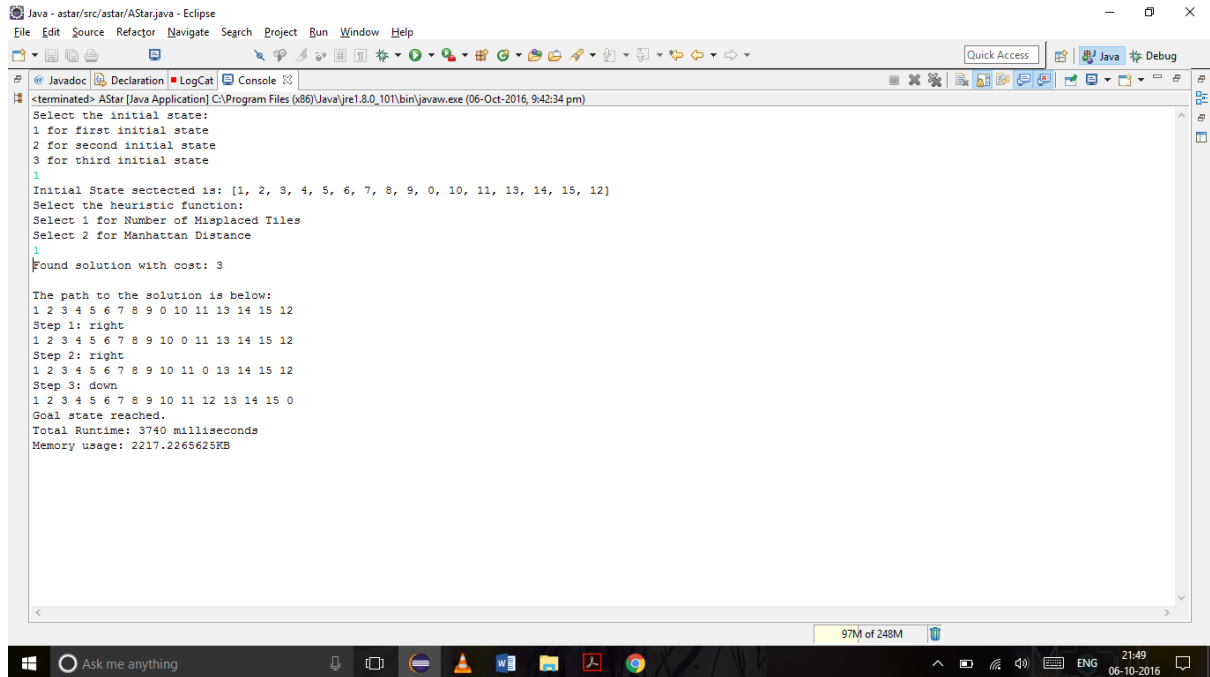


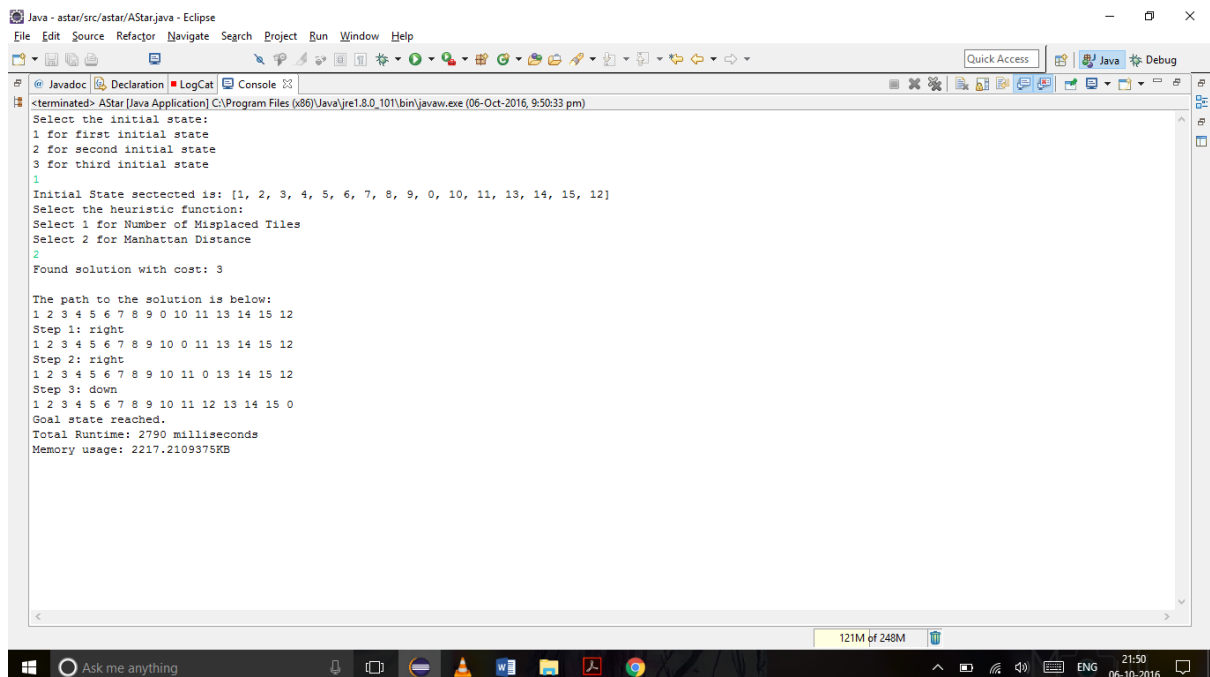
Initial State 1:

Heuristic: Number of misplaced tiles.



```
Java - astar/src/astar/AStar.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Quick Access Java Debug
Javadoc Declaration LogCat Console
<terminated> AStar [Java Application] C:\Program Files (x86)\Java\jre1.8.0_101\bin\javaw.exe (06-Oct-2016, 9:42:34 pm)
Select the initial state:
1 for first initial state
2 for second initial state
3 for third initial state
1
Initial State selected is: [1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 10, 11, 13, 14, 15, 12]
Select the heuristic function:
Select 1 for Number of Misplaced Tiles
Select 2 for Manhattan Distance
1
Found solution with cost: 3

The path to the solution is below:
1 2 3 4 5 6 7 8 9 0 10 11 13 14 15 12
Step 1: right
1 2 3 4 5 6 7 8 9 10 11 13 14 15 12
Step 2: right
1 2 3 4 5 6 7 8 9 10 11 0 13 14 15 12
Step 3: down
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 0
Goal state reached.
Total Runtime: 3740 milliseconds
Memory usage: 2217.2265625KB
97M of 248M
Ask me anything
21:49
06-10-2016
```

