The Government of the Russian Federation

The Federal State Autonomous Institution of Higher Education "National Research University - Higher School of Economics"

National Research University «Higher School of Economics»

Faculty of Information Technology and Computer Engineering
Department of Computer Systems and Networks

Course title: Network computing

Practical training № 1. Language Basics.

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Practical training № 1. Language Basics.

Goal (цель):

1. Find ‘z’ of the function given below. Check the occurrence of solutions.
2. Tabulate the function.

Variant: (вариант): #13

$$z_i = \frac{\sin\alpha + \cos(2\beta - \alpha)}{\cos\alpha - \sin(2\beta - \alpha)}$$

Listings (листинги) **and Figures** (рисунки):

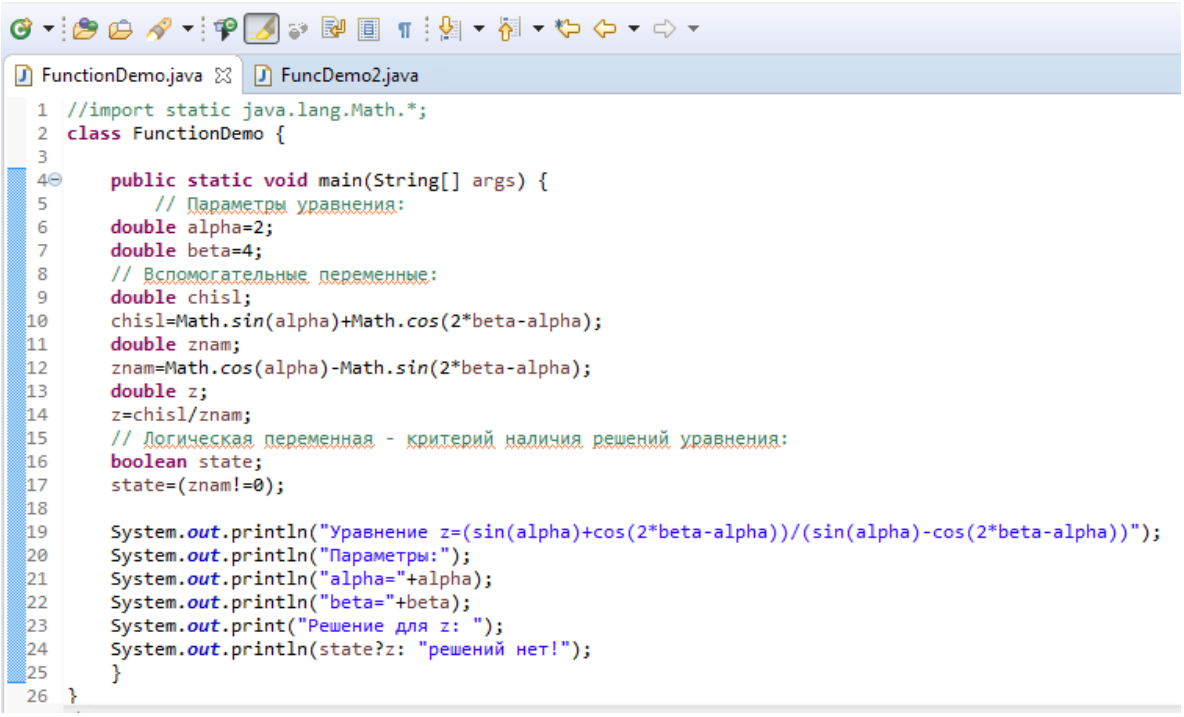
Listing 1 (Goal 1).

```
class FunctionDemo {

	public static void main(String[] args) {
		// Параметры уравнения:
	double alpha=2;
	double beta=4;
	// Вспомогательные переменные:
	double chisl;
	chisl=Math.sin(alpha)+Math.cos(2*beta-alpha);
	double znam;
	znam=Math.cos(alpha)-Math.sin(2*beta-alpha);
	double z;
	z=chisl/znam;
	// Логическая переменная - критерий наличия решений уравнения:
	boolean state;
	state=(znam!=0);

	System.out.println("Уравнение z=(sin(alpha)+cos(2*beta-alpha))/(sin(alpha)-
cos(2*beta-alpha))");
	System.out.println("Параметры:");
	System.out.println("alpha="+alpha);
	System.out.println("beta="+beta);
	System.out.print("Решение для z: ");
	System.out.println(state?z: "решений нет!");
	}
	}
```

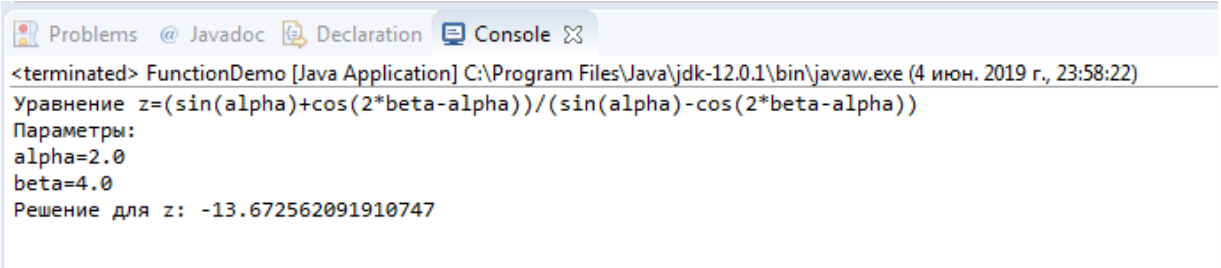
Figure 1.1. Listing (Goal 1).



FunctionDemo.java | FuncDemo2.java

```
1  //import static java.lang.Math.*;
2  class FunctionDemo {
3
4      public static void main(String[] args) {
5          // Параметры уравнения:
6      double alpha=2;
7      double beta=4;
8      // Вспомогательные переменные:
9      double chisl;
10     chisl=Math.sin(alpha)+Math.cos(2*beta-alpha);
11     double znam;
12     znam=Math.cos(alpha)-Math.sin(2*beta-alpha);
13     double z;
14     z=chisl/znam;
15     // Логическая переменная - критерий наличия решений уравнения:
16     boolean state;
17     state=(znam!=0);
18
19     System.out.println("Уравнение z=(sin(alpha)+cos(2*beta-alpha))/(sin(alpha)-cos(2*beta-alpha))");
20     System.out.println("Параметры:");
21     System.out.println("alpha="+alpha);
22     System.out.println("beta="+beta);
23     System.out.print("Решение для z: ");
24     System.out.println(state?z: "решений нет!");
25     }
26 }
```

Figure 1.2 Results (Goal 1).



Problems | Javadoc | Declaration | Console

```
<terminated> FunctionDemo [Java Application] C:\Program Files\Java\jdk-12.0.1\bin\javaw.exe (4 июн. 2019 г., 23:58:22)
Уравнение z=(sin(alpha)+cos(2*beta-alpha))/(sin(alpha)-cos(2*beta-alpha))
Параметры:
alpha=2.0
beta=4.0
Решение для z: -13.672562091910747
```

Listing 2 (Goal 2).

```
class FuncDemo2 {

	public static void main(String[] args) {
		// TODO Auto-generated method stub
		System.out.println("Уравнение z=(sin(alpha)+cos(2*beta-
alpha))/(sin(alpha)-cos(2*beta-alpha))");
		for (double alpha=10, beta=22; alpha < 120 ; alpha+=10, beta+=10) {
		double chisl;
		chisl=Math.sin(alpha)+Math.cos(2*beta-alpha);
		double znam;
		znam=Math.cos(alpha)-Math.sin(2*beta-alpha);
		double z;
		z=chisl/znam;
		// Логическая переменная - критерий наличия решений уравнения:
		boolean state;
		state=(znam!=0);
		System.out.println("Параметры:");
		System.out.println("alpha="+alpha);
```

```
            System.out.println("beta="+beta);
            System.out.print("Решение для z: ");
            System.out.println(state?z: "решений нет!");
        }
        }
}
```

Figure 2.1. Listing (Goal 2).

FunctionDemo.java | FuncDemo2.java

```
1
2  class FuncDemo2 {
3
4      public static void main(String[] args) {
5          // TODO Auto-generated method stub
6          System.out.println("Уравнение z=(sin(alpha)+cos(2*beta-alpha))/(sin(alpha)-cos(2*beta-alpha))");
7          for (double alpha=10, beta=22; alpha < 120 ; alpha+=10, beta+=10) {
8          double chisl;
9          chisl=Math.sin(alpha)+Math.cos(2*beta-alpha);
10         double znam;
11         znam=Math.cos(alpha)-Math.sin(2*beta-alpha);
12         double z;
13         z=chisl/znam;
14         // Логическая переменная - критерий наличия решений уравнения:
15         boolean state;
16         state=(znam!=0);
17         System.out.println("Параметры:");
18         System.out.println("alpha="+alpha);
19         System.out.println("beta="+beta);
20         System.out.print("Решение для z: ");
21         System.out.println(state?z: "решений нет!");
22     }
23     }
24 }
```

Figure 2.2. Results (Goal 2).

Problems | Javadoc | Declaration | Console

```
<terminated> FuncDemo2 [Java Application] C:\Program Files\Java\jdk-12.0.1\bin\javaw.exe (4 июн. 2019 г., 23:58:39)
Уравнение z=(sin(alpha)+cos(2*beta-alpha))/(sin(alpha)-cos(2*beta-alpha))
Параметры:
alpha=10.0
beta=22.0
Решение для z: 1.017861415187022
Параметры:
alpha=20.0
beta=32.0
Решение для z: 4.8998101581335565
Параметры:
alpha=30.0
beta=42.0
Решение для z: -2.5487212299573994
Параметры:
alpha=40.0
beta=52.0
Решение для z: -0.7164436744454674
Параметры:
alpha=50.0
beta=62.0
Решение для z: -0.046488354740578726
Параметры:
alpha=60.0
beta=72.0
Решение для z: 0.5842620955975665
Параметры:
alpha=70.0
beta=82.0
Решение для z: 1.9843014099941831
```

(Figure 2.2. Continuation)

```
Параметры:
alpha=80.0
beta=92.0
Решение для z: -9.187659246169966
Параметры:
alpha=90.0
beta=102.0
Решение для z: -1.2274541668532954
Параметры:
alpha=100.0
beta=112.0
Решение для z: -0.32246499264154765
Параметры:
alpha=110.0
beta=122.0
Решение для z: 0.26954175171498096
```

Conclusions (выводы**):**

Variant 13 represents the trigonometric equation where *z* is considered unknown. Values for *alpha* and *beta* have been chosen beforehand for the Case 1 (goal 1). Additional variables *chisl* and *znam* were added to determine a numerator and a denominator of the function given. Boolean was included to define the state of the function results according to which the occurrence of solutions is possible only when the denominator is not equal to 0. Therefore, if it is equal to zero then there are no solutions to the function given. Additional variables also help to shorten the listing.

As for the Case 2 (goal 2), using the for-statement allows to calculate z according to the initialization (`double alpha=10, beta=22`), termination (`alpha < 120`) and increments (`alpha+=10, beta+=10`).

References:

- ‘Function’ project files
- Learning materials in LMS