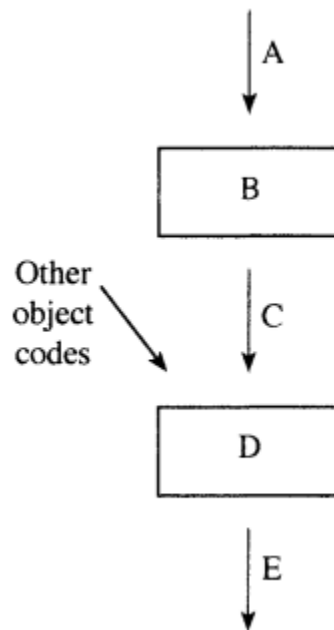


1. A teacher of a programming class draws the following diagram and asks the students to identify the components indicated by A, B, C, D and E:



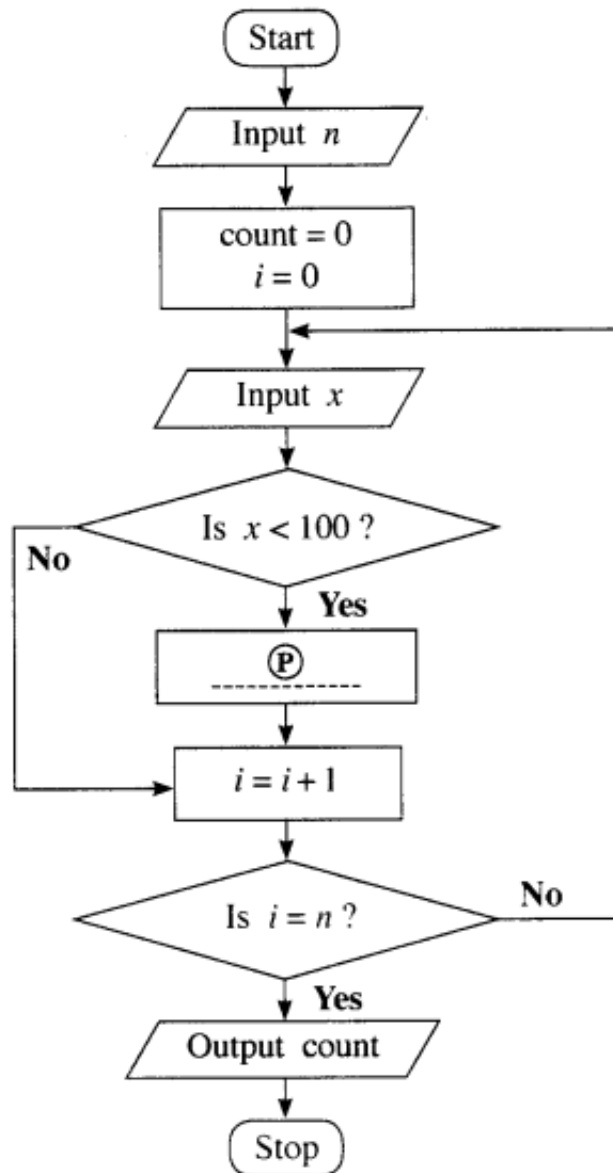
Which of the following gives the correct choices for A, B, C, D and E?

- 1) A – Compiler, B – Executable code, C – source code, D – linker, E – Object code
- 2) A – Compiler, B – source code, C – Executable code, D – Object code, E – linker
- 3) A – linker, B – source code, C –Object code, D – Executable code, E – Compiler
- 4) A – source code, B – Object code, C - linker, D – Compiler, E – Executable code
- 5) A – source code, B – Compiler, C – Object code, D – linker, E – Executable code

- Consider the algorithm expressed by the flowchart and answer questions 2 and 3.

This algorithm takes as input first an integer n (≥ 1) followed by a sequence of n integers one by one.

The algorithm is expected to output the count of integers that are less than 100 among the sequence of n inputs.