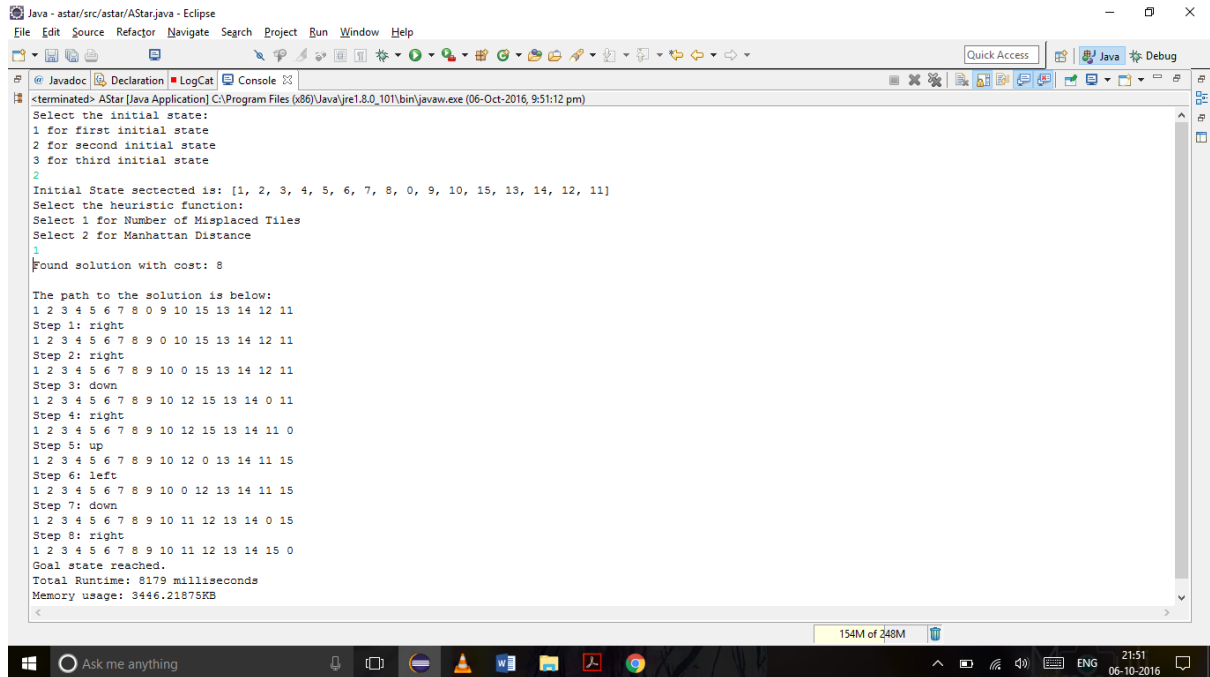
Heuristic: Manhattan Distance

```
Java - astar/src/astar/AStar.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Quick Access Java Debug
Javadoc Declaration LogCat Console
<terminated> AStar [Java Application] C:\Program Files (x86)\Java\jre1.8.0_101\bin\javaw.exe (06-Oct-2016, 9:50:33 pm)
Select the initial state:
1 for first initial state
2 for second initial state
3 for third initial state
1
Initial State selected is: [1, 2, 3, 4, 5, 6, 7, 8, 9, 0, 10, 11, 13, 14, 15, 12]
Select the heuristic function:
Select 1 for Number of Misplaced Tiles
Select 2 for Manhattan Distance
2
Found solution with cost: 3

The path to the solution is below:
1 2 3 4 5 6 7 8 9 0 10 11 13 14 15 12
Step 1: right
1 2 3 4 5 6 7 8 9 10 11 13 14 15 12
Step 2: right
1 2 3 4 5 6 7 8 9 10 11 0 13 14 15 12
Step 3: down
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 0
Goal state reached.
Total Runtime: 2790 milliseconds
Memory usage: 2217.2109375KB
121M of 248M
Ask me anything
21:50
06-10-2016
```

Initial State 2:

Heuristic: Number of misplaced tiles



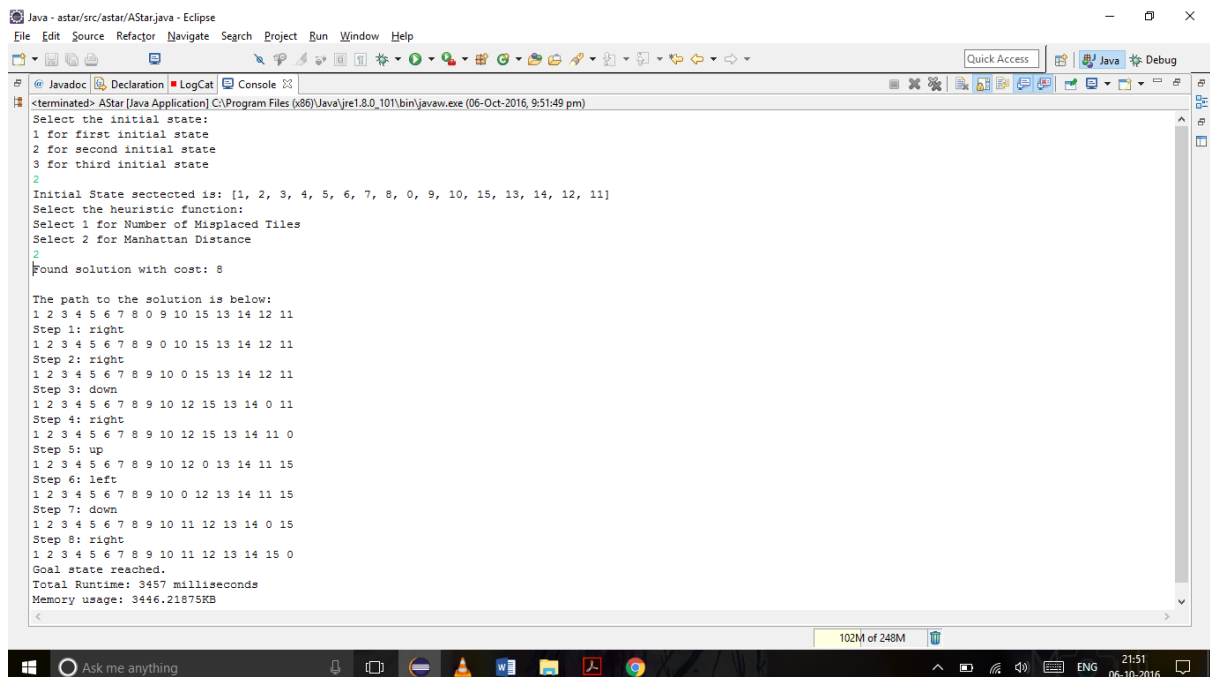
```
Java - astar/src/astar/AStar.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help

Javadoc Declaration LogCat Console
<terminated> AStar [Java Application] C:\Program Files (x86)\Java\jre1.8.0_101\bin\javaw.exe (06-Oct-2016, 9:51:12 pm)

Select the initial state:
1 for first initial state
2 for second initial state
3 for third initial state
2
Initial State selected is: [1, 2, 3, 4, 5, 6, 7, 8, 0, 9, 10, 15, 13, 14, 12, 11]
Select the heuristic function:
Select 1 for Number of Misplaced Tiles
Select 2 for Manhattan Distance
1
Found solution with cost: 8

The path to the solution is below:
1 2 3 4 5 6 7 8 0 9 10 15 13 14 12 11
Step 1: right
1 2 3 4 5 6 7 8 9 0 10 15 13 14 12 11
Step 2: right
1 2 3 4 5 6 7 8 9 10 0 15 13 14 12 11
Step 3: down
1 2 3 4 5 6 7 8 9 10 12 15 13 14 0 11
Step 4: right
1 2 3 4 5 6 7 8 9 10 12 15 13 14 11 0
Step 5: up
1 2 3 4 5 6 7 8 9 10 12 0 13 14 11 15
Step 6: left
1 2 3 4 5 6 7 8 9 10 0 12 13 14 11 15
Step 7: down
1 2 3 4 5 6 7 8 9 10 11 12 13 14 0 15
Step 8: right
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 0
Goal state reached.
Total Runtime: 8179 milliseconds
Memory usage: 3446.21875KB
```

