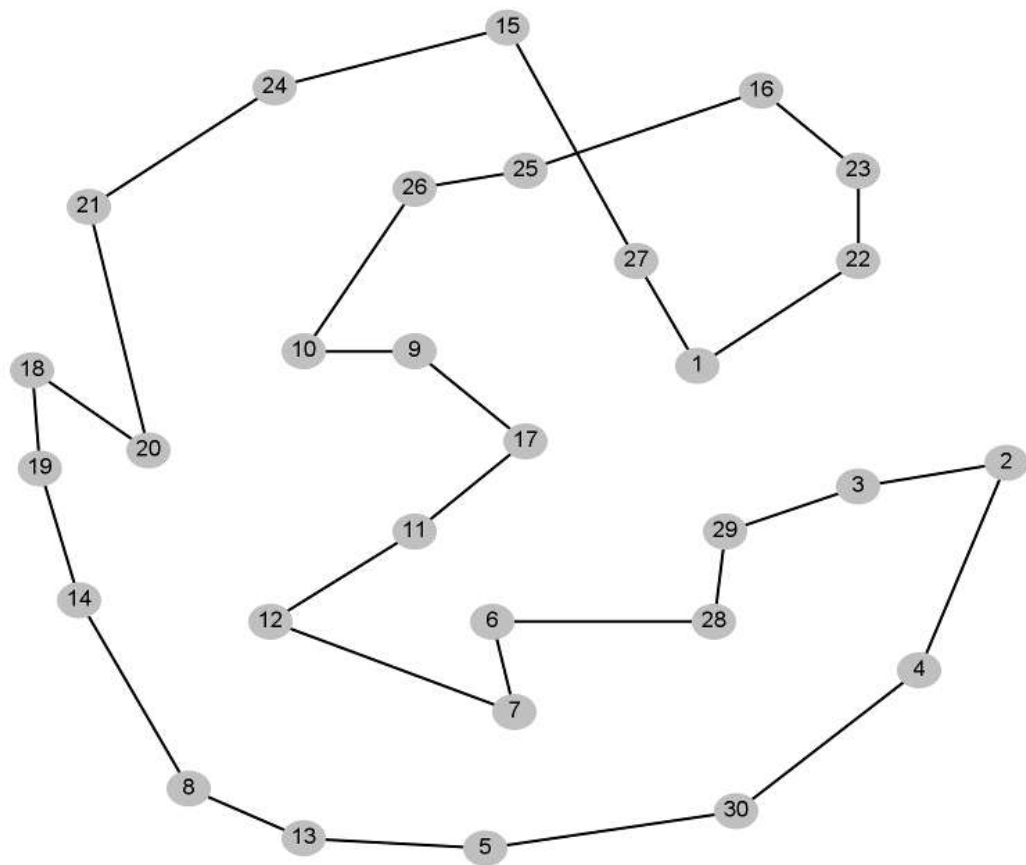


References:Wikipedia ,chatgpt.

best ant colony hyperparameters (maximum iteration count=100, ant count per iteration=50, degradation factor=0.9, alpha=0.8, beta=1.5, initial pheromone intensity=0.1, and Q value=0.0001)

Using antcolony method means less time consuming which is really important but some times it's results can be a little bit different from true values.



```

input04.txt  ≡  input01.txt

> or
in the gutter.

VALUE;

ializes a list for brute force algorithm.

s holds time.

yList<>();

//this reads txt file to access coordinates

```

```

C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\IntelliJ IDEA 2023.3.4\lib\idea_rt.jar=51914:C:\Users\ACER\Desktop\IntelliJ IDEA 2023.3.4\bin" -jar C:\Users\ACER\Desktop\IntelliJ IDEA 2023.3.4\bin\idea_rt.jar 51914
Method: Antcolony Method
Shortest Distance: 5.137171704811402
Shortest Path: [1, 22, 23, 16, 25, 26, 10, 9, 17, 11, 12, 7, 6, 28, 29, 3, 2, 4, 30, 5, 13, 8, 14, 19, 18, 20, 21, 24, 15, 27, 1]
Time it takes to find the shortest path: 1,43 seconds.

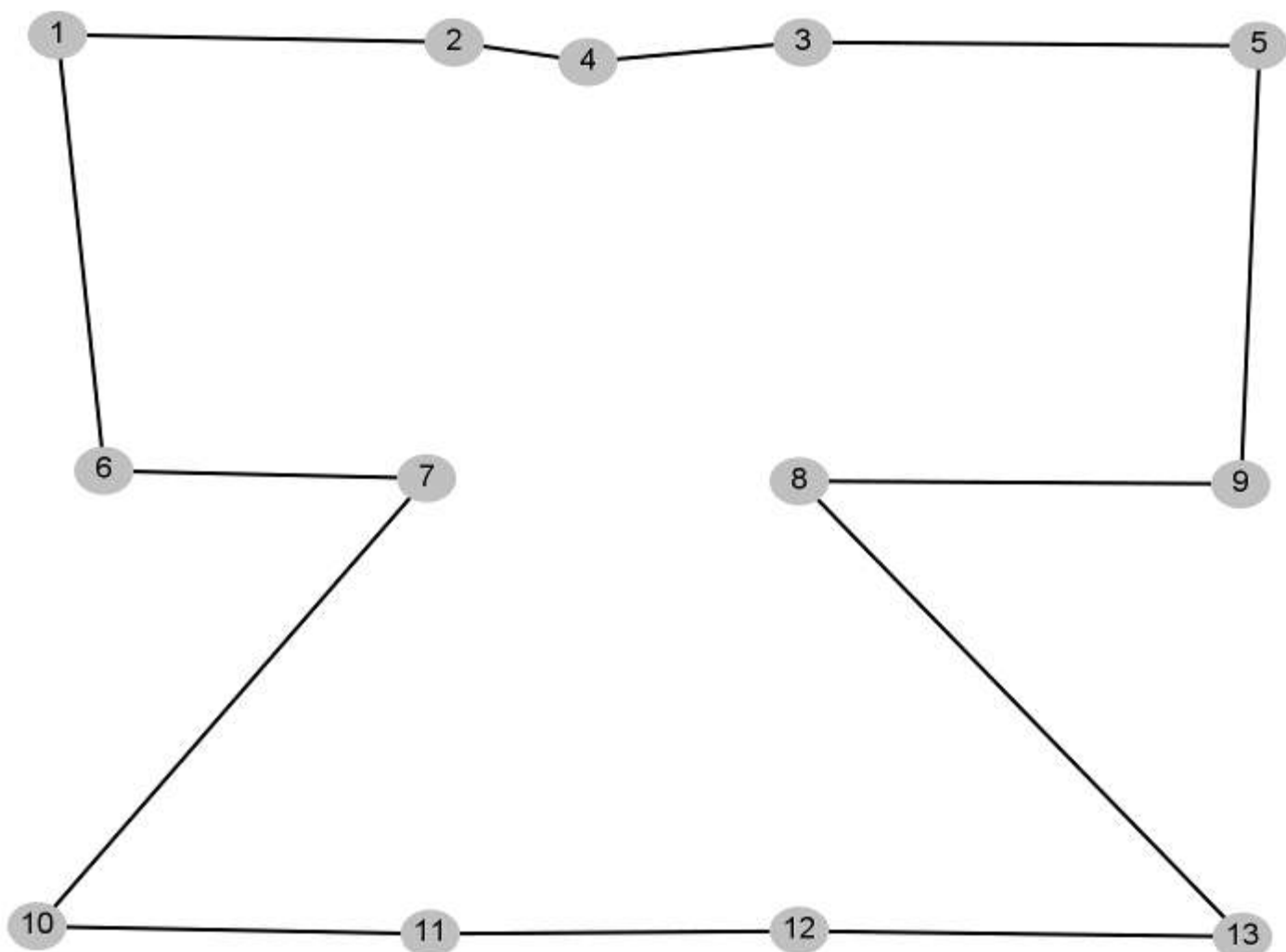
```



