BSCCS1001: Activity Questions
Week-1

Contents

1 Lecture-1

Introduction to datasets

1. What are the datasets introduced in this lecture?
   - ◯ Student Scores
   - ◯ Shopping Bills
   - ◯ Paragraph Words
   - √ All of the above
2. Which of the following is a question that cannot be asked using the "Scores" dataset?
   - ◯ Who is the student with maximum marks in physics?
   - ◯ How many students scored more than 60 in mathematics?
   - √ How many students scored less than 40 in biology?
   - ◯ Who is the student with maximum marks in chemistry?
3. What is a feature that is common to all datasets?
   - √ The cards in all three datasets have serial numbers.
   - ◯ The datasets have nothing in common.

2 Lecture-2

Concept of variables, iterators and filtering

1. State whether the following statement is true or false:

   When moving cards from one pile to the other for counting the number of cards, the order in which the cards are processed is important.

   ◯ True

   √ False

2. At any intermediate stage in the process of moving the cards from one pile to the other, what does the value in the variable **count** represent?

   ◯ It does not mean anything.

   √ It is the number of cards that have been moved from one pile to the other so far.

   ◯ It is the number of cards that are remaining in the first pile.

3. Match the following statements with the corresponding concepts:

   Statements

   S1: Going through a sequence of objects and performing the same operations on each object.

   S2: An entity whose value keeps changing as the computation goes on.

   Concepts

   C1: Variable

   C2: Iteration

   ◯ (S1, C1), (S2, C2)

   √ (S1, C2), (S2, C1)

4. State whether the following statement is true or false:

   For finding the average mathematics marks, we need to perform two iterations through the cards. First, to find the number of cards. Second, to find the sum of the marks. We cannot do both in a single iteration.

   ◯ True

   √ False

5. We use the variables **verbCount**, **pronounCount** and **otherCount** to maintain counts for the verbs, pronouns and other parts of speech in the "Paragraph Words" dataset. We iterate through all the cards to get these three counts. At the end of the execution, we add the values in all three variables. What can you say about this sum?

   ◯ It represents nothing.

   √ It is equal to the total number of cards in the dataset.

3 Lecture-3

Iterations using combination of filtering conditions

1. In the "Scores" dataset, we are interested in finding the number of females from Chennai. Which of the following statements are true? It is a Multiple Select Question (MSQ).

   √ We can find the count in a single iteration using a combination of filters.

   ☐ We can find the count in two iterations. But the order in which the filters are used affects the result.

   √ We can find the count in two iterations. The order in which the filters are used does not affect the result.

2. We wish to compare the performances of boys and girls in mathematics. What is a good metric to decide which of the two groups is doing better?

   √ Average mathematics marks of the group

   ◯ Maximum mathematics marks of the group

3. Consider the following variables: **boyCount**, **girlCount**, **boySum** and **girlSum**. They have the same meaning as used in the lecture. Which of the following statements expresses the average mathematics marks obtained by all students in the dataset?

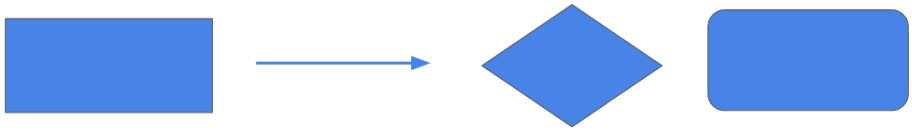
   ◯ (**boySum** / **boyCount**) + (**girlSum** / **girlCount**)

   √ (**boySum** + **girlSum**) / (**boyCount** + **girlCount**)

4 Lecture-4

Introduction to flowcharts

1. Map some of the commonly used flowchart symbols with the operations for which they stand for. It is a Multiple Select Question (MSQ).



From left to right, we have:

- ☐ Flowline, Decision, Terminal, Process
- ☐ Terminal, Flowline, Decision, Activity
- √ Process, Flowline, Decision, Terminal
- √ Activity, Flowline, Decision, Terminal

2. Which of the following flowchart symbols is used to change the value of a variable?

- √ Activity
- ◯ Flowline
- ◯ Terminal
- ◯ Decision

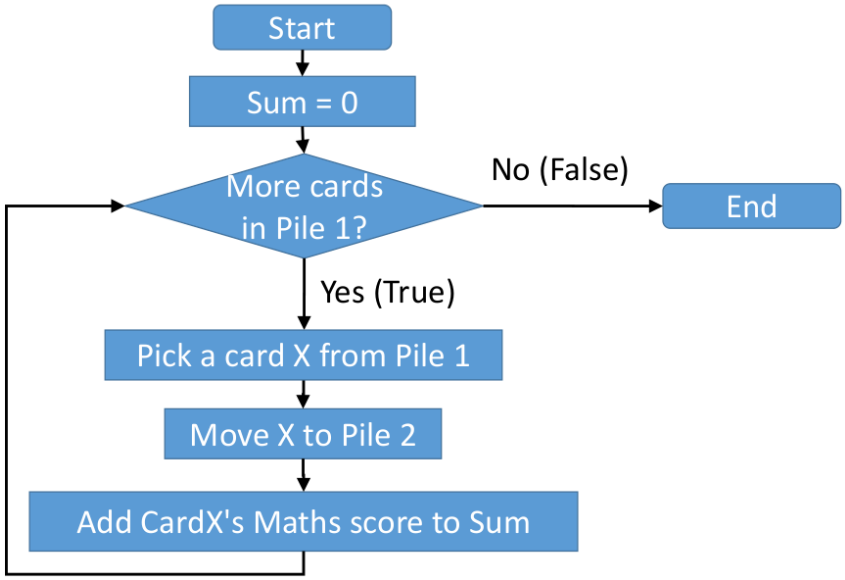
3. A start block in a flowchart is represented by which of the following flowchart symbols?

- ◯ Activity
- ◯ Decision
- √ Terminal

5 Lecture-5

Flowchart for sum with filtering

1. Consider the following flowchart that calculates the sum of the marks of all students in the dataset. We wish to modify this flowchart to compute the sum of maths marks of all girls in the dataset.



(a) What type of flowchart symbol should be inserted?

- √ Decision
- ◯ Terminal
- ◯ Flowline
- ◯ Activity

(b) Where should this symbol be inserted?

- ◯ Between More cards in Pile 1? and Pick a card X from Pile 1
- ◯ Between Sum = 0 and More cards in Pile 1?
- √ Between Move X to Pile 2 and Add Card X's maths score to Sum

(c) What should be the text inside this symbol?

- ◯ Is X a boy?
- √ Is X a girl?

6 Lecture-6

Sanity of Data

1. Consider the following table created using the "Paragraph Words" dataset:

Word	Part of speech	Letter count
and	conjunction	3
Saturday	noun	4
was	adjective	3

How many data entry errors does the above table have?

Answer: 2

2. Consider the following table maintained by the staff at "SV stores":

Item	Cost per unit	Number of units	Total cost
Socks	60	2	150
Shampoo	150	1	150
Horlicks	270	1	270
		Grand total	570

Are there any data entry errors with respect to the sanity of data?

- ◯ Yes. The error is in summing the total cost of all items to get the grand total.
- √ Yes. The error is in computing the total cost of the item "Socks".
- ◯ No. The sanity of data has not been compromised.

7 Lecture-7

Introduction to datatypes

1. What are the basic datatypes that we have come across in this lecture? It is a Multiple Select Question (MSQ).

   √ Boolean

   √ Integer

   √ Character

2. Let **x** and **y** be two variables of integer type. What is the datatype of the outcome of the following operation: $\mathbf{x} > \mathbf{y}$

   √ Boolean

   ◯ Integer

   ◯ Character

3. In the "Scores" dataset, what is the datatype of the variable used to store the physics marks of the students?

   √ Integer

   ◯ Character

   ◯ Boolean

4. State whether the following statement is true or false:

   A variable's datatype does not constrain the operations that can be performed on it.

   ◯ True

   √ False

8 Lecture-8

Subtypes of basic datatypes

1. Consider SeqNo as a subtype of the integer datatype. Which of the following operations on a variable of the SeqNo datatype seem reasonable?

   ◯ Addition

   ◯ Multiplication

   ◯ Division

   √ None of the above

2. Which of the following operations on a variable of the Marks datatype do not make sense? It is a Multiple Select Question (MSQ).

   ☐ Addition

   ☐ Subtraction

   √ Multiplication

   √ Division

   ☐ Comparison

3. Gender can be seen as a subtype of which of the following basic datatypes?

   ◯ Boolean

   ◯ Integer

   √ Character

4. Which of the following subtypes are derived from the String datatype?

   ◯ Names

   ◯ City

   ◯ Words

   √ All of the above.

9 Lecture-9

Transformation of sub-datatypes

1. If Date is transformed into a subtype of the integer datatype using the method mentioned in the lecture, what would be the value of "15th August" in a non-leap year?

   Answer: 226

2. After transforming Marks into a subtype of the integer datatype using the steps mentioned in the lecture, what would be the result of the operation *print(7050)*?

   ◯ "7050"

   √ "70.5"

   ◯ "7.050"

   ◯ "705.0"

10 Lecture-10

Introduction to complex datatypes

1. In the ShoppingBill record, what is the datatype of the field called items?

   √ list

   ◯ record

2. How many fields does the record MarksCard have?

   Answer: 9

3. The record WordInPara has four fields that have different datatypes. But all of them have been derived from certain basic datatypes. Which of the following basic types have been used? It is a Multiple Select Question (MSQ).

   √ Integer

   ☐ Boolean

   √ Character

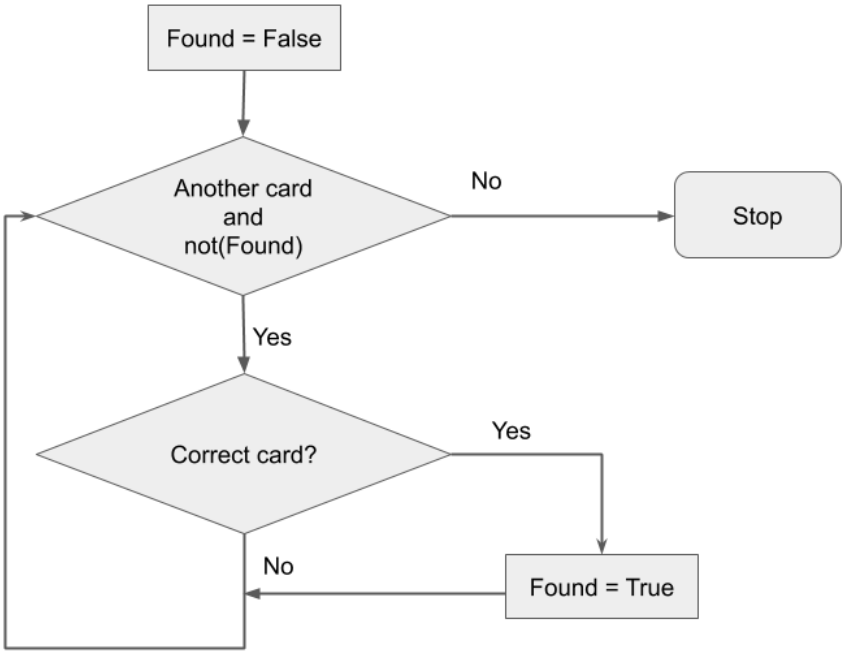
BSCCS1001: Activity Questions
Week-2

Contents

1 Lecture-2.1

Conditional termination in iteration

1. Use the following flowchart that was used at the end of the lecture to answer the remaining questions:



(a) If the variable **Found** stores the value True, what is the outcome of the operation *not*(**Found**)?

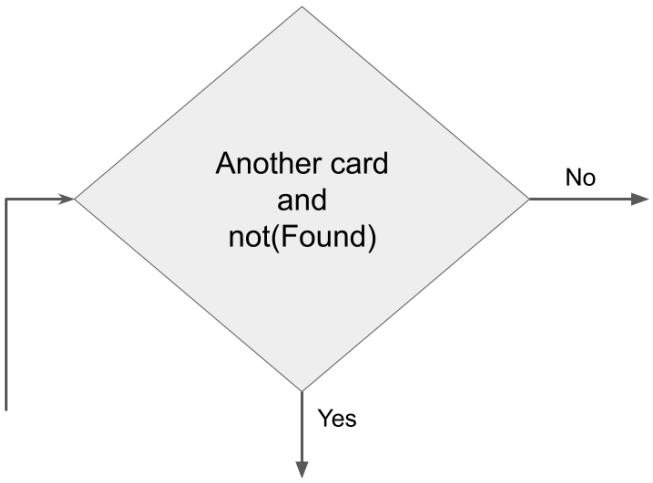
- ◯ True
- √ False

(b) Consider the main decision block used in the above flowchart:

After a certain number of steps in the iteration, the flow transfers to the "No" branch. Which of the following situations are possible at this stage of the program's execution? It is a Multiple Select Question (MSQ).

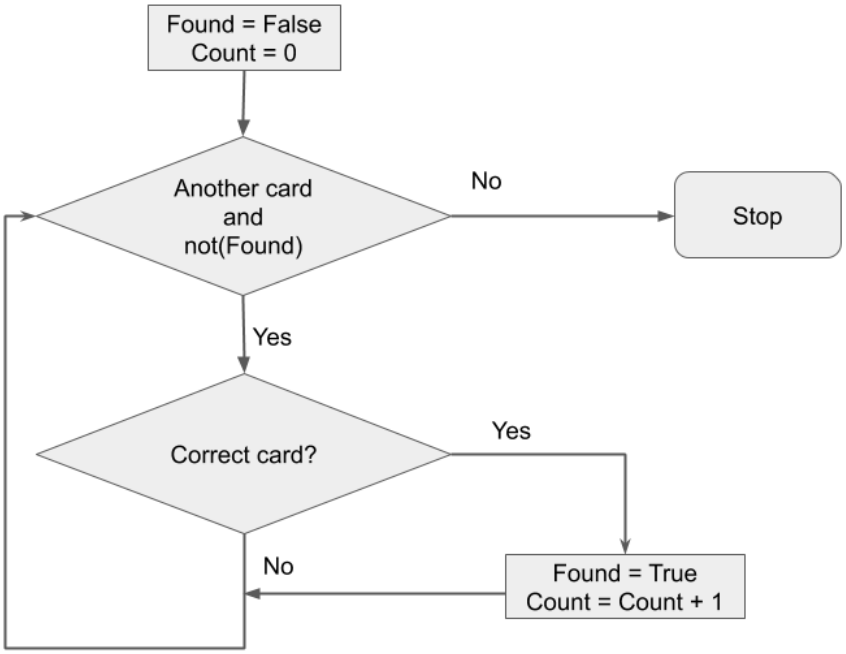
- √ The variable **Found** stores the value True and some cards have not been read.
- ◯ The variable **Found** stores the value False and some cards have not been read.
- √ The variable **Found** stores the value False and all cards have been read.
- √ The variable **Found** stores the value True and all cards have been read.

(c) At the end of the execution, the variable **Found** stores the value True. How many times was it updated?



◯ 0
√ 1
◯ As many times as a correct card was discovered
◯ 30

2. Consider the following flowchart:



If there are 10 cards that satisfy the condition for the "Correct card", what will be the value of the variable **Count** at the end of execution of the above flowchart?

- ◯ 10
- ◯ 0
- √ 1
- ◯ 30

2 Lecture-2.2

Local operations and max in single iteration, part-1

The following questions are based on the procedure to find the maximum marks that was discussed in the lecture:

1. While finding the maximum marks, the variable **max** was initialised to 0. Is the following claim true: the variable **max** can also be initialised with the marks of any card in the "Scores" dataset.

   √ True

   ◯ False

2. At any intermediate stage in the procedure's execution, what does the variable **max** store? Choose only the option that always applies for any arbitrary stage in the program's execution.

   ◯ It stores the total marks of the most recent card that was removed from the first pile.

   √ It stores the maximum marks among the cards that have been moved to the second pile.

   ◯ It stores the maximum marks among the cards that are remaining in the first pile.

   ◯ It stores the maximum marks among all the cards in the dataset.

3 Lecture-2.3

Local operations and max in single iteration, part-2

1. Suppose we wish to find the shortest sentence in the "Paragraph words" dataset. We decide to use two variables, **min** and **count** that keep track of the length of the shortest sentence seen so far and the length of the current sentence respectively. Which of the following is a valid initialisation for **min**?

   ◯ 0

   ◯ 3

   √ 10000

2. A programmer writes the following program to find the length of the longest word in the "Paragraph words" dataset:

```
Step 1 Arrange all cards in a single pile called Pile-1.
Step 2 Maintain a variable called max and initialise it
       to 0.
Step 3 Read the top card in Pile-1.
Step 4 If letter count < max, then set max equal to
       letter count
Step 5 Move the current card to another pile
called Pile-2 and repeat from step 3.
```

   Has the programmer made a mistake in one of the steps? If yes, what step is it?

   ◯ Step-2

   ◯ Step-3

   √ Step-4

   ◯ There is no mistake.

4 Lecture-2.4

Local operations and max in single iteration, part-3

1. Refer to the procedure to find the maximum number of bills that have been generated by any shop. At an intermediate stage in the procedure, we have the following values for these variables:

   BB = 1, **SV** = 3, **SG** = 2, **MAX** = 3

   Now, a new card comes up. It belongs to "SV stores". After updating one of these variables, which of the following pairs of variables would have to be compared:

   - ◯ **MAX** and **BB**
   - √ **MAX** and **SV**
   - ◯ **SG** and **MAX**
   - ◯ **SG** and **SV**

2. Assume that we have already figured out the maximum number of bills generated by any shop. It is stored in a variable called **MAX**. Now, 30 new cards are added where all contain the shopping bills from three new shops. What is the least number of cards that we would have to iterate over to determine the maximum number of bills generated among all six shops? Note that the dataset already has 30 cards.

   - √ 30
   - ◯ 60
   - ◯ 6
   - ◯ 0

3. We have a new version of the "Shopping Bills" dataset with 1000 cards drawn from several new shops. Apart from the variable **MAX**, what is the maximum number of variables that we would have to maintain if we wish to find the maximum number of bills generated by any one of the shops?

   - ◯ 3
   - ◯ 6
   - √ 1000

5 Lecture-2.5

Local operations and max in single iteration, part-4

1. Consider the following variables and their corresponding values:

Variable	Content
SV	stores the total revenue generated by SV Stores
SG	stores the total revenue generated by Sun General
BB	stores the total revenue generated by Big Bazar
SVcount	stores the total number of bills generated by SV Stores
SGcount	stores the total number of bills generated by Sun General
BBcount	stores the total number of bills generated by Big Bazar

(a) Which of the following expressions gives the average revenue generated by all shops put together?

◯ **SV / SVcount + SG / SGcount + BB / BBcount**

√ **(SV + SG + BB) / (SVcount + SGcount + BBcount)**

(b) The variable **avg** stores the average revenue generated by all the shops. Which of the following expressions checks if the average revenue generated by "SV Stores" is more than the average revenue generated by all shops?

◯ **SV > avg**

√ **avg < SV / SVcount**

(c) Let **SVavg**, **SGavg** and **BBavg** represent the average revenues generated by the three shops. How many pairwise comparisons among the three variables would be needed to find the shop with the maximum average?

◯ 1

√ 2

◯ 3

6 Lecture-2.6

Max in a single iteration and max in two iterations (non-nested)

1. Without modifying any step in the procedure given in the lecture, is it possible to find the word that has the maximum frequency?

   ◯ Yes

   √ No

2. Let **max** be the variable that is used to keep track of the maximum frequency in the procedure discussed in the lecture.

   (a) The final value of **max** is 6. How many times was it updated during the course of the program?

   ◯ Exactly six times.

   ◯ Less than six times.

   ◯ More than six times.

   √ At most six times.

   (b) Is the following statement true or false?
   The word corresponding to which **max** was updated for the final time is one of the words that has the maximum frequency.

   √ True

   ◯ False

7 Lecture-2.7

Max in a single iteration without losing information and applications of frequency count

1. Let **maxMarks** be a variable that keeps track of the maximum *total marks* in the "Scores" dataset. Let **maxCard** be a variable that tracks the index of the card which has the maximum *total marks*. We write a procedure similar to the one given in the lecture to determine the maximum *total marks* and the index of the card corresponding to it.

   (a) If **maxMarks** is updated n times during the execution, how many times is the variable **maxCard** updated?

   ◯ $n-1$
   √ n
   ◯ $n+1$

   (b) Let there be N cards in the pile. Assume that the pile is arranged in the ascending order of *total marks*, so that the *total marks* in any given card is always less than or equal to the *total marks* in the card immediately below it. How many times will the variable **maxCard** be updated if we execute the above program?

   ◯ $\frac{N}{2}$
   ◯ $N-1$
   √ N
   ◯ $N+1$

   (c) Based on the answers from the above questions, what is the correct relationship between n and N?

   ◯ $N = n$
   ◯ $N \leq n$
   √ $n \leq N$
   ◯ We cannot reach any conclusion.

2. Consider the following procedure that iterates through the "Paragraph Words" dataset:

```
Step 1 Arrange all cards in a single pile called Pile-1.
Step 2 Maintain two variables called count and
       prev and initialise them to 0 and "None"
       respectively.
Step 3 Read and move one card at a time from Pile-1 to
       another pile called Pile-2.
Step 4 If word is equal to "was" and prev is equal to
       "it", increment count.
Step 5 Store word in prev.
Step 6 Repeat steps 3 to 5 until Pile-1 is empty.
```

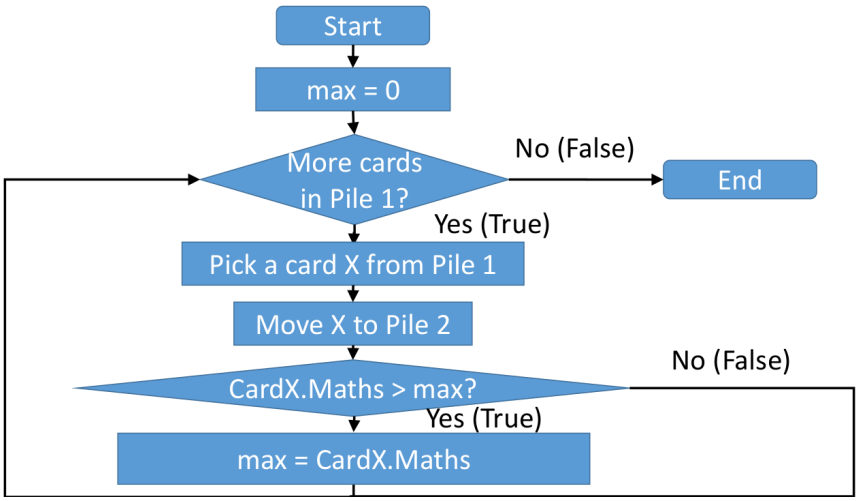
(a) What is the above procedure trying to compute?

- ◯ It computes the number of times the word "was" occurs in the paragraph.
- √ It computes the number of times the phrase "it was" occurs in the paragraph.
- ◯ It computes the number of times the word "it" occurs in the paragraph.

8 Lecture-2.8

Flowchart for max marks

1. Consider the following flowchart discussed in the lecture:



(a) If there are N cards in the dataset, how many times is the first decision block visited?

- ◯ N
- √ $N + 1$

(b) A programmer inadvertently changes the second decision operation so that it reads as follows: CardX.Maths < max?. All other blocks are left unchanged. If we go by this flowchart, what does the variable **max** store at the end of the execution?

- ◯ It stores the maximum maths marks.
- ◯ It stores the minimum maths marks.
- √ It stores the value 0.
- ◯ Insufficient information to answer this question.

(c) Continuing with the previous question, how many times will the last block in the flowchart - max = CardX.Maths - be visited?

- √ 0
- ◯ 1
- ◯ 2
- ◯ 3

(d) The programmer realizes his mistake and reverts to the original flowchart. But now, for some weired reason, he decides to change the second block to read as follows: $\boxed{\text{max} = 98}$. What would the variable **max** store at the end of the execution? It is a Multiple Select Question (MSQ).

- ☐ It will store the maximum maths marks.
- √ It will store the maximum maths marks, provided there is at least one student who has scored greater than or equal to 98.
- √ If no student has scored more than 98, **max** will store the value 98.
- ☐ Insufficient information.

9 Lecture-2.9

Introduction to pseudocodes

1. Is the following representation of a procedure a pseudocode?

```
Step 0 Start
Step 1 Initialize count to 0.
Step 2 Check cards in Pile 1.
Step 3 If no more cards, go to step 8.
Step 4 Pick a card X from Pile 1.
Step 5 Move X to Pile 2.
Step 6 Increment count.
Step 7 Go back to Step 2.
Step 8 End
```

◯ Yes

√ No

2. Consider the following pseudocode:

```
Start
count = 0
while(Pile 1 has more cards){
    Pick a card X from Pile 1
    Move X to Pile 2
    Increment count
    Increment count
}
End
```

If there are N cards in the dataset, what will the variable **count** store at the end of the execution?

◯ N

◯ $N+1$

√ $2N$

◯ 0

3. Consider the following pseudocode:

```
Start
count = 0
while(Pile 1 has more cards){
    Pick a card X from Pile 1
    Move X to the bottom of Pile 1
    Increment count
}
End
```

What will happen when the above code is executed?

- ◯ The code will terminate after all cards in the dataset have been seen.
- √ The code will never terminate and will keep running forever, seeing the cards again and again.

10 Lecture-2.10

Pseudocode for iteration with filtering

1. What can you say about the two lines of pseudocode given below:

```
1    first = 0
2    second = first
```

   ◯ Statement-1 is an assignment statement, statement-2 tests for equality between two variables.

   √ Both are assignment statements.

   ◯ Statement-1 is an assignment statement, statement-2 is not a valid statement in a pseudocode.

2. The following pseudocode to calculate the sum of physics marks of all students may have some incorrect statements. Identify the erroneous lines. It is a Multiple Select Question (MSQ).

```
1    sum == 0
2    while(Pile 1 has more cards){
3        Pick a card X from Pile 1
4        Move X to Pile 2
5        Sum = Sum + X.Maths
6    }
```

   √ Line-1

   ☐ Line-2

   ☐ Line-3

   ☐ Line-4

   √ Line-5

3. Consider the following line in a pseudocode to calculate the sum of chemistry marks of all students:

   `Sum = Sum + X.Chemistry`

   Which of the following is (are) equivalent to the above statement? It is a Multiple Select Question (MSQ).

   √ `Sum = X.Chemistry + Sum`

   ☐ `Sum == Sum + X.Chemistry`

   ☐ `X.Chemistry = Sum + X.Chemistry`

   ☐ `X.Chemistry == Sum + X.Chemistry`

4. A programmer wishes to determine the minimum marks in chemistry. Help her complete the following pseudocode. It is a Multiple Select Question (MSQ).

```
**** statement-1 ****
while(Pile 1 has more cards){
    Pick a card X from Pile 1
    Move X to Pile 2
    if( **** statement-2 ****){
        minC = X.Chemistry
    }
}
```

- ☐ statement-1: `minC = 0`
- √ statement-1: `minC = 100`
- √ statement-2: `X.Chemistry < minC`
- ☐ statement-2: `minC < X.Chemistry`

BSCCS1001: Activity Questions
Week-3

Contents

1 Lecture-3.1

Presentation of datasets in the form of a table

1. Let us assume that the we are working with a new dataset. Similar to the "Scores dataset", this dataset is given to us in the form of cards. Each card has F fields and there are N cards in the dataset. This dataset is to be represented as a table with the fields in the card as the columns. Now answer the following questions:

   (a) How many rows will the table have?
   - √ N
   - ◯ F
   - ◯ $N + F$
   - ◯ $N \cdot F$

   (b) How many columns will the table have?
   - ◯ N
   - √ F
   - ◯ $N + F$
   - ◯ $N \cdot F$

   (c) How many cells will the table have?
   - ◯ N
   - ◯ F
   - ◯ $N + F$
   - √ $N \cdot F$

   (d) If a data entry operator takes t seconds to enter the information in one cell, how much time will it take for the operator to completely fill the table?
   - ◯ $N \cdot t$
   - ◯ $F \cdot t$
   - ◯ $(N + F) \cdot t$
   - √ $N \cdot F \cdot t$

2. Consider a tabular representation of the "Shopping Bills" dataset with the following columns:

ID	Shop	Customer	Item	Category	Qty	Price	Cost	Total

   What is the *ID* of the card that occupies the maximum number of rows in this table?
   Answer: 3

3. Assume that each card in the "Shopping Bills" dataset is represented using the following pair of tables:

ID	Shop	Customer	Total

ID	Item	Category	Qty	Price	Cost

Can any of the columns from either table be removed without losing information?

- ◯ No column can be deleted without losing information
- ◯ ID
- ◯ Category
- √ Total

2 Lecture-3.2

Below average students in two iterations (non-nested) and grade allocation

1. In the "Scores" dataset, we had 15 students who had scored below the class average in a group of 30 students. If we generalize it to a group of N students, how many students would be below the class average?

   ◯ $\frac{N}{2}$
   ◯ $\frac{N}{3}$
   ◯ $\frac{N}{4}$
   √ Insufficient information

2. Consider the scenario discussed in the lecture, where 29 of the 30 students score 50 marks in maths while exactly one student has a score of 100. How many students have scored below the class average in maths for this special case?

   ◯ 15
   ◯ 20
   √ 29
   ◯ 30

3. Assume that we have computed the average maths marks and stored it in a variable called **avg**. Consider the following pseudocode:

```
count = 0
while(Pile 1 has more cards){
    Pick a card X from Pile 1
    Move X to Pile 2
    if(X.Gender == G and avg < X.Maths){
        count = count + 1
    }
}
```

   At the end of the execution of the above pseudocode, what does the variable **count** store?

   ◯ It stores the number of students who have scored above average in maths.
   ◯ It stores the number of boys who have scored below average in maths.
   ◯ It stores the number of girls who have scored below average in maths.
   √ It stores the number of girls who have scored above average in maths.

4. Let **Acount** represent a variable to count the number of students who have obtained "A" grade. The range for "A" grade is 84-97. If **X** represents a card, which of the following code blocks checks if the card belongs to this range and increments **Acount**?

√
```
if(X.Maths >= 84 and X.Maths <= 97){
    Acount = Acount + 1
}
```

◯
```
if(X.Maths > 83 and X.Maths > 98){
    Acount = Acount + 1
}
```

◯
```
if(X.Maths == 84 and X.Maths == 97){
    Acount = Acount + 1
}
```

◯
```
if(X.Maths < 84 and X.Maths > 97){
    Acount = Acount + 1
}
```

5. Consider a variant of the "Scores" dataset with the following minimum and maximum values: **min** = 50 and **max** = 99. We decide to offer 5 grades - A, B, C, D, E - where A is the highest and E is the lowest. What would be the range of scores associated with a D grade? Assume that the interval size is the same for all grades.

√ $60 - 69$

◯ $60 - 70$

◯ $59 - 69$

◯ $61 - 70$

3 Lecture-3.3

Systematic process of hypothesis verification to find the relation between word length and frequency

1. Select all statements that form a part of the hypothesis that was discussed in this lecture. It is a Multiple Select Question (MSQ).

   √ High frequency words are short.

   ☐ Low Frequency words are short.

   √ Low frequency words are long.

   ☐ High frequency words are long.

2. What are the criteria used in the lecture to decide if a given word is short or long?

   ☐ A word is long if it takes a long time to type.

   ☐ A word is short if can be read in under half a second.

   √ A word is long if its *letter count* is six or above.

   √ A word is short if it has at most five characters.

3. Consider the following table that has been generated from a paragraph with 100 words:

Word type	Count
High frequency and long	20
Low frequency and long	2
High frequency and short	60
Low frequency and short	18

   (a) What percentage of the high frequency words confirm the hypothesis that high frequency words are short?

   √ 75

   ◯ 25

   ◯ 60

   ◯ 40

   (b) What percentage of the low frequency words reject the hypothesis that low frequency words are long?

   √ 90

   ◯ 10

   ◯ 60

   ◯ 40

4. Consider the following pseudocode to find the average word length for the "Paragraph words" dataset:

```
count = 0
sum = 0
while(Pile 1 has more cards){
    Pick a card X from Pile 1
    Move X to Pile 2
    sum = sum + X.LetterCount
    count = count + 1
    avgI = sum / count
}
avgF = sum / count
```

   (a) At any intermediate stage in the execution of the above code, what does the variable **avgI** store?

   ◯ It stores the average length of all words in the paragraph.

   √ It stores the average length of all words that have been moved to Pile-2.

   ◯ It stores the average length of all words that are still remaining in Pile-1.

   ◯ It does not store anything meaningful.

   (b) After the code has been executed, which of the following expressions concerning the relationship between the variables **avgI** and **avgF** is True?

   ◯ **avgI > avgF**

   ◯ **avgI < avgF**

   √ **avgI == avgF**

5. We plan to have a three way classification for both frequency and length. There is now a medium frequency in addition to high and low; also, there is a medium length in addition to long and short. Given this setup, how many variables would we need to maintain to keep track of the word-counts for the different combinations that would come up?

   ◯ 4

   ◯ 6

   ◯ 8

   √ 9

4 Lecture-3.4

Three prizes problem

1. If A, B and C are three candidates who have obtained the three prizes, which of the following statements are true? It is a Multiple Select Question (MSQ).

   ☐ All three are girls.

   √ At least one of them is a boy.

   ☐ All three feature in the list of the top three scorers in every subject.

   √ Each one of them should have come within the top three scorers in at least one subject.

2. We have a student who has topped both maths and physics. Will this student get a prize?

   ◯ Yes, she will certainly get a prize.

   ◯ No, she will certainly not get a prize.

   √ She has a good chance of getting a prize.

3. Let **max1**, **max2** and **max3** represent three variables that keep track of the maximum maths marks, such that:

   max1 > **max2** > **max3**

   The current values are as follows:

   max1 = 89, **max2** = 78, **max3** = 67

   Let us assume that we always compare a new card first with **max1**, then with **max2** and finally with **max3**. A new card is now picked up from Pile-1 that has the maths marks as 95.

   (a) How many pairwise comparisons among the variables and cards are needed to update all the variables? Note that each pair consists of a card and one of the three variables.
   Answer: 1

   (b) What will be the value of **max1** + **max2** + **max3** after the update?
   Answer: 262

   (c) After making this update, another card comes up with 50 as the maths marks. How many pairwise comparisons are needed to update all variables? Note that each pair consists of a card and one of the three variables.
   Answer: 3

4. Now, repeat all parts of the previous question by changing the order of comparison with the three variables. That is, let us assume that we always compare a new card first with **`max3`**, then with **`max2`** and finally with **`max1`**.

   (a) How many pairwise comparisons among the variables and cards are needed to update all the variables? Note that each pair consists of a card and one of the three variables.
   Answer: 3

   (b) What will be the value of **`max1`** + **`max2`** + **`max3`** after the update?
   Answer: 262

   (c) After making this update, another card comes up with 50 as the maths marks. How many pairwise comparisons are needed to update all variables? Note that each pair consists of a card and one of the three variables.
   Answer: 1

5. In a variant of the "Scores" dataset, the maximum marks in maths, physics and chemistry are 95, 96 and 97 respectively. A student has scored 94 in all three subjects and has topped the class based on the total marks. Will she get a prize?

   ◯ Yes, she will certainly get a prize.

   √ No, she will certainly not get a prize.

   ◯ She has a good chance of getting a prize.

5 Lecture-3.5

Introduction to procedures and parameters

1. In the lecture, how many times was the procedure **MAX** called?

   Answer: 4

2. What is the datatype of the value returned by the procedure **MAX**?

   √ Integer
   ◯ Boolean
   ◯ Character

3. Is the following statement true or false:

   The logic used by the procedure **MAX** to compute the maximum marks depends on the parameter that is passed to it.

   ◯ True
   √ False

4. Is the following statement true or false:

   The maximum total is equal to the sum of the maximum marks in the three subjects.

   ◯ True
   √ False

5. Assume that we wish to find the length of the longest word in the "Paragraph words" dataset. Can we write a procedure that is similar in logic to the one that we saw in the lecture to achieve this goal?

   √ Yes
   ◯ No

6. Let us clone the "Scores" dataset and modify it in the following way: for every card in the cloned dataset, we replace the maths marks by hundred minus the current maths marks. That is, we take the maths marks in a card, subtract it from hundred, and then replace the maths marks in the card with this new number. We refer to the maths marks in the cloned dataset as `maths-clone`. Now, consider the following code:

   ```
   max-clone = MAX(maths-clone)
   max = 100 - max-clone
   ```

   If this code is executed, what does the variable **max** store?

   √ It is the minimum maths marks in the original dataset.
   ◯ It is the maximum maths marks in the cloned dataset.
   ◯ It is the minimum maths marks in the cloned dataset.
   ◯ It is the maximum maths marks in the original dataset.

6 Lecture-3.6

Pseudocode for procedures and parameters (Part 1)

1. Refer to the procedure **SumMaths**(gen) discussed at the beginning of the lecture. Which of the following expressions calculates the sum of maths marks of all students in the dataset? It is a Multiple Select Question (MSQ).

   ☐ **SumMaths**(M, F)

   ☐ **SumMaths**(F, M)

   √ **SumMaths**(F) + **SumMaths**(M)

   √ **SumMaths**(M) + **SumMaths**(F)

2. What would be the value stored in the variable `marks`?

   ```
   marks = SumMaths(Z)
   ```

   Answer: 0

3. What does the following procedure compute? Assume that it accepts gender as an argument.

```
Procedure Mystery(gen)
    count = 0
    sum = 0
    while(Pile 1 has more cards){
        Pick a card X from Pile 1
        Move X to Pile 2
        if(X.Gender == gen){
            count = count + 1
            sum = sum + X.Physics
        }
    }
    return(sum / count)
end Mystery
```

   ◯ It computes the sum of physics marks of all students

   ◯ It computes the sum of physics marks of all students who belong to gender `gen`

   √ It computes the average physics marks of all students who belong to gender `gen`

   ◯ It computes the average physics marks of all students

4. Consider the procedure **SumMarks**(gen, fld) discussed in the lecture:

   Statement-1: **SumMaths**(M, Physics)

   Statement-2: **SumMaths**(Physics, M)

   √ Statement-1 is correct, Statement-2 is wrong

   ◯ Statement-1 is wrong, Statement-2 is correct

   ◯ Both statements are correct

   ◯ Both statements are wrong

5. State whether the following statement is true or false:

   A procedure must always return a value

   ◯ True

   √ False

6. State whether the following statement is true or false:

   A procedure cannot have more than three arguments.

   ◯ True

   √ False

7. Is the following statement valid:

   ```
   SumMarks(F, Chemistry) = 10
   ```

   ◯ Yes

   √ No

7 Lecture-3.7

Pseudocode for procedures and parameters (Part 2)

1. If a student has topped the class in terms of the *total marks* obtained, which of the following statements is true?

   ◯ The student has certainly topped in every subject.

   ◯ The student has certainly topped in at least one subject.

   √ The student may not have topped in any subject.

   ◯ The student has certainly topped in exactly one subject.

2. Using the procedure Maxmarks(fld) discussed in the lecture, we compute the following expression:

   Maxmarks(Maths) + Maxmarks(Physics) + Maxmarks(Chemistry) - Maxmarks(Total)

   What can you say about the outcome of the above expression? Assume that we run it on a variant of the "Scores" dataset that has 100 cards in it.

   ◯ It is always zero.

   ◯ It is always less than zero.

   ◯ It is always greater than zero.

   ◯ It is always less than or equal to zero.

   √ It is always greater than or equal to zero.

3. Assume that we have a procedure Minmarks(fld) that computes the minimum marks for a given field. Using this procedure we compute the following expression:

   Minmarks(Maths) + Minmarks(Physics) + Minmarks(Chemistry) - Minmarks(Total)

   What can you say about the outcome of the above expression? Assume that we run it on a variant of the "Scores" dataset that has 100 cards in it.

   ◯ It is always zero.

   ◯ It is always less than zero.

   ◯ It is always greater than zero.

   √ It is always less than or equal to zero.

   ◯ It is always greater than or equal to zero.

8 Lecture-3.8

Pseudocode for three prizes problem

1. Consider the following code-block in the procedure **TopThreeMarks(Subj)** discussed in the lecture:

```
if(X.Subj > max){
    thirdmax = secondmax
    secondmax = max
    max = X.Subj
}
```

   Assume that we call the procedure **TopThreeMarks(Maths)**. At an intermediate stage in the execution of this procedure, we find the variables having the following values:

   `max = 88, seconodmax = 76, thirdmax = 68`

   For the next card that we pick up from Pile 1, the if condition that is given above evaluates to true. What could be the smallest value of the maths marks on this card?

   Answer: 89

2. Under which of the following conditions will the following code-block be executed? Select only that option which applies for any card.

```
if(max > X.Subj ≥ secondmax){
    thirdmax = secondmax
    secondmax = X.Subj
}
```

   ◯ Whenever **X.**`Subj` is greater than `secondmax`

   ◯ Whenever **X.**`Subj` is less than `max`

   √ Whenever **X.**`Subj` is greater than `secondmax` and **X.**`Subj` is less than `max`

   ◯ Whenever **X.**`Subj` is less than `secondmax` and **X.**`Subj` is greater than `max`

3. In the procedure **`TopThreeMarks(Subj)`**, we are just returning `thirdmax`. Which of the following options gives the correct reason behind this decision?

   ◯ We will be using this procedure to find out who has got the third highest mark in a given subject. So it is sufficient if we return just this variable.

   √ We will be using this procedure to find out if a given student has come within the top three scorers in a given subject. So it is sufficient if we return just this variable.

4. Consider the procedure **`SubjectTopper(Card, MMark, PMark, CMark)`** discussed in the lecture. What is the basic datatype of the value that this procedure returns?

   ◯ Integer

   √ Boolean

   ◯ Character

5. For some arbitrary card **`X`**, we execute the following statements:

   ```
   SubjectTopper(X, 0, 0, 0)
   SubjectTopper(X, 100, 0, 0)
   SubjectTopper(X, 0, 50, 70)
   ```

   What would be the return values when read from top to bottom?

   ◯ True, True, False

   ◯ False, True, True

   √ True, True, True

   ◯ False, False, False

   ◯ Insufficient information. We need to know more details about the card.

6. After running the entire procedure for the three prizes problem, we find that all three candidates obtained are girls. Among the boys, no one has come within the top three scorers in any subject. Can we award the three prizes for such a scenario?

   ◯ Yes

   √ No

7. In the extremely improbable event that all the students have scored 100 in all three subjects, how do we distribute the three prizes?

   ◯ We find the three youngest students and give them the prizes.

   ◯ We randomly pick two boys and one girl and give them the prizes.

   ◯ We randomly pick two girls and one boy and give them the prizes.

   √ We do not distribute any prizes.

9 Lecture-3.9

Side effects of procedures

1. Changing the sequence of cards is one of the side effects while working with procedures. Is the following statement true or false:

   Side effects always harm the end goal of the program.

   ◯ True

   √ False

2. What is the point of adding `deck` as an argument in the procedure **`SumMarks(gen, fld, deck)`**?

   ◯ This is because, a procedure should have at least three arguments

   √ This gives us the flexibility of working with different decks

3. Consider the following procedures:

   ```
   pro1(a, b)
   pro2(a, b)
   ```

   Both procedures accept a pair of integers and return the same value when a given pair of arguments are passed to them, i.e., they are functionally identical. In addition, both procedures produce identical side effects. Which of the following statements is true?

   √ Both of them have the same interface but could have different implementations.

   ◯ Both of them have the same implementation but could have different interfaces.

   ◯ Neither the interface nor the implementation is common across the two procedures.

   ◯ Insufficient information. We need to look at the code to arrive at a decision.

BSCCS1001: Activity Questions
Week-4

Contents

1 Lecture-4.1

Concept of nested iterations using the birthday paradox (Naive approach)

1. State whether the following statements are true or false.
   (a) We can always find at least one pair of students with same date of birth in a single iteration.
   - ◯ True
   - √ False

   (b) Two nested iterations are sufficient to find pairs of students with same date of birth.
   - √ True
   - ◯ False

2. Consider the following statements:

   Statement-1: Student X is compared with another student Y from Pile 1.
   Statement-2: Repeat statement-1 until Pile 1 is empty.
   Statement-3: The date of birth of student X does not match with any other student in Pile 1.

   Based on the above statements choose the correct option below.
   - ◯ Both X and Y can be discarded from the deck
   - ◯ We can discard Y and keep X for further iterations
   - ◯ Both X and Y are required for further iterations
   - √ We can discard X and keep Y for further iterations

2 Lecture-4.2

Concept of nested iterations using the birthday paradox (Using binning)

1. What are the possible binning strategies to find pairs of students with same date of birth? It is a Multiple Select Question (MSQ).
   - √ Bin by month of birth
   - √ Bin by day of birth
   - ☐ Bin by City/Town
   - ☐ Bin by range of total marks
2. State whether the following statements are true or false.
   (a) If a bin has at most one card, then there is no need to iterate that bin.
   - √ True
   - ◯ False

   (b) One iteration is sufficient to bin the cards.
   - √ True
   - ◯ False

   (c) We can solve the birthday paradox problem after binning, in one iteration.
   - ◯ True
   - √ False
3. What is the advantage of binning?
   - √ It reduces the number of comparisons.
   - ◯ It avoids nested iterations.
   - ◯ Binning has no advantage.

3 Lecture-4.3

Importance of binning to reduce number of comparisons in nested iterations

1. We have n cards in a pile. We compare each card with every other card in the pile exactly once. What is the total number of comparisons that we made?

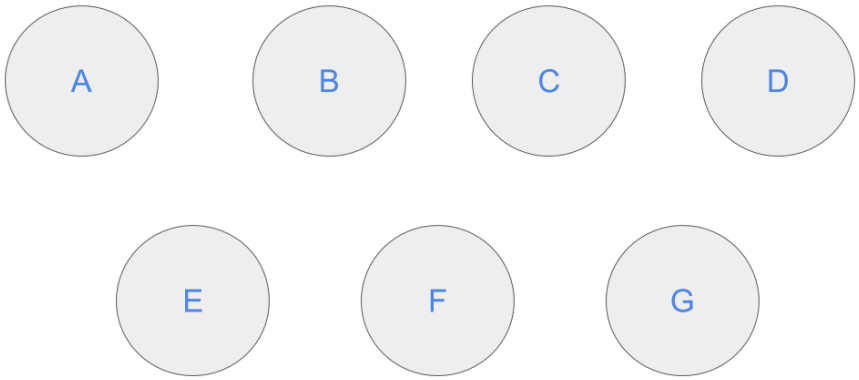
   ◯ n^2

   ◯ $\frac{n^2}{2}$

   ◯ $n(n-1)$

   √ $\frac{n(n-1)}{2}$

2. Consider the following seven elements.



   If we connect each element with every other element by lines, what is the total number of lines that we would have to draw?