Heuristic: Manhattan Distance



```
Java - astar/src/astar/AStar.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help

Javadoc Declaration LogCat Console
<terminated> AStar [Java Application] C:\Program Files (x86)\Java\jre1.8.0_101\bin\javaw.exe (06-Oct-2016, 9:51:49 pm)

Select the initial state:
1 for first initial state
2 for second initial state
3 for third initial state
2
Initial State selected is: [1, 2, 3, 4, 5, 6, 7, 8, 0, 9, 10, 15, 13, 14, 12, 11]
Select the heuristic function:
Select 1 for Number of Misplaced Tiles
Select 2 for Manhattan Distance
2
Found solution with cost: 8

The path to the solution is below:
1 2 3 4 5 6 7 8 0 9 10 15 13 14 12 11
Step 1: right
1 2 3 4 5 6 7 8 9 0 10 15 13 14 12 11
Step 2: right
1 2 3 4 5 6 7 8 9 10 0 15 13 14 12 11
Step 3: down
1 2 3 4 5 6 7 8 9 10 12 15 13 14 0 11
Step 4: right
1 2 3 4 5 6 7 8 9 10 12 15 13 14 11 0
Step 5: up
1 2 3 4 5 6 7 8 9 10 12 0 13 14 11 15
Step 6: left
1 2 3 4 5 6 7 8 9 10 0 12 13 14 11 15
Step 7: down
1 2 3 4 5 6 7 8 9 10 11 12 13 14 0 15
Step 8: right
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 0
Goal state reached.
Total Runtime: 3457 milliseconds
Memory usage: 3446.21875KB
```

Initial State 3:

Heuristic: Number of misplaced tiles

```

Java - astar/src/astar/Puzzle.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Quick Access Java Debug
<terminated> AStar [Java Application] C:\Program Files (x86)\Java\jre1.8.0_101\bin\javaw.exe (06-Oct-2016, 10:30:14 pm)
[1, 0, 12, 10, 5, 4, 2, 11, 8, 7, 3, 6, 9, 13, 14, 15]
[1, 0, 12, 10, 5, 4, 2, 11, 8, 7, 3, 6, 9, 13, 14, 15]
[1, 0, 12, 10, 5, 4, 2, 11, 8, 7, 3, 6, 9, 13, 14, 15]
[5, 0, 2, 4, 12, 1, 15, 7, 9, 3, 8, 10, 13, 14, 6, 11]
[5, 0, 2, 4, 12, 1, 15, 7, 9, 3, 8, 10, 13, 14, 6, 11]
[5, 0, 2, 4, 12, 1, 15, 7, 9, 3, 8, 10, 13, 14, 6, 11]
[0, 1, 12, 10, 5, 4, 2, 11, 8, 7, 3, 6, 9, 13, 14, 15]
[0, 1, 12, 10, 5, 4, 2, 11, 8, 7, 3, 6, 9, 13, 14, 15]
[1, 2, 3, 4, 9, 5, 8, 10, 13, 15, 14, 11, 0, 12, 7, 6]
[1, 2, 3, 4, 9, 5, 8, 10, 13, 15, 14, 11, 0, 12, 7, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[1, 12, 4, 10, 5, 7, 2, 11, 8, 3, 15, 6, 9, 13, 14, 0]
[1, 12, 4, 10, 5, 7, 2, 11, 8, 3, 15, 6, 9, 13, 14, 0]
[8, 1, 2, 3, 5, 9, 12, 4, 13, 7, 6, 10, 0, 14, 11, 15]
[8, 1, 2, 3, 5, 9, 12, 4, 13, 7, 6, 10, 0, 14, 11, 15]
[5, 1, 4, 10, 9, 8, 2, 0, 7, 15, 3, 11, 13, 12, 14, 6]
[5, 1, 4, 10, 9, 8, 2, 0, 7, 15, 3, 11, 13, 12, 14, 6]
[5, 1, 4, 10, 9, 8, 2, 0, 7, 15, 3, 11, 13, 12, 14, 6]
[0, 5, 3, 4, 7, 1, 2, 10, 9, 13, 12, 11, 14, 8, 15, 6]
[0, 5, 3, 4, 7, 1, 2, 10, 9, 13, 12, 11, 14, 8, 15, 6]
[1, 12, 2, 4, 9, 7, 11, 10, 8, 3, 6, 0, 13, 5, 14, 15]
[1, 12, 2, 4, 9, 7, 11, 10, 8, 3, 6, 0, 13, 5, 14, 15]
[1, 12, 2, 4, 9, 7, 11, 10, 8, 3, 6, 0, 13, 5, 14, 15]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
No solution found!
Total Runtime: 183856 milliseconds
Memory usage: 2147.3984375KB
152M of 348M
22:33
06-10-2016

