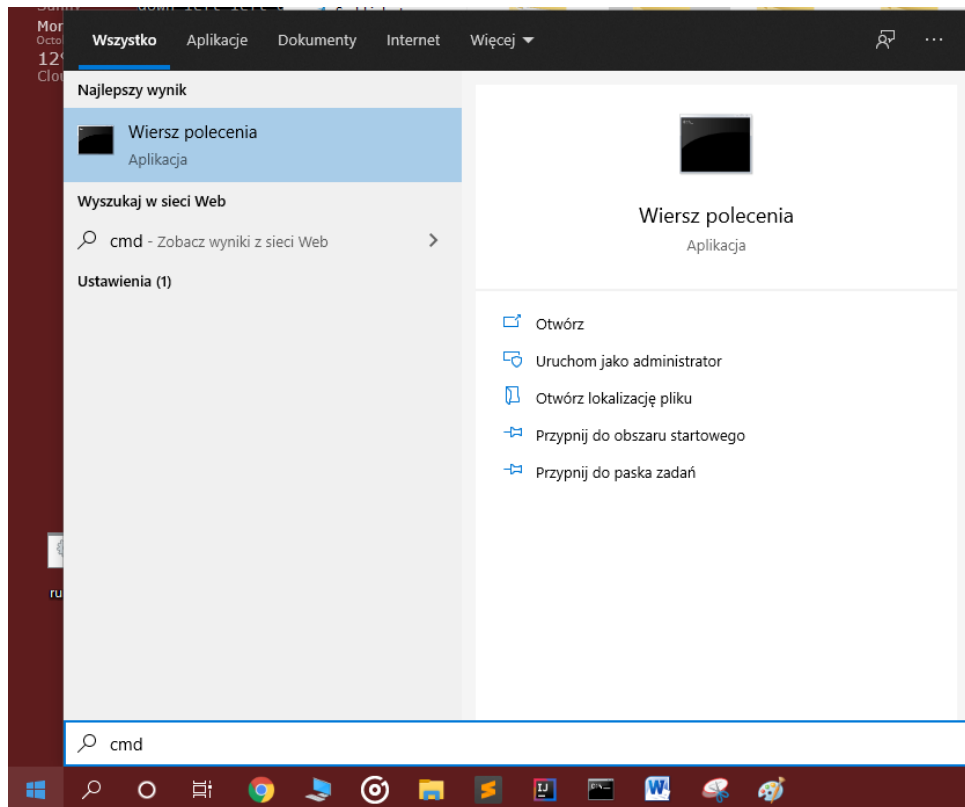


# How to run program Main.java

Open cmd:



Go to directory, where file Main.java is. The easiest way is to put it on desktop.

```
C:\Users\Rafał>cd desktop  
C:\Users\Rafał\Desktop>
```

Or directly on disk C:

```
C:\Users\Rafał>cd..  
C:\Users>cd..  
C:\>
```

You can check if it is there by command "dir":

```
C:\Users\Rafał\Desktop>dir
Volume in drive C has no label.
Volume Serial Number is 9232-8037

Directory of C:\Users\Rafał\Desktop

23.10.2020  11:34    <DIR>          .
23.10.2020  11:34    <DIR>          ..
23.10.2020  11:17      15 337 Main.java
               1 File(s)              15 337 bytes
               2 Dir(s)  63 974 445 056 bytes free

C:\Users\Rafał\Desktop>
```

Now it's time to compile it: "javac Main.java"

```
C:\Users\Rafał\Desktop>javac Main.java
C:\Users\Rafał\Desktop>
```

There should be new file: "Main.class"

```
C:\Users\Rafał\Desktop>dir
Volume in drive C has no label.
Volume Serial Number is 9232-8037

Directory of C:\Users\Rafał\Desktop

23.10.2020  11:35    <DIR>          .
23.10.2020  11:35    <DIR>          ..
23.10.2020  11:35      5 841 Main.class
23.10.2020  11:17      15 337 Main.java
               2 File(s)              21 178 bytes
               2 Dir(s)  63 978 582 016 bytes free

C:\Users\Rafał\Desktop>
```

Now, there are a few options how to run the program:

1. Simple start program with default set:

“java Main”

```
C:\Users\Rafał\Desktop>java Main
```

```
Start state:
```

```
3 1 2  
4 7 5  
6 8 0
```

```
3 1 2  
4 7 5  
6 0 8
```

```
3 1 2  
4 0 5  
6 7 8
```

```
3 1 2  
0 4 5  
6 7 8
```

```
Final state:
```

```
0 1 2  
3 4 5  
6 7 8
```

```
Number of generated states: 9
```

```
Number of moves: 4
```

```
Importance of h: 1
```

```
The correct path:
```

```
left up left up
```

```
C:\Users\Rafał\Desktop>
```

2. If you only want to change the value of heuristic:

“java Main x” (x – importance of h)

```
C:\Users\Rafał\Desktop>java Main 0

Start state:
3 1 2
4 7 5
6 8 0

3 1 2
4 7 5
6 0 8

3 1 2
4 0 5
6 7 8

3 1 2
0 4 5
6 7 8

Final state:
0 1 2
3 4 5
6 7 8

Number of generated states: 30
Number of moves: 4
Importance of h: 0

The correct path:
left up left up

C:\Users\Rafał\Desktop>
```

3. When you want change start state:

“java Main” + 9 parameters

```
C:\Users\Rafał\Desktop>java Main 1 0 4 3 5 2 6 7 8

Start state:
1 0 4
3 5 2
6 7 8

1 4 0
3 5 2
6 7 8

1 4 2
3 5 0
6 7 8

1 4 2
3 0 5
6 7 8

1 0 2
3 4 5
6 7 8

Final state:
0 1 2
3 4 5
6 7 8

Number of generated states: 12
Number of moves: 5
Importance of h: 1

The correct path:
right down left up left

C:\Users\Rafał\Desktop>
```

4. When you want change start state and importance of h:

“java Main” + 10 parameters (10<sup>th</sup> parameter is h)

```
C:\Users\Rafał\Desktop>java Main 8 0 6 5 4 7 2 3 1 8

Start state:
8 0 6
5 4 7
2 3 1

8 4 6
5 0 7
1 4 5
0 7 8

3 1 2
0 4 5
6 7 8

Final state:
0 1 2
3 4 5
6 7 8

Number of generated states: 9333
Number of moves: 41
Importance of h: 8

The correct path:
down left down right right up left left up right down down
right up up left down left down right up right down left
left up up right down left down right up up left down
right down left up up

C:\Users\Rafał\Desktop>
```

