

CS110T: Programming Language1

Lab 1: Java basics I



Lab Objectives:

In this lab, the student will practice:

- ✓ Analyze problems using pseudocode, and draw a flow chart
- ✓ Using the output statements in Java: System.out.print and System.out.println
- ✓ Creating, compiling and running a simple Java program.

Lab Exercise 1: Analyze the Problem and Design an Algorithm

For the following problems analyze them by showing (the input, output, and process) then design an algorithm as written algorithm (both regular writing and pseudocode):

- A. Design an algorithm to convert a US Dollar to Saudi Riyal. Hint: 1 US Dollar = 3.75 Saudi Riyal
- B. Write an algorithm that compares between x and y then print the largest value among them.
- C. Design an algorithm that reads the grade of a student and prints pass if the student's grade is greater than or equal 60 and fail otherwise.

Lab Exercise 2: Write an Algorithm in pseudocode

A. Using pseudocode: Calculate and print the area of three geometrical shapes: Rectangle, Tringle and Circle. You need to specify the sides length (first_side, second_size) in order to calculate the area using these formulas:

- Rectangle area = first_side * second_side
- Tringle area = first_side /2 * second_side
- Circle area = π * (first_side * first_side)
- Knowing that $\pi = 3.14$

A)

Input: USD as a number

Output:

Print the equivalent amount in Saudi Riyal, using the conversion rate: "1 USD = 3.75 Saudi Riyal"

Process:

Program takes USD as input and multiplies it by 3.75 then prints the result

B)

Input: Two numbers x and y

Output:

Print the largest value between x and y

Process:

Program compare the two numbers x and y and prints the largest value among them.

C)

Input: Student's grade as a number

Output:

Print "Pass" if the grade is 60 or above, Otherwise print "Fail"

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Process:

Program read the student's grade and checks if the grade is greater than or equal to 60 and prints Pass" if true Otherwise, print "Fail"

Exercise 1:

A)

Algorithm

Make a variable SAR and Assign the Value 3.75 to it
Ask the user to enter the amount of US Dollars and save it to USD
Calculate Conversion = USD * SAR
Print Conversion

Pseudocode

SAR = 3.75
Input USD
Conversion = USD * SAR
Print Conversion

B)

Algorithm

Ask the user to enter the first number and store it to x
Ask the user to enter the second number and store it to y If x is larger than y then print x
Otherwise, print y

Pseudocode

Input x, y
if (x > y) then
 Max = x
else
 Max = y
endif
print "The largest value is", Max

C)

Algorithm

Read grade from the user
if grade greater than or equal to 60 then print student passed Otherwise, print student failed

Pseudocode

Input grade
if (grade >= 60) then
 print "Student Passed"
else
 print "Student Failed"
endif

Exercise 2:

Input first_side, second_side

```
Rectangle = first_side * second_side  
print "Rectangle Area = Rectangle"
```

```
Triangle = first_side / 2 * second_side  
print "Triangle Area = Triangle"
```

```
PI = 3.14  
Circle = PI * (first_side * first_side)  
print "Circle Area = Circle"
```

Exercise 2 (More Complicated): Optional

Use Variables first_side, second_side, Rectangle, Triangle, Circle, Answer, PI = 3.14

```
print "Enter 1 To Calculate Rectangle, 2 For Triangle, 3 For Circle"
```

Input Answer

```
if (Answer == 1) then  
    Input first_side, second_side  
    Rectangle = first_side * second_side  
    print "Rectangle Area = Rectangle"  
elseif (Answer == 2) then  
    Input first_side, second_side  
    Triangle = first_side / 2 * second_side  
    print "Triangle Area = Triangle"  
elseif (Answer == 3) then  
    Input first_side, second_side  
    Circle = PI * (first_side * first_side)  
    print "Circle Area = Circle"  
else  
    print "Wrong Input"
```

Lab Exercise 3: Design Flow Chart Algorithm

A. milk carton can hold 3.78 liters of milk. Each morning, dairy farm ships cartons of milk to local grocery store. The cost of producing one liter of milk is \$ 0.38 and the profit of each carton of milk is \$ 0.27.

You need to:

- Get from the user the amount of milk produced in the morning in liters.
- Output the number of milk cartons needed to hold the milk.
- Output the cost of the producing milk.
- Output the profit for producing milk.

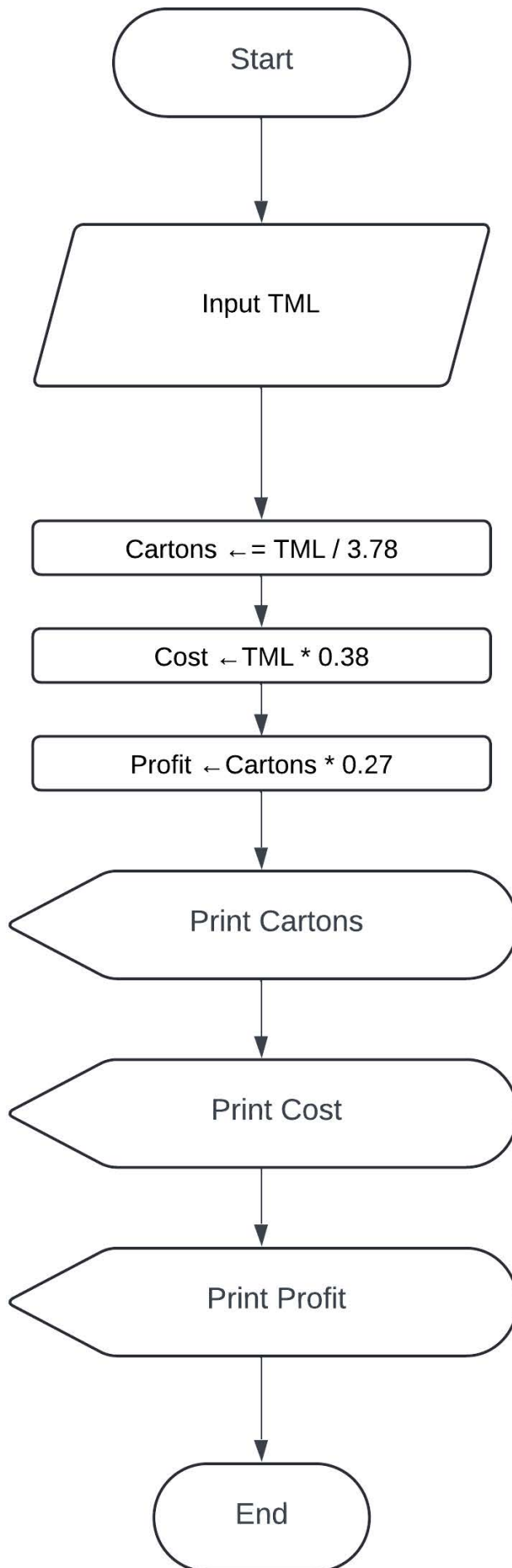
B. To determine whether a person's weight is in the healthy range, you need to measure their body mass index (BMI). The BMI is measured by:

$$\text{BMI} = \text{weight in kilograms} / (\text{height in meters} * \text{height in meters})$$

