SOF103 C and C++ Programming
Lab Exercise 3
Operators and Control Structures

Part A: Review Questions

Instructions: Answer the following review questions.

1.   Which of the following are *not* valid assignment statements?
      A) total = 9;
      B) 72 = amount;
      C) yourAge = myAge;

2.   Assume x = 4, y = 7, and z = 2. What value will be stored in integer variable result by each of the following statements?
      A) result = x + y;
      B) result = y * 2;
      C) result = y / z;

3.   Assume x = 2.5, y = 7.0, and z = 3. What value will be stored in integer variable result by each of the following statements?
      A) result = x + y;
      B) result = y * 2;
      C) result = y / z;

4.   Write assignment statements that perform the following operations with int variable i, double variables d1 and d2, and char variable c.
      A) Subtract 8.5 from d2 and store the result in d1.
      B) Divide d1 by 3.14 and store the result in d2.
      C) Store the ASCII code for the character 'F' in c.
      D) Add 1 to i and store the new value back in i.
      E) Add d1 to the current value of d2 and store the result back in d2 as its new value.

5.   Assuming x is 5, y is 6, and z is 8, indicate whether each of the following relational expressions is true or false:
          A) x == 5
          B) 7 <= (x + 2)
          C) z > 4
          D) (2 + x) != y
          E) z != 4
          F) x >= 0
          G) x <= (y * 2)

6.   Indicate whether each of the following statements about relational expressions is correct or incorrect.
          A) x <= y is the same as y > x
          B) x != y is the same as y >= x
          C) x >= y is the same as y <= x

7.   Answer the following questions with a yes or no.
      A) If i is true that x > y and it is also true that x < z,
          does that mean y < z is true?

B) If it is true that x >= y and it is also true that z == x,
   does that mean that z == y is true?
C) If it is true that x != y and it is also true that x != z,
   does that mean that z != y is true?

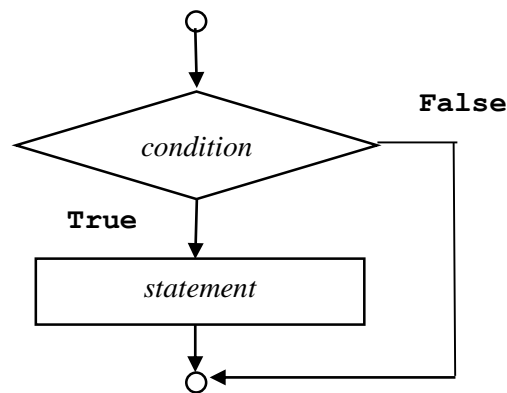8. What will the following program segment display?
```
int a = 0, b = 2, x = 4, y = 0;
cout << (a == b) << endl;
cout << (a != y) << endl;
cout << (b <= x) << endl;
cout << (y > a) << endl;
```

Part B: Program Flow Chart

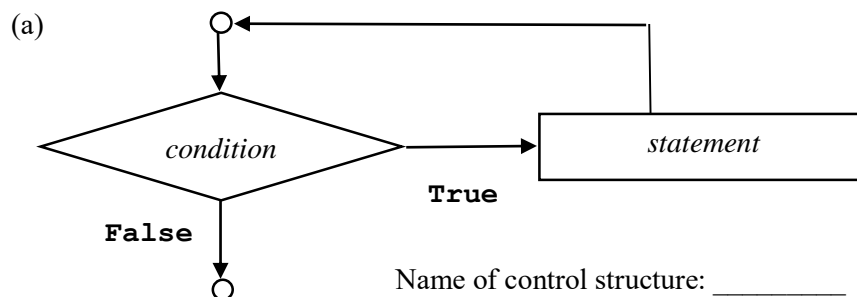1. An **if** statement can be visualized using a program flow chart shown below

if (*condition*)
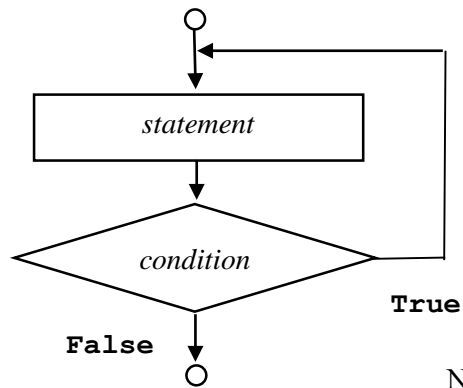   *statement*

Construct a program flow chart for the following nested **if-else** code:
```
if(grade >= 50)
     cout << "Passed" << endl;
else if (grade <50)
     cout << "Failed" << endl;
```