   Answer: 21

3. As mentioned in the lecture, assume that a computer can do 10^8 comparisons in a second. How many seconds will it take for the computer to do pairwise comparisons of one million $(1,000,000)$ elements?

   √ Nearly 5000 seconds

   ◯ Nearly 1000 seconds

   ◯ Less than 1 second

   ◯ Nearly 10 seconds

4 Lecture-4.4

Concept of binning to avoid the complexity of nested iterations

1. Assume that we have 20 objects that need to be compared.
   (a) How many pairwise comparisons do we need to make if each object is compared with every other object exactly once?
   Answer: 190
   (b) Assume that we can distribute the 20 objects into bins of equal size. If we go with four bins, how many comparisons would we have to make overall?
   Answer: 40
   (c) We distribute the 20 objects into bins of equal size. How many bins should we choose to make the least number of comparisons overall?
   Answer: 10
   (d) Based on questions 1 and 3, by what factor does binning reduce the number of comparisons?
   Answer: 19

2. We want to find the number of pairs of students who satisfy both the conditions given below:
   - Both students in the pair have the same *total marks*.
   - Both students do not belong to the same gender.

   We now divide the students into two bins, one which contains boys and the other which contains girls, and perform pairwise comparisons within the bins. Will this approach give us the correct answer for the number of pairs?
   ◯ Yes
   √ No

3. We have data about the birth dates (year/month/date) of 100 people in a room. We wish to find the number of pairs of people who were born in the same year. Which of the following is the most ideal binning strategy?
   ◯ Use 12 bins, one for each month.
   ◯ Use 2 bins, one for people born before the year 2000 and another for people born on or after the year 2000.
   √ Use 12 bins, one for each decade starting from the year 1900.

5 Lecture-4.5

Concept of Fair Teams

1. We have two students **X** and **Y** who satisfy the following condition:

   ```
   X.Maths + X.Physics == Y.Maths + Y.Physics
   ```

   Which of the following scenarios are possible? It is a Multiple Select Question (MSQ).

   ☐ `X.Maths > Y.Maths and X.Physics > Y.Physics`

   √ `X.Maths == Y.Maths and X.Physics == Y.Physics`

   √ `X.Maths > Y.Maths and X.Physics < Y.Physics`

   √ `X.Maths < Y.Maths and X.Physics > Y.Physics`

2. We wish to count the number of students in the bin "201 - 225" (endpoints included) and store the result in a variable **A**. Which of the following if conditions checks if a given card **X** falls in this range? Assume that the variable **A** has already been initialized to zero. It is a Multiple Select Question (MSQ).

   ☐
   ```
   if(201 ≤ X.Total ≤ 225){
       A = 1
   }
   ```

   √
   ```
   if(201 ≤ X.Total ≤ 225){
       A = A + 1
   }
   ```

   √
   ```
   if(200 < X.Total < 226){
       A = A + 1
   }
   ```

   √
   ```
   if(X.Total ≥ 201){
       if(X.Total ≤ 225){
           A = A + 1
       }
   }
   ```

3. Consider an arbitrary team represented by `(X, Y)`. Consider the following procedure:

```
isLeftHeavy(M, N){
    if(M.Total - N.Total > 0){
        return(True)
    }
    else{
        return(False)
    }
}
```

(a) If `isLeftHeavy(X, Y)` returns the value False. Which of the following scenarios are possible? It is a Multiple Select Question (MSQ).

- √ Both **X** and **Y** have scored the same total marks.
- ☐ The total marks of **X** is greater than that of **Y**.
- √ The total marks of **Y** is greater than that of **X**.

(b) Is the following statement true or false?

The return value of `isLeftHeavy(X, Y)` is always the opposite of the return value of `isLeftHeavy(Y, X)`. Note that `(X, Y)` is some arbitrary team.

- ◯ True
- √ False

(c) What is the following procedure doing?

```
Mystery(M, N){
    if(isLeftHeavy(X, Y) == False){
        if(isLeftHeavy(Y, X) == False){
            return(True)
        }
        else{
            return(False)
        }
    }
    else{
        return(False)
    }
}
```

- ◯ It is checking if **X** has scored more total marks than **Y**
- ◯ It is checking if **Y** has scored more total marks than **X**
- √ It is checking if **X** has scored the same total marks as **Y**

6 Lecture-4.6

Procedure to find same date of birth for different students

1. Let **X** and **Y** be the cards of two students. Are the following code-blocks equivalent?

   Code-block 1

```
if(X.DateOfBirth == Y.DateOfBirth){
    return(True)
}
else{
    return(False)
}
```

   Code-block 2

```
if(X.DateOfBirth ≠ Y.DateOfBirth){
    return(False)
}
else{
    return(True)
}
```

   √ Yes

   ◯ No

2. **sameBirthday(X, P)** is a procedure that accepts a card **X** and a pile **P** of cards as parameters. It returns the value true if there is at least one person in the pile whose date of birth matches with **X**. Also, the procedure returns the pile in exactly the same way that it was passed. Consider the following code:

```
*** Statement-1 ***
while(More cards in Pile-1 and found == False){
    Pick a card X from Pile-1
    Move X to Pile-2
    if(sameBirthday(X, Pile-1)){
        *** Statement-2 ***
    }
}
```

   We wish to use this code to find if there is a pair of students in the dataset with the same birthday. The iteration terminates as soon as such a pair is found. Complete the code.

(a) Which of the following is an ideal choice for Statement-1?

- √ **found** = False
- ◯ **found** = True
- ◯ **found** = None

(b) Which of the following is an ideal choice for Statement-2?

- ◯ **found** = False
- √ **found** = True
- ◯ **found** = None

7 Lecture-4.7

Procedure to resolve pronoun with its equivalent matching noun

1. Does the "Paragraph words" dataset provide the information of personal nouns/pronouns to resolve pronoun with its equivalent matching noun?

   ◯ Yes

   √ No

2. State whether the following statement is true or false.

   We can use the concept of binning to resolve pronoun with its equivalent matching noun.

   √ True

   ◯ False

BSCCS1001: Activity Questions
Week-5

Contents

1 Lecture-5.1

Introduction to collections and list data structure

1. State whether the following statements are true or false. Two subsets of a dataset cannot have any elements in common.

   ◯ True

   √ False

2. Consider the "Paragraph Words" dataset and execute the following procedures.

   Procedure-1: Arrange all cards in the ascending order of serial numbers. Iterate through the cards and filter the nouns. Store card numbers of all such cards in a list **X**.

   Procedure-2: Arrange all cards in the descending order of serial numbers. Iterate through the cards and filter the nouns. Store card numbers of all such cards in a list **Y**.

   What can you say about these two lists **X** and **Y**?

   ◯ The elements and their order in the lists X and Y will be same.

   ◯ The elements and their order in the lists **X** and **Y** will be different.

   √ The elements in the lists **X** and **Y** will be same but their order will be different.

   ◯ Can not be determined.

3. Let us consider the "Scores" dataset. Lists **`X`** and **`Y`** are defined as follows:

   `X`: Students who belong to Chennai.
   `Y`: Students who belong to Madurai.

   `length(S)` is a procedure that returns the number of elements in list **`S`**. If there are more students from Chennai than Madurai in the dataset, which of the following statements will evaluate to true?

   ◯ **`X > Y`**

   ◯ **`Y > X`**

   √ **`length(X) > length(Y)`**

   ◯ **`length(Y) > length(X)`**

4. Let **`X`** and **`Y`** be two lists. **`intersect(X, Y)`** is a procedure that finds the elements common in these two lists. What should be the datatype of the value that this procedure returns?

   ◯ Integer

   ◯ Boolean

   √ List

5. What are the advantages of bookmarking the filtered cards in a dataset? It is a Multiple Select Question (MSQ).

   √ Data can be accessed without disturbing the order of cards in the dataset.

   √ We can find a particular card without iterating over them.

   ☐ There are no advantages.

2 Lecture-5.2

Pseudocodes for lists

1. What will be the value of **C** at the end of execution of the following pseudocode?

```
A = [1, 2, 3, 4, 5]
B = [1, 2, 3, 4, 5]
C = A ++ B
```

   ◯ [2, 4, 6, 8, 10]

   ◯ [1, 2, 3, 4, 5, 5, 4, 3, 2, 1]

   √ [1, 2, 3, 4, 5, 1, 2, 3, 4, 5]

   ◯ The ++ operation is invalid.

2. Consider the following list:

   sent = [“I”, “am”, “a”, “sincere”]

   After executing one of the statements in the options given below, the value of **sent** becomes:

   sent = [“I”, “am”, “a”, “sincere”, “student”]

   Select the correct statement.