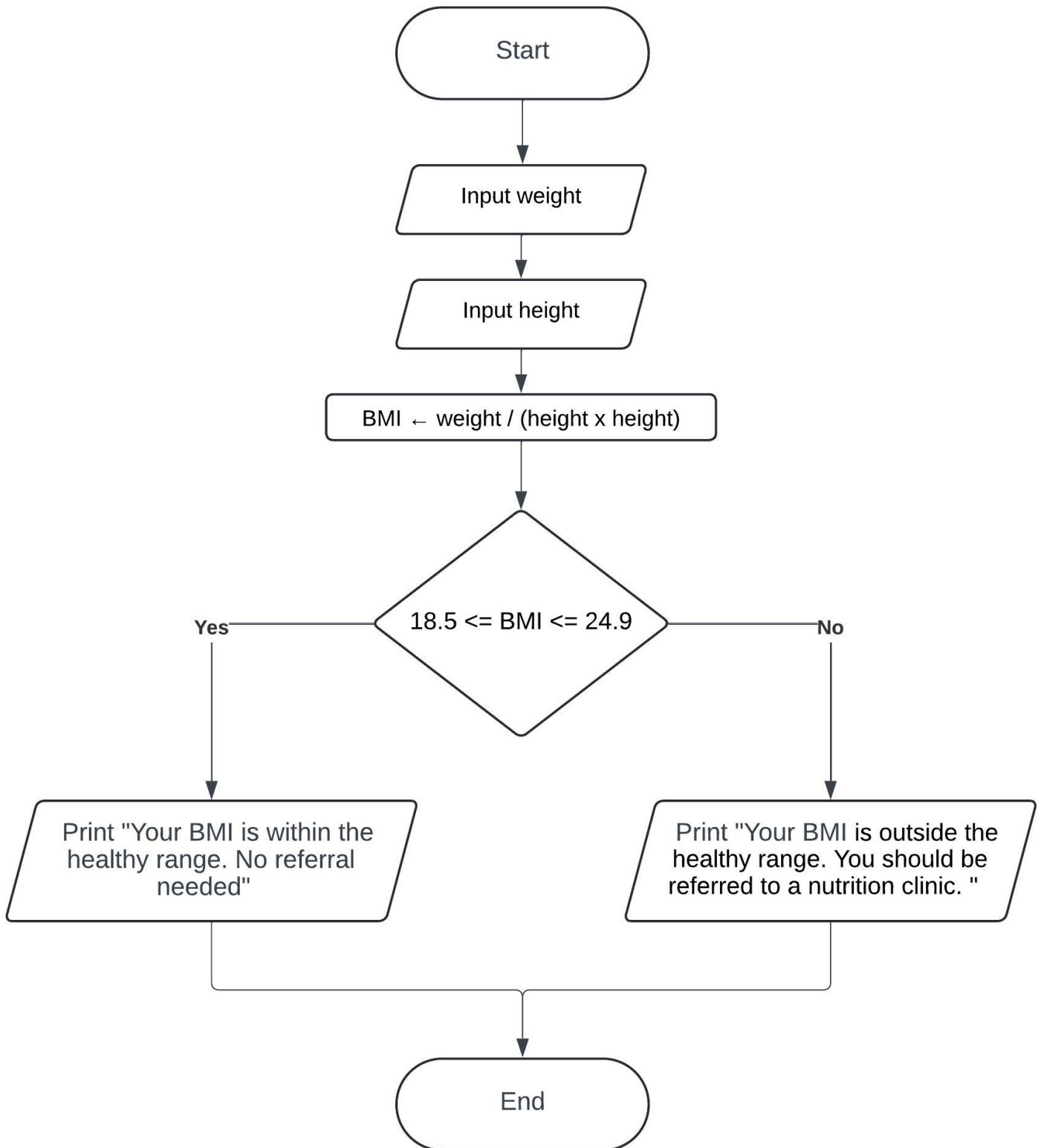
Calculate the BMI for each patient and determine whether they should be referred to a nutrition clinic based on the following criteria:

- A healthy BMI ranges from 18.5 to 24.9.
- Otherwise, the BMI is considered outside the healthy range. In these cases, refer the patient to a nutrition clinic.

Exercise 3: (1)

