

Digital Skills Academy

# FUNDAMENTALS OF PROGRAMMING

## LAB 3 – PROBLEM SHEET



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## Development Approach

- **STAGE 1: Before writing code your code design should be documented in the eLabbook as follows:**
- Problem Definition
  - What is the objective
  - What is the program to do
- Design
  - Draw a picture of the execution steps
  - Write down in words the execution steps
  - Draw the design Object or Class diagrams
- Test Cases (how will you test it)
  - Write what you will use for testing that it runs and creates the right answer
    - Test Case 10 :  $1 + 1 = 2$  Simple Case
    - Test Case 20:  $5 + 9 = 14$  Normal Case
    - Test Case 30:  $0 + 9 = 9$  Edge condition
    - Test Case 40 :  $5 + 0 = 5$  Edge condition
  - *If this was division we could have division by zero issues and very small answers*
  - Test Case 50 :  $166666666666 + 788777777777 = 78894444444443$  test the very big
- **STAGE 2: Once you have documented your approach you should proceed to do the following:**
- Write Code
  - Step by step, on piece of functionality at a time, get it working, save a copy of that working version ***addTwoNumbers\_v1.code*** in your `_Attic` directory, add the next bit of functionality
- Test Code with test cases
  - Debug the code, change ONLY ONE thing at a time, KEEP SAVING VERSIONS
- **STAGE 3: The code once written should be documented in the eLabBook under the following headings:**
- Code
  - Insert the code into the eLabBook
- Screens
  - Take snapshots of the program screens and copy them into the eLabBook
- Test Records
  - Records of the tests you performed and the results
- documentation
  - How to use the program documentation
  - Object and class diagrams showing the implementation
- References
  - Any websites or code you looked up or used in the creation of your program

# PROBLEM 3.1

**Develop a program that calculates the area of a rectangle**

**area = length \* breadth**

**If the area is greater than 40 meters squared print out “This rectangle is too big, it has a length of xxx and breath of xxxx please reduce one of the valuse.”**

**Otherwise printout “ this rectangle will fit, the length you entered was xxxx, the breath was xxxxx. The area of the triangle will be xxxxxx”**

## Objectives

- Understand and use numerical data types and the associated operators.
- Be able to write arithmetic expressions in Java.
- Use IF ELSE.

# PROBLEM 3.2

Based on the problem in 3.1 implement the following logic

Area < 20	too small
Area > 20 and Area < 40	perfect size
Area > 40 and Area < 60	too big

## Objectives

- Be able to write arithmetic expressions in Java with constants.
- Nested IF ELSE

# PROBLEM 3.3

Create a program to print out numbers from 8 to 80 in steps of 2

## Objectives

- Be able to write arithmetic expressions in Java.
- Use a while loop

# PROBLEM 3.5

Create a program to print out the prime numbers between the numbers 1 to 100.

## Objectives

- Be able to write arithmetic expressions in Java.
- Use a while loop

# PROBLEM 3.6

Create a program to display the first 20 Fibonacci numbers  $F(n)$ , where  $F(n)=F(n-1)+F(n-2)$  and  $F(1)=F(2)=1$ . Also compute their average. The output shall look like:

The first 20 Fibonacci numbers are:

1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584 4181 6765

The average is 885.5

## Objectives

- Be able to write arithmetic expressions in Java.
- Use a while loop

# References

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- [http://www.ntu.edu.sg/home/ehchua/programming/java/J2a\\_BasicsExercises.html](http://www.ntu.edu.sg/home/ehchua/programming/java/J2a_BasicsExercises.html)