   ◯ **sent** = **sent** ++ “student”

   √ **sent** = **sent** ++ [“student”]

   ◯ **sent** = **sent** + “student”

   ◯ **sent** = **sent** + [“student”]

   ◯ **sent** + [“student”]

3. The following pseudocode is executed on the "Scores" table. What will the list **L** represent at the end of execution?

```
L = [ ]
while (Table 1 has more rows) {
    Read the first row X in Table 1
    if (X.Mathematics == X.Physics) {
        L = L ++ [X.Chemistry]
    }
    Move X to Table 2
}
```

- ◯ It stores the Chemistry marks of all students.
- ◯ It stores the Chemistry marks of all students who have scored the same marks in both Physics and Chemistry.
- ✓ It stores the Chemistry marks of all students who have scored the same marks in both Physics and Mathematics.
- ◯ It stores the names of all students who have scored the same marks in both Physics and Mathematics.
- ◯ The above code has an error and will not execute properly.

4. What will be the value of **l2** at the end of execution of the following pseudocode?

```
l1 = [13, 35, 67, 89, 94]
l2 = [ ]
foreach x in l1 {
    l2 = [x] ++ l2
}
```

- ◯ [13, 35, 67, 89, 94]
- ◯ [35, 67, 89, 94]
- ◯ [13, 35, 67, 89]
- ✓ [94, 89, 67, 35, 13]

5. What will be the value of **C** at the end of execution of the following pseudocode?

```
A = [1, 2, 3, 4, 5]
B = [1, 2, 3, 4, 5]
indexA = 0
C = [ ]
foreach x in A {
    indexB = 0
    foreach y in B {
        if (indexA == indexB) {
            z = x + y
            C = C ++ [z]
        }
        indexB = indexB + 1
    }
    indexA = indexA + 1
}
```

- ✓ [2, 4, 6, 8, 10]
- ◯ [1, 2, 3, 4, 5, 5, 4, 3, 2, 1]
- ◯ [1, 2, 3, 4, 5, 1, 2, 3, 4, 5]
- ◯ The ++ operation is invalid.

3 Lecture-5.3

Operations on the data collected in three prizes problem using lists

1. Let **M**, **P** and **C** represent the lists of students who have come within the top three scorers in Mathematics, Physics and Chemistry respectively. Additionally, we have the following information:

$$\mathbf{X} = \boldsymbol{length}(\boldsymbol{M})$$
$$\mathbf{Y} = \boldsymbol{length}(\boldsymbol{P})$$
$$\mathbf{Z} = \boldsymbol{length}(\boldsymbol{C})$$

   Using the above information, answer the following questions.

   (a) We have nested iterations to find the list of students who are among the top three scorers in both Mathematics and Physics. How many pairwise comparisons among the elements of the lists **M** and **P** are needed to determine this list of students?

   ◯ $X + Y$
   ◯ $X - Y$
   √ $X \cdot Y$
   ◯ X/Y

   (b) Assume that we obtain a list **K** that has students who are among the top three scorers in both Mathematics and Physics. We have nested iterations to find the list of students who are among top three scorers in all three subjects. How many pairwise comparisons among the elements of the lists **K** and **C** are required to determine this list of students? Assume that $\mathbf{L} = \boldsymbol{length}(\boldsymbol{K})$.

   ◯ $L + Z$
   ◯ $L - Z$
   √ $L \cdot Z$
   ◯ L/Z

2. Consider the "Score" dataset. The lists of sequence numbers of the top three students are in given below:
   Mathematics = [14, 11, 23, 20]
   Physics = [11, 23, 7, 9, 18, 5]
   Chemistry = [14, 11, 18, 25]
   Which is the correct list of the sequence numbers of students which are among the top three in any of the two subjects?

   ◯ [11, 23, 5]
   ◯ [11, 18, 5, 14]
   √ [11, 23, 14, 18]

4 Lecture-5.4

Pseudocodes for operations on the data collected in three prizes problem using lists

1. Let **list1**, **list2**, **list3** and **list4** be four non-empty lists. We wish to find the list of elements that are common among all four lists. Select the correct code fragment that does this. It is a Multiple Select Question (MSQ).

```
Procedure Intersection(aList, bList)
    cList = [ ]
    foreach a in aList {
        foreach b in bList {
            if (a == b) {
                cList = cList ++ [a]
            }
        }
    }
    return (cList)
End Procedure
```

- ✓ **list12 = Intersection(list1, list2)**
  list34 = Intersection(list3, list4)
  list1234 = Intersection(list12, list34)
- ✓ **list13 = Intersection(list1, list3)**
  list24 = Intersection(list2, list4)
  list1234 = Intersection(list13, list24)
- ☐ **list12 = Intersection(list1, list2)**
  list23 = Intersection(list2, list3)
  list1234 = Intersection(list12, list23)
- ✓ **list12 = Intersection(list1, list2)**
  list123 = Intersection(list12, list3)
  list1234 = Intersection(list123, list4)

5 Lecture-5.5

Insertion sort and ordered sort

1. There are n cards of runs scored by a player in n matches. We want to arrange these cards in increasing order in such a way that lowest score card will be on the top. We perform sorting process in such a way that we pick a card from pile 1 and place in pile 2 after finding its correct position. Same method is followed as explained in the lecture. Answer the following questions.

   (a) While sorting, how many cards from pile 1 need to go through the process of finding the correct position in Pile 2?

   - ✓ $n-1$
   - ◯ n
   - ◯ $n+1$
   - ◯ data is insufficient.

   (b) In insertion sort, maximum how many numbers of comparisons will be performed?

   - ✓ $n(n-1)/2$
   - ◯ $n(n+1)/2$
   - ◯ $n(n-1)!$
   - ◯ $n(n+1)!$

   (c) In lecture while sorting, insertion of a new card from pile 1 to pile 2 is done by comparing from top. At some intermediate stage of sorting we decided to perform the process of comparison from bottom. Will this method give incorrect result?

   - ◯ Yes
   - ✓ No

6 Lecture-5.6

Pseudocodes for insertion sort and ordered list

1. The following is a special pseudocode used to sort the contents of the list **A** in ascending order and store the result in another list **B**. Choose the correct code fragment to complete it.

```
A = [1, 2, 3, 4, 5, 9, 8, 7, 6]
B = [ ]
C = [ ]
foreach x in A {
      **********************
      *      Fill the code      *
      **********************
}
foreach x in C {
      B = B ++ [x]
}
```

◯
```
if (x < 5) {
      B = [x] ++ B
}
else {
      C = [x] ++ C
}
```

◯
```
if (x < 5) {
      C = C ++ [x]
}
else {
      B = [x] ++ B
}
```

√
```
if (x ≤ 5) {
      B = B ++ [x]
}
else {
      C = [x] ++ C
}
```

◯ if (**x** < 5) {
    B = **B** ++ [**x**]
  }
  else {
    C = [**x**] ++ **C**
  }

2. Consider the following procedure used to insert an element **x** in a sorted list **l**:

```
Procedure SortedListInsert(l, x)
    newList = [ ]
    inserted = False
    foreach z in l {
        if (not(inserted) and x < z) {
            newList = newList ++ [x]
            inserted = True
        }
        newList = newList ++ [z]
    }
    if (not(inserted)) {
        newList = newList ++ [x]
    }
    return (newList)
End SortedListInsert
```

(a) What will be the value of **l** at the end of execution of the following pseudocode?

```
l = [1, 2, 3, 4, 5]
l = SortedListInsert(l, 5)
l = SortedListInsert(l, 4)
l = SortedListInsert(l, 3)
l = SortedListInsert(l, 2)
l = SortedListInsert(l, 1)
```

◯ **l** = [1, 2, 3, 4, 5, 5, 4, 3, 2, 1]
◯ **l** = [1, 2, 3, 4, 5, 4, 3, 2, 1]

√ l = [1, 1, 2, 2, 3, 3, 4, 4, 5, 5]
◯ l = [1, 2, 3, 4, 5]

(b) What will be the value of **l** at the end of execution of the following pseudocode?

```
l = [5, 4, 3, 2, 1]
l = SortedListInsert(l, 5)
l = SortedListInsert(l, 4)
l = SortedListInsert(l, 3)
l = SortedListInsert(l, 2)
l = SortedListInsert(l, 1)
```

◯ l = [5, 5, 4, 4, 3, 3, 2, 2, 1, 1]
√ l = [1, 2, 3, 4, 5, 4, 3, 2, 1, 5]
◯ l = [5, 4, 3, 2, 1, 1, 2, 3, 4, 5]
◯ l = [1, 2, 3, 4, 5, 5, 4, 3, 2, 1]

(c) What will be the value of **l** at the end of execution of the following pseudocode?

```
l = [ ]
l = SortedListInsert(l, 5)
l = SortedListInsert(l, 1)
l = SortedListInsert(l, 2)
l = SortedListInsert(l, 4)
l = SortedListInsert(l, 3)
```

◯ l = [5, 1, 2, 4, 3]
◯ l = [5, 4, 3, 2, 1]
√ l = [1, 2, 3, 4, 5]
◯ There is an error. An empty list cannot be passed as an argument to the procedure

7 Lecture-5.7

Systematic process of hypothesis verification to find relation between Mathematics and Physics marks usi

1. The proposed hypothesis is based on "Paragraph Words" dataset.

   Hypothesis: Adjectives are followed by nouns.
   Let **con** and **ref** are the lists of sequence number of adjectives which confirm and refute the proposed hypothesis respectively. The variables **X** and **Y** represent the lengths of lists **con** and **ref** respectively.

   $$\mathbf{X} = \boldsymbol{length}(\boldsymbol{con})$$
   $$\mathbf{Y} = \boldsymbol{length}(\boldsymbol{ref})$$

   Statement I: The sum of **X** and **Y** will give the total numbers of adjectives in the given dataset.
   Statement II: The sum of **X** and **Y** will give the total numbers of nouns in the given dataset.

