

## Lab#15

### OPEN ENDED

The objective of this program is to create a **Math Quiz Game** for Kids that helps children practice basic math operations in a fun way. It also demonstrates the use of **multithreading**, **synchronization**, and **exception handling** in Java.

```
1 package interface1;
2 import java.util.Random;
3 import java.util.Scanner;
4 import java.util.concurrent.locks.Lock;
5 import java.util.concurrent.locks.ReentrantLock;
6
7 // ----- Base Class (Inheritance) -----
8 abstract class Question {
9     int a, b;
10    char operator;
11
12    Question(int a, int b, char operator) {
13        this.a = a;
14        this.b = b;
15        this.operator = operator;
16    }
17
18    abstract int getAnswer();
19
20    void displayQuestion() {
21        System.out.println("Question: " + a + " " + operator +
22    }
23 }
24
25 // ----- Child Classes -----
26 class Addition extends Question {
27     Addition(int a, int b) {
28         super(a, b, '+');
29     }
30
31     int getAnswer() {
32         return a + b;
33     }
34 }
35
36 class Subtraction extends Question {
37     Subtraction(int a, int b) {
38         super(a, b, '-');
39     }
40
41     int getAnswer() {
42         return a - b;
43     }
44 }
45
46 class Multiplication extends Question {
47     Multiplication(int a, int b) {
48         super(a, b, '*');
49     }
50
51     int getAnswer() {
52         return a * b;
53     }
54 }
55
56 class Division extends Question {
57     Division(int a, int b) {
58         super(a, b, '/');
59     }
60
61     int getAnswer() {
62         return a / b;
63     }
64 }
65
66 // ----- Score (Shared Resource) -----
67 class Score {
68     private int score = 0;
69     Lock lock = new ReentrantLock();
```

```

70     void increase() {
71         lock.lock();
72         try {
73             score++;
74         } finally {
75             lock.unlock();
76         }
77     }
78 }
79
80 int getScore() {
81     return score;
82 }
83 }
84
85 // ----- Thread Class -----
86 class QuizThread extends Thread {
87
88     Question question;
89     Score score;
90     Scanner sc;
91
92     QuizThread(Question question, Score score, Scanner sc) {
93         this.question = question;
94         this.score = score;
95         this.sc = sc;
96     }
97
98     public void run() {
99         try {
100             question.displayQuestion();
101             Thread.sleep(500);
102
103             System.out.print("Your Answer: ");
104             int userAnswer = sc.nextInt();
105
106             if (userAnswer == question.getAnswer()) {
107                 System.out.println("Correct 🎉");
108                 score.increase();
109             } else {
110                 System.out.println("Wrong X Correct Answer is: " + question.getAnswer());
111             }
112
113             } catch (ArithmeticException e) {
114                 System.out.println("Error: Division by zero not allowed!");
115             } catch (Exception e) {
116                 System.out.println("Invalid input! Please enter numbers only.");
117                 sc.nextLine();
118             }
119         }
120     }
121
122 // ----- Main Class -----
123 public class Main {
124
125     public static void main(String[] args) {
126
127         Scanner sc = new Scanner(System.in);
128         Random rand = new Random();
129         Score score = new Score();
130
131         System.out.println("👋 Welcome to Math Quiz Game for Kids 👋\n");
132
133         for (int i = 1; i <= 5; i++) {
134
135             int a = rand.nextInt(10) + 1;
136             int b = rand.nextInt(10) + 1;
137             int type = rand.nextInt(4);
138
139             Question q;
140
141             switch (type) {
142                 case 0:
143                     q = new Addition(a, b);
144                     break;
145                 case 1:
146                     q = new Subtraction(a, b);
147                     break;
148                 case 2:
149                     q = new Multiplication(a, b);
150                     break;
151                 default:
152                     if (b == 0) b = 1;
153                     q = new Division(a, b);
154             }
155
156             QuizThread qt = new QuizThread(q, score, sc);
157             qt.start();
158
159             try {
160                 qt.join(); // wait for thread
161             } catch (InterruptedException e) {
162                 System.out.println("Thread interrupted");
163             }
164
165             System.out.println();
166         }
167
168         System.out.println("🏆 Final Score: " + score.getScore() + "/" + 5);
169         System.out.println("Game Over 🎮");
170         sc.close();
171     }
172 }

```

## Output:

```
🔊 Welcome to Math Quiz Game for Kids 🔊
```

```
Question:  $10 - 6 = ?$ 
```

```
Your Answer: 4
```

```
Correct ✅
```

```
Question:  $3 + 7 = ?$ 
```

```
Your Answer: 15
```

```
Wrong ❌ Correct Answer is: 10
```

```
Question:  $9 / 1 = ?$ 
```

```
Your Answer: 4
```

```
Wrong ❌ Correct Answer is: 9
```

## GitHub: