20),\, (5,\,18),\, (22,\,28),\, (9,\,28),\, (9,\,22),\, (8,\,28),\, (8,\,22),\, (13,\,28),\, (13,\,22),\, (8,\,13),\, (9,\,13),\, (12,\,28),\, (12,\,22),\, (8,\,12),\, (9,\,12),\, (11,\,28),\, (11,\,22),\, (8,\,11),\, (9,\,11),\, (3,\,28),\, (2,\,28),\, (3,\,22),\, (2,\,22),\, (3,\,8),\, (2,\,8),\, (3,\,9),\, (2,\,9),\, (3,\,11),\, \\ (3,\,12),\, (3,\,13),\, (2,\,11),\, (2,\,12),\, (2,\,13),\, (19,\,28),\, (19,\,22),\, (8,\,19),\, (9,\,19),\, (11,\,19),\, (12,\,19),\, (13,\,19),\, (21,\,28),\, (26,\,27),\, (7,\,26),\, (7,\,27),\, (7,\,28),\, (7,\,21)\, \end{array} \}$

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 22, 7, 21, 28, 27, 26, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 28, 27, 26, 20, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

59. Candidate schedule costs: [230, 230, 230, 230, 230, 230, 230, 236, 232, 240, 230, 235, 230, 235]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26) }

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 28, 27, 20, 26, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (17,\,25),\, (5,\,14),\, (5,\,16),\, (5,\,24),\, (5,\,25),\, (15,\,23),\, (14,\,15),\, (1,\,10),\, (5,\,17),\, (2,\,21),\, (2,\,19),\, (18,\,20),\, \\ (6,\,20),\, (5,\,18),\, (22,\,28),\, (9,\,28),\, (9,\,22),\, (8,\,28),\, (8,\,22),\, (13,\,28),\, (13,\,22),\, (8,\,13),\, (9,\,13),\, (12,\,28),\, (12,\,22),\, (8,\,12),\, (9,\,12),\, (11,\,28),\, (11,\,22),\, (8,\,11),\, (9,\,11),\, (3,\,28),\, (2,\,28),\, (3,\,22),\, (2,\,22),\, (3,\,8),\, (2,\,8),\, (3,\,9),\, (2,\,9),\, (3,\,11),\, \\ (3,\,12),\, (3,\,13),\, (2,\,11),\, (2,\,12),\, (2,\,13),\, (19,\,28),\, (19,\,22),\, (8,\,19),\, (9,\,19),\, (11,\,19),\, (12,\,19),\, (13,\,19),\, (21,\,28),\, (26,\,27),\, (7,\,26),\, (7,\,27),\, (7,\,28),\, (7,\,21),\, (7,\,22),\, (20,\,26),\, (20,\,27) \; \} \end{array}$

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 28, 20, 27, 26, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28) }

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 28, 27, 26, 6, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

62. Candidate schedule costs: [230, 230, 230, 230, 230, 230, 230, 232, 240, 230, 235, 230, 235]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26) }

Best cost so far: 230 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 28, 27, 6, 26, 5, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 230

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26) }

Best cost so far: 228 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 28, 27, 6, 5, 26, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 228

64. Candidate schedule costs: [228, 228, 228, 228, 228, 228, 230, 228, 238, 228, 233, 228, 233]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27) }

Best cost so far: 228 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 28, 6, 27, 5, 26, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 228

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27) }

Best cost so far: 225 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 28, 6, 5, 27, 26, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 225

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28) }

Best cost so far: 225 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 28, 5, 27, 26, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 225

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28) }

Best cost so far: 222

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 28, 27, 26, 18, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 222

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (17,\,25),\, (5,\,14),\, (5,\,16),\, (5,\,24),\, (5,\,25),\, (15,\,23),\, (14,\,15),\, (1,\,10),\, (5,\,17),\, (2,\,21),\, (2,\,19),\, (18,\,20),\, \\ (6,\,20),\, (5,\,18),\, (22,\,28),\, (9,\,28),\, (9,\,22),\, (8,\,28),\, (8,\,22),\, (13,\,28),\, (13,\,22),\, (8,\,13),\, (9,\,13),\, (12,\,28),\, (12,\,22),\, (8,\,12),\, (9,\,12),\, (11,\,28),\, (11,\,22),\, (8,\,11),\, (9,\,11),\, (3,\,28),\, (2,\,28),\, (3,\,22),\, (2,\,22),\, (3,\,8),\, (2,\,8),\, (3,\,9),\, (2,\,9),\, (3,\,11),\, \\ (3,\,12),\, (3,\,13),\, (2,\,11),\, (2,\,12),\, (2,\,13),\, (19,\,28),\, (19,\,22),\, (8,\,19),\, (9,\,19),\, (11,\,19),\, (12,\,19),\, (13,\,19),\, (21,\,28),\, (26,\,27),\, (7,\,26),\, (7,\,27),\, (7,\,28),\, (7,\,21),\, (7,\,22),\, (20,\,26),\, (20,\,27),\, (20,\,28),\, (6,\,26),\, (5,\,26),\, (6,\,27),\, (5,\,27),\, (6,\,28),\, (5,\,28),\, (18,\,26)\, \end{array} \}$

Best cost so far: 222 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 28, 27, 18, 26, 17, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 222

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26) }

Best cost so far: 220 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 28, 27, 18, 17, 26, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 220

70. Candidate schedule costs: [220, 220, 220, 220, 220, 223, 220, 222, 220, 225, 220, 225]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27) }

Best cost so far: 220 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 28, 18, 27, 17, 26, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 220

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27) }

Best cost so far: 217 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 28, 18, 17, 27, 26, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 217

72. Candidate schedule costs: [217, 217, 217, 217, 217, 220, 217, 220, 217, 217, 222, 217, 222]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28) }

Best cost so far: 217 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 28, 17, 27, 26, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 217

73. Candidate schedule costs: [217, 217, 217, 217, 217, 217, 217, 212, 220, 217, 217, 222, 217, 222]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20),