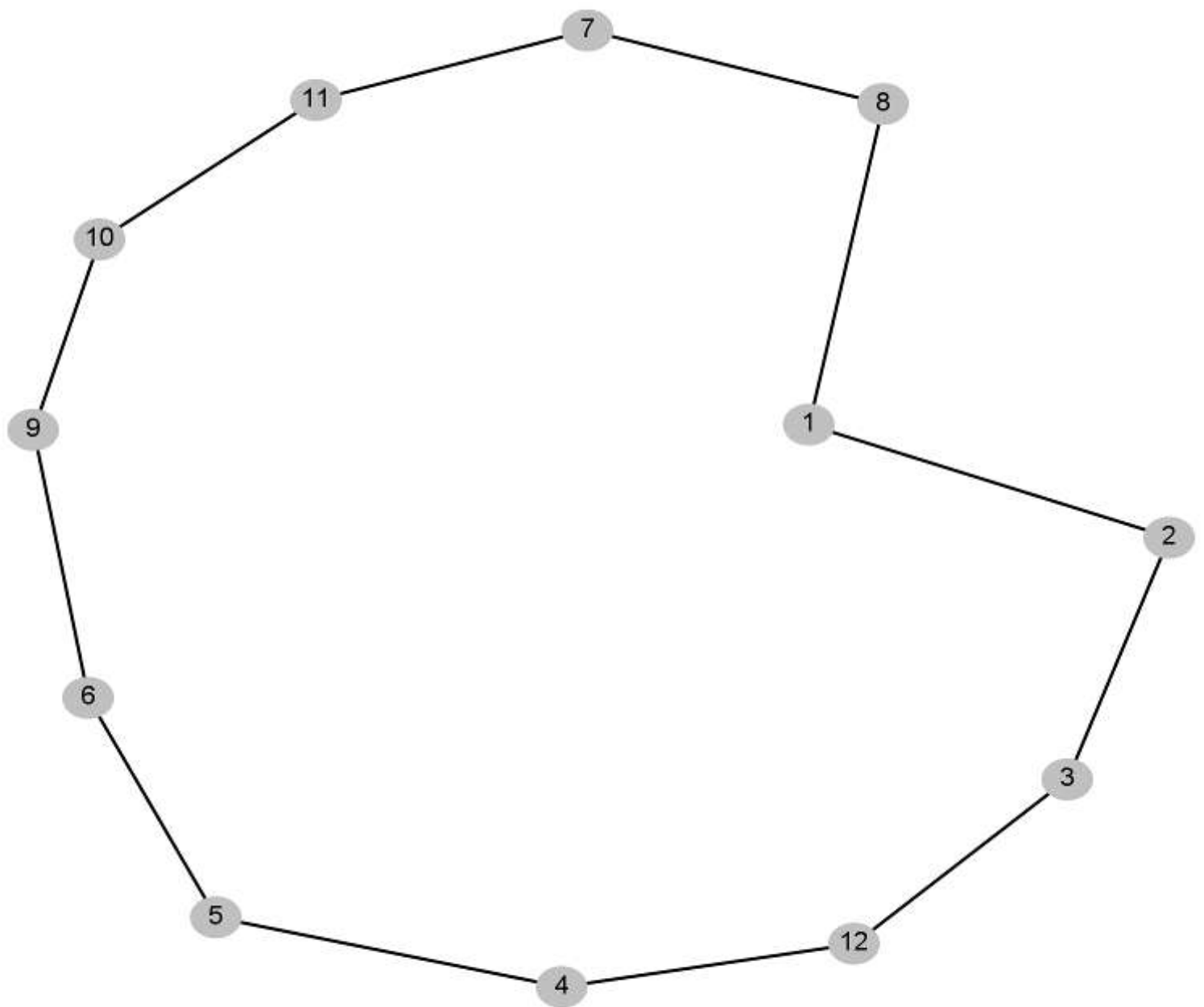
—

1

Time it takes to find the shortest path: 1,03 seconds.



```
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\Intelli
Method: Antcolony Method
Shortest Distance: 3.802919361826042
Shortest Path: [1, 2, 4, 3, 5, 9, 8, 13, 12, 11, 10, 7, 6, 1]
Time it takes to find the shortest path: 0,83 seconds.
```



