Week-2, Practice Assignment Solution

Question-1 [3 Marks]

Statement

The following procedure counts the number of students from Mumbai whose total marks are more than the average total marks from the "Scores" dataset and stores it in variable **A**. Let **avgT** be the average total marks. The programmer may have made mistakes in one or more steps. Identify all such steps (if any). It is a Multiple Select Question (MSQ).

Step 1 : Arrange all cards in a single pile called Pile 1

Step 2 : Initialize variable **A** to 0

Step 3 : If Pile 1 is empty then stop the iteration

Step 4 : Read the top card in Pile 1

Step 5 : If *CityTown* == "Mumbai" and *Total* > **avgT** then add 1 to **A**

Step 6 : Move the current card to another pile called Pile 2 and repeat from step 3

Options

(a)

Step 2

(b)

Step 4

(c)

Step 5

(d)

No mistake

Answer

(d)

Solution

In this question we have to find mistakes done by the programmer in order to count the number of students from Mumbai whose total marks are more than the average total marks from the "Scores" dataset which is stored in variable **A**.

Step 1 : In this step, cards are arranged in a pile called Pile 1.
Step 2 : In this step, variable **A** is initialized with 0. As at the start, no cards are yet filtered A should be initialized to 0.
Step 3 and 4 : The usual steps for iteration and ending the procedure.
Step 5 : In this step **A** is incremented when *Total* > **avgT** which is correct.
Step 6 : There is no error.
So the above procedure has no mistakes.

Question-2 [3 Marks]

Statement

The following procedure takes data from the "Scores" dataset and counts the number of female students whose Physics marks are more than their Chemistry marks but less than their Mathematics marks and stores it in variable **A**. The programmer may have made mistakes in one or more steps. Assume that the steps not mentioned in the options are free from errors. Identify all such steps (if any). It is a Multiple Select Question (MSQ).

Step 1 : Arrange all cards in a single pile called Pile 1

Step 2 : Initialize variable **A** to 1

Step 3 : If Pile 1 is empty then stop the iteration

Step 4 : Read the top card in Pile 1

Step 5 : If *Gender* is 'F' and *Mathematics marks < Physics marks* and *Chemistry marks < Physics marks* then add 1 to **A**

Step 6 : Move the current card to another pile called Pile 2 and repeat from step 3

Options

(a)

Step 2

(b)

Step 5

(c)

Step 6

(d)

No mistake

Answer

(a), (b)

Solution

In this question we have to find the mistakes in order to count the number of female students whose Physics marks are more than the Chemistry marks but less than their Mathematics marks. We will go through each steps of the given procedure.

Step 1 : In this step, cards are arranged in a pile called Pile 1.

Step 2 : In this step, variable **A** is initialized with 1 which seems to be incorrect. It should be initialized with 0.

Step 3 and 4 : These steps are correct.

Step 5 : In this step **A** is incremented by 1 when any female student's Mathematics marks are less than the Physics marks but greater than their Chemistry marks.

As this was not our goal, there is a mistake in this step.

Step 6 :There is no error in this line.

So in the above procedure, we have found mistakes in steps 2 and 5.

Question-3 [3 Marks]

Statement

The given procedure finds the number of sentences with maximum number of words from the "Words" dataset. Fill in the blanks from the given choices and complete the procedure.

Step 1: Arrange all cards in a single pile called Pile 1

Step 2: Initialize variable **A**, **B**, and **count** to 0

Step 3: If Pile 1 is empty then stop the iteration

Step 4: Read the top card in Pile 1

Step 5: Add 1 to variable **A**

Step 6: If *Word* does not end with a full stop, then go to step 11

Step 7: If **A** < **B**, then go to step 10

Step 8: If **A** > **B**, then store **A** in **B**, assign 1 to **count**, and go to step 10

Step 9: ------------------------

Step 10: Reinitialize **A** to 0

Step 11: Move the current card to another pile called Pile 2 and repeat from step 3

Options

(a)

If **A** == **B**, then add 1 to **count**

(b)

If **A** == **B**, then assign 1 to **count**

(c)

If Word ends with a full stop and **A** == **B**, then add 1 to **count**

(d)

If Word ends with a full stop and **A** == **B**, then assign 1 to **count**

Answer

(a), (c)

Solution

As the procedure finds the number of sentences with maximum number of words from the "Words" dataset, there will three variables be required.

One variable to keep track of the number of sentences in each sentence and it should be initialized to 0 and once a sentence ends, it should be re-initialized to 0.

The second variable to keep track of maximum number of words in a sentence. It should be initialized to 0 and should be updated whenever a sentence have more number of words than the current value of this variable.

Let n be the number of words in the sentence which has the maximum number of words. There might be more than one sentence with n words. To keep track of this we need the third variable which should be updated to 1 whenever the second variable (which keeps track of maximum number of words in a sentence) gets updated and should be incremented if any sentence has the number of words equal to the current value of second variable.

In step 2, three variables are used and initialized to 0.

From step 5, it is clear that **A** is the first variable which keeps track of number of words in a sentence.

Step 6: If the sentence ends then step 7, 8, 9, and 10 will be executed.

From step 8, it is clear that **B** is the second variable and **count** is the third variable. If step 8 is being executed then the iterator is moving to step 10 so that **count** does not get incremented for the same sentence.

In step 8, whenever the new maximum value is being found (i.e., the current value of **A** is greater than **B**), the length of current sentence (with respect to the number of words) is being stored in **B** (i.e., **B** is being updated). At this point count is being assigned to 1. If the next sentence has the same length, **count** should be incremented. Therefore, step 9 should be

If **A == B** then add 1 to **count**. (Option a)

Now option (c) will also be correct As the word is already ending with full stop.

Therefore, Options (a) and (c) both are correct options.

Question-4 [3 Marks]

Statement

What will (**A–B**) represent after execution of the following procedure using the "Shopping Bills" dataset?

Step 1 : Arrange all cards in a single pile called Pile 1

Step 2 : Initialize variables **A** and **B** to 0

Step 3 : If Pile 1 is empty then stop the iteration

Step 4 : Read the top card in Pile 1

Step 5 : If the bill contains an item "Milk" then add 1 to variable **A**

Step 6 : If *Name* == "Srivatsan" and the bill contains an item "Milk", then add 1 to variable **B**

Step 7 : Move the current card to another pile called Pile 2 and repeat from step 3

Options

(a)

Number of Srivatsan's bills which do not contain the item "Milk"

(b)

Number of bills other than Srivatsan's which do not contain the item "Milk"

(c)

Number of bills other than Srivatsan's which contain the item "Milk"

(d)

Number of bills which contain the item "Milk"

Answer

(c)

Solution

The above procedure is executed on the "Shopping Bills" dataset and asked to find what (**A-B**) represents at the end of execution. First of all we will find what **A** and **B** represent individually. From the above pseudocode it is clear that variable **A** is being incremented when any bill contains an item "Milk". Therefore **A** will count the number of bills which contain an item "Milk" whereas variable **B** will count the number of Srivatsan's bills which contains an item "Milk". So when we will subtract **B** from **A** i.e. (**A-B**) will have only the bills other than Srivatsan's which contain the item "Milk".

Question 5 [3 Marks]

Statement

What will **B** represent after the execution of the following procedure using the "Scores" dataset?

Step 1 : Arrange all cards in a single pile called Pile 1

Step 2 : Initialize variables **A** and **B** to 0

Step 3 : If Pile 1 is empty then stop the iteration

Step 4 : Read the top card in Pile 1

Step 5 : If *Physics marks* is not less than *Mathematics marks* then store (*Physics marks − Mathematics marks*) in **A**

Step 6 : If **A > B** then store **A** in **B**

Step 7 : Move the current card to another pile called Pile 2 and repeat from step 3

Answer : — — — — — — —

Answer

28

Solution

The given procedure is executed on the "Scores" dataset and we need to find the value stored in the variable **B** at the end of the execution. The value of **B** depends on the variable **A**. So first, we will check that what variable **A** store at the end of the execution.