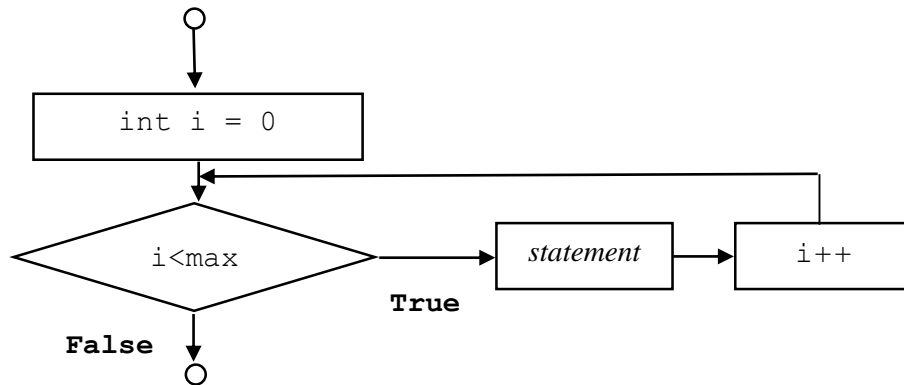2. Label the following the flow chart diagram with the name of the control structures.
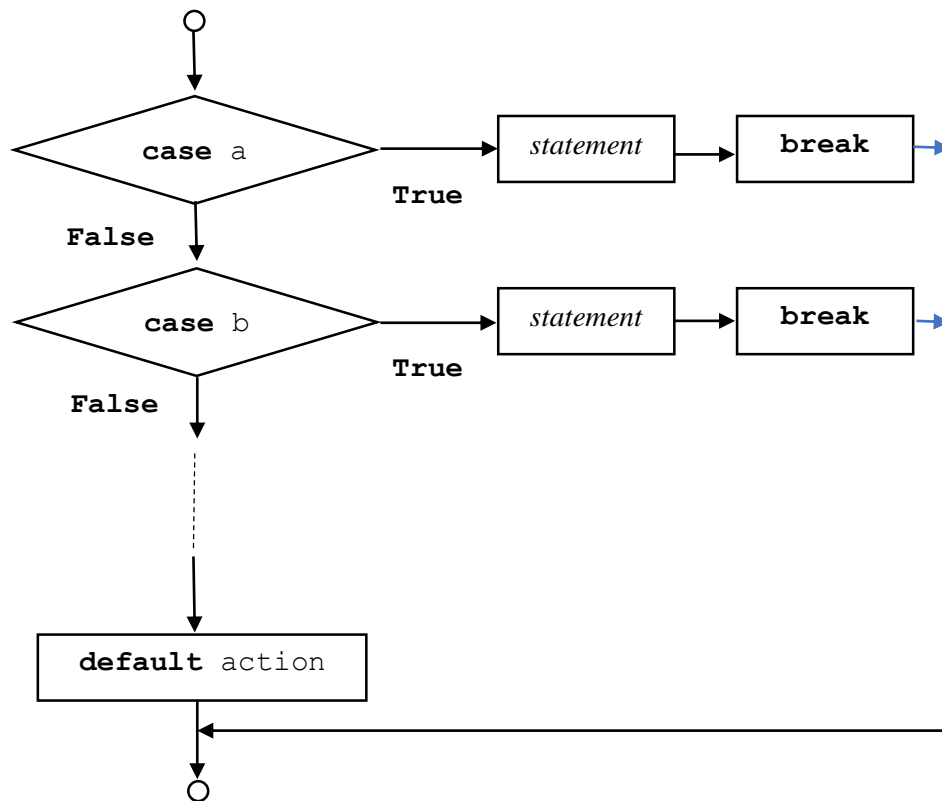
(a)

Name of control structure: _____

(b)

```
        O
        |
        v
+-----------------+
|   statement     |<---+
+-----------------+    |
        |              |
        v              |
      condition -------+
        |         True
  False |
        v
        O
```

Name of control structure: _____

(c)

```
        O
        |
        v
+-----------------+
|   int i = 0     |
+-----------------+
        |        +-----------------------+
        v        v                       |
      i<max --------> +-----------+    +-------+
        |      True   | statement |--->| i++   |
  False |             +-----------+    +-------+
        v
        O
```

Name of control structure: _____

(d)

```
        O
        |
        v
      case a --------> +-----------+    +-------+
        |       True   | statement |--->| break |--->
  False |              +-----------+    +-------+
        v
      case b --------> +-----------+    +-------+
        |       True   | statement |--->| break |--->
  False |              +-----------+    +-------+
        :
        v
+------------------+
| default action   |
+------------------+
        |
        v
        O
```

Name of control structure: _____

3

Part C: Programming Part

Instruction: Complete the following programming exercises.

1. Write a C++ program to calculate the average age of a class of ten students. Prompt the user to enter the age of each student.

2. Write a program that reads in a positive integer N and then calculates and displays the sum of the first N odd integers. For example, if N is 4, your program should display the value 16, which is $1 + 3 + 5 + 7$.

3. Write a program to display those numbers from 1 to 100 that are divisible by 5

4. Write a program to display numbers from 1 to 50. the output will be like following:

    1 is Odd

    2 is Even

    3 is Odd etc.

5. Write a program that reads in a list of integers from the user until the user enters the value 0 as a sentinel. When the sentinel appears, your program should display the largest value in the list, as illustrated in the following sample run:

```
This program finds the largest integer in a list.
  Enter 0 to signal the end of the list.

45
76
23
49
98
47
0
 The largest integer is 98
```

6. Develop a C++ program that will determine the gross pay for each employee. The company pays "straight time" for the first 40 hours worked by each employee and pays "time-and-a-half" for all hours worked in excess of 40 hours. You are given a list of employees of the company, the numbers of hours each employee worked last week, and the hourly rate of each employee. Your program should input this information for each employee and should determine and display the employee's gross pay. See example below:

```
Enter hours worked (-1 to end): 39
Enter hourly rate of the worker ($00.00) =
10.00 Salary is $390.00

Enter hours worked (-1 to end): 40
Enter hourly rate of the worker ($00.00) =
10.00 Salary is $400.00

Enter hours worked (-1 to end): 41
Enter hourly rate of the worker ($00.00) =
10.00 Salary is $415.00

Enter hours worked (-1 to end): -1
```