```

Heuristic: Manhattan Distance

```

Java - astar/src/astar/Puzzle.java - Eclipse
File Edit Source Refactor Navigate Search Project Run Window Help
Quick Access Java Debug
<terminated> AStar [Java Application] C:\Program Files (x86)\Java\jre1.8.0_101\bin\javaw.exe (06-Oct-2016, 10:34:09 pm)
[0, 1, 12, 10, 5, 4, 2, 11, 8, 7, 3, 6, 9, 13, 14, 15]
[1, 2, 3, 4, 9, 5, 8, 10, 13, 15, 14, 11, 0, 12, 7, 6]
[1, 2, 3, 4, 9, 5, 8, 10, 13, 15, 14, 11, 0, 12, 7, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[5, 1, 3, 4, 9, 7, 0, 10, 13, 8, 12, 11, 14, 2, 15, 6]
[1, 12, 4, 10, 5, 7, 2, 11, 8, 3, 15, 6, 9, 13, 14, 0]
[1, 12, 4, 10, 5, 7, 2, 11, 8, 3, 15, 6, 9, 13, 14, 0]
[8, 1, 2, 3, 5, 9, 12, 4, 13, 7, 6, 10, 0, 14, 11, 15]
[8, 1, 2, 3, 5, 9, 12, 4, 13, 7, 6, 10, 0, 14, 11, 15]
[5, 1, 4, 10, 9, 8, 2, 0, 7, 15, 3, 11, 13, 12, 14, 6]
[5, 1, 4, 10, 9, 8, 2, 0, 7, 15, 3, 11, 13, 12, 14, 6]
[5, 1, 4, 10, 9, 8, 2, 0, 7, 15, 3, 11, 13, 12, 14, 6]
[0, 5, 3, 4, 7, 1, 2, 10, 9, 13, 12, 11, 14, 8, 15, 6]
[0, 5, 3, 4, 7, 1, 2, 10, 9, 13, 12, 11, 14, 8, 15, 6]
[1, 12, 2, 4, 9, 7, 11, 10, 8, 3, 6, 0, 13, 5, 14, 15]
[1, 12, 2, 4, 9, 7, 11, 10, 8, 3, 6, 0, 13, 5, 14, 15]
[1, 12, 2, 4, 9, 7, 11, 10, 8, 3, 6, 0, 13, 5, 14, 15]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[9, 1, 4, 10, 2, 12, 3, 11, 13, 5, 0, 7, 14, 8, 15, 6]
[1, 2, 3, 4, 7, 8, 12, 10, 0, 9, 6, 15, 5, 13, 14, 11]
[1, 2, 3, 4, 7, 8, 12, 10, 0, 9, 6, 15, 5, 13, 14, 11]
[1, 2, 3, 4, 7, 8, 12, 10, 0, 9, 6, 15, 5, 13, 14, 11]
[2, 10, 3, 4, 1, 5, 7, 11, 9, 12, 15, 0, 13, 8, 14, 6]
[2, 10, 3, 4, 1, 5, 7, 11, 9, 12, 15, 0, 13, 8, 14, 6]
[2, 10, 3, 4, 1, 5, 7, 11, 9, 12, 15, 0, 13, 8, 14, 6]
[1, 3, 10, 0, 9, 2, 4, 7, 5, 12, 15, 11, 8, 13, 14, 6]
No solution found!
Total Runtime: 198463 milliseconds
Memory usage: 2143.1953125KB
155M of 348M
22:42
06-10-2016

```