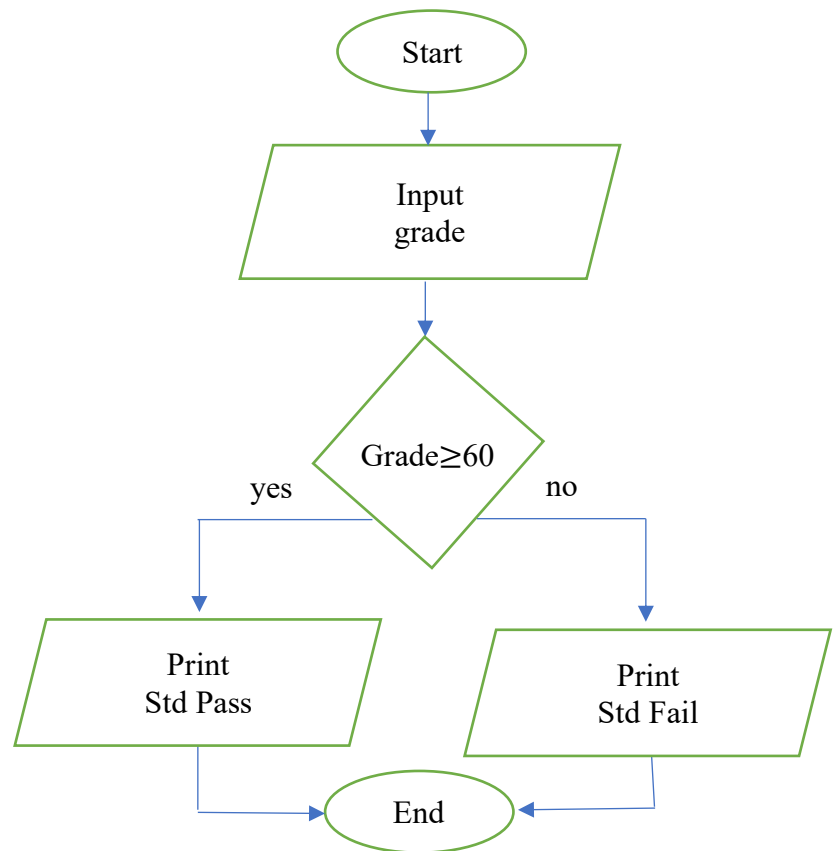


Exercise 3: (2)



Lab Exercise 4: Analyze and Design

For the following flowchart design of a problem do:



1- Analyze the problem (show the input – output – process)

Input: grade as number

Output:

Print "Std Pass" if grade greater than or equal to 60

Print "Std Failed" if grade is less than 60

Process:

The program calculates whether the grade is larger than 60 or not and prints the appropriate message

2- Write the pseudocode algorithm for the problem.

Input grade

```
if (grade >= 60) then
    print "Std Pass"
else
    print "Std Fail"
endif
```

Lab Exercise 5: Code writing (1)

Problem Description: create a new file with your name and write a program that: print your name, print your ID and print “I'm studying Java “. Each message is printed on a separate line.

- The output should look something like the following:

Norah
446000000
I'm studying Java

Lab Exercise 6: Code writing (2)

Problem Description: Write a Java program that prints the following Pascal Triangle.
Use the escape character \t

$$\begin{array}{ccccccccccc}
 & & & & 1 & & & & & & \\
 & & & 1 & & 1 & & & & & \\
 & & 1 & & 2 & & 1 & & & & \\
 & 1 & & 3 & & 3 & & 1 & & & \\
 1 & & 1 & & 4 & & 6 & & 4 & & 1 \\
 & 1 & & 5 & & 10 & & 10 & & 5 & 1 \\
 1 & & & & & & & & & &
 \end{array}$$

Lab Exercise 5

```
public static void main( String[] args )
{
    String name = "Norah";
    int id = 446000000;
    String message = "I'm studying Java";
    System.out.println(name + "\n" + id + "\n" + message);
}
```

Lab Exercise 6

[illegible]

Lab Assignment Problems:

For Question 1 and Question 2 do the following:

- (1) Design an algorithm.
- (2) Draw a flowchart.
- (3) Write a pseudocode.

Question 1: Solve an equation and find the mean.

Write an algorithm that takes two values x and y as arguments then calculates z and finally returns the mean of x , y , and z . (Note: $z=x+2y$)

Question 2: Describe an algorithm that computes the gold zakat.

The user should enter the gold weight in gram and its worth. The program should print and calculate the zakat if the gold is worth 3000 or more. Otherwise, the program should print (Hint: $\text{zakat} = \text{gold worth} * 2.5\%$)