Logo, company name

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**Faculty of Engineering and Applied Science**

**SOFE 3980U – Software Quality**

**Assignment 1: Choosing the right software process to build good-quality software, and ensuring quality using test automation (12.5 points)**

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Problem:   
a) You have to develop a very simple gaming software in just 1 week. If you want, you may   
take some code (with proper reference to the source from where it is taken) from an   
existing game implementation to extend/improve the functionalities. To develop a good-  
quality software, you would like to follow a particular software engineering process or   
more than one process (waterfall, incremental, agile etc.) and choose an appropriate   
programming language. The goal is to release a good-quality software in 1 week. (6.5   
points)

I chose to develop a simple calculator math practice game. I developed this game in Python and then used unittest to test the functions. I also generated a coverage report with a test run of the program to better show which lines are being tested and utilized. The program utilizes functions to perform calculations that it then verifies against user input, providing a score based on performance. The game can be repeated and adjusted based on personal input, such as only addition or subtraction etc., a user defined number of questions to be asked, and the range of numbers used in the questions. The game also features a modulo operator version of the game, useful for computer science students.

The game starts by asking the user which type of game they would like to play:

Text

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The user is prompted to enter a number ranging from 1 through 6. (The user selected 6, modulus)

Then, the user is asked to provide additional details to modify the game settings:

Text

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After this, the game starts and the user is presented with a question that they are prompted to answer:



The user can then enter their guess and receive feedback:

Text

Description automatically generated

The user is asked as many questions as they previously specified and then provided their score and an option to play again:

Text

Description automatically generated

If the user inputs ‘1’ then they are sent back to the beginning of the game. If the user inputs ‘2’ then the program gets terminated.

The program properly handles division by zero through re-randomizing the integer given to the functions:



The programs full source-code can be found within the calculatorGame.py file.

b) To validate that your software is a good-quality software, you have to write automated   
tests for the software that you have developed. You can either implement the automated   
testing framework by your own or use any existing available tool. For example, in Java   
you may use separate Java class test files which can be compiled and run automatically   
using the Windows command-line scripting or Linux shell scripting. Alternatively, you   
may use any existing tool which can be integrated with your software. For example, in   
Java you may use JUnit. (6 points)

I utilized unittest and python to test my simple calculator math practice game. When coding my game I made 10 different functions with a test for each, five functions for calculating, one for simplicity, and four for valid input. Most of the testing carried out for the program is done to verify the consistency of the calculation functions. Additional testing for valid input functions is included but not heavily expanded upon.

An example of unit testing for the floor division function is as follows:

Text

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The test has 7 assertEqual statements to cover basic math operations between types of numbers. Not all assertEqual statements are necessary, but together they cover all aspects of the calculation function.

2 / 5 = 0.4 but floor division renders this 0

-1 / 1 = -1

-1 / -1 = 1

0 / 1 = 0

1 / 1 = 1

An example of unit testing for the basic Operators function is as follows:

A screenshot of a computer

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The test is to assert that the basic Operators functions is properly asking the other functions to solve an operation for it using the operatorType variable (basicOperatorsGame(n1,n2,operatorType)).

To test the valid input functions I utilized assertNotEqual functions:

Text

Description automatically generated with medium confidence

This prompts the tester after a test run:

Text

Description automatically generated

Additionally, coverage.py was used when running the tests on the game to verify the lines tested and covered by the testing code.

A test run was completed utilizing all 6 game modes with varying ranges and questions asked per mode. This run was then analyzed by coverage and unittest and these results were provided (this is the example provided within the ‘htmlcov’ folder of the .zip file provided):

Text

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All 6 tests ran and completed successfully, verifying the accuracy of the game functions.

The statements missed in the test run were:

Graphical user interface, text, application, chat or text message

Description automatically generated

The above line is not important as it is never executed.

Graphical user interface, text, application, chat or text message

Description automatically generated

This line is executed after randNum2 is confirmed to be 0, which would normally create a divide by zero error, and it randomizes the number until it is not 0. This is important, but this line was never reached within the test run that was completed, meaning the program never randomized the second number to 0 during a division operation. This is okay, an example of the exact same code is shown to work at another point in the program during the basic operators game:Graphical user interface, text, application

Description automatically generated

Additionally, the last four lines that were missed were the break statements in each of the four valid input functions:

Text

Description automatically generated with medium confidence

It was my understanding that the break statement is executed every time the function receives a valid int, and that terminates the while loop. I do not know why coverage says this line is not executed.

**c) Navigation Assistance**

The .zip folder provided has a few folders and files within it. The calculatorGame.py and testGame.py files are the source code of the program. The ‘htmlcov’ folder is the results of the coverage and unittest test run. The word document ‘Assign1 SoftQuality Matthew Gardiner 100768198’ is this report.

To run the code, I utilized visual studio code with python 3.9.0 in my environment PATH. I then installed coverage.py to use in my testing. To run the code, I can run it inside vscode and it runs in the terminal. To run the testGame.py file, you should type “python testGame.py” into the terminal as long as the source codes are in the same folder. To run a coverage test utilizing the testGame.py code, type “coverage run testGame.py”. To then generate an html report of the test that was run, type “coverage html”.

After generating the coverage html report, the “htmlcov” folder should be updated. Within the folder, open up the index.html file to navigate throughout the results of the test run. (You can click the names of the files)

Here is the example given:

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Description automatically generated

Graphical user interface, application

Description automatically generatedetc…

Text

Description automatically generatedetc…

Here is the full text version of the test run completed within the terminal of vscode:

PS C:\Users\matta\OneDrive\Documents\School 2021-2022\Semester 2\software quality\assign1> coverage run testGame.py

This is a Calculator Math Game!

The goal of this game is practice basic and advanced math functions

Type the games number to select that game

1. Addition

2. Subtraction

3. Multiplication

4. Floor Division

5. Basic operators with floor division

6. Modulus

1

What range of numbers do you want to use?

Enter the lower end of the range: g

Please enter a number

Enter the lower end of the range: 0

Enter the higher end of the range: -2

Enter a valid range.

Enter the higher end of the range: g

Please enter a number

Enter the higher end of the range: 4

How many questions do you want to be asked?: -2

Enter a value greater than zero.

How many questions do you want to be asked?: g

Sorry, I didn't understand that.

How many questions do you want to be asked?: 2

What is 3 + 4 ?

7

Correct!

What is 3 + 3 ?

6

Correct!

Your score was 2 out of 2

Would you like to play again?

1. Yes

2. No

5

Enter a value from 1 to 6.

g

Sorry, I didn't understand that.

1

This is a Calculator Math Game!

The goal of this game is practice basic and advanced math functions

Type the games number to select that game

1. Addition

2. Subtraction

3. Multiplication

4. Floor Division

5. Basic operators with floor division

6. Modulus

-2

Enter a value from 1 to 6.

0

Enter a value from 1 to 6.

f

Sorry, I didn't understand that.

2

What range of numbers do you want to use?

Enter the lower end of the range: -1

Enter the higher end of the range: -2

Enter a valid range.

Enter the higher end of the range: 0

How many questions do you want to be asked?: -2

Enter a value greater than zero.

How many questions do you want to be asked?: g

Sorry, I didn't understand that.

How many questions do you want to be asked?: 2

What is 0 - 0 ?

0

Correct!

What is -1 - -1 ?

g

Please enter a number.

0.0

Correct!

Your score was 2 out of 2

Would you like to play again?

1. Yes

2. No

1

This is a Calculator Math Game!

The goal of this game is practice basic and advanced math functions

Type the games number to select that game

1. Addition

2. Subtraction

3. Multiplication

4. Floor Division

5. Basic operators with floor division

6. Modulus

3

What range of numbers do you want to use?

Enter the lower end of the range: 0

Enter the higher end of the range: 5

How many questions do you want to be asked?: 4

What is 3 \* 2 ?

6

Correct!

What is 5 \* 3 ?

15

Correct!

What is 2 \* 2 ?

4

Correct!

What is 1 \* 1 ?

2

Incorrect!

The Answer was 1 !

Your score was 3 out of 4

Would you like to play again?

1. Yes

2. No

4

Enter a value from 1 to 6.

g

Sorry, I didn't understand that.

1

This is a Calculator Math Game!

The goal of this game is practice basic and advanced math functions

Type the games number to select that game

1. Addition

2. Subtraction

3. Multiplication

4. Floor Division

5. Basic operators with floor division

6. Modulus

-0

Enter a value from 1 to 6.

g

Sorry, I didn't understand that.

4

What range of numbers do you want to use?

Enter the lower end of the range: -2

Enter the higher end of the range: 2

How many questions do you want to be asked?: -2

Enter a value greater than zero.

How many questions do you want to be asked?: g

Sorry, I didn't understand that.

How many questions do you want to be asked?: 2

What is -1 // 1 ?

1

Incorrect!

The Answer was -1 !

What is -2 // -1 ?

g

Please enter a number.

1

Incorrect!

The Answer was 2 !

Your score was 0 out of 2

Would you like to play again?

1. Yes

2. No

1

This is a Calculator Math Game!

The goal of this game is practice basic and advanced math functions

Type the games number to select that game

1. Addition

2. Subtraction

3. Multiplication

4. Floor Division

5. Basic operators with floor division

6. Modulus

5

What range of numbers do you want to use?

Enter the lower end of the range: 0

Enter the higher end of the range: 2

How many questions do you want to be asked?: 20

What is 2 \* 2 ?

4

Correct!

What is 0 // 2 ?

4

Incorrect!

The Answer was 0 !

What is 0 - 0 ?

4

Incorrect!

The Answer was 0 !

What is 1 - 1 ?

4

Incorrect!

The Answer was 0 !

What is 2 \* 2 ?

4

Correct!

What is 0 // 1 ?

4

Incorrect!

The Answer was 0 !

What is 2 // 1 ?

4

Incorrect!

The Answer was 2 !

What is 2 // 2 ?

4

Incorrect!

The Answer was 1 !

What is 2 \* 1 ?

4

Incorrect!

The Answer was 2 !

What is 0 + 2 ?

4

Incorrect!

The Answer was 2 !

What is 2 \* 2 ?

4

Correct!

What is 0 // 2 ?

4

Incorrect!

The Answer was 0 !

What is 1 - 1 ?

4

Incorrect!

The Answer was 0 !

What is 1 - 2 ?

4

Incorrect!

The Answer was -1 !

What is 0 - 0 ?

2

Incorrect!

The Answer was 0 !

What is 0 // 2 ?

2

Incorrect!

The Answer was 0 !

What is 1 \* 2 ?

2

Correct!

What is 1 \* 2 ?

2

Correct!

What is 2 - 1 ?

2

Incorrect!

The Answer was 1 !

What is 1 \* 0 ?

2

Incorrect!

The Answer was 0 !

Your score was 5 out of 20

Would you like to play again?

1. Yes

2. No

1

This is a Calculator Math Game!

The goal of this game is practice basic and advanced math functions

Type the games number to select that game

1. Addition

2. Subtraction

3. Multiplication

4. Floor Division

5. Basic operators with floor division

6. Modulus

6

What range of numbers do you want to use?

Enter the lower end of the range: 0

Enter the higher end of the range: 4

How many questions do you want to be asked?: 4

What is 2 % 1 ?

2

Incorrect!

The Answer was 0 !

What is 2 % 4 ?

21

Incorrect!

The Answer was 2 !

What is 1 % 1 ?

1

Incorrect!

The Answer was 0 !

What is 4 % 3 ?

2

Incorrect!

The Answer was 1 !

Your score was 0 out of 4

Would you like to play again?

1. Yes

g

Sorry, I didn't understand that.

2

.What is 4 + 3 ?

What is 4 - 3 ?

What is 4 // 10 ?

..Test: must enter 2:2

Test: must enter 2:2

.Test: must enter 2:2

Test: must enter 2:2

Test: must enter 2:2

.Test: must enter 2:2

Test: must enter 2:2

.Test: must enter 2:2

Test: must enter 2:2

Test: must enter 2:2

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----------------------------------------------------------------------

Ran 10 tests in 3.314s

OK

PS C:\Users\matta\OneDrive\Documents\School 2021-2022\Semester 2\software quality\assign1> coverage report

Name Stmts Miss Cover

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calculatorGame.py 140 6 96%

testGame.py 65 0 100%

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TOTAL 205 6 97%

PS C:\Users\matta\OneDrive\Documents\School 2021-2022\Semester 2\software quality\assign1> coverage html

Wrote HTML report to htmlcov\index.html