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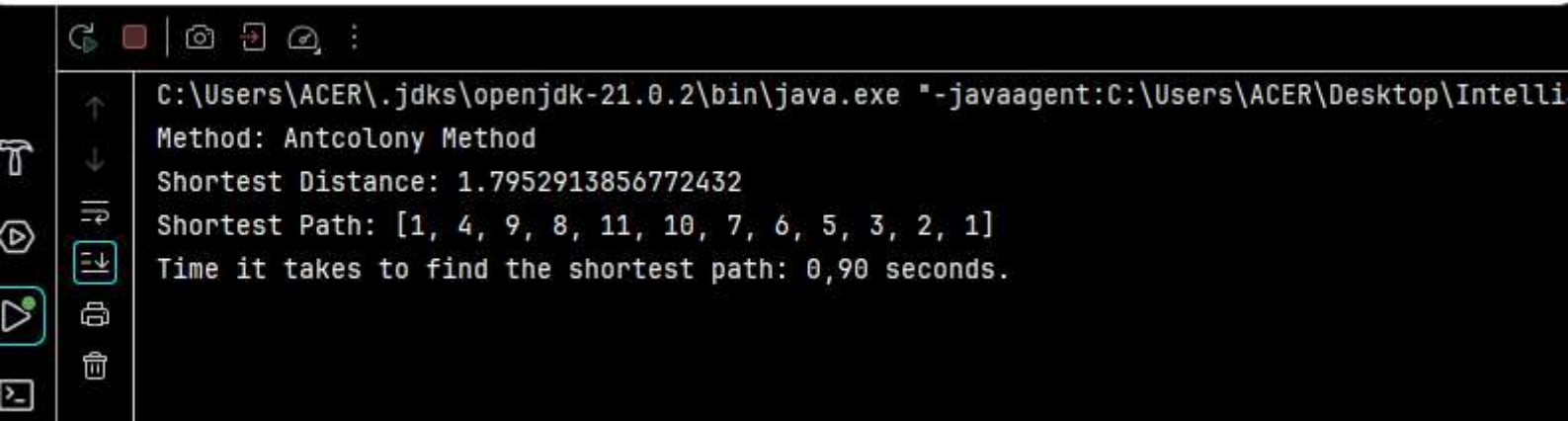
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\Intelli

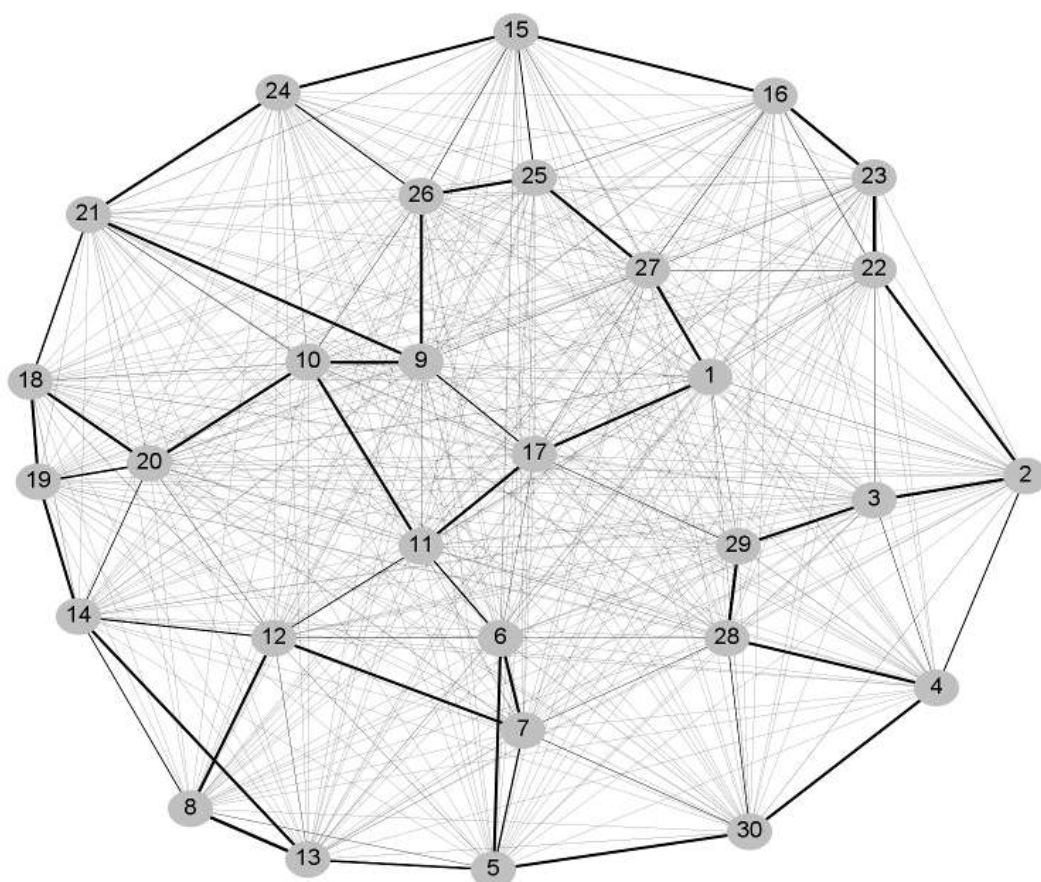
Method: Antcolony Method

Shortest Distance: 2.935877143237598

Shortest Path: [1, 8, 7, 11, 10, 9, 6, 5, 4, 12, 3, 2, 1]

Time it takes to find the shortest path: 0,84 seconds.





