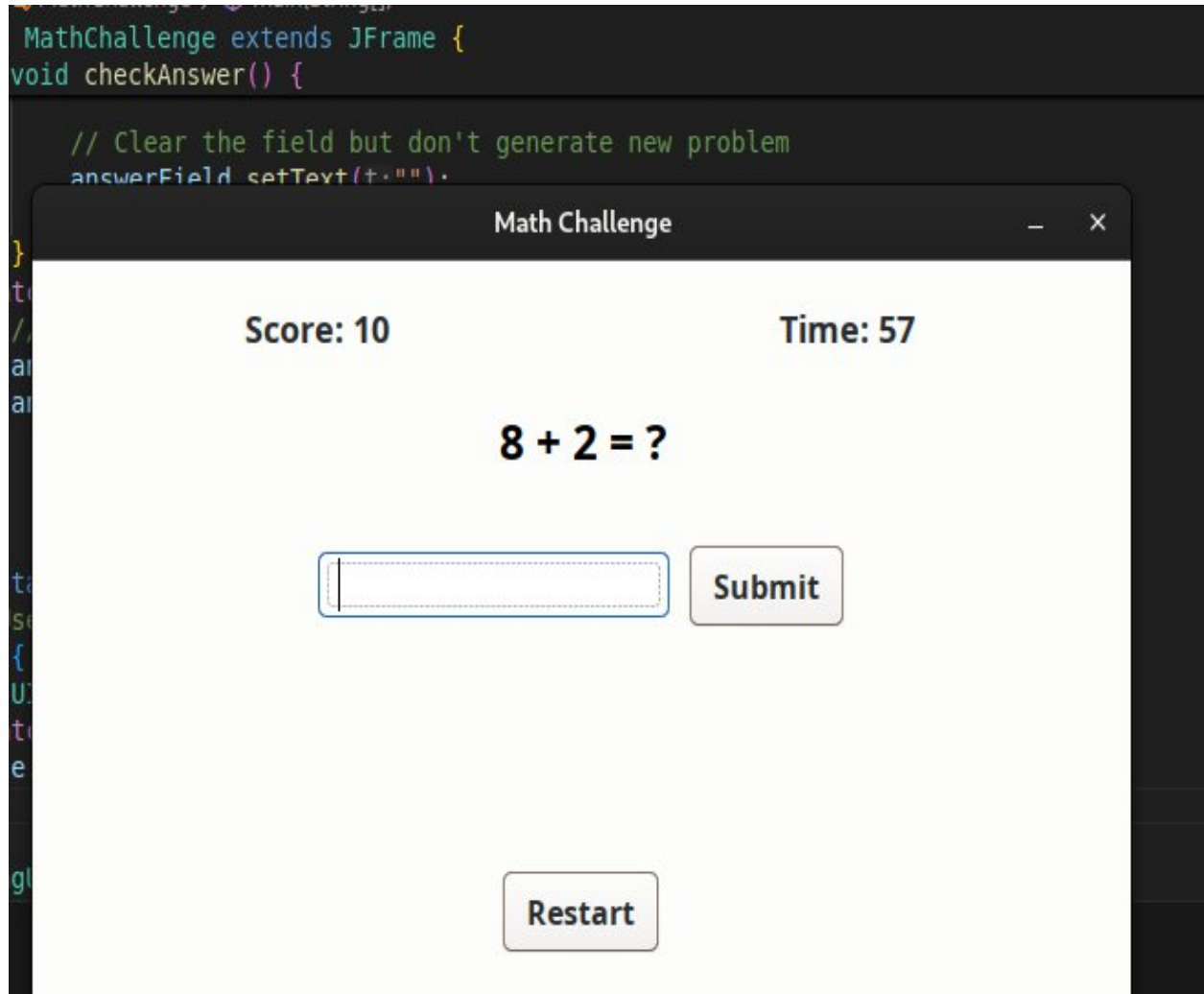
