Week-3, Practice

Question- (1)

Statement

In the “Shopping Bills” dataset, the procedure **countBills** counts the number of bills from Big Bazaar with total amount more than the average total bill amount. Assume that the variable **Avg** holds the value of the average total bill amount. Choose the correct code fragments to complete the procedure. It is a Multiple Select Question (MSQ).

```
Procedure countBills()
     Count = 0
     while(Pile 1 has more cards){
           Read the top card X from Pile 1
           **********************
           ** Fill the code   **
           **********************
          Move card X to Pile 2
     }
     return(Count)
End countBills
```

Options

(a)

```
if(X.ShopName == "BigBazaar"){
   if(X.TotalBillAmount > Avg){
      Count = Count + 1
   }
}
```

(b)

```
if(X.TotalBillAmount > Avg){
   if(X.ShopName == "BigBazaar"){
      Count = Count + 1
   }
}
```

(c)

```
if(X.TotalBillAmount > Avg and X.ShopName == "BigBazaar"){
   Count = Count + 1
}
```

(d)

```
if(X.TotalBillAmount < Avg and X.ShopName == "BigBazaar"){
   Count = Count + 1
}
```

Solution

As per the given information in the question statement, we are supposed to find the total number of shopping bills which satisfy two conditions: (i) ShopName == "BigBazaar" and, (ii) TotalBillAmount > **Avg**.
Now, this can be achieved in many ways:

1. Check condition (i) and then check condition (ii) inside it (Option a)
2. Check condition (ii) first and then check condition (i) inside it (Option b)
3. Check both these conditions in a single if statement using “and” operator (Option c)

Therefore the correct options are (a), (b), (c).

Question 2

Statement

The following pseudocode is executed using the “Scores” dataset. What will be the value of the variable **Z** at the end of the execution?

```
SumT = 0, SumM = 0, SumP = 0, SumC = 0
while(Pile 1 has more cards){
      Read the top card X from Pile 1
      SumT = SumT + X.Total
      SumM = SumM + X.Mathematics
      SumP = SumP + X.Physics
      SumC = SumC + X.Chemistry
      Move card X to Pile 2
}
Z =0
if((SumM + SumP + SumC)/SumT >= 0){
   Z = 1
}
if((SumM + SumP + SumC)/SumT <= 1){
   Z = -1
}
```

Options

(a)

0

(b)

1

(c)

-1

(d)

None of the above

Solution

Let us first understand what each variable used in the pseudocode represents at the end of the execution.
SumT: Sum of total marks of all cards in the dataset.
SumM: Sum of Mathematics marks of all cards in the dataset.
SumP: Sum of Physics marks of all cards in the dataset.
SumC: Sum of Chemistry marks of all cards in the dataset.

We know that the sum of **SumM, SumP** and **SumC** is always going to be equal to **SumT**. Therefore, (**SumM + SumP + SumC) / SumT** will always return 1. So, the first if statement (1 ≥ 0) will be True and value of **Z** will become 1. Similarly, the second if condition (1 ≤ 1) will also be True and the value of **Z** will be updated to -1. Therefore, the correct option is (c)

Question 3

Statement

The following pseudocode is executed using the “Scores” dataset. At the end of the execution, variable **Count** captures the number of students whose total marks are more than the class average (of total marks) but have scored below the subject average in at least one subject. Assume that the variable **AvgT** holds the value of the average total marks. Similarly, the variables **AvgP, AvgC** and **AvgM** hold the value of the average marks of Physics, Chemistry and Mathematics respectively. Choose the correct code fragment to complete the pseudocode.

```
Count = 0
while(Table 1 has more rows){
      Read the first row X from Table 1
      A = False, B = False, C = False, D = False
      if(X.Total > AvgT){
         A = True
      }
      if(X.Mathematics < AvgM){
         B = True
      }
      if(X.Physics < AvgP){
         C = True
      }
      if(X.Chemistry < AvgC){
         D = True
      }
      **********************
      **   Fill the code **
      **********************
      }
      Move X to Table 2
}
```