04.txt ≡ input01.txt

ialies a list for brute force algorithm.

is holds time.

byList<>());

//this reads txt file to access coordinat

yList<>());

0]]);

1]]);

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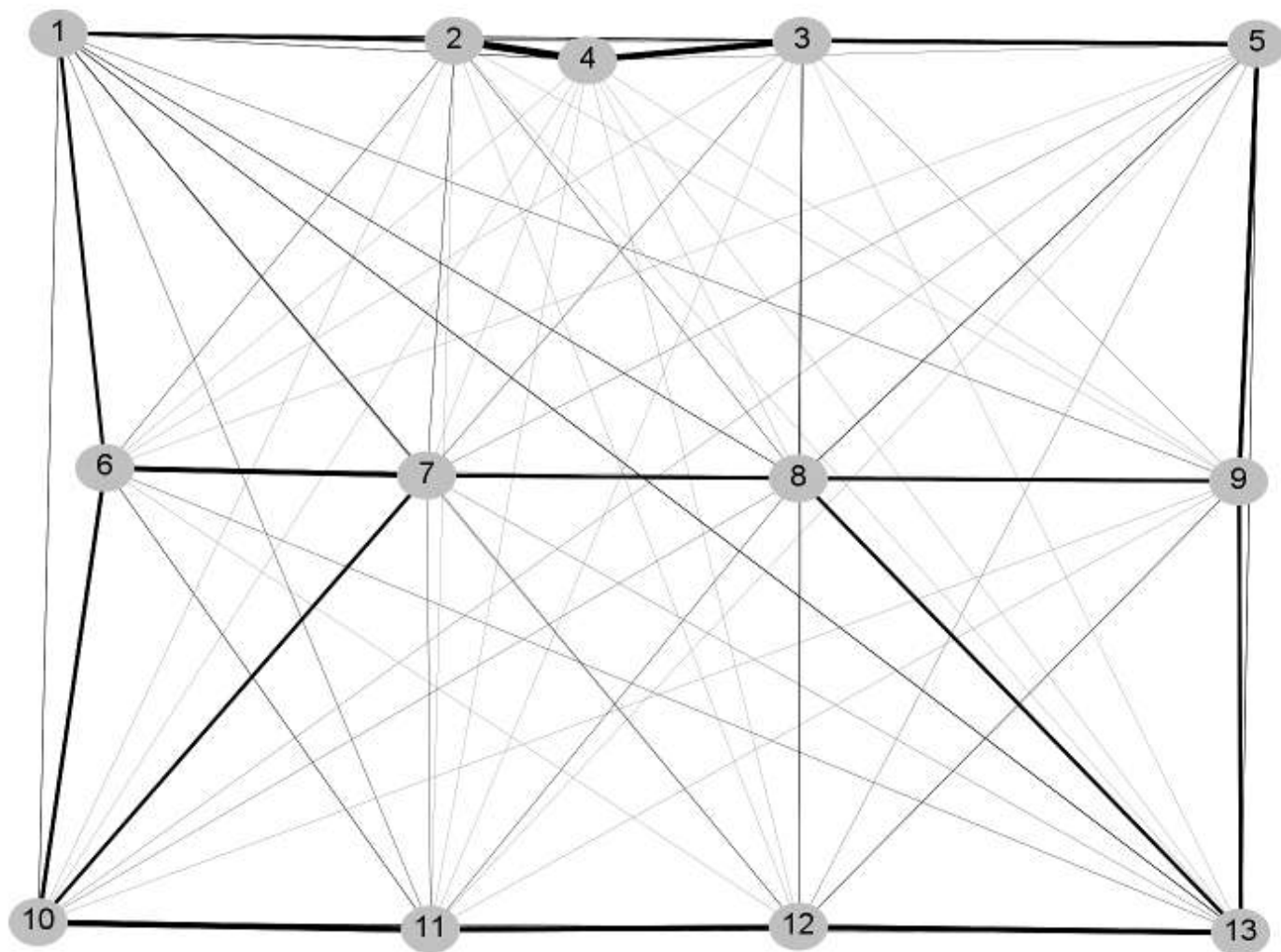
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\IntelliJ IDEA 2023.3.4\lib\idea_rt.jar=50714:C:\U

Method: Antcolony Method

Shortest Distance: 5.421806100482084

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

Time it takes to find the shortest path: 6,35 seconds.