2. For the algorithm to function correctly as expected, what should be inserted at the blank (P)?

- 1) `count = count + 1`
- 2) `count = count + i`
- 3) `count = count + x`
- 4) `n = n - 1`
- 5) `n = n + 1`

3. which of the following Python programs implement the algorithm in the flowchart?

```
I  n = int(input())
    count = 0
    for i in range(n):
        x = int(input())
        if (x < 100):
            count = count + i
    print(count)

II n = int(input())
   count = 0
   for i in range(n):
       x = int(input())
       if (x < 100):
           count += 1
   print(count)

III n = int(input())
    count = i = 0
    while (i < n):
        x = int(input())
        if (x < 100):
            count = count + 1
    print(count)
```

- 1) only I
- 2) only II
- 3) only I and II
- 4) only II and III
- 5) All I, II and III

4. What would be the output after executing the following Python code?

```
n = 117
m = (n & 127) // (2 ** 3)
print(m)
```

- 1) 1 2) 14 3) 14.625 4) 15 5) 19

5. What will be the result when the following Python code is executed?

```
x = 10
def myfun(a):
    global x
    a = x + a
    x = 30
    return a
print(myfun(x))
```

- 1) 10 2) 20 3) 30 4) 40 5) an error

6. What will be the output of the following Python code segment?

```
S = ["covid", "pandemic", "vaccine", "booster", "virus"]
V = "aeiou"
count = 0
for i in range(len(S)):
    for j in range(len(S[i])):
        if (S[i][j] in V):
            count = count + 1
print(count)
```

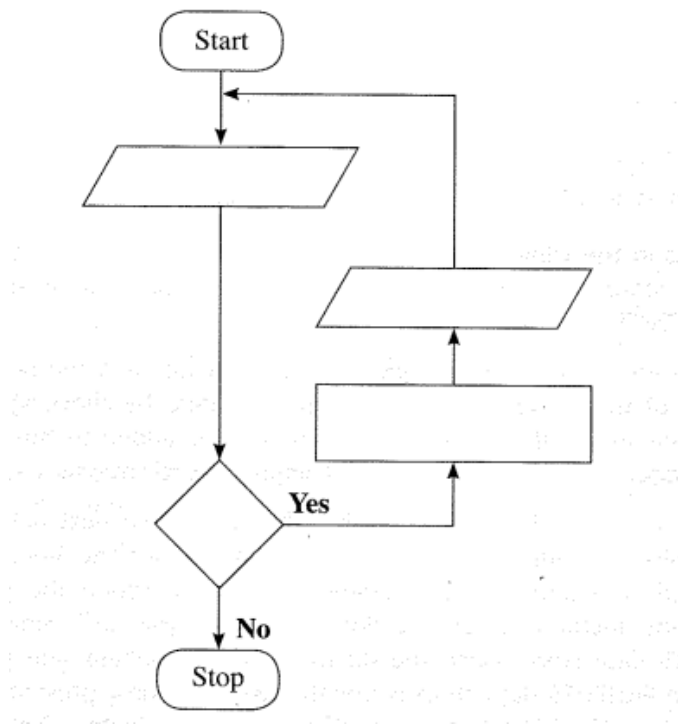
- 1) 0 2) 5 3) 12 4) 14 5) 32

7. What will be the output when the following Python code is executed?

```
s = 1
for i in range(1,10):
    if (i < 5):
        s = s * i
    elif (i < 8):
        s = s - i
    else:
        s = s + i
        break
print(s)
```

- 1) 6 2) 14 3) 23 4) 33 5) 121

8. (a) flowchart is to be drawn for an algorithm to calculate and output the **areas** of triangles. The **base** and **height** of each triangle are given as inputs.



Note: Area of triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

The algorithm should stop when an input is less than or equal to zero.

Complete the flowchart by writing the required content for the four components left blank.

- (b) complete the four blanks (indicated by) in the following python program to calculate the factorial of an integer.

Note: The factorial of a positive integer is defined as the product of that integer and all the integers below it. e.g., factorial of 4 is equal to $1 \times 2 \times 3 \times 4 = 24$. The factorial of 0 is defined as 1.

```

# Get input from user
.....=int(input("Enter a number:"))
factorial = 1
if num < 0:
    print("Factorial is not defined for negative numbers!")

elif ..... :
    print("The factorial of 0 is 1")
else:
    for i in range(1,num + 1):
        .....

print("The factorial of",num,"is",.....)
  
```

(c) Consider the following python program:

```
lower = 2
upper = 5

for num in range(lower, upper + 1):
    flag = 1
    if num > 1:
        for i in range(2, num):
            if (num % i) == 0:
                flag = 0
                break
        if flag == 1:
            print(num)
```

Write the output of the above program.