Option

(a)

```
if(A and (B or C or D)){
   Count = Count + 1
}
```

(b)

```
if((A or B) and (C or D)){
   Count = Count + 1
}
```

(c)

```
if((A and B) and (C or D)){
   Count = Count + 1
}
```

(d)

```
if((A and B) or (C and D)){
   Count = Count + 1
}
```

Solution

Let us first understand the meaning of each variable using the given pseudocode:
AvgT: Average total marks
AvgM: Average Mathematics marks
AvgP: Average Physics marks
AvgC: Average Chemistry marks
A: Initially False but it will become True if Total > **AvgT**
B: Initially False but it will become True if MathematicsMarks < **AvgM**
C: Initially False but it will become True if PhysicsMarks < **AvgP**
D: Initially False but it will become True if ChemistryMarks < **AvgC**

Now, as per the question statement **Count** will be incremented only if **A** is True and at least one of **B**, **C** and **D** is True. And the programmatic way to right this is option (a).

Question 4

Statement

The following pseudocode is executed using the “Shopping bills” dataset. What will the values of the variables **A** and **B** represent at the end of the execution?

```
SumSV = 0, SumBB = 0
CountSV = 0, CountBB = 0
while(Pile 1 has more cards){
      Read the top card X from Pile 1
      if(X.ShopName == "SV Stores"){
         SumSV = SumSV + X.TotalBillAmount
         CountSV = CountSV + 1
      }
      if(X.ShopName == "Big Bazaar"){
         SumBB = SumBB + X.TotalBillAmount
         CountBB = CountBB + 1
      }
      Move card X to Pile 2
}
MSV = SumSV / CountSV
MBB = SumBB / CountBB
A = 0, B = 0
while(Pile 2 has more cards){
      Read the top card X from Pile 2
      if(X.ShopName == "SV Stores" and X.TotalBillAmount > MSV){
         A = A + 1
      }
      if(X.ShopName == "Big Bazaar" and X.TotalBillAmount < MBB){
         B = B + 1
      }
      Move card X to Pile 1
}
```

Option

(a)

A = Number of bills from “Big Bazaar” with total bill amount greater than the average total bill amount of “SV Stores”
B = Number of bills from “SV Stores” with total bill amount less than the average total bill amount of “Big Bazaar”

(b)

A = Number of bills from “SV Stores” with total bill amount greater than the average total bill amount of “SV Stores”
B = Number of bills from “Big Bazaar” with total bill amount less than the average total bill amount of “Big Bazaar”

(c)

A = Number of bills from “SV Stores” with total bill amount less than the average total bill amount of “Big Bazaar”
B = Number of bills from “Big Bazaar” with total bill amount greater than the average total bill amount of “SV Stores”

(d)

A = Number of bills with total bill amount greater than the average total bill amount
B = Number of bills with total bill amount less than the average total bill amount

Solution

In the first while loop we are computing values of **SumSV**, **CountSV**, **SumBB** and **CountBB**. Let us understand what these variable represent in this pseudocode:

SumSV: Sum of total bill amount of SV Stores
CountSV: Number of bills of SV Stores
SumBB: Sum of total bill amount of Big Bazaar
CountBB: Number of bills of Big Bazaar

After the first while loop we are calculating values of **MSV** and **MBB** which represents average bill amount of SV Stores and Big Bazaar respectively.

In the second while loop we are iterating over Pile 2 where all cards are stacked as a result of first while loop. In this loop, value of **A** will be incremented if ShopName == “SV Stores” and TotalBillAmount > **MSV**. Similarly, value of B will be incremented if ShopName == “Big Bazaar” and TotalBillAmount < **MBB**. Therefore, the option (b) is the correct answer.

Question (5 - 8)

Statement

The following pseudocode is executed using the “Scores” dataset. Assume that the variable **AvgP** holds the average Physics marks. What will be the values of **CountA, CountB, CountC** and **CountD** at the end of the execution? Fractions can be rounded to next nearest integer. For example 50.1 and 50.9 can be rounded to 51.

```
AvgP = 73
Mid2 = 1.25*AvgP
Mid1 = 0.75*AvgP
CountA = 0, CountB = 0, CountC = 0, CountD = 0
while(Pile 1 has more cards){
     Read the top card X from Pile 1
     if(X.Gender == 'F' ){
        if(X.Physics >= Mid2){
           CountA = CountA + 1
        }
        if(X.Physics < Mid2 and X.Physics >= AvgP){
           CountB = CountB + 1
        }
        if(X.Physics < AvgP and X.Physics >= Mid1){
           CountC = CountC + 1
        }
        if(X.Physics < Mid1){
           CountD = CountD + 1
        }
     }
     Move card X to Pile 2
}
```

Solution

It is a numerical input type question where we are supposed to find the values of variable **CountA, CountB, CountC** and **CountD**.