File Edit View Settings Run Debug Tools Window Help

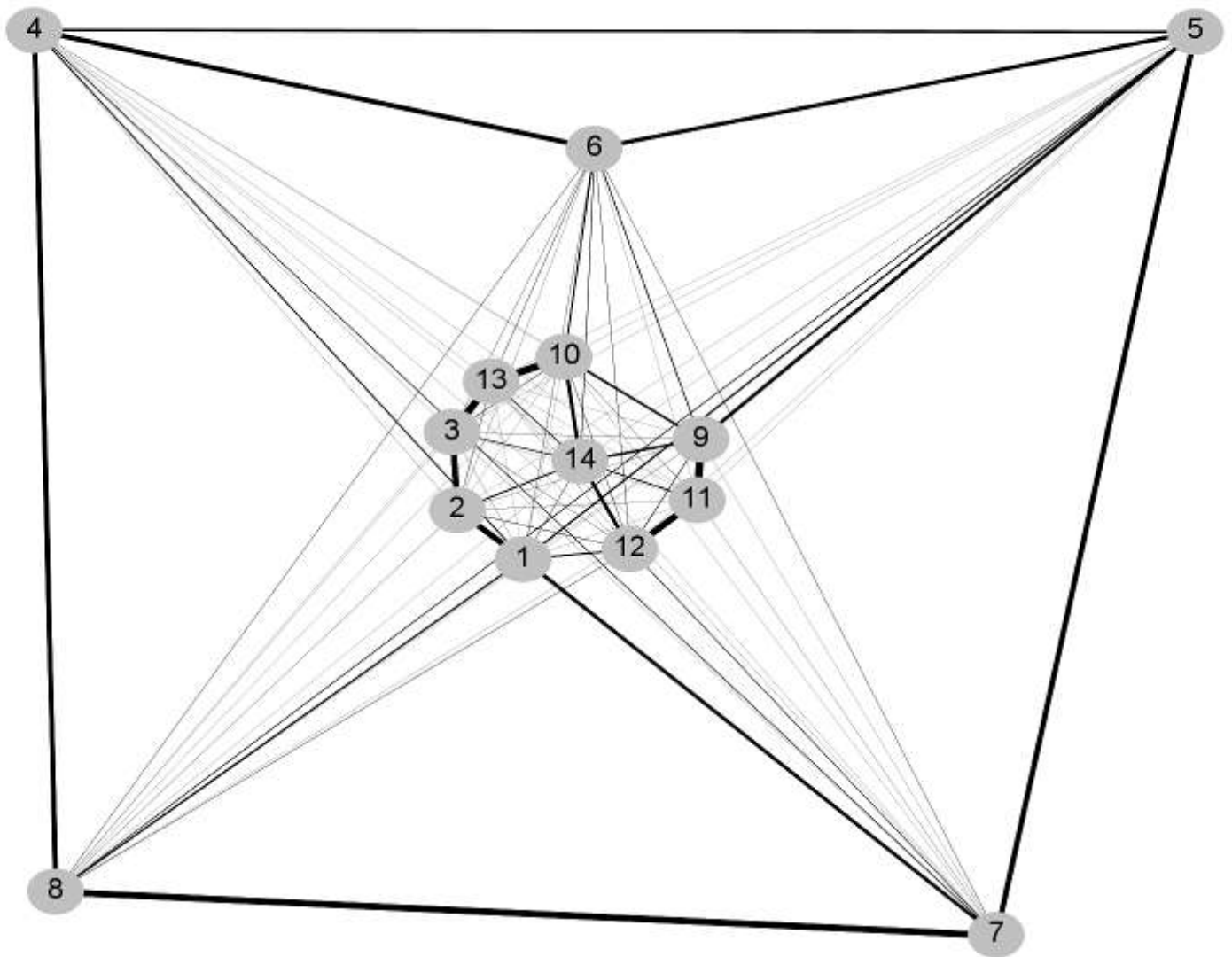
```
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\IntelliJ\lib\idea_rt.jar=12345:C:\Users\ACER\Desktop\IntelliJ\bin" -Dfile.encoding=UTF-8
```

```
Method: Antcolony Method
```

```
Shortest Distance: 3.802919361826042
```

```
Shortest Path: [1, 2, 4, 3, 5, 9, 8, 13, 12, 11, 10, 7, 6, 1]
```

```
Time it takes to find the shortest path: 1,86 seconds.
```

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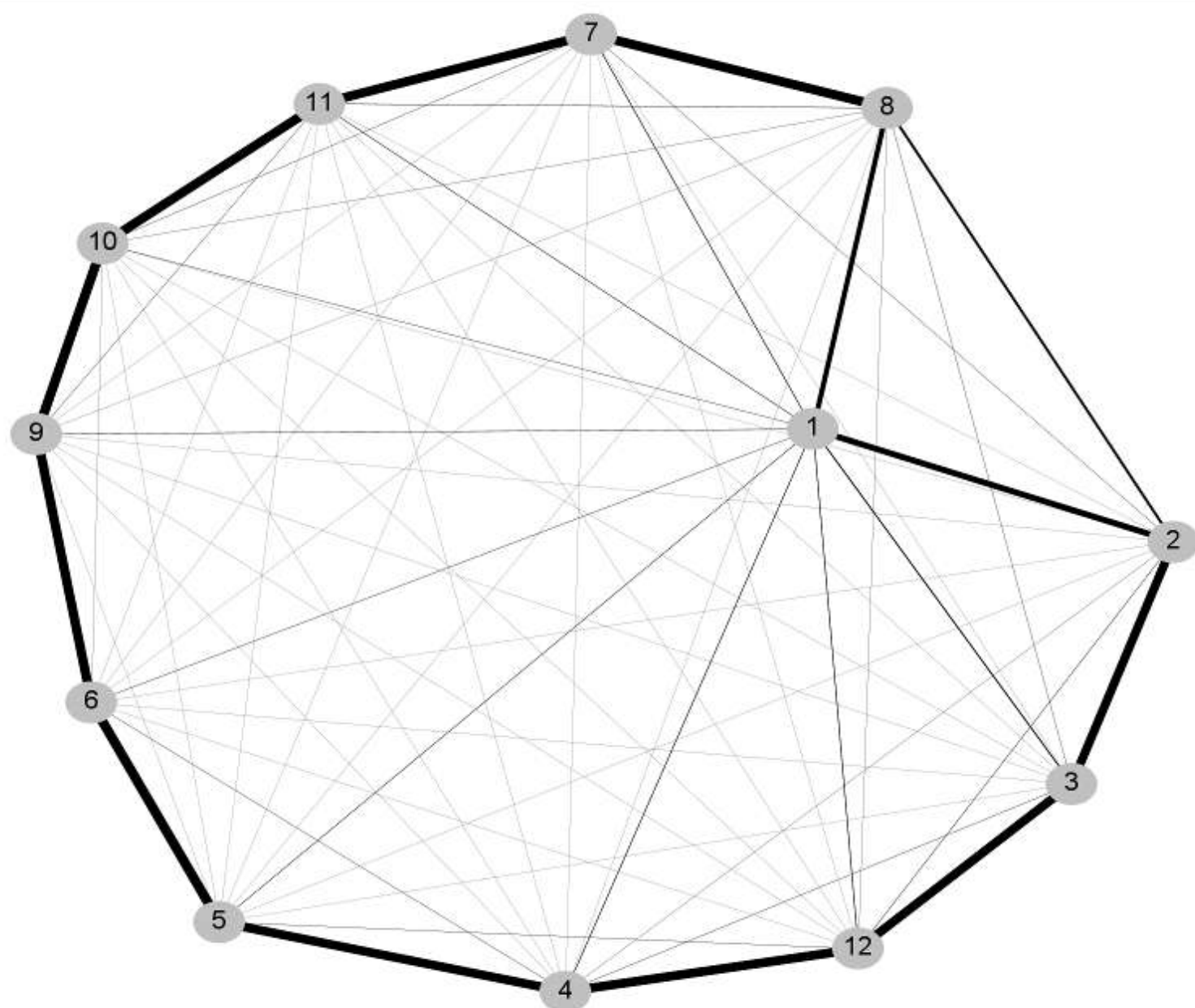
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe -javaagent:C:\Users\ACER\Desktop\Intelli.

Method: Antcolony Method

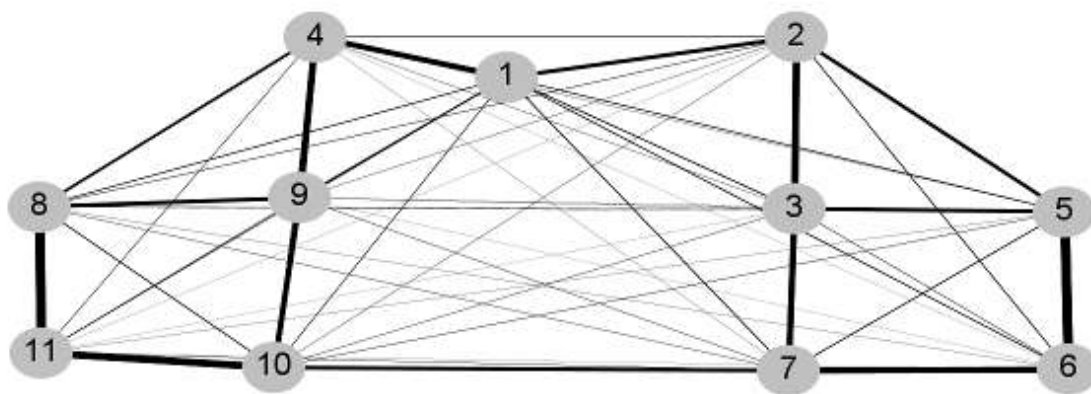
Shortest Distance: 3.7371379170255183

Shortest Path: [1, 2, 3, 13, 10, 14, 12, 11, 9, 5, 6, 4, 8, 7, 1]

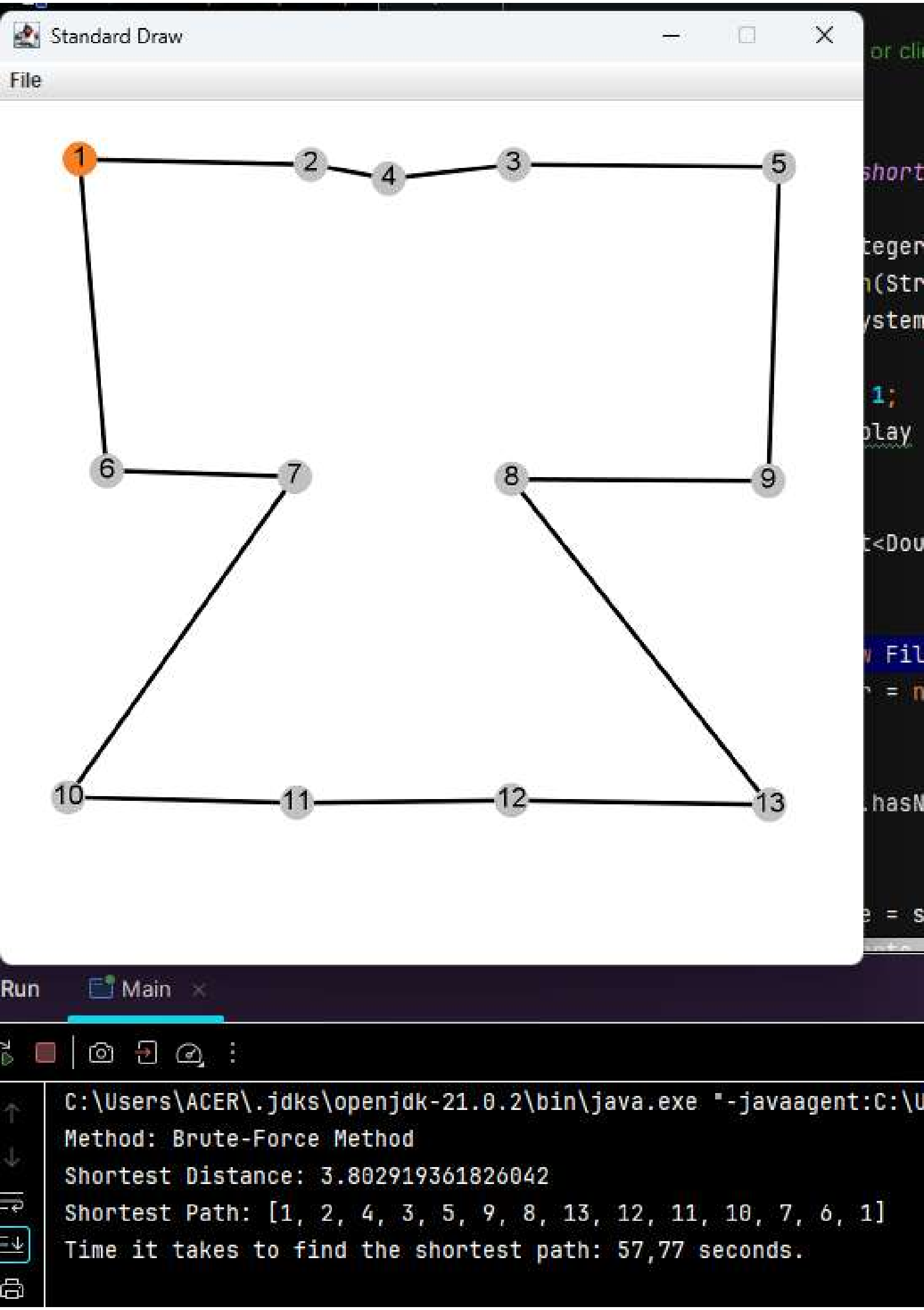
Time it takes to find the shortest path: 1,99 seconds.