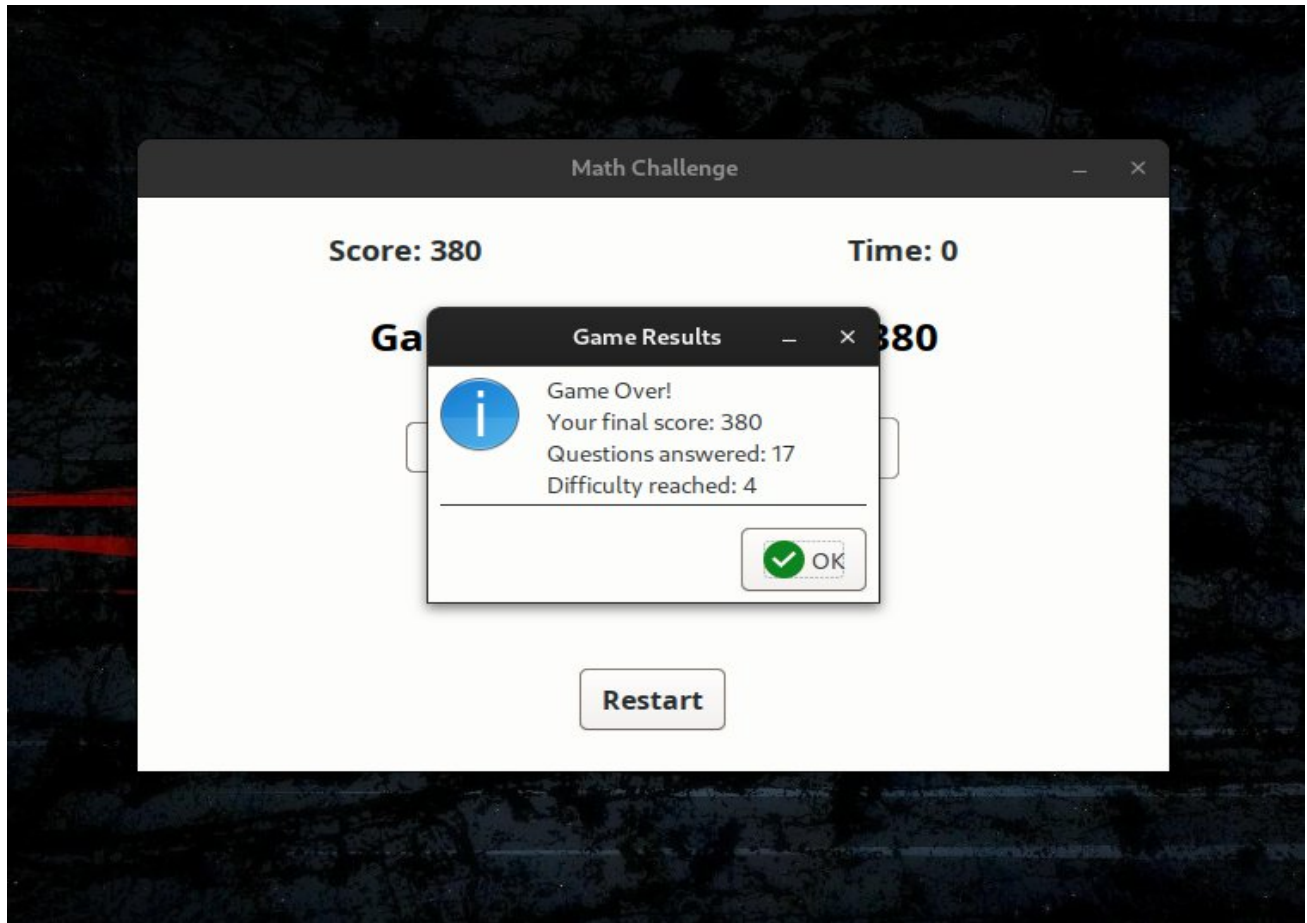