Given: **AvgP** = 73 therefore, **Mid2** = 91.25 and **Mid1** = 54.75
As per the outer if statement, we will consider only those cards where gender is female.
Then as per in inner if statements,
CountA will be incremented if PhysicsMarks ≥ **Mid2**,
CountB will be incremented if PhysicsMarks < **Mid2** and PhysicsMarks ≥ **AvgP**,
CountC will be incremented if PhysicsMarks < **AvgP** and PhysicsMarks ≥ **Mid1**,
CountD will be increamented if PhysicsMarks < **Mid1**. Therefore, the answers will be,
CountA = 2 (Card numbers: 5, 18)
CountB = 3 (Card numbers: 23, 25, 28)
CountC = 7 (Card numbers: 4, 10, 12, 14, 15, 21, 22)
CountD = 1 (Card number: 3)

Question 9

Statement

The following pseudocode is executed using the “Scores” dataset. What will **count** represent at the end of execution?

```
count = 0
while(Table 1 has more rows){
      Read the first row X in Table 1
      Move the row X to Table 2
      while(Table 1 has more rows){
            Read the first row Y in Table 1
            count = count + compareSomething(X.Total, Y.Total)
            count = count + compareSomething(Y.Total, X.Total)
            Move the row Y to Table 3
      }
      Move all rows from Table 3 to Table 1
}
Procedure compareSomething(A, B)
     if(A > B){
        return (-1)
     }
     else {
        return (1)
     }
End compareSomething
```

Options

(a)

Number of pairs of students who have different total marks

(b)

Number of pairs of students who have same total marks

(c)

Twice the number of pairs of students who have different total marks

(d)

Twice the number of pairs of students who have same total marks

(e)

It is always zero

Solution

The given pseudocode contains nested while loops and we are iterating on scores dataset. So, every student's total marks will be compared against every other student's total marks. This comparison will happen twice with different sequence of arguments for the procedure **compareSomething**(). The procedure is comparing parameters **A**, **B** and it will return -1 if **A > B**, 1 otherwise that is if **A < B** or **A == B**.

Based on this information we can analyse 3 results of comparisons:

1. **X**.Total > **Y**.Total : This will return -1 and decrements the value of count
2. **X**.Total < **Y**.Total : This will return 1 and increments the value of count
3. **X**.Total == **Y**.Total : This will return 1 and increments the value of count

Now, because of the two successive procedure calls with different order of arguments, comparison
results 1 and 2 will nullify each others effect. But due to result 3, **count** will be incremented twice when **X**.Total == **Y**.Total. Therefore, the correct option will be (d).

Question 10

Statement

The following pseudocode is executed using the “Shopping bills” dataset to find the number of eligible bills for the lowest three total bill amounts. Choose the correct code fragment to complete the pseudocode.

```
FirstT = 10000, SecondT = 10000, ThirdT = 10000
while(Pile 1 has more cards){
      Read the top card X from Pile 1
      if(X.TotalBillAmount < FirstT){
         ThirdT = SecondT
         SecondT = FirstT
         FirstT = X.TotalBillAmount
      }
      if(X.TotalBillAmount > FirstT and X.TotalBillAmount < SecondT){
         ThirdT = SecondT
         SecondT = X.TotalBillAmount
      }
      if(X.TotalBillAmount > SecondT and X.TotalBillAmount < ThirdT){
         ThirdT = X.TotalBillAmount
      }
      Move card X to Pile 2
}
Count = 0
while(Pile 2 has more cards){
      Read the top card X from Pile 2
      **********************
      **  Fill the code  **
      **********************
      Move card X to Pile 1
}
```

