



CS110T: Programming Language1

Lab 1



Lab Objectives:

In this lab, the student will practice:

Analyze problems using pseudocode, and draw a flow chart

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

Answer

- **Input:** Amount in US Dollars (usd)
- **Process:** Multiply the input by the conversion rate (3.75)
- **Output:** Amount in Saudi Riyals (sar)

Written Algorithm:



1. Get the amount in US Dollars.
2. Multiply that amount by 3.75.
3. Display the result as the amount in Saudi Riyals.

Pseudocode:

```
text
BEGIN
  DISPLAY "Enter amount in US Dollars: "
  INPUT usd
  SET sar = usd * 3.75
  DISPLAY usd, " USD is ", sar, " SAR"
END
```

B. Write an algorithm that compares between x and y then print the largest value among them.

Answer

- **Input:** Two numbers (x, y)
- **Process:** Compare the two numbers to see which is larger.
- **Output:** The largest number.

Written Algorithm:

1. Get the first number, x.
2. Get the second number, y.
3. If x is greater than y, display x.
4. Otherwise, display y.

Pseudocode:



text

BEGIN

DISPLAY "Enter first number (x): "

INPUT x

DISPLAY "Enter second number (y): "

INPUT y

IF $x > y$ THEN

DISPLAY "The largest value is: ", x

ELSE

DISPLAY "The largest value is: ", y

END IF

END

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.

Answer

- **Input:** Student's grade (grade)
- **Process:** Check if the grade is greater than or equal to 60.
- **Output:** "Pass" or "Fail"



Written Algorithm:

1. Get the student's grade.
2. If the grade is 60 or more, display "Pass".
3. Otherwise, display "Fail".

Pseudocode:

text

BEGIN

 DISPLAY "Enter the student's grade: "
 INPUT grade

 IF grade \geq 60 THEN
 DISPLAY "Pass"

 ELSE
 DISPLAY "Fail"

 END IF

END

Lab Exercise 2: Write an Algorithm in pseudocode

A. **Using pseudocode:** Calculate and print the area of three geometrical shapes: Rectangle, Triangle 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
- Triangle area = first_side / 2 * second_side
- Circle area = π * (first_side * first_side)
- Knowing that $\pi = 3.14$

Answer

BEGIN

SET PI = 3.14

// Calculate and print Rectangle Area

DISPLAY "Enter length and width for the rectangle:"

INPUT length, width

rect_area = length * width

DISPLAY "Rectangle Area: ", rect_area

// Calculate and print Triangle Area

DISPLAY "Enter base and height for the triangle:"

INPUT base, height

tri_area = 0.5 * base * height

DISPLAY "Triangle Area: ", tri_area

// Calculate and print Circle Area

DISPLAY "Enter the radius for the circle:"