In step 5, (*Physics marks − Mathematics marks*) is stored in variable **A** when Physics marks is not less than Mathematics marks i.e. Physics marks is greater than or equal to Mathematics marks. In expression form:

if (*Physics marks >= Mathematics marks*), then **A** = (*Physics marks − Mathematics marks*).

Then in Step 6, **A** is being stored in **B** when **A** is greater than **B**. In expression form:

if (**A > B**), then **B = A**.

Hence, **B** stores the maximum value of (*Physics marks − Mathematics marks*) among all cards of the "Scores" dataset. For the card No.24, (*Physics marks − Mathematics marks*) = 28 which is the maximum among all cards of the "Scores" dataset. Therefore the value of **B** will be 28.

Question-6 [3 Marks]

Statement

The given procedure is executed on the "Scores" dataset. What will **min** represent after execution of the procedure?

Step 1 : Arrange all cards in a single pile called Pile 1

Step 2 : Initialize variables **A, B, C**, and **min** to 1000

Step 3 : If Pile 1 is empty then stop the iteration and go to step 9

Step 4 : Read the top card in Pile 1

Step 5 : If *Mathematics marks* < **A** then store *Mathematics marks* in **A**

Step 6 : If *Physics marks* < **B** then store *Physics marks* in **B**

Step 7 : If *Chemistry marks* < **C** then store *Chemistry marks* in **C**

Step 8 : Move the current card to another pile called Pile 2 and repeat from step 3

Step 9 : If **A < B** then store **A** in **min** otherwise store **B** in **min**

Step 10 : If **C < min** then store **C** in **min**

Options

(a)

Lowest Mathematics marks

(b)

Lowest Physics marks

(c)

Lowest Chemistry marks

(d)

Lowest marks across all subjects

Answer

(d)

Solution

The above pseudocode is executed on the "Scores" dataset and we need to find what **min** represents at the end of the execution From the pseudocode, till step 8, we we can conclude that variables **A, B** and **C** store the lowest marks in Mathematics, Physics and Chemistry respectively. In steps 9, variable **min** stores the lowest between **A** and **B**. In steps 10, variable **min** stores the lowest between **min** and **C**. Hence, **min** stores the lowest marks across all subjects.

Question-7 [3 Marks]

Statement

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

```
1   count = 0
2   while(Table 1 has more rows){
3       Read the first row X from Table 1
4       C = 0
5       if(X.Mathematics > 75){
6           C = C + 1
7       }
8       if(X.Physics > 75){
9           C = C + 1
10      }
11      if(X.Chemistry > 75){
12          C = C + 1
13      }
14      if(C <= 2){
15          count = count + 1
16      }
17      Move X to Table 2
18  }
```

Options

(a)

Number of students who scored more than 75 marks in at least two subjects

(b)

Number of students who scored more than 75 marks in two subjects

(c)

Number of students who scored more than 75 marks in at most two subjects

(d)

Number of students who scored more than 75 marks in all three subjects

Answer

(c)

Solution

The above pseudocode is executed on the "Scores" dataset. In the pseudocode variable **C** is reinitialized with zero for every card and it is being incremented when any subject marks are greater than 75. There for every card **C** stores the number of subjects in which the student **X** has scored more than 75. Finally, **count** is incremented whenever value stored in **C** is less than or

equal to 2. Therefore, variable **count** counts the number of students who scored more than 75 marks in at most two subjects.

Question (8 - 9) [6 Marks]

Statement

The following pseudocode is executed using the "Scores" dataset?

```
1   A = 0, B = 0, C = 0
2   while(Pile 1 has more cards){
3       Read the top card X from Pile 1
4       if(X.Mathematics < X.Physics){
5           A = A + 1
6           B = B + 1
7           C = C + 1
8       }
9       if(X.Mathematics > X.Physics){
10          B = B + 1
11          C = C + 1
12      }
13      if(X.Mathematics == X.Physics){
14          C = C + 1
15      }
16      Move card X to Pile 2
17  }
```

Question-8 [3 Marks]

Statement

What will the value of (**C–A**) represent? It is a Multiple Select Question (MSQ).