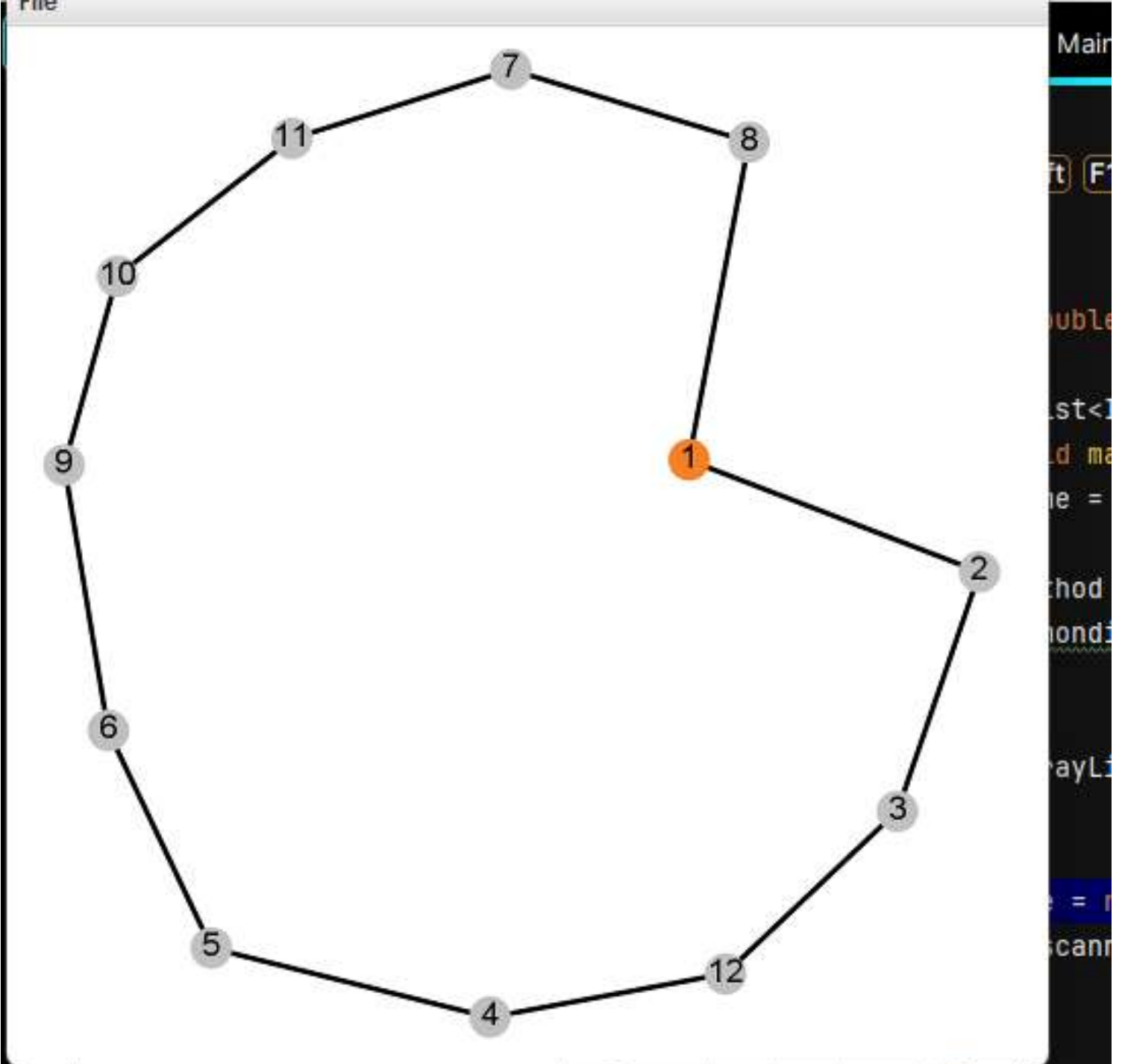


```
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\Intelli
Method: Antcolony Method
Shortest Distance: 2.935877143237598
Shortest Path: [1, 8, 7, 11, 10, 9, 6, 5, 4, 12, 3, 2, 1]
Time it takes to find the shortest path: 1,76 seconds.
```



```
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent:C:\Users\ACER\Desktop\Intelli.  
Method: Antcolony Method  
Shortest Distance: 1.7952913856772432  
Shortest Path: [1, 4, 9, 8, 11, 10, 7, 6, 5, 3, 2, 1]  
Time it takes to find the shortest path: 1,60 seconds.
```