INPUT radius

circle_area = PI * radius * radius

DISPLAY "Circle Area: ", circle_area

END

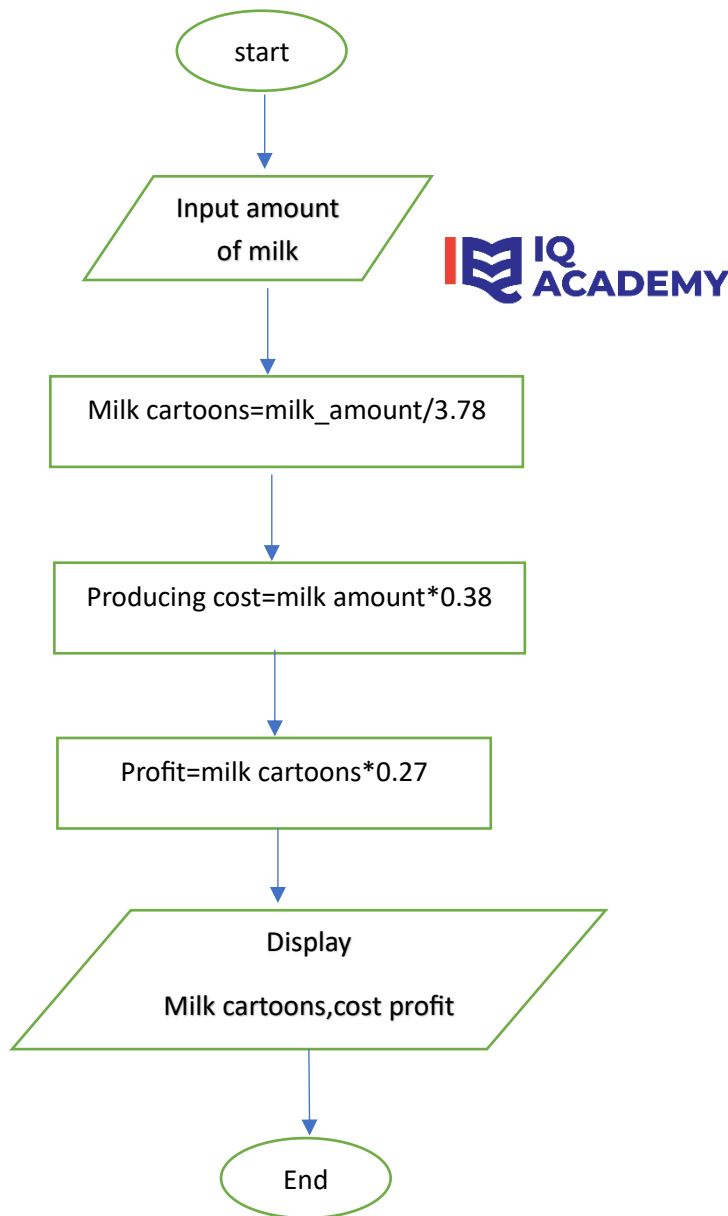


3- Design Flow Chart Algorithm

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.

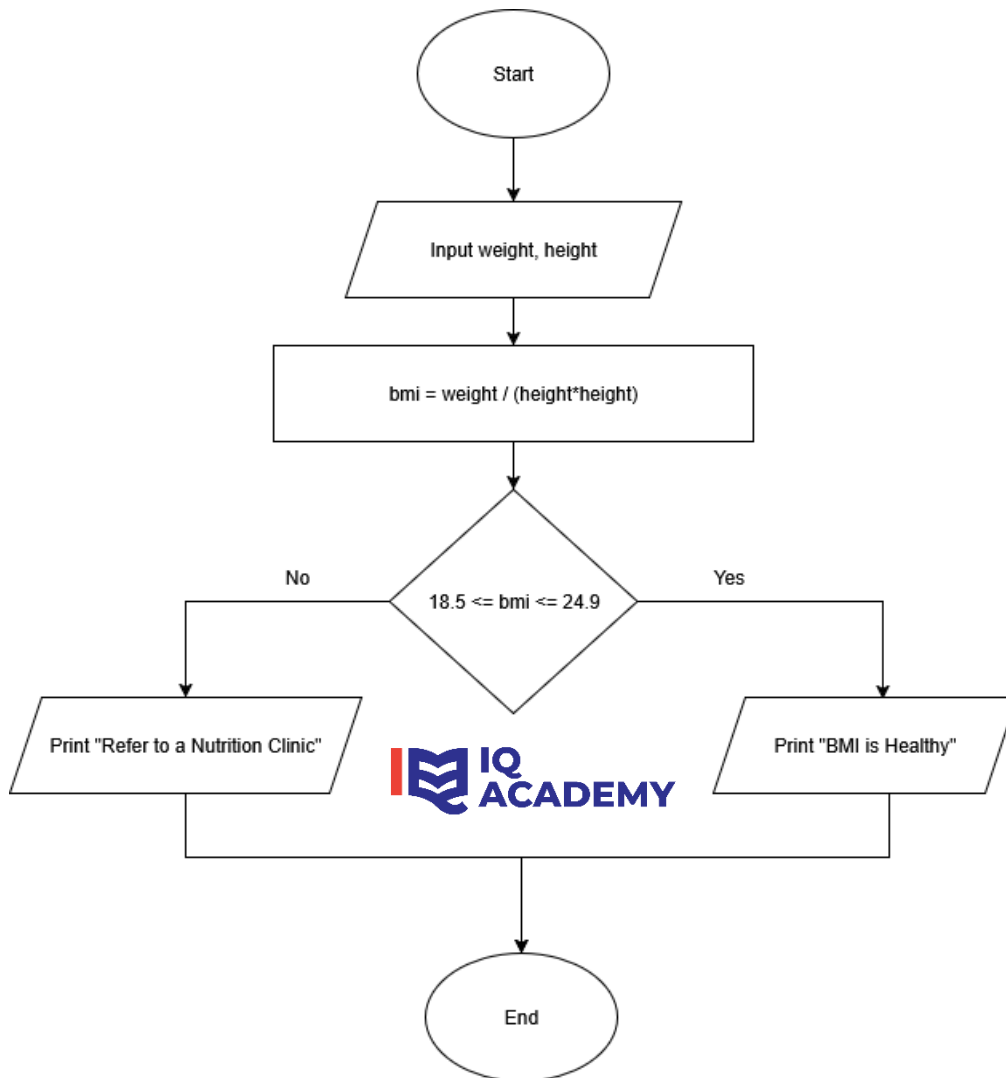
You need to:

- 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: Calculate the BMI for each patient and determine whether they should be referred to a nutrition **BMI = weight in kilograms / (height in meters * height in meters)** 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.