.....

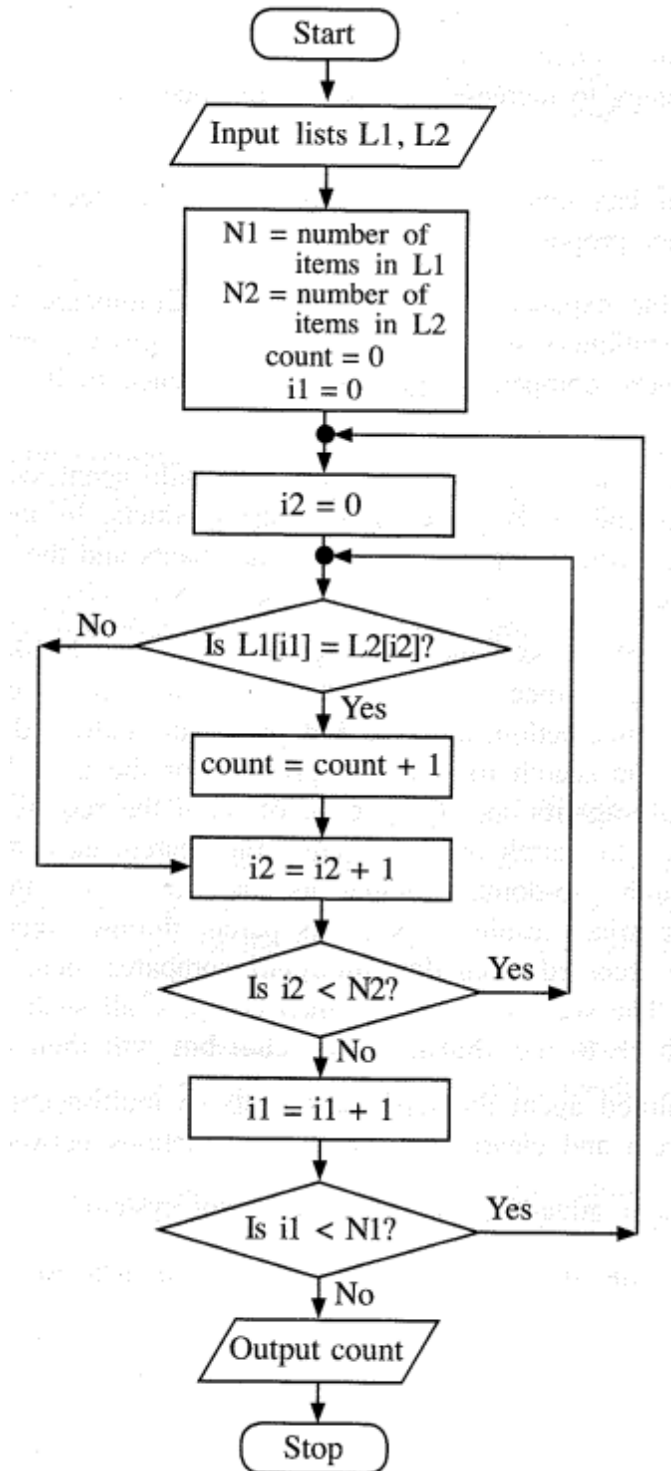
.....

.....

.....

9. (a) suppose the ages (in years) of n ($n > 1$) students in a school are in a list L . Assuming the list L and an integer k are inputs, express an algorithm using **either** a flowchart **or** pseudo – code to complete and output the average age of students in L whose age is less than k years.

(b) Consider the algorithm expressed by the flowchart. L1 and L2 are non – empty lists of integers. Each of L1 and L2 has unique elements (no duplicates). But there can be elements that are in both L1 and L2. The notation $L[x]$ denotes the element at Index x of a list L . If there are N elements in list L , then the indices are from 0, 1, 2, ... to $(N-1)$.



(i) What would be the output if $L1=2, 4, 7, 9, 3, 5$ and $L2 = 1, 3, 8, 9, 6, 5, 7$?

(ii) What is the purpose of the algorithm?

(iii) Develop a python program to implement the algorithm expressed by the flowchart.