**(States between)**

**h**

When number of parameters is incorrect:

```
C:\Users\Rafał\Desktop>java Main 1 0 4 3

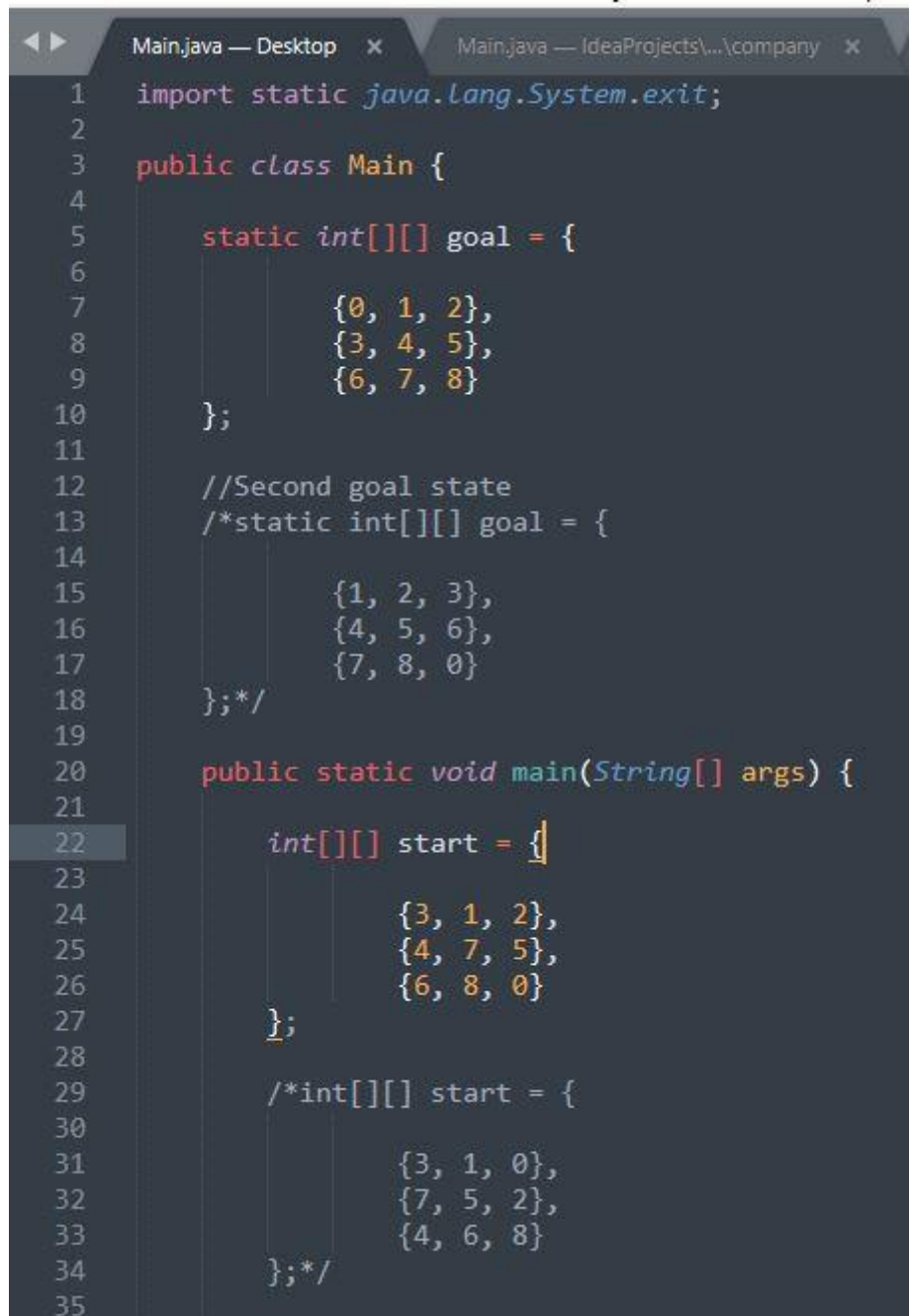
Wrong number of parameters (4). Try again.

C:\Users\Rafał\Desktop>
```