 $(6,20), (5,18), (22,28), (9,28), (9,22), (8,28), (8,22), (13,28), (13,22), (8,13), (9,13), (12,28), (12,22), (8,12), (9,12), (11,28), (11,22), (8,11), (9,11), (3,28), (2,28), (3,22), (2,22), (3,8), (2,8), (3,9), (2,9), (3,11), (3,12), (3,13), (2,11), (2,12), (2,13), (19,28), (19,22), (8,19), (9,19), (11,19), (12,19), (13,19), (21,28), (26,27), (7,26), (7,27), (7,28), (7,21), (7,22), (20,26), (20,27), (20,28), (6,26), (5,26), (6,27), (5,27), (6,28), (5,28), (18,26), (17,26), (18,27), (17,27), (18,28), (17,28) \}$

Best cost so far: 212 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 26, 25, 24, 16, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 212

74. Candidate schedule costs: [212, 212, 212, 212, 212, 212, 217, 212, 217, 212, 217]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24) }

Best cost so far: 212 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 26, 25, 16, 24, 15, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 212

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24) }

Best cost so far: 194 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 26, 25, 16, 15, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 194

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25) }

Best cost so far: 194 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 26, 16, 25, 15, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 194

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25) }

Best cost so far: 184 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 26, 16, 15, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 184

78. Candidate schedule costs: [184, 184, 184, 184, 184, 184, 189, 184, 184, 194, 184, 184, 189]

Tabu list: { (17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 28), (12, 28), (12, 28), (13, 28)

12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26)

Best cost so far: 184 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 16, 26, 15, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 184

79. Candidate schedule costs: [184, 184, 184, 184, 184, 184, 189, 184, 184, 182, 194, 184, 184, 189]

Tabu list: { $(17, 25), (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26) }$ Best cost so far: 182

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 27, 16, 15, 26, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 182

80. Candidate schedule costs: [182, 182, 182, 182, 182, 182, 187, 182, 184, 182, 182, 187]

Tabu list: { (5, 14), (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27) } Best cost so far: 182

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 16, 27, 15, 26, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 182

81. Candidate schedule costs: [182, 182, 182, 182, 182, 182, 187, 182, 182, 179, 184, 182, 182, 187]

Tabu list: { (5, 16), (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27) } Best cost so far: 179

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 28, 16, 15, 27, 26, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 179

82. Candidate schedule costs: [179, 179, 179, 179, 179, 179, 184, 179, 182, 179, 179, 179, 184]

Tabu list: { (5, 24), (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28) }
Best cost so far: 179

Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 28, 15, 27, 26, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 179

83. Candidate schedule costs: [179, 179, 179, 179, 179, 179, 179, 173, 182, 179, 179, 179, 184]

Tabu list: { (5, 25), (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 22), (3, 22), (2, 23), (3, 24), (2, 28), (2, 28),

13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28)

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 15, 28, 27, 26, 25, 24, 14, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 173

84. Candidate schedule costs: [173, 173, 173, 173, 173, 173, 179, 173, 173, 173, 178]

Tabu list: { (15, 23), (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 15, 28, 27, 26, 25, 14, 24, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 173

85. Candidate schedule costs: [173, 173, 173, 173, 173, 173, 179, 173, 173, 173, 178]

Tabu list: { (14, 15), (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 15, 28, 27, 26, 14, 25, 24, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 173

86. Candidate schedule costs: [173, 173, 173, 173, 173, 173, 179, 173, 173, 173, 178]

Tabu list: { (1, 10), (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 15, 28, 27, 14, 26, 25, 24, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 173

87. Candidate schedule costs: [173, 173, 173, 173, 173, 173, 179, 173, 173, 178]

Tabu list: { (5, 17), (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 15, 28, 14, 27, 26, 25, 24, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 173

88. Candidate schedule costs: [173, 173, 173, 173, 173, 173, 179, 173, 173, 173, 178]

Tabu list: { (2, 21), (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 20), (11, 20), (12, 20), (13, 20), (13, 20), (13, 20), (13, 20), (14, 20), (15,

 $19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 15, 14, 28, 27, 26, 25, 24, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 173

89. Candidate schedule costs: [173, 173, 173, 173, 173, 173, 178, 173, 178]

Tabu list: { (2, 19), (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 1, 10, 0, 30]

Selected neighbour cost: 178

90. Candidate schedule costs: [178, 178, 178, 178, 178, 178, 173, 184, 178, 183]

Tabu list: { (18, 20), (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 2, 19, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

91. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (6, 20), (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 3, 19, 2, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

92. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (5, 18), (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 22, 21, 20, 6, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

93. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (22, 28), (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 22, 21, 6, 20, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

Tabu list: { (9, 28), (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 22, 6, 21, 20, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

Tabu list: { (9, 22), (8, 28), (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (10, 28

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 22, 21, 20, 5, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

96. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (8,\,28),\, (8,\,22),\, (13,\,28),\, (13,\,22),\, (8,\,13),\, (9,\,13),\, (12,\,28),\, (12,\,22),\, (8,\,12),\, (9,\,12),\, (11,\,28),\, (11,\,22),\, (8,\,11),\, (9,\,11),\, (3,\,28),\, (2,\,28),\, (3,\,22),\, (2,\,22),\, (3,\,8),\, (2,\,8),\, (3,\,9),\, (2,\,9),\, (3,\,11),\, (3,\,12),\, (3,\,13),\, (2,\,11),\, (2,\,12),\, (2,\,13),\, (19,\,28),\, (19,\,22),\, (8,\,19),\, (9,\,19),\, (11,\,19),\, (12,\,19),\, (13,\,19),\, (21,\,28),\, (26,\,27),\, (7,\,26),\, (7,\,27),\, (7,\,28),\, (7,\,21),\, (7,\,22),\, (20,\,26),\, (20,\,27),\, (20,\,28),\, (6,\,26),\, (5,\,26),\, (6,\,27),\, (5,\,27),\, (6,\,28),\, (5,\,28),\, (18,\,26),\, (17,\,26),\, (18,\,27),\, (17,\,27),\, (18,\,28),\, (17,\,28),\, (16,\,24),\, (15,\,24),\, (16,\,25),\, (15,\,25),\, (16,\,26),\, (15,\,26),\, (16,\,27),\, (15,\,27),\, (16,\,28),\, (15,\,28),\, (14,\,24),\, (14,\,25),\, (14,\,26),\, (14,\,27),\, (14,\,28),\, (14,\,15),\, (1,\,10),\, (2,\,19),\, (3,\,19),\, (6,\,20),\, (6,\,21),\, (6,\,22),\, (5,\,20)\, \end{array} \} \\ \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 22, 21, 5, 20, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

97. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (8, 22), (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 22, 5, 21, 20, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4,

10, 1, 0, 30]

Selected neighbour cost: 183

98. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (13, 28), (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 5, 22, 21, 20, 18, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

99. Candidate schedule costs: [183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (13, 22), (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 5, 22, 21, 18, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

100. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (8, 13), (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 5, 22, 18, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

101. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (9, 13), (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 5, 18, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

102. Candidate schedule costs: [183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (12, 28), (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 6, 18, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4,

10, 1, 0, 30]

Selected neighbour cost: 183

103. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (12, 22), (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 7, 18, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

104. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (8, 12), (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 8, 18, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

105. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (9, 12), (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 9, 18, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

106. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (11, 28), (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18) }

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 11, 18, 9, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

107. Candidate schedule costs: [183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (11, 22), (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (15, 26), (15, 26), (15, 26), (15, 26), (15, 26), (15, 26), (15, 26), (16, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (15, 26), (15, 26), (15, 26), (15, 26), (15, 26), (16, 27), (16, 28), (16, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (16, 26), (16, 26), (16, 27), (16, 28), (16, 28), (16, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (16, 26), (16,

(6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18)

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 12, 18, 11, 9, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

108. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (8, 11), (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 13, 18, 12, 11, 9, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

109. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (9, 11), (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 2, 18, 13, 12, 11, 9, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

110. Candidate schedule costs: [183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (3, 28), (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 3, 18, 2, 13, 12, 11, 9, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

111. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (2, 28), (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 13, 12, 11, 9, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

112. Candidate schedule costs: [183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (3, 22), (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 20), (20,

 $26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 13, 12, 9, 11, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

113. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (2, 22), (3, 8), (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 13, 9, 12, 11, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

114. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

 $\begin{array}{l} \textbf{Tabu list:} \; \{ \; (3,8), (2,8), (3,9), (2,9), (3,11), (3,12), (3,13), (2,11), (2,12), (2,13), (19,28), (19,22), (8,19), \\ (9,19), (11,19), (12,19), (13,19), (21,28), (26,27), (7,26), (7,27), (7,28), (7,21), (7,22), (20,26), (20,27), (20,28), (6,26), (5,26), (6,27), (5,27), (6,28), (5,28), (18,26), (17,26), (18,27), (17,27), (18,28), (17,28), (16,24), \\ (15,24), (16,25), (15,25), (16,26), (15,26), (16,27), (15,27), (16,28), (15,28), (14,24), (14,25), (14,26), (14,27), (14,28), (14,15), (1,10), (2,19), (3,19), (6,20), (6,21), (6,22), (5,20), (5,21), (5,22), (18,20), (18,21), \\ (18,22), (5,18), (6,18), (7,18), (8,18), (9,18), (11,18), (12,18), (13,18), (2,18), (3,18), (9,11), (9,12), (9,13) \\ \} \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 9, 13, 12, 11, 8, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

115. Candidate schedule costs: [183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (2, 8), (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 9, 13, 12, 8, 11, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

116. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (3, 9), (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 9, 13, 8, 12, 11, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

117. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (2, 9), (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 9, 8, 13, 12, 11, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

10, 1, 0, 30]

Selected neighbour cost: 183

118. Candidate schedule costs: [183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (3, 11), (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 2, 9, 8, 13, 12, 7, 11, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

119. Candidate schedule costs: [183, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (3, 12), (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 3, 9, 2, 8, 13, 12, 7, 11, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

120. Candidate schedule costs: [183, 183, 183, 187, 183, 183, 183, 183, 183, 183, 184, 185, 186, 187]

Tabu list: { (3, 13), (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 13, 12, 7, 11, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

121. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (2, 11), (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12) }

Best cost so far: 173 Tabu list used?: Yes **Selected neighbour**: [29, 19, 18, 9, 3, 2, 8, 13, 7, 12, 11, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

122. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (2, 12), (2, 13), (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 13, 12, 11, 6, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

123. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 178, 189, 183, 188, 178]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 13, 12, 6, 11, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

124. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (19, 28), (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 13, 6, 12, 11, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

125. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (19, 22), (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 13, 12, 11, 5, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

126. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (8, 19), (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18),

 $(9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11) }$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 13, 12, 5, 11, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 20]

10, 1, 0, 30]

Selected neighbour cost: 183

127. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (9, 19), (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 13, 5, 12, 11, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

128. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (11, 19), (12, 19), (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 13, 12, 11, 22, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

129. Candidate schedule costs: [183, 183, 187, 183, 183, 178, 189, 183, 188, 178]

 $\begin{array}{l} \textbf{Tabu list:} \ \{ \ (12, \, 19), \ (13, \, 19), \ (21, \, 28), \ (26, \, 27), \ (7, \, 26), \ (7, \, 27), \ (7, \, 28), \ (7, \, 21), \ (7, \, 22), \ (20, \, 26), \ (20, \, 27), \ (20, \, 28), \ (6, \, 26), \ (5, \, 26), \ (6, \, 27), \ (5, \, 27), \ (6, \, 28), \ (5, \, 28), \ (18, \, 26), \ (17, \, 26), \ (18, \, 27), \ (17, \, 27), \ (18, \, 28), \ (17, \, 28), \ (16, \, 24), \ (15, \, 24), \ (16, \, 25), \ (15, \, 25), \ (16, \, 26), \ (15, \, 26), \ (16, \, 27), \ (15, \, 27), \ (16, \, 28), \ (15, \, 28), \ (14, \, 24), \ (14, \, 25), \ (14, \, 26), \ (14, \, 27), \ (14, \, 28), \ (14, \, 15), \ (1, \, 10), \ (2, \, 19), \ (3, \, 19), \ (6, \, 20), \ (6, \, 21), \ (6, \, 22), \ (5, \, 20), \ (5, \, 21), \ (5, \, 22), \ (18, \, 20), \ (18, \, 21), \ (18, \, 22), \ (5, \, 18), \ (6, \, 18), \ (7, \, 18), \ (8, \, 18), \ (9, \, 18), \ (11, \, 18), \ (12, \, 18), \ (13, \, 18), \ (2, \, 18), \ (3, \, 18), \ (9, \, 11), \ (9, \, 12), \ (9, \, 13), \ (8, \, 11), \ (8, \, 12), \ (8, \, 13), \ (7, \, 11), \ (2, \, 9), \ (3, \, 9), \ (7, \, 12), \ (7, \, 13), \ (6, \, 11), \ (6, \, 12), \ (6, \, 13), \ (5, \, 11), \ (5, \, 12), \ (5, \, 13), \ (11, \, 22) \ \} \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 13, 12, 22, 11, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

130. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (13, 19), (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 13, 22, 12, 11, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

131. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 184, 178, 189, 183, 188, 178]

Tabu list: { (21, 28), (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26),

(6,27), (5,27), (6,28), (5,28), (18,26), (17,26), (18,27), (17,27), (18,28), (17,28), (16,24), (15,24), (16,25), (15,25), (16,26), (15,26), (16,27), (15,27), (16,28), (15,28), (14,24), (14,25), (14,26), (14,27), (14,28), (14,15), (1,10), (2,19), (3,19), (6,20), (6,21), (6,22), (5,20), (5,21), (5,22), (18,20), (18,21), (18,22), (5,18), (6,18), (7,18), (8,18), (9,18), (11,18), (12,18), (13,18), (2,18), (3,18), (9,11), (9,12), (9,13), (8,11), (8,12), (8,13), (7,11), (2,9), (3,9), (7,12), (7,13), (6,11), (6,12), (6,13), (5,11), (5,12), (5,13), (11,22), (12,22), (13,

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 13, 12, 11, 21, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

132. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (26, 27), (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 13, 12, 21, 11, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

133. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (7, 26), (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 13, 21, 12, 11, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

134. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (7, 27), (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 13, 12, 11, 20, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

135. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (7, 28), (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 13, 12, 20, 11, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4,

10, 1, 0, 30]

Selected neighbour cost: 183

136. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (7, 21), (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 13, 20, 12, 11, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4,

 $10,\,1,\,0,\,30]$

Selected neighbour cost: 183

137. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 183, 184, 189, 183, 188, 178]

Tabu list: { (7, 22), (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 13, 12, 11, 17, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4,

10, 1, 0, 30]

Selected neighbour cost: 183

138. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (20, 26), (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 13, 12, 17, 11, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

[10, 1, 0, 30]

Selected neighbour cost: 183

139. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (20, 27), (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 13, 17, 12, 11, 16, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

140. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (20, 28), (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (12, 17), (12, 17), (12, 17), (12, 18), (13, 18), (13, 18), (14, 17), (12, 17), (15, 18), (1

(13, 17) }

Best cost so far: 173 Tabu list used?: Yes

10, 1, 0, 30]

Selected neighbour cost: 183

141. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (6, 26), (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 12, 16, 11, 14, 15, 28, 27, 26, 25, 24, 23, 4,

10, 1, 0, 30

Selected neighbour cost: 183

142. Candidate schedule costs: [183, 183, 187, 183, 183, 183, 183, 183, 183, 184, 189, 183, 188, 178]

Tabu list: { (5, 26), (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16) }

Best cost so far: 173
Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 12, 11, 14, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

143. Candidate schedule costs: [183, 183, 187, 183, 187, 183, 187, 183, 183, 178, 189, 183, 188, 178]

Tabu list: { (6, 27), (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 12, 14, 11, 15, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 183

144. Candidate schedule costs: [183, 183, 187, 183, 187, 183, 183, 183, 183, 181, 189, 183, 188, 178]

Tabu list: { (5, 27), (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 12, 14, 15, 11, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 181

Tabu list: { (6, 28), (5, 28), (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 28), (14, 28), (14, 28), (14, 28), (14, 28), (14, 28), (15, 28), (15, 28), (18

 $15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 12, 15, 11, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 181

146. Candidate schedule costs: [181, 181, 185, 181, 181, 185, 181, 178, 183, 181, 181, 186, 176]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 12, 11, 28, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

147. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 181, 178, 178, 183, 173]

Tabu list: { (18, 26), (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28) }

Best cost so far: 173 Tabu list used?: Yes

 $\begin{array}{l} \textbf{Selected neighbour} : \ [29,\ 19,\ 18,\ 9,\ 3,\ 2,\ 8,\ 7,\ 6,\ 5,\ 22,\ 21,\ 20,\ 17,\ 13,\ 16,\ 14,\ 15,\ 12,\ 28,\ 11,\ 27,\ 26,\ 25,\ 24,\ 23,\ 4,\ 10,\ 1,\ 0,\ 30] \end{array}$

Selected neighbour cost: 178

148. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 181, 178, 178, 178, 178, 183, 173]

Tabu list: { (17, 26), (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 12, 11, 27, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

149. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 183, 173]

Tabu list: { (18, 27), (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 12, 27, 11, 26, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

150. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 178, 183, 173]

Tabu list: { (17, 27), (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 27, 12, 11, 26, 25, 24, 23, 4, 10, 1, 0, 30]

 $10,\,1,\,0,\,30]$

Selected neighbour cost: 178

151. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 183, 173]

Tabu list: { (18, 28), (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 27, 12, 26, 11, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

152. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 178, 183, 173]

Tabu list: { (17, 28), (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 27, 26, 12, 11, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

153. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 183, 173]

Tabu list: { (16, 24), (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 12, 11, 25, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

154. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 183, 173]

Tabu list: { (15, 24), (16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25) }

Best cost so far: 173 Tabu list used?: Yes **Selected neighbour**: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 12, 25, 11, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

155. Candidate schedule costs: [178, 178, 182, 178, 178, 182, 173, 184, 178, 178, 178, 178, 178, 183, 173]Tabu list: $\{(16, 25), (15, 25), (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 12, 11, 24, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

156. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 183, 173]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 12, 24, 11, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

157. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 178, 178, 183, 173]

Tabu list: { (16, 26), (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 24, 12, 11, 23, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

158. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 178, 183, 173]

Tabu list: { (15, 26), (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 24, 12, 23, 11, 4, 10, 1, 0, 30]

Selected neighbour cost: 178

159. Candidate schedule costs: [178, 178, 182, 178, 178, 182, 173, 184, 178, 178, 178, 178, 183, 173]

Tabu list: { (16, 27), (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 16), (12, 16), (12, 16), (13, 16), (13, 16), (13, 16), (13, 16), (13, 16), (14, 12), (14, 1