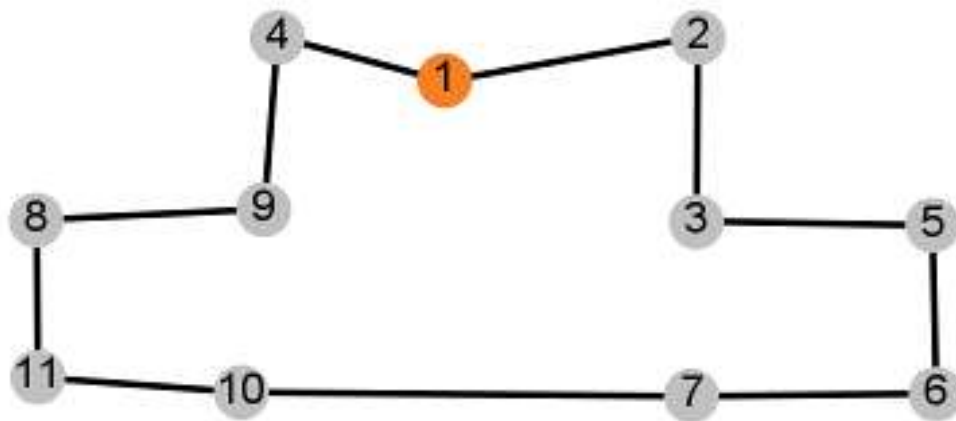
```
27
28
29
30
31
```

while (scanned
String l1
String l2

Run Main x

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```
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-javaagent  
Method: Brute-Force Method  
Shortest Distance: 2.935877143237598  
Shortest Path: [1, 8, 7, 11, 10, 9, 6, 5, 4, 12, 3, 2, 1]  
Time it takes to find the shortest path: 4,84 seconds.
```

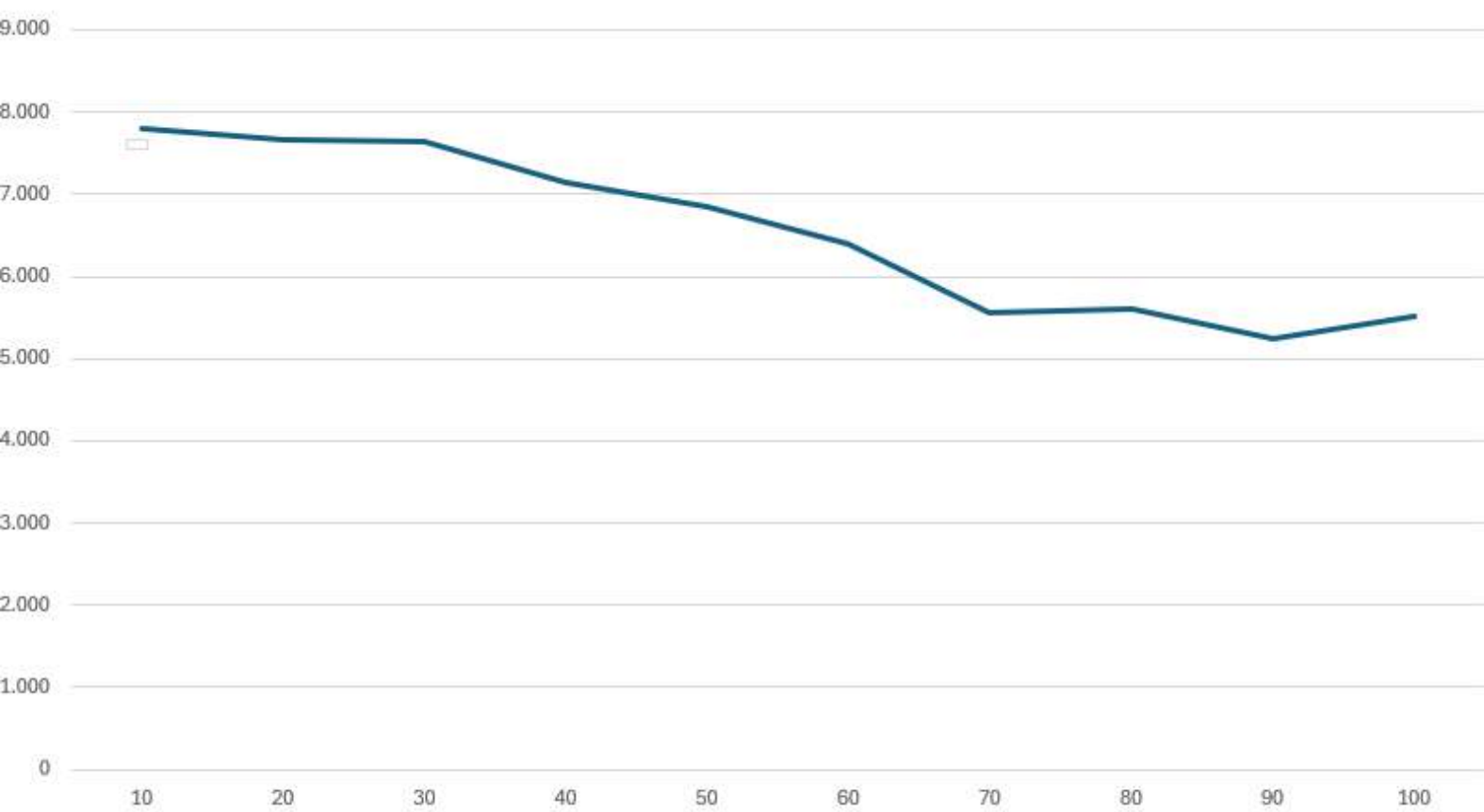



Run Main x



```
C:\Users\ACER\.jdk\openjdk-21.0.2\bin\java.exe "-java
Method: Brute-Force Method
Shortest Distance: 1.7952913856772432
Shortest Path: [1, 4, 9, 8, 11, 10, 7, 6, 5, 3, 2, 1]
Time it takes to find the shortest path: 0,59 seconds.
```


Shortest path distance



<u>Input File</u>	<u>Number of Houses+Migrants</u>	<u>Brute-Force Time (seconds)</u>	<u>Ant Colony Time (seconds)</u>	<u>Speed Up Factor</u>
Input01.txt	11	0,57 <u>Distance:</u> 1.7952913856772432	0,77 <u>Distance:</u> 1.7952913856772432	1,37 times slower
Input02.txt	12	5,14 <u>Distance:</u> 2.935877143237598	0,84 <u>Distance:</u> 2.935877143237598	6,11 times faster
Input03.txt	13	58,71 <u>Distance:</u> 3.802919361826042	0,84 <u>Distance:</u> 3.802919361826042	69 times faster
Input04.txt	14	9000 <u>Distance:</u> 3.7371379170255183	0,91 <u>Distance:</u> 3.7371379170255183	9.890 times faster
Input05.txt	30		1,36 <u>Distance:</u> 5.412442020047719	