Options

(a)

```
if(X.TotalBillAmount < ThirdT){
   Count = Count + 1
}
```

(b)

```
if(X.TotalBillAmount <= ThirdT){
   Count = Count + 1
}
```

(c)

```
if(X.TotalBillAmount > ThirdT){
   Count = Count + 1
}
```

(d)

```
if(X.TotalBillAmount >= ThirdT){
   Count = Count + 1
}
```

Answer

As per the given question statement we are supposed to find the number of eligible bills for the lowest three total bill amounts. At the end of first while loop variables **FirstT**, **SecondT** and **ThirdT** will store the lowest bill amount, second lowest bill amount and third lowest bill amount respectively. Therefor, in order to find the number of eligible bills for the lowest three total bill amounts, we should filter all such shopping bills where total bill amount is less than or equal to **ThirdT**. The corerct option is (c).

Question 11

Statement

The following pseudocode is executed using the “Scores” dataset. Let **minTotal** stores the minimum total marks obtained by any student. What will the value of **Flag** be at the end of the execution?

```
A = 101, B = 101, C = 101, D = 101
Flag = False
while(Pile 1 has more cards){
      Read the top card X from Pile 1
      A, B, C = doSomething(X, A, B, C)
      Move X to Pile 2
}
D = A + B + C
if((minTotal - D) >= 0){
   Flag = True
}
Procedure doSomething(Y, A, B, C){
     if(Y.Mathematics < A){
        A = Y.Mathematics
     }
     if(Y.Physics < B){
        B = Y.Physics
     }
     if(Y.Chemistry < C){
        C = Y.Chemistry
     }
     return ([A, B, C])
End doSomething
```

Options

(a)

False

(b)

True

(c)

Can not be determined

Solution

In the given pseudocode, variables **A**, **B** and **C** store the minimum Mathematics, Physics and Chemistry marks respectively. And, **D** is sum of all these minimum subject marks whereas **minTotal** stores the minimum total marks in the dataset.
If the student who scored minimum total marks has also scored minimum subject marks in all

three subjects then in such a case **minTotal** − **D** == 0, **minTotal** - **D** > 0 otherwise.
In either scenario the value of **Flag** will True.

Question 12

Statement

The following pseudocode is executed using the “Scores” dataset. At the end of the execution, **CountM** captures the number of male students whose Mathematics marks are less than the average Mathematics marks of female students. But the pseudocode may have mistakes in one or more lines. Identify all such lines (if any). Assume that all statements not listed in the options below are free of errors. It is a Multiple Select Question (MSQ).

```
1  Sum = 0, Count = 0
2  while(Pile 1 has more cards){
3        Read the top card X in Pile 1
4        Sum, Count = addMarks(X, Sum, Count)
5        Move card X to Pile 2
6  }
7  AvgT = Sum / Count
8  CountM = 0
9  while(Pile 2 has more cards){
10       Read the top card X in Pile 2
11       if(X.Mathematics < AvgT){
12          CountM = CountM + 1
13       }
14      Move card X to Pile 1
15 }
16 Procedure addMarks (Y, SumF, CountF)
17       if(Y.Gender == 'F'){
18          SumF = SumF + Y.Mathematics
19          CountF = CountF +1
20       }
21       return ([SumF, CountF])
22 End addMarks
```

Options

(a)

Error in Line 4

(b)

Error in Line 11

(c)

Error in Line 17

(d)

Error in Line 18

(e)

Error in Line 21

(f)

No error in the code

Solution

The given pseudocode is supposed to compute the number of male students whose Mathematics marks are less than the average Mathematics marks of female students in varibale **CountM**.
Let us understand the purpose of each variable used in the pseudocode.
Sum: Sum of Mathematics marks of female students
Count: Number of female students
AvgT: Average Mathematics marks of female students
CountM (Expected): Number of **male** students whose Mathematics marks are less than the average Mathematics marks of female students
CountM (Actual): Number of students whose Mathematics marks are less than the average Mathematics marks of female students
Therefore, there is an error in line 11, the correct statement should be,
if (**X**.Gender == 'M' and **X**.Mathematics < **AvgT**)