14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 2, 8, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 24, 23, 12, 11, 4, 10, 10, 20]

10, 1, 0, 30]

Selected neighbour cost: 178

160. Candidate schedule costs: [178, 178, 182, 178, 182, 173, 184, 178, 178, 183, 173]

Tabu list: { (15, 27), (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 3, 8, 2, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 24, 23, 12, 11, 4, 10, 1, 0, 30]

Selected neighbour cost: 182

161. Candidate schedule costs: [182, 182, 182, 178, 182, 182, 186, 177, 188, 182, 182, 187, 177]

Tabu list: { (16, 28), (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 13, 16, 14, 15, 28, 26, 27, 25, 24, 23, 12, 11, 4, 10, 1, 0, 30]

Selected neighbour cost: 182

162. Candidate schedule costs: [182, 182, 182, 182, 186, 177, 188, 182, 182, 187, 177]

Tabu list: { (15, 28), (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 13, 14, 15, 28, 26, 27, 25, 24, 23, 12, 11, 4, 10, 1, 0, 30]

Selected neighbour cost: 186

163. Candidate schedule costs: [186, 186, 186, 182, 191, 181, 192, 186, 186, 191, 181]

Tabu list: { (14, 24), (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 13, 15, 28, 26, 27, 25, 24, 23, 12, 11, 4, 10, 1, 0, 30]

Selected neighbour cost: 191

164. Candidate schedule costs: [191, 191, 191, 186, 194, 197, 191, 191, 196, 186]

Tabu list: { (14, 25), (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20),

 $(5,21), (5,22), (18,20), (18,21), (18,22), (5,18), (6,18), (7,18), (8,18), (9,18), (11,18), (12,18), (13,18), (2,18), (3,18), (9,11), (9,12), (9,13), (8,11), (8,12), (8,13), (7,11), (2,9), (3,9), (7,12), (7,13), (6,11), (6,12), (6,13), (5,11), (5,12), (5,13), (11,22), (12,22), (13,22), (11,21), (12,21), (13,21), (11,20), (12,20), (13,20), (11,17), (12,17), (13,17), (11,16), (12,16), (11,14), (11,15), (12,14), (12,15), (11,28), (12,28), (11,27), (12,27), (11,26), (12,26), (26,27), (11,25), (12,25), (11,24), (12,24), (11,23), (12,23), (2,8), (3,8), (13,16), (13,14), (13,15) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 13, 28, 26, 27, 25, 24, 23, 12, 11, 4, 10, 1, 0, 30]

Selected neighbour cost: 194

165. Candidate schedule costs: [194, 194, 194, 189, 191, 200, 194, 194, 199, 189]

Tabu list: { (14, 26), (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 13, 28, 26, 27, 25, 24, 23, 12, 11, 10, 4, 1, 0, 30]

Selected neighbour cost: 199

166. Candidate schedule costs: [199, 199, 199, 194, 196, 205, 199, 199, 199, 194]

Tabu list: { (14, 27), (14, 28), (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 13, 28, 26, 27, 25, 24, 23, 12, 10, 11, 4, 1, 0, 30]

Selected neighbour cost: 199

167. Candidate schedule costs: [199, 199, 199, 194, 196, 205, 199, 199, 199, 199]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 13, 28, 26, 27, 25, 24, 23, 10, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 199

168. Candidate schedule costs: [199, 199, 199, 194, 196, 205, 199, 199, 199]

Tabu list: { (14, 15), (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 13, 28, 26, 27, 25, 24, 10, 23, 12, 11,

4, 1, 0, 30]

Selected neighbour cost: 199

169. Candidate schedule costs: [199, 199, 199, 194, 196, 205, 199, 199, 199, 199]

Tabu list: { (1, 10), (2, 19), (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 14, 15, 13, 28, 26, 27, 25, 10, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 199

170. Candidate schedule costs: [199, 199, 199, 194, 196, 205, 199, 199, 199]

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (2,\,19),\, (3,\,19),\, (6,\,20),\, (6,\,21),\, (6,\,22),\, (5,\,20),\, (5,\,21),\, (5,\,22),\, (18,\,20),\, (18,\,21),\, (18,\,22),\, (5,\,18),\, \\ (6,\,18),\, (7,\,18),\, (8,\,18),\, (9,\,18),\, (11,\,18),\, (12,\,18),\, (13,\,18),\, (2,\,18),\, (3,\,18),\, (9,\,11),\, (9,\,12),\, (9,\,13),\, (8,\,11),\, (8,\,12),\, \\ (8,\,13),\, (7,\,11),\, (2,\,9),\, (3,\,9),\, (7,\,12),\, (7,\,13),\, (6,\,11),\, (6,\,12),\, (6,\,13),\, (5,\,11),\, (5,\,12),\, (5,\,13),\, (11,\,22),\, (12,\,22),\, \\ (13,\,22),\, (11,\,21),\, (12,\,21),\, (13,\,21),\, (11,\,20),\, (12,\,20),\, (13,\,20),\, (11,\,17),\, (12,\,17),\, (13,\,17),\, (11,\,16),\, (12,\,16),\, (11,\,14),\, (11,\,15),\, (12,\,14),\, (12,\,15),\, (11,\,28),\, (12,\,28),\, (11,\,27),\, (12,\,27),\, (11,\,26),\, (12,\,26),\, (26,\,27),\, (11,\,25),\, (12,\,25),\, (11,\,24),\, (12,\,24),\, (11,\,23),\, (12,\,23),\, (2,\,8),\, (3,\,8),\, (13,\,16),\, (13,\,14),\, (13,\,15),\, (4,\,10),\, (10,\,11),\, (10,\,12),\, (10,\,23),\, (10,\,24),\, (14,\,15) \; \} \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 13, 28, 26, 27, 25, 10, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 194

171. Candidate schedule costs: [194, 194, 194, 199, 189, 200, 194, 194, 194, 194]

Tabu list: { (3, 19), (6, 20), (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 13, 28, 26, 27, 10, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 194

