**Program Requirements:**

This program will allow the user to teach/instruct elementary students the different operations of fractions including addition, subtraction, multiplication, division, and reducing. This program will also allow students/users to take/practice different fraction operation quizzes of their choice and show the most recent results of their quiz. The program will need input from the student/user such as main menu option, submenus option, fractions for calculator, and fraction for quiz answers.

**Program Inputs:**

* Main menu choice (integer of 0, 1, 2, 3, 4, or 5)
* Submenus choice (integer of 0, 1, 2, 3, 4, or 5)
* Fraction (integer numerator and integers denominator)
* Quiz answers (integer fractions)

**Program Outputs:**

* Main menu selection (void)
* Submenus selection (void)
* Fraction examples (integers of numerator and denominator)
* Quiz questions and feedback (integers Fractions)
* Quiz result (integer number)

**Test Plan:**

Case #1:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 1-Instructions

Show: Instruction menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 1-Addition

Show: Addition Instruction

Case #2:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 1-Instructions

Show: Instruction menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 2-Subtraction

Show: Subtraction Instruction

Case #3:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 1-Instructions

Show: Instruction menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 3-Multiplication

Show: Multiplication Instruction

Case #4:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 1-Instructions

Show: Instruction menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 0-Main Menu

Show: Main Menu Selection for 1-Instruction, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-See Quiz Result, and 0 for Main Menu.

Case #5:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 1-Instructions

Show: Instruction menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 9 or S

Show: Default Selection for Show: Instruction menu selection for 1-addition, 2-subtraction, 3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Case #6:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 2-Examples

Show: Examples menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 4-Division

Show: Division example

Case #7:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 2-Examples

Show: Examples menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 5-Reducing

Show: Reducing example

Case #8:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 2-Examples

Show: Examples menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 1-Addition

Show: Addition example

Case #9:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 2-Examples

Show: Examples menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 0-Main Menu

Show: Main Menu Selection for 1-Instruction, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-See Quiz Result, and 0 for Main Menu.

Case #10:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 2-Examples

Show: Examples menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 6 or F

Show: Default Selection for Show: Instruction menu selection for 1-addition, 2-subtraction, 3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Case #11:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 3-Fraction Calculator

Show: Fraction calculator menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 1-Addition

Show: Addition Fraction Calculator; Enter 2 Fractions from user; Answer.

Case #12:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 3-Fraction Calculator

Show: Fraction calculator menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 5-Reducing

Show: Reducing Fraction Calculator; Enter 1 Fractions from user; Answer.

Case #13:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 3-Fraction Calculator

Show: Fraction calculator menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 4-Division

Show: Division Fraction Calculator; Enter 2 Fractions from user; Answer.

Case #14:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 3-Fraction Calculator

Show: Fraction calculator menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 0-Main Menu

Show: Main Menu Selection for 1-Instruction, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-See Quiz Result, and 0 for Main Menu.

Case #15:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 3-Fraction Calculator

Show: Fraction menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 8 or K

Show: Default Selection for Show: Instruction menu selection for 1-addition, 2-subtraction, 3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Case #16:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 4-Quiz

Show: Quiz menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 3-Multiplication

Show: Multiplication quiz. Enter answer in a fraction form from user.

Result: Answer will be determined and will be send to score.

Case #17:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 4-Quiz

Show: Quiz menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 4-Division

Show: Multiplication quiz. Enter answer in a fraction form from user.

Result: Answer will be determined and will be send to score.

Case #18:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 4-Quiz

Show: Quiz menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 5-Reducing

Show: Multiplication quiz. Enter answer in a fraction form from user.

Result: Answer will be determined and will be send to score.

Case #19:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 4-Quiz

Show: Quiz menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 0-Main Menu

Show: Main Menu Selection for 1-Instruction, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-See Quiz Result, and 0 for Main Menu.

Case #20:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 4-Quiz

Show: Quiz menu selection for 1-addition, 2-subtraction,

3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Option: 9 or A

Show: Default Selection for Show: Instruction menu selection for 1-addition, 2-subtraction, 3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Case #21:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Main menu: 5-Quiz Result

Show: Most recent quiz score/result

Option: Main menu selection for Instruction menu selection for 1-addition, 2-subtraction, 3-multiplication, 4-division, and 5-reducing and 0 for Main Menu.

Case #22:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Option: 0-Quit Program

Show: Goodbye!

Result: Quit Program

Case #23:

Main menu selection: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

Option: 7 or B

Show: 0-Quit Program, 1-Instructions, 2-Examples, 3-Fraction Calculator,

4-Quiz, 5-Quiz Result.

**Algorithm/Solution Overview:**

* Have the user input their choice in main menu including instructions for operations, examples of operations, calculator for different operations, quizzes for different operations, and a quiz result.
* Have the user input fractions (integer for both numerator and denominator) for calculator and quiz answers.
* Instructions Menu
  + Addition guide
* Output instructions for addition
  + Subtraction guide
    - Output instructions for subtraction
  + Multiplication guide
    - Output instructions for multiplication
  + Division guide
    - Output instructions for division
  + Reducing
    - Output instructions for reducing
  + Main Menu
    - Output main menu selection
* Examples Menu
  + Addition Example
    - Output random fractions added together
  + Subtraction Example
    - Output random fractions subtracted together
  + Multiplication Example
    - Output random fractions multiplied together
  + Division Example
    - Output random fractions divided together
  + Reducing Example
    - Output a random fraction that is being reduced
* Main Menu
  + - Output main menu selection
* Fraction Calculator Menu
  + Addition
    - User enter fractions to be added
    - Output answer
  + Subtraction
    - User enter fractions to be subtracted
    - Output answer
  + Multiplication
    - User enter fractions to be multiplied
    - Output answer
  + Division
    - User enter fractions to be divided
    - Output answer
  + Reducing
    - User enter a fraction to be reduced
    - Output answer
  + Main Menu
    - Output main menu selection
* Quiz Menu
  + Addition
    - Output addition problems
    - User enter fractions for answer
    - Score: If 0/4 = 0, 1/4 = 25, 2/4 = 50, 3/4 = 75, 4/4 = 100
* Subtraction
  + - Output subtraction problems
    - User enter fractions for answer
    - Score: If 0/4 = 0, 1/4 = 25, 2/4 = 50, 3/4 = 75, 4/4 = 100
  + Multiplication
    - Output multiplication problems
    - User enter fractions for answer
    - Score: If 0/4 = 0, 1/4 = 25, 2/4 = 50, 3/4 = 75, 4/4 = 100
  + Division
    - Output division problems
    - User enter fractions for answer
    - Score: If 0/4 = 0, 1/4 = 25, 2/4 = 50, 3/4 = 75, 4/4 = 100
  + Reducing
    - Output reducing problems
    - User enter fractions for answer
    - Score: If 0/4 = 0, 1/4 = 25, 2/4 = 50, 3/4 = 75, 4/4 = 100
  + Main Menu
    - Output main menu selection
* Quiz Result
* Output the most recent quiz score/result

**Algorithm Flowchart:**

**A close up of a map

Description generated with very high confidence**