Math Challenge Game Development Documentation

Project Overview

The Math Challenge game is an educational application designed to help users practice basic math operations in an engaging, time-pressure environment. The game implements progressive difficulty levels and a scoring system to keep players motivated.





Development Process

Phase 1: Conceptualization

- Identified the need for an interactive math practice tool
- Defined core gameplay mechanics:
- Timed challenges
- Progressive difficulty
- Score-based rewards
- Determined target audience (students learning basic math operations)

```
J MathChallenge.java > MathChallenge > endGame()
1  import java.awt.*;
2  import java.awt.event.*;
3  import java.util.Random;
4  import javax.swing.*;
5  import javax.swing.border.EmptyBorder;
6
7  public class MathChallenge extends JFrame {
8      private JLabel problemLabel = new JLabel(text:"", JLabel.CENTER);
9      private JLabel scoreLabel = new JLabel(text:"Score: 0", JLabel.CENTER);
10     private JLabel timeLabel = new JLabel(text:"Time: 60", JLabel.CENTER);
11     private JTextField answerField = new JTextField(columns:10);
12     private JButton submitButton = new JButton(text:"Submit");
13     private JButton startButton = new JButton(text:"Start Game");
14
15     private int score = 0;
16     private int timeLeft = 60;
17     private int num1, num2, correctAnswer;
18     private Timer gameTimer;
19     private Random random = new Random();
20     private boolean gameRunning = false;
21     private int difficulty = 1;
22     private int questionCount = 0;
23
24     public MathChallenge() {
25         // Set up the frame
26         super(title:"Math Challenge");
27         setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
28         setSize(width:600, height:400);
29         setResizable(resizable:false);
30
31         // Create panels with spacing
32         JPanel mainPanel = new JPanel(new BorderLayout(hgap:10, vgap:10));
33         mainPanel.setBorder(new EmptyBorder(top:20, left:20, bottom:20, right:20));
34
35         JPanel topPanel = new JPanel(new GridLayout(rows:1, cols:2, hgap:20, vgap:0));
36
37         JPanel gamePanel = new JPanel(new GridLayout(rows:3, cols:1, hgap:0, vgap:20));
38         JPanel inputPanel = new JPanel(new FlowLayout(FlowLayout.CENTER, hgap:10, vgap:0));
39         JPanel controlPanel = new JPanel(new FlowLayout(FlowLayout.CENTER));
40
41         // Set up components
42         problemLabel.setFont(new Font(name:"Arial", Font.BOLD, size:24));
43         scoreLabel.setFont(new Font(name:"Arial", Font.BOLD, size:18));
44         timeLabel.setFont(new Font(name:"Arial", Font.BOLD, size:18));
45         answerField.setFont(new Font(name:"Arial", Font.PLAIN, size:18));
46         submitButton.setFont(new Font(name:"Arial", Font.BOLD, size:16));
47         startButton.setFont(new Font(name:"Arial", Font.BOLD, size:16));
48
49         // Make submit button initially disabled
50         submitButton.setEnabled(b:false);
51         answerField.setEnabled(enabled:false);
52
53         // Add components to panels
54         topPanel.add(scoreLabel);
55         topPanel.add(timeLabel);
56
57         inputPanel.add(answerField);
58         inputPanel.add(submitButton);
59
60         gamePanel.add(problemLabel);
61         gamePanel.add(inputPanel);
62
63         controlPanel.add(startButton);
64
65         // Add panels to main panel
66         mainPanel.add(topPanel, BorderLayout.NORTH);
67         mainPanel.add(gamePanel, BorderLayout.CENTER);
68     }
69 }
```

Phase 2: Design

- UI/UX planning:
- Created a clean, distraction-free interface
- Designed feedback mechanisms for correct/incorrect answers
- Planned visual hierarchy for information display
- Game mechanics design:

- Developed difficulty progression algorithm
- Created time bonus/penalty system
- Designed scoring formula based on difficulty

```

J MathChallenge.java > MathChallenge > endGame()
7 public class MathChallenge extends JFrame {
24 public MathChallenge() {
65 mainPanel.add(topPanel, BorderLayout.NORTH);
66 mainPanel.add(gamePanel, BorderLayout.CENTER);
67 mainPanel.add(controlPanel, BorderLayout.SOUTH);
68
69 // Add main panel to frame
70 add(mainPanel);
71
72 // Create the game timer (updates every second)
73 gameTimer = new Timer(delay:1000, new ActionListener() {
74 @Override
75 public void actionPerformed(ActionEvent e) {
76 timeLeft--;
77 timeLabel.setText("Time: " + timeLeft);
78
79 if (timeLeft <= 0) {
80 endGame();
81 }
82 }
83 });
84
85 // Add action listeners
86 startButton.addActionListener(new ActionListener() {
87 @Override
88 public void actionPerformed(ActionEvent e) {
89 startGame();
90 }
91 });
92
93 submitButton.addActionListener(new ActionListener() {
94 @Override
95 public void actionPerformed(ActionEvent e) {
96 checkAnswer();
97 }
98 });
99 }
100 }

Ln 140, Col 40 Spaces: 4 UTF-8 LF {} Java

J MathChallenge.java > MathChallenge > endGame()
7 public class MathChallenge extends JFrame {
150
151 private void generateProblem() {
152 // Generate numbers based on difficulty
153 int maxNumber = 10 * difficulty;
154 num1 = random.nextInt(maxNumber) + 1;
155 num2 = random.nextInt(maxNumber) + 1;
156
157 // Decide the operation based on difficulty
158 String operation = "+";
159 int operationType = 0;
160
161 if (difficulty >= 2) {
162 operationType = random.nextInt(bound:2); // 0 for addition, 1 for subtraction
163 operation = operationType == 0 ? "+" : "-";
164 }
165
166 if (difficulty >= 3) {
167 operationType = random.nextInt(bound:3); // Add multiplication
168 operation = operationType == 0 ? "+" : (operationType == 1 ? "-" : "x");
169 }
170
171 if (difficulty >= 5) {
172 operationType = random.nextInt(bound:4); // Add division
173 operation = operationType == 0 ? "+" : (operationType == 1 ? "-" :
174 (operationType == 2 ? "x" : "/"));
175
176 // For division, ensure it's a clean integer division
177 if (operationType == 3) {
178 num2 = random.nextInt(bound:10) + 1;
179 num1 = num2 * (random.nextInt(maxNumber / 2) + 1);
180 }
181 }
182 }
183 }

Ln 140, Col 40 Spaces: 4 UTF-8 LF {} Java

```



```
J MathChallenge.java > MathChallenge > endGame()
7 public class MathChallenge extends JFrame {
151 private void generateProblem() {
152     // Calculate the correct answer
153     switch (operation) {
184         case "+":
185             correctAnswer = num1 + num2;
186             break;
187         case "-":
188             // Ensure positive answer for subtraction
189             if (num1 < num2) {
190                 int temp = num1;
191                 num1 = num2;
192                 num2 = temp;
193             }
194             correctAnswer = num1 - num2;
195             break;
196         case "*":
197             correctAnswer = num1 * num2;
198             break;
199         case "/":
200             correctAnswer = num1 / num2;
201             break;
202     }
203
204     // Update problem label
205     problemLabel.setText(num1 + " " + operation + " " + num2 + " = ?");
206
207     // Clear answer field
208     answerField.setText("");
209 }
210
211 private void checkAnswer() {
212     if (!gameRunning) return;
213
214     try {
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- Developed scoring and difficulty progression

Phase 4: Testing

- Functionality testing:
- Verified correct answer validation
- Tested timer functionality
- Validated difficulty progression
- User experience testing:
- Assessed readability and visual feedback
- Evaluated game pacing and difficulty curve
- Tested input handling and error prevention

Phase 5: Refinement

- Performance optimization
- Visual polish and consistency
- Added game statistics summary upon completion

Technical Implementation

- **Language & Framework:** Java with Swing GUI toolkit
- **Architecture:** Object-oriented design with event-driven programming
- **Key Components:**
- Problem generation engine that scales with difficulty
- Timed game loop with visual feedback
- Input validation and error handling
- Dynamic difficulty adjustment based on player performance

Future Enhancements

- Save high scores and player statistics
- Add customizable difficulty settings
- Implement different game modes (practice, challenge, time attack)
- Create a mobile-friendly version

Deployment

- Packaged as a standalone Java application
- Compatible with any platform running Java
- Easy to run from IDEs like Visual Studio Code or IntelliJ IDEA