172. Candidate schedule costs: [194, 194, 194, 199, 189, 200, 194, 194, 194, 194]

 $\begin{array}{l} \textbf{Tabu list:} \ \{ \ (6, \, 20), \ (6, \, 21), \ (6, \, 22), \ (5, \, 20), \ (5, \, 21), \ (5, \, 22), \ (18, \, 20), \ (18, \, 21), \ (18, \, 22), \ (5, \, 18), \ (6, \, 18), \ (7, \, 18), \ (8, \, 18), \ (9, \, 18), \ (11, \, 18), \ (12, \, 18), \ (13, \, 18), \ (2, \, 18), \ (3, \, 18), \ (9, \, 11), \ (9, \, 12), \ (9, \, 13), \ (8, \, 11), \ (8, \, 12), \ (8, \, 13), \ (7, \, 11), \ (2, \, 9), \ (3, \, 9), \ (7, \, 12), \ (7, \, 13), \ (6, \, 11), \ (6, \, 12), \ (6, \, 13), \ (5, \, 11), \ (5, \, 12), \ (5, \, 13), \ (11, \, 22), \ (12, \, 22), \ (13, \, 22), \ (11, \, 21), \ (12, \, 21), \ (13, \, 21), \ (11, \, 20), \ (12, \, 20), \ (13, \, 20), \ (11, \, 17), \ (12, \, 17), \ (13, \, 17), \ (11, \, 16), \ (12, \, 16), \ (11, \, 14), \ (11, \, 15), \ (12, \, 14), \ (12, \, 15), \ (11, \, 28), \ (12, \, 28), \ (11, \, 27), \ (12, \, 27), \ (11, \, 26), \ (12, \, 26), \ (26, \, 27), \ (11, \, 25), \ (12, \, 25), \ (11, \, 24), \ (12, \, 24), \ (11, \, 23), \ (12, \, 23), \ (2, \, 8), \ (3, \, 8), \ (13, \, 16), \ (13, \, 14), \ (13, \, 15), \ (4, \, 10), \ (10, \, 11), \ (10, \, 12), \ (10, \, 23), \ (10, \, 24), \ (14, \, 15), \ (10, \, 25), \ (10, \, 27) \ \} \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 13, 28, 26, 10, 27, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 194

173. Candidate schedule costs: [194, 194, 194, 199, 189, 200, 194, 194, 194]

Tabu list: { (6, 21), (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25),

(10, 27), (10, 26)

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 13, 28, 10, 26, 27, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 194

174. Candidate schedule costs: [194, 194, 194, 199, 189, 200, 194, 194, 194, 194]

Tabu list: { (6, 22), (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 13, 10, 28, 26, 27, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 194

175. Candidate schedule costs: [194, 194, 194, 199, 189, 199, 194, 194, 194]

Tabu list: { (5, 20), (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13) }

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 10, 13, 28, 26, 27, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 199

176. Candidate schedule costs: [199, 199, 199, 204, 194, 205, 199, 199]

Tabu list: { (5, 21), (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 10, 28, 13, 26, 27, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 205

177. Candidate schedule costs: [205, 205, 205, 210, 205, 199, 207, 205, 205]

Tabu list: { (5, 22), (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26) }

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 10, 28, 26, 13, 27, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 207

178. Candidate schedule costs: [207, 207, 207, 212, 207, 205, 210, 207]

Tabu list: { (18, 20), (18, 21), (18, 22), (5, 18), (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 12), (6, 12), (18, 12), (18, 12), (18, 12), (18, 12), (18, 12), (18, 18), (18, 18), (18, 18), (19, 18), (11, 18), (12, 18), (13, 18), (13, 18), (13, 18), (18,

 $13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 5, 22, 21, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

179. Candidate schedule costs: [210, 210, 210, 215, 210, 210, 207, 220, 210]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 6, 22, 5, 21, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

180. Candidate schedule costs: [210, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 7, 22, 6, 5, 21, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

181. Candidate schedule costs: [210, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 22, 7, 6, 5, 21, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

182. Candidate schedule costs: [210, 210, 224, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (6, 18), (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 22, 7, 6, 21, 5, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

183. Candidate schedule costs: [210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (7, 18), (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 22, 7, 21, 6, 5, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

184. Candidate schedule costs: [210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (8, 18), (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21) }

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 22, 21, 7, 6, 5, 20, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

185. Candidate schedule costs: [210, 210, 224, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (9, 18), (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20) }

Best cost so far: 173

Tabu list used?: Yes

 $\begin{array}{l} \textbf{Selected neighbour} : \ [29, \ 19, \ 18, \ 9, \ 8, \ 3, \ 2, \ 22, \ 21, \ 7, \ 6, \ 20, \ 5, \ 17, \ 16, \ 15, \ 14, \ 10, \ 28, \ 26, \ 27, \ 13, \ 25, \ 24, \ 23, \ 12, \ 11, \ 4, \ 1, \ 0, \ 30] \end{array}$

Selected neighbour cost: 210

186. Candidate schedule costs: [210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (11, 18), (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20) }

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 19, 18, 9, 8, 3, 2, 22, 21, 7, 20, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

187. Candidate schedule costs: [210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (12, 18), (13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18) }

Best cost so far: 173 Tabu list used?: Yes **Selected neighbour**: [29, 19, 9, 18, 8, 3, 2, 22, 21, 7, 20, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

188. Candidate schedule costs: [210, 210, 210, 210, 224, 210, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210] Tabu list: $\{(13, 18), (2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 19, 18, 8, 3, 2, 22, 21, 7, 20, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

189. Candidate schedule costs: [210, 210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]Tabu list: $\{(2, 18), (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18) \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 19, 8, 18, 3, 2, 22, 21, 7, 20, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

190. Candidate schedule costs: [210, 210, 210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210] Tabu list: { (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11),

Tabu list: { (3, 18), (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 19, 18, 3, 2, 22, 21, 7, 20, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

191. Candidate schedule costs: [210, 210, 224, 210, 210, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (9, 11), (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 19, 18, 3, 2, 22, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

192. Candidate schedule costs: [210, 210, 224, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (9, 12), (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28),

```
(13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (7, 20), (3, 18)
```

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 19, 3, 18, 2, 22, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 210

193. Candidate schedule costs: [210, 210, 210, 208, 224, 210, 210, 215, 210, 210, 207, 220, 210]

Tabu list: { (9, 13), (8, 11), (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 19, 3, 2, 18, 22, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 208

194. Candidate schedule costs: [208, 208, 210, 208, 208, 208, 213, 208, 208, 205, 218, 208]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 19, 2, 18, 22, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 208

Tabu list: { (8, 12), (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 19, 18, 22, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

196. Candidate schedule costs: [206, 208, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (8, 13), (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22) }

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 19, 22, 18, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

197. Candidate schedule costs: [206, 208, 206, 206, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (7, 11), (2, 9), (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 12), (13, 14), (14, 14), (15,

22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22)

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 19, 18, 21, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

198. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (2,\,9),\, (3,\,9),\, (7,\,12),\, (7,\,13),\, (6,\,11),\, (6,\,12),\, (6,\,13),\, (5,\,11),\, (5,\,12),\, (5,\,13),\, (11,\,22),\, (12,\,22),\, (13,\,22),\, (11,\,21),\, (12,\,21),\, (13,\,21),\, (11,\,20),\, (12,\,20),\, (13,\,20),\, (11,\,17),\, (12,\,17),\, (13,\,17),\, (11,\,16),\, (12,\,16),\, (11,\,14),\, (11,\,15),\, (12,\,14),\, (12,\,15),\, (11,\,28),\, (12,\,28),\, (11,\,27),\, (12,\,27),\, (11,\,26),\, (12,\,26),\, (26,\,27),\, (11,\,25),\, (12,\,25),\, (11,\,24),\, (12,\,24),\, (11,\,23),\, (12,\,23),\, (2,\,8),\, (3,\,8),\, (13,\,16),\, (13,\,14),\, (13,\,15),\, (4,\,10),\, (10,\,11),\, (10,\,12),\, (10,\,23),\, (10,\,24),\, (14,\,15),\, (10,\,25),\, (10,\,27),\, (10,\,26),\, (10,\,28),\, (10,\,13),\, (13,\,28),\, (13,\,26),\, (13,\,27),\, (5,\,22),\, (6,\,22),\, (7,\,22),\, (5,\,21),\, (6,\,21),\, (7,\,21),\, (5,\,20),\, (6,\,20),\, (9,\,18),\, (9,\,19),\, (8,\,18),\, (8,\,19),\, (7,\,20),\, (3,\,18),\, (2,\,18),\, (3,\,19),\, (2,\,19),\, (18,\,22),\, (19,\,22),\, (18,\,21)\, \end{array} \}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 19, 21, 18, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

199. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (3, 9), (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 19, 18, 20, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

200. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (7, 12), (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 19, 20, 18, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

201. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (7, 13), (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 19, 18, 7, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11,

4, 1, 0, 30

Selected neighbour cost: 206

202. Candidate schedule costs: [206, 219, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (6, 11), (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 16), (11,28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 10), (10, 11), (10, 12),(10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 21), (7,20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18)

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 19, 7, 18, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30

Selected neighbour cost: 206

203. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (6, 12), (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 21), (12, 21), (13, 21), (12, 21), (13, 2 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 25), (26, 27), (27, 28), (28, 27), (28, 28), (28,8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 27), (10, 28), (1026), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 21), (18, 21), (19, 21), (18, 21), (19, 21), (18, 21), (1920), (19, 20), (7, 18), (7, 19) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 7, 19, 18, 6, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

204. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (6, 13), (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 21), (13, 21), (13, 21), (14, 20), (15, 21), (15, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (12, 27), (11, 28), (12, 28), (13, 28), (13, 28), (14, 28), (14, 28), (15, 28)(13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 27), (10, 26), (10, 27), (10, 27), (10, 28), (10,28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 21), (120), (7, 18), (7, 19), (6, 18) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 7, 19, 6, 18, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

205. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (5, 11), (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 21), (14, 20), (15, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16),(13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10,13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 20), (9, 21), 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19)

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 7, 6, 19, 18, 5, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

206. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (5, 12), (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 18), (13, 18), (14, 18), (15,27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (9, 19), (10, 10), (10, 1(8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 18), (7, 19), (19 19), (6, 18), (6, 19), (5, 18)

Best cost so far: 173

Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 7, 6, 19, 5, 18, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

207. Candidate schedule costs: [206, 219, 206, 206, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (5, 13), (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 13, 25, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 206

208. Candidate schedule costs: [206, 219, 206, 206, 211, 206, 206, 203, 216, 206]

Tabu list: { (11, 22), (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 2, 22, 21, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 216

209. Candidate schedule costs: [216, 229, 216, 216, 221, 216, 216, 206, 234, 216]

Tabu list: { (12, 22), (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 3, 22, 2, 21, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 229

210. Candidate schedule costs: [229, 229, 216, 232, 229, 229, 234, 229, 229, 219, 247, 229]

Tabu list: { (13, 22), (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 8, 22, 3, 2, 21, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 229

211. Candidate schedule costs: [229, 229, 232, 229, 229, 234, 229, 229, 219, 247, 229]

Tabu list: { (11, 21), (12, 21), (13, 21), (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 27), (12, 27), (13, 27), (13, 27), (13, 27), (12, 27), (13, 27), (

25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22)

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 9, 22, 8, 3, 2, 21, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 229

212. Candidate schedule costs: [229, 229, 229, 232, 229, 234, 229, 229, 219, 247, 229]

 $\begin{array}{l} \textbf{Tabu list:} \; \{\; (12,\,21),\, (13,\,21),\, (11,\,20),\, (12,\,20),\, (13,\,20),\, (11,\,17),\, (12,\,17),\, (13,\,17),\, (11,\,16),\, (12,\,16),\, (11,\,14),\, (11,\,15),\, (12,\,14),\, (12,\,15),\, (11,\,28),\, (12,\,28),\, (11,\,27),\, (12,\,27),\, (11,\,26),\, (12,\,26),\, (26,\,27),\, (11,\,25),\, (12,\,25),\, (11,\,24),\, (12,\,24),\, (11,\,23),\, (12,\,23),\, (2,\,8),\, (3,\,8),\, (13,\,16),\, (13,\,14),\, (13,\,15),\, (4,\,10),\, (10,\,11),\, (10,\,12),\, (10,\,23),\, (10,\,24),\, (14,\,15),\, (10,\,25),\, (10,\,27),\, (10,\,26),\, (10,\,28),\, (10,\,13),\, (13,\,28),\, (13,\,26),\, (13,\,27),\, (5,\,22),\, (6,\,22),\, (7,\,22),\, (5,\,21),\, (6,\,21),\, (7,\,21),\, (5,\,20),\, (6,\,20),\, (9,\,18),\, (9,\,19),\, (8,\,18),\, (8,\,19),\, (7,\,20),\, (3,\,18),\, (2,\,18),\, (3,\,19),\, (2,\,19),\, (18,\,22),\, (19,\,22),\, (18,\,21),\, (19,\,21),\, (18,\,20),\, (19,\,20),\, (7,\,18),\, (7,\,19),\, (6,\,18),\, (6,\,19),\, (5,\,18),\, (5,\,19),\, (13,\,25),\, (2,\,22),\, (3,\,22),\, (8,\,22),\, (9,\,22)\, \} \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 9, 8, 3, 2, 21, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 229