# Changes directly in the code

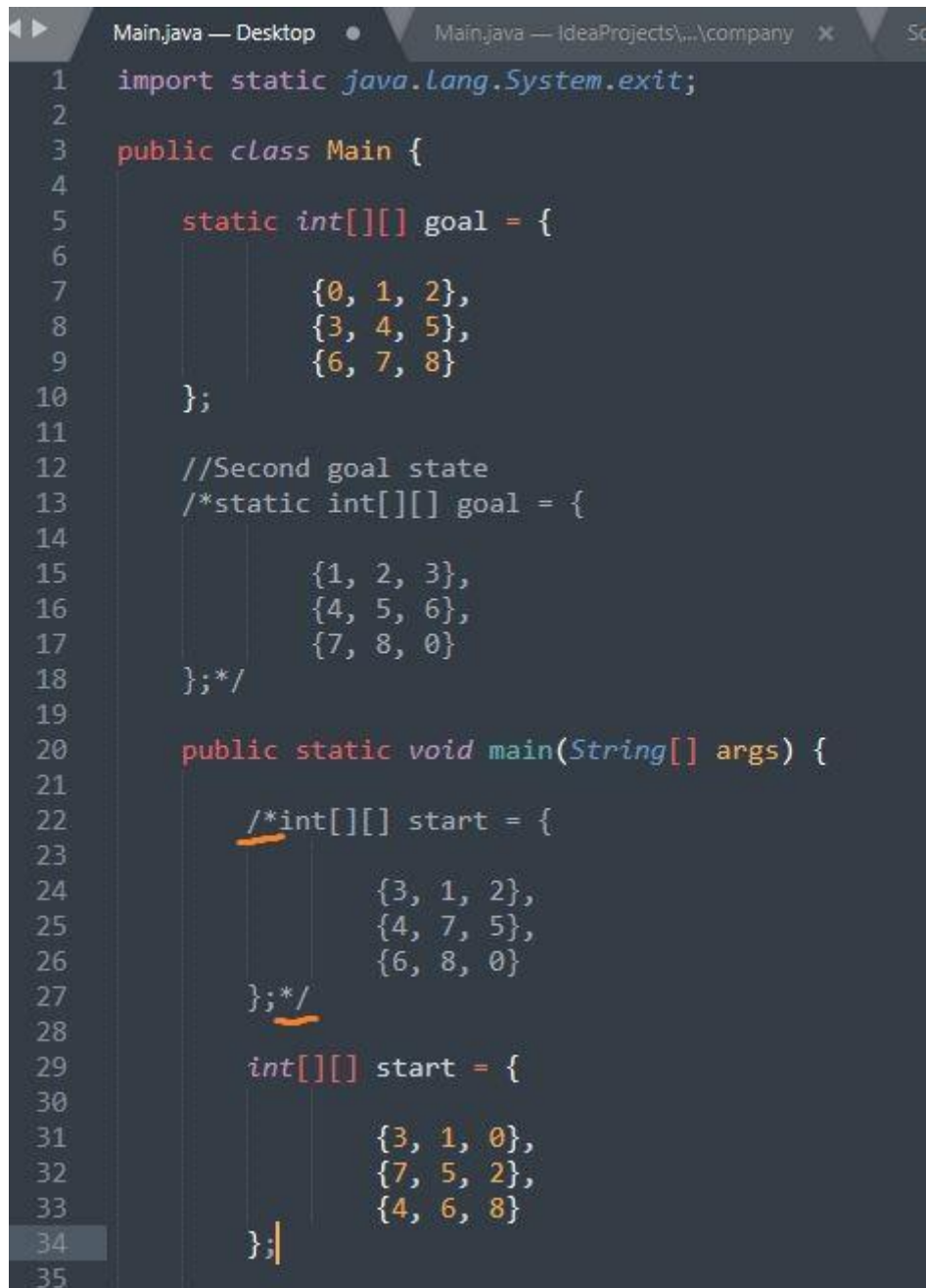
The other way to change value of start state, h but also the goal state is by doing it in the code.

Open file “Main.java” using any text editor (I recommend “sublime text”). Now you can change values by hand or use one of commented:



```
1  import static java.lang.System.exit;
2
3  public class Main {
4
5      static int[][] goal = {
6
7          {0, 1, 2},
8          {3, 4, 5},
9          {6, 7, 8}
10     };
11
12     //Second goal state
13     /*static int[][] goal = {
14
15         {1, 2, 3},
16         {4, 5, 6},
17         {7, 8, 0}
18     };*/
19
20     public static void main(String[] args) {
21
22         int[][] start = {
23
24             {3, 1, 2},
25             {4, 7, 5},
26             {6, 8, 0}
27         };
28
29         /*int[][] start = {
30
31             {3, 1, 0},
32             {7, 5, 2},
33             {4, 6, 8}
34         };*/
35     }
```

When uncommenting one state, remember to comment the previous one:



```
1  import static java.lang.System.exit;
2
3  public class Main {
4
5      static int[][] goal = {
6
7          {0, 1, 2},
8          {3, 4, 5},
9          {6, 7, 8}
10     };
11
12     //Second goal state
13     /*static int[][] goal = {
14
15         {1, 2, 3},
16         {4, 5, 6},
17         {7, 8, 0}
18     };*/
19
20     public static void main(String[] args) {
21
22         /*int[][] start = {
23
24             {3, 1, 2},
25             {4, 7, 5},
26             {6, 8, 0}
27         };*/
28
29         int[][] start = {
30
31             {3, 1, 0},
32             {7, 5, 2},
33             {4, 6, 8}
34         };
35     }
```