Options

(a)

a. Number of students whose Mathematics marks are at least as much as Physics marks

(b)

Number of students whose Mathematics marks are at most as much as Physics marks

(c)

Number of students whose Physics marks are at least as much as Mathematics marks

(d)

Number of students whose Physics marks are at most as much as Mathematics marks

Answer

(a), (d)

Solution

To find the value of (**C–A**), we need to check what variables **C** and **A** represent. When we look at the pseudocode, we found that **A** counts the number of students whose <u>Mathematics marks are less than Physics marks,</u> it can be seen that there are three filtering conditions and at a time only one condition would be True. It is also clear that **C** is being incremented for every case therefore, whenever a card is picked up any of the three conditions would be True. Hence **C** will be incremented. This means it counts the total number of students in the dataset. So when **A** is being subtracted from **C**, i.e. (**C–A**), will give the number of students whose <u>Mathematics marks are **not** less than Physics marks</u> OR whose Physics marks are less than or equal to Mathematics marks. When we look at the options, (a) and (c) are correct.

Question-9 [2 Marks]

Statement

What will the value of (**C–B**) represent?

Options

(a)

Number of students whose Mathematics marks are equal to Physics marks

(b)

Number of students whose Mathematics marks are more than Physics marks

(c)

Number of students whose Mathematics marks are less than Physics marks

(d)

Number of students whose Physics marks are less than or equal to Mathematics marks

Answer

(a)

Solution

From the pseudocode, **B** is incremented when any of the two condition is valid.

Condition 1: Mathematics mark is greater than Physics Marks.

Condition 2: Mathematics mark is less than Physics Marks.

We also know that both the condition can not be True for a single card. Which means either **B** counts the number of students whose Mathematics marks are either greater than or less than the Physics marks. In other word **B** counts the number of students whose Mathematics mark is not equal to Physics mark. So when we subtract **B** from **C**, (**C - B**) will give the the number of students whose Mathematics marks are equal to Physics marks.

Question-10 [4 Marks]

Statement

The following pseudocode is executed using the "Scores" dataset.

```
1  A = 0, B = 0, C = False
2  while(Pile 1 has more cards){
3      Read the top card X from Pile 1
4      if(X.Gender == 'F'){
5          if(X.CityTown == "Chennai"){
6              A = A + 1
7          }
8      }
9      Move card X to Pile 2
10 }
11 while(Pile 2 has more cards){
12     Read the top card X from Pile 2
13     if(X.CityTown == "Bangalore"){
14         if(X.Gender != 'F'){
15             B = B + 1
16         }
17     }
18     Move card X to Pile 1
19 }
20 if(A > B){
21     C = True
22 }
```

When will **C** be True?

Options

(a)

If there are more male students from Bangalore than female students from Chennai

(b)

If there are more female students from Chennai than female students from Bangalore

(c)

If there are more female students from Chennai than male students from Bangalore

(d)