4 Analyze and Design

For the following flowchart :

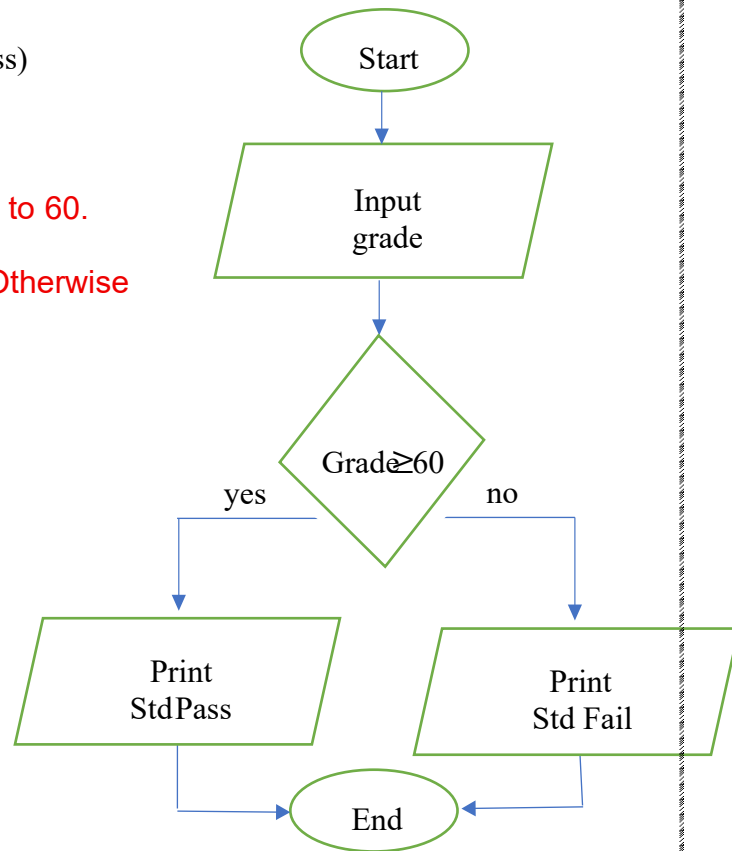
1- Analyze the problem (show the input – output – process)

Input: A numerical grade.

Process: Check if the grade is greater than or equal to 60.

Output: The text "Std Pass" if the condition is met. Otherwise

Print "std fail"



2- Write the pseudocode algorithm for the problem.

```
BEGIN
  INPUT grade
  IF grade >= 60 THEN
    PRINT "Std Pass"
  Else
    Print"std fail"
  END IF
END
```

Lab Assignment Problems:

For Question 1 and Question 2 do the following:



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

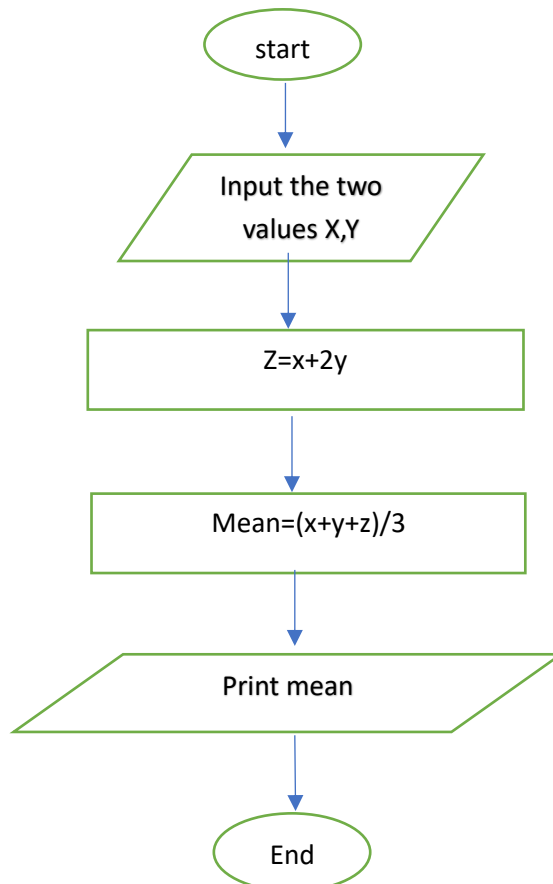
Question 1: Solve an equation and find the mean.

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: $z=x+2y$)

* Algorithm:

1. Get values for x and y.
2. Calculate z using the formula: $z = x + (2 * y)$
3. Calculate the mean of x, y, and z: $\text{mean} = (x + y + z) / 3$
4. Display the calculated mean.