213. Candidate schedule costs: [229, 229, 232, 229, 229, 234, 229, 229, 219, 247, 229]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 9, 8, 3, 21, 2, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 232

214. Candidate schedule costs: [232, 232, 232, 229, 234, 232, 232, 237, 232, 232, 222, 250, 232]

Tabu list: { (11, 20), (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 9, 8, 21, 3, 2, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 232

215. Candidate schedule costs: [232, 232, 232, 234, 232, 232, 237, 232, 232, 222, 250, 232]

Tabu list: { (12, 20), (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 9, 21, 8, 3, 2, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 232

216. Candidate schedule costs: [232, 232, 232, 232, 234, 232, 237, 232, 232, 232, 250, 232]

Tabu list: { (13, 20), (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21), (9, 21) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 21, 9, 8, 3, 2, 20, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 232

217. Candidate schedule costs: [232, 232, 234, 232, 232, 237, 232, 232, 222, 250, 232]

Tabu list: { (11, 17), (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21), (9, 21), (2, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 21, 9, 8, 3, 20, 2, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 234

218. Candidate schedule costs: [234, 234, 234, 232, 234, 239, 234, 234, 224, 252, 234]

Tabu list: { (12, 17), (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21), (9, 21), (2, 20), (3, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 21, 9, 8, 20, 3, 2, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 234

219. Candidate schedule costs: [234, 234, 234, 234, 239, 234, 234, 224, 252, 234]

Tabu list: { (13, 17), (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21), (9, 21), (2, 20), (3, 20), (8, 20) }

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 21, 9, 20, 8, 3, 2, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 234

Tabu list: { (11, 16), (12, 16), (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21), (9, 21), (2, 20), (3, 20), (8, 20), (9, 20) }

Best cost so far: 173 Tabu list used?: Yes **Selected neighbour**: [29, 22, 21, 20, 9, 8, 3, 2, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 13, 24, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 234

221. Candidate schedule costs: [234, 234, 234, 239, 234, 234, 224, 252, 234]

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 21, 20, 9, 8, 3, 2, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 24, 13, 23, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 252

222. Candidate schedule costs: [252, 252, 252, 257, 252, 252, 254, 257, 252]

 $\begin{array}{l} \textbf{Tabu list:} \ \{ \ (11, \ 14), \ (11, \ 15), \ (12, \ 14), \ (12, \ 15), \ (11, \ 28), \ (12, \ 28), \ (11, \ 27), \ (12, \ 27), \ (11, \ 26), \ (12, \ 26), \ (26, \ 27), \ (11, \ 25), \ (12, \ 25), \ (11, \ 24), \ (12, \ 24), \ (11, \ 23), \ (12, \ 23), \ (2, \ 8), \ (3, \ 8), \ (13, \ 16), \ (13, \ 14), \ (13, \ 15), \ (4, \ 10), \ (10, \ 11), \ (10, \ 12), \ (10, \ 23), \ (10, \ 24), \ (14, \ 15), \ (10, \ 25), \ (10, \ 27), \ (10, \ 26), \ (10, \ 28), \ (10, \ 13), \ (13, \ 28), \ (13, \ 26), \ (13, \ 27), \ (5, \ 22), \ (6, \ 22), \ (7, \ 22), \ (5, \ 21), \ (6, \ 21), \ (7, \ 21), \ (5, \ 20), \ (6, \ 20), \ (9, \ 18), \ (9, \ 19), \ (8, \ 18), \ (8, \ 19), \ (7, \ 20), \ (3, \ 18), \ (2, \ 18), \ (3, \ 19), \ (2, \ 19), \ (18, \ 22), \ (18, \ 21), \ (19, \ 21), \ (18, \ 20), \ (13, \ 20), \ (13, \ 20), \ (8, \ 20), \ (9, \ 20), \ (13, \ 24), \ (13, \ 23) \ \} \end{array}$

Best cost so far: 173 Tabu list used?: Yes

Selected neighbour: [29, 22, 21, 20, 9, 8, 3, 2, 7, 6, 5, 19, 18, 17, 16, 15, 14, 10, 28, 26, 27, 25, 24, 23, 13, 12, 11, 4, 1, 0, 30]

Selected neighbour cost: 257

223. Candidate schedule costs: [257, 257, 257, 262, 257, 257, 252]

Tabu list: { (11, 14), (11, 15), (12, 14), (12, 15), (11, 28), (12, 28), (11, 27), (12, 27), (11, 26), (12, 26), (26, 27), (11, 25), (12, 25), (11, 24), (12, 24), (11, 23), (12, 23), (2, 8), (3, 8), (13, 16), (13, 14), (13, 15), (4, 10), (10, 11), (10, 12), (10, 23), (10, 24), (14, 15), (10, 25), (10, 27), (10, 26), (10, 28), (10, 13), (13, 28), (13, 26), (13, 27), (5, 22), (6, 22), (7, 22), (5, 21), (6, 21), (7, 21), (5, 20), (6, 20), (9, 18), (9, 19), (8, 18), (8, 19), (7, 20), (3, 18), (2, 18), (3, 19), (2, 19), (18, 22), (19, 22), (18, 21), (19, 21), (18, 20), (19, 20), (7, 18), (7, 19), (6, 18), (6, 19), (5, 18), (5, 19), (13, 25), (2, 22), (3, 22), (8, 22), (9, 22), (2, 21), (3, 21), (8, 21), (9, 21), (2, 20), (3, 20), (8, 20), (9, 20), (13, 24), (13, 23) }

Best cost so far: 173 Tabu list used?: Yes Selected neighbour: None Selected neighbour cost: None

2.2 Best Schedule