   Choose the correct option.

   - ◯ Both statements are true.
   - √ Statement I is true but statement II is false.
   - ◯ Statement I is false but statement II is true.
   - ◯ Both statements are false.

2. Consider the given lists that have been generated from a paragraph.

   VV stores the words which start with vowels and followed by word starts with vowel.
   VC stores the words which start with vowels and followed by word starts with consonant.
   CV stores the words start with consonants and followed by word starts with vowel.
   CC stores the words which start with consonants and followed by word starts with consonant.

   Lengths of the lists are given below:

   $$\mathbf{p} = \boldsymbol{length}(\boldsymbol{VV}) = 5$$
   $$\mathbf{q} = \boldsymbol{length}(\boldsymbol{VC}) = 15$$
   $$\mathbf{r} = \boldsymbol{length}(\boldsymbol{CV}) = 20$$
   $$\mathbf{s} = \boldsymbol{length}(\boldsymbol{CC}) = 60$$

Answer the following questions.

(a) What percentage confirm the hypothesis that words start with consonants are followed by word starts with consonant?

- ◯ 45
- ◯ 65
- √ 75
- ◯ 85

(b) What percentage refute the hypothesis that words start with vowels are followed by word starts with vowel?

- ◯ 25
- √ 75
- ◯ 30
- ◯ 70

(c) What is the total number of words present in the paragraph? (NAT)
Ans: 101

8 Lecture-5.8

Pseudocodes for systematic process of hypothesis verification to find relation between Mathematics and P

1. Consider the following list:

   L = [[0, 1], [1, 1], [2, 2], [3, 3], [4, 5]]

   (a) What is the output of the following code?

   first(**L**)

   - ◯ 0
   - ◯ 1
   - ◯ 4
   - ◯ 5
   - √ [0, 1]
   - ◯ [4, 5]

   (b) What is the output of the following code?

   last(**L**)

   - ◯ 0
   - ◯ 1
   - ◯ 4
   - ◯ 5
   - ◯ [0, 1]
   - √ [4, 5]

   (c) What is the output of the following code?

   first(**last**(**L**))

   - ◯ 0
   - ◯ 1
   - √ 4
   - ◯ 5
   - ◯ [0, 1]
   - ◯ [4, 5]

   (d) What is the output of the following code?

   last(**first**(**L**))

   - ◯ 0
   - √ 1
   - ◯ 4
   - ◯ 5
   - ◯ [0, 1]
   - ◯ [4, 5]

(e) What is the output of the following code?
first(**first**(**L**))

- √ 0
- ◯ 1
- ◯ 4
- ◯ 5
- ◯ [0, 1]
- ◯ [4, 5]

(f) What is the output of the following code?
last(**last**(**L**))

- ◯ 0
- ◯ 1
- ◯ 4
- √ 5
- ◯ [0, 1]
- ◯ [4, 5]

2. Consider the following list:

L = [1, 2, 3, 4, 5]

(a) What is the output of the following code?
rest(**L**)

- ◯ [1, 2, 3, 4, 5]
- ◯ [1, 2, 3, 4]
- √ [2, 3, 4, 5]
- ◯ 1
- ◯ 5

(b) What is the output of the following code?
init(**L**)

- ◯ [1, 2, 3, 4, 5]
- √ [1, 2, 3, 4]
- ◯ [2, 3, 4, 5]
- ◯ 1
- ◯ 5

(c) What is the output of the following code?

init(**init**(**init**(**init**(**L**))))

- ◯ [1, 2, 3, 4]
- ◯ [1, 2, 3]
- ◯ [1, 2]
- ✓ [1]
- ◯ 1

3. Consider the following pseudocode. What will be the values of **i** and **j** at the end of execution of the following pseudocode?

```
L = ["this", "statement", "is", "false"]
i = 0, j = 0
foreach x in L {
    i = i + 1
}
j = length(L)
```

- ✓ **i** = 4, **j** = 4
- ◯ **i** = 4, **j** = 5
- ◯ **i** = 5, **j** = 4
- ◯ **i** = 5, **j** = 5

4. What will be the value of **j** at the end of execution of the following pseudocode?

```
L = [ [0, 1, 2], [3, 4, 5], [6, 7, 8, 9] ]
j = 0
foreach x in L {
    foreach y in x {
        if (y == 3 or y == 6) {
            exitloop
        }
        j = j + 1
    }
}
```

◯ 0
◯ 1
◯ 2
√ 3
◯ 6
◯ 10

9 Lecture-5.9

Introduction to train dataset

1. Which are the different types of datasets demonstrated in the lecture? It is a Multiple Select Question (MSQ).
   - √ Train dataset
   - ☐ Ticket dataset
   - √ Station dataset
   - ☐ Passenger dataset

2. State whether the following statements are true or false.
   (a) A terminal can be a station and vice versa.
   - √ True
   - ◯ False

   (b) Multiple trains run between two stations, the train number depends of the direction of the train.
   - √ True
   - ◯ False

   (c) We can not extract/get the information of train dataset from station dataset because both datasets details are totally different from each other.
   - ◯ True
   - √ False

   (d) A particular station can not be find more than one in cards of station dataset but it can be find more than one in cards of train number dataset.
   - ◯ False
   - √ True

3. A card of train number dataset is arranged according to?
   - √ Distance
   - ◯ Arrival time
   - ◯ Departure time
   - √ Number of days of running

4. The data on cards from the station dataset is sorted using which field?
   - ◯ Train number
   - √ Arrival time
   - ◯ Departure time
   - ◯ Days of running

BSCCS1001: Activity Questions
Week-6

Contents

1 Lecture-6.1

1. What is the “distance between two customers” signifies in the lecture? [MSQ]

   ◯ If the distance is high, then the customers are more similar.

   √ If the distance is low, then the customers are more similar.

   √ If the distance is high, then the customers are less similar.

   ◯ If the distance is low, then the customers are less similar.

   ◯ The distance is not related to the similarity between customers.

2. Fill in the blank. To find the similarity between customers, the comparison is made on _____

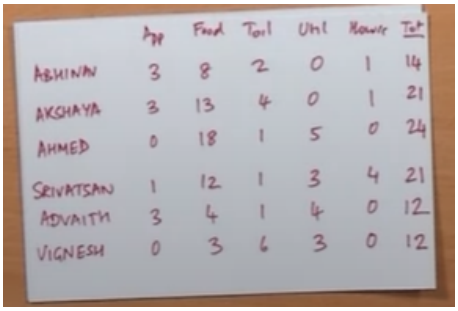
   √ number of items purchased corresponding to each category

   ◯ the total price of the items purchased corresponding to each category

   ◯ the total cost of items purchased corresponding to each customer.

   ◯ None of the above.

3. Consider the table **Tab A**, prepared by the professors in the lecture based on the number of rows of items in the shopping bill dataset as shown below. What information will be stored in **Tab B** after the execution of the following pseudocode?



	App	Food	Toil	Util	House	Tot
ABHINAV	3	8	2	0	1	14
AKSHAYA	3	13	4	0	1	21
AHMED	0	18	1	5	0	24
SRIVATSAN	1	12	1	3	4	21
ADVAITH	3	4	1	4	0	12
VIGNESH	0	3	6	3	0	12

```
M = 0
while (more rows in Tab A){
    Read the top row X from Tab A
    M = count(X, "Apparel") + count(X, "Toiletries") +
        count(X, "Household") + count(X, "utilities") +
        count(X, "Food")
    if (M > 4 and X.Total ≥ 15 ){
        Move X to Tab B
    }
    else{
        Move X to Tab C
    }
}
Procedure count(X, fld)
    if ( X.fld == 0 ) {
        Flag = 0
    }
    else {
        Flag = 1
    }
    return(Flag)
End count
```

◯ **Tab B** contains shopping information of all customers who bought more than 15 items.

◯ **Tab B** contains shopping information of all customers who bought more than 15 items representing at least 4 category's listed in **Tab A**.

√ **Tab B** contains shopping information of all customers who bought more than 15 items representing each category listed in **Tab A**.

◯ **Tab B** contains shopping information of all customers who bought more than 15 items representing at most 4 category's listed in **Tab A**.

4. In the above question if the procedure **count** returns **X**.fld instead of **Flag**. For a customer **X**, the value of **M** obtained is 4. Identify the correct statements.

√ The customer may have bought items from exactly 4 item categories.

√ The customer may have bought items from at least 1 item category.

√ The customer may have bought items from 2 item categories.

◯ The customer may have bought items from all the item categories.

2 Lecture-6.2

Customers	a	b	c
X	20	10	5
Y	10	5	15
Z	18	7	10

Table 1: Customer behaviour

1. If **X** and **Y** are two customers and **X**a, **X**b, **X**c and **Y**a, **Y**b, **Y**c are the number of items corresponding to the categories a, b, c respectively. How will you calculate the Manhattan distance between the two customers? [MSQ].

   ◯ $(\mathbf{X}a - \mathbf{Y}a) + (\mathbf{X}b - \mathbf{Y}b) + (\mathbf{X}c - \mathbf{Y}c)$

   √ $|\ \mathbf{X}a - \mathbf{Y}a\ | + |\ \mathbf{X}b - \mathbf{Y}b\ | + |\ \mathbf{X}c - \mathbf{Y}c\ |$

   √ $|\ \mathbf{Y}a - \mathbf{X}a\ | + |\ \mathbf{Y}b - \mathbf{X}b\ | + |\ \mathbf{Y}c - \mathbf{X}c\ |