There are 3 most difficult start states:

```
//          9 importance - 41 moves - 16.000 states,
//          8 - 41 - 9.000, 7 - 41 - 20.000,
//          6 - 33 - 25.000, 5 - 38 - 80.000,
//          4 - 33 - 143.000, 3 - 33 - 252.000
//
/*int[][] start = {
    {8, 0, 6},
    {5, 4, 7},
    {2, 3, 1}
};*/

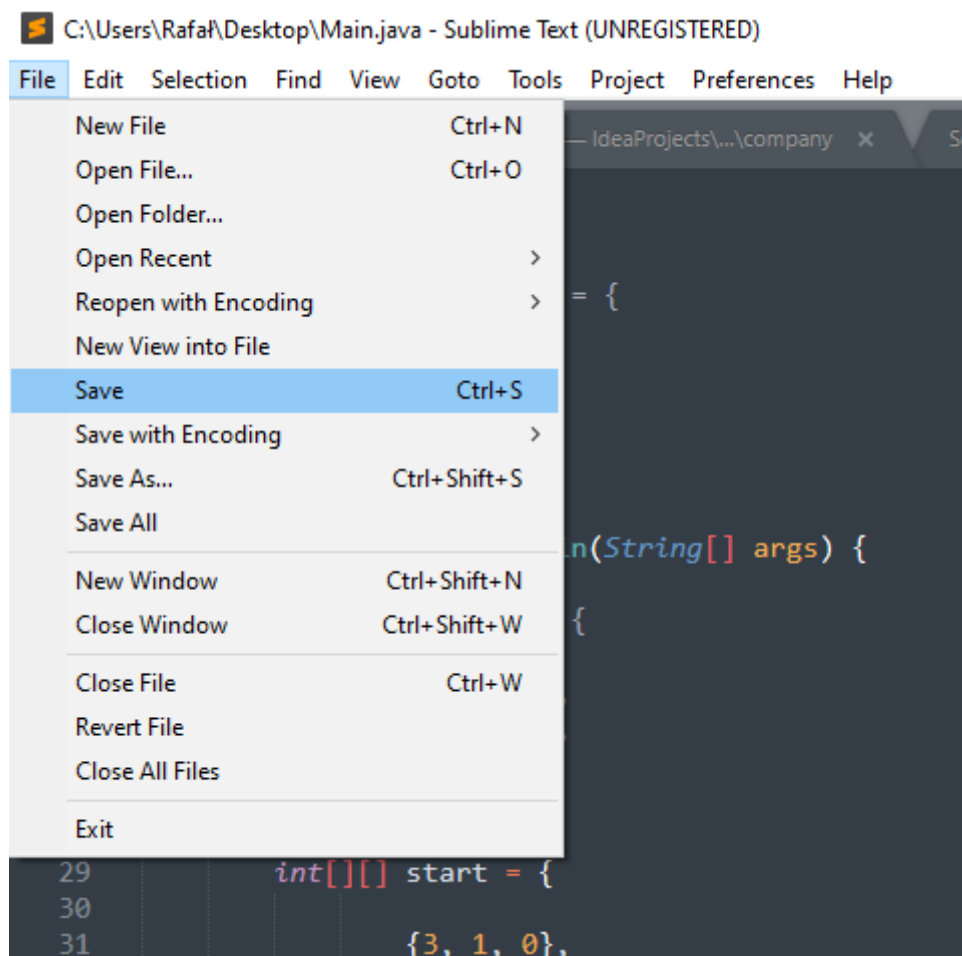
//          9 importance - 41 moves - 16.000 states,
//          8 - 41 - 9.000, 7 - 41 - 20.000,
//          6 - 33 - 23.000, 5 - 37 - 75.000,
//          4 - 33 - 159.000, 3 - 33 - 275.000
//
/*int[][] start = {
    {8, 7, 6},
    {0, 4, 1},
    {2, 5, 3}
};*/

//The hardest 8-Puzzle state for second goal state
//Remember to change the goal state!
/*
int[][] start = {
    {8, 6, 7},
    {2, 5, 4},
    {3, 0, 1}
};*/

int importanceH= 1; //      CHANGE IT IF YOU ARE USING DIFFICULT STARTING STATES
```

There are examples for the results of those states. For example: when you take middle start state and set “importanceH” = 5. The answer should take 37 moves and the number of generated states is around 75 thousand.

Now when everything is set, it's time save changes in the text editor:



Compile file "Main.java" ones again:

```
C:\Users\Rafał\Desktop>javac Main.java
C:\Users\Rafał\Desktop>
```

Run:

```
C:\Users\Rafał\Desktop>java Main
Start state:
3 1 0
7 5 2
```