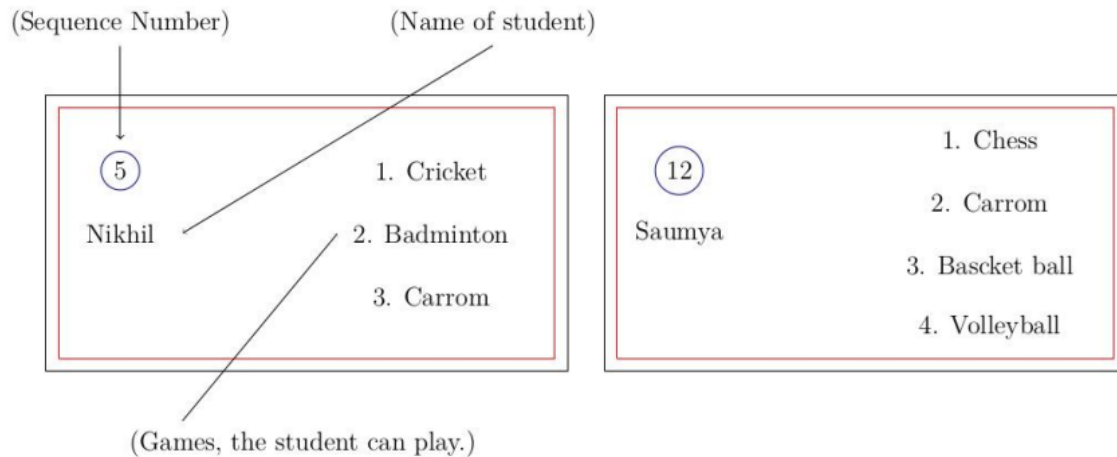If there are more students from Chennai than students from Bangalore

Answer

(c)

Solution

The following pseudocode is executed over the "Scores" dataset and the question is to check when **C** will be True. The given pseudocode can be divided into three parts: first part in which **A** is being updated, second part in which **B** is being updated and in the third part both **A** and **B** are compared to each other. In the first part of the pseudocode, **A** counts the number of female students from Chennai. And in the second part **B** counts the number of male (not female) students from Bangalore. Finally in the last part of the pseudocode, **C** will be updated to True only when **A** is greater than **B**. In other words **C** will be True when there are more female students from Chennai than male students from Bangalore.

Question-11 [4 Marks]

Statement

A principal wants to send students of her college to participate in an annual inter-collegiate sports festival. She created a dataset of students' interest in sports in the form of cards, as shown below.

(Sequence Number)   (Name of student)

5
Nikhil
1. Cricket
2. Badminton
3. Carrom

(Games, the student can play.)

12
Saumya
1. Chess
2. Carrom
3. Bascket ball
4. Volleyball

Using the created dataset, Rehana created a procedure to count the number of students who possess the following conditions:

1. The student plays at least three games.
2. The student plays either Cricket or Football but not both.

But she may have made mistakes in one or more steps. Identify all such steps (if any). Assume that all steps not listed in the options below are free of errors. It is a Multiple Select Question (MSQ).

Step 1 : Arrange all cards in a single pile called Pile 1

Step 2 : Initialize variables **C**, **F**, and **X** to 0

Step 3 : If Pile 1 is empty then stop the iteration

Step 4 : Read the top card in Pile 1

Step 5 : If the student plays at least three games, then go to step 10

Step 6 : If the student plays "Cricket", Increment **C**

Step 7 : If the student plays "Football", Increment **F**

Step 8 : If **C + F == 2** , Increment **X**

Step 9 : Re-initialize variables **C** and **F** to 0

Step 10 : Move the current card to another pile called Pile 2 and repeat from step 3

Options

(a)

Step 2: **X** should be initialized with 1

(b)

Step 5: Rather than going to step 10, the iterator should go to step 6

(c)

Step 8: Incorrect conditional statement

(d)

There is no mistake in any step

Answer

(b), (c)

Solution

In this question Rehana has created procedure to count the number of students who posses the conditions given in the question.

Step 2: Three variables are initialized to 0. One to track if student plays Cricket. Second to track if student plays Football. And third which counts the number of students passing the conditions mentioned.

Step 5: In this step, a filter is applied to screen that if a student plays at least 3 games, which is the requirement of question. Therefore, if the condition given in step 5 is True, then step 6 should be executed not then step 10. But the iterator is moving to step 10 even if the condition is true, which is incorrect.

Step 6: **C** is being incremented if student plays Cricket.

Step 6: **F** is being incremented if student plays Football.

Step 8: If the student plays only one of the Cricket and Football, then **C** + **F** should be equal to 1 not 2. Therefore step 8 is incorrect.

Step 9: Variables **C** and **F** should be initialized for every new card which is fine here.