*Flowchart



*pseudo code

BEGIN

DISPLAY "Enter value for x: "

INPUT x

DISPLAY "Enter value for y: "

INPUT y

SET $z = x + (2 * y)$

SET $mean = (x + y + z) / 3$

DISPLAY "The mean of x, y, and z is: ", mean
END



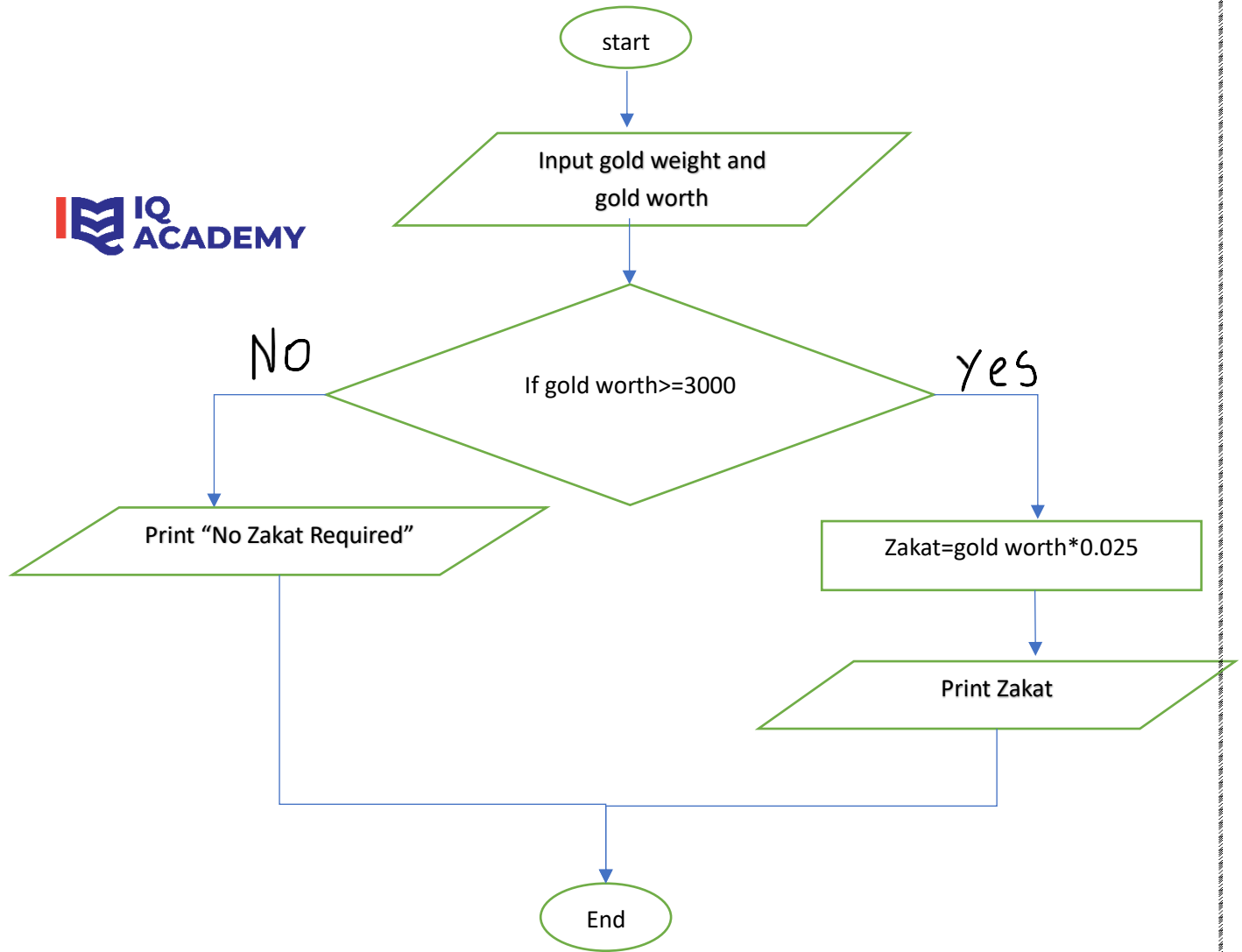
Question 2: Describe an algorithm that computes the gold zakat.

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: $zakat = gold\ worth * 2.5\%$)

*Algorithm

1. Get the gold weight in grams.
2. Get the worth of the gold (e.g., price per gram or total worth).
3. If the total gold worth is greater than or equal to 3000:
 - Calculate the zakat: $zakat = gold_worth * 0.025$
 - Display the zakat amount.
4. If the total gold worth is less than 3000, display a message that no zakat is due.

***Flowchart**



***pseudo code**

BEGIN

DISPLAY "Enter gold weight in grams: "

INPUT weight

DISPLAY "Enter total worth of the gold: "

INPUT worth

IF worth \geq 3000 THEN

SET zakat = worth * 0.025

DISPLAY "The zakat due is: ", zakat

ELSE

DISPLAY "No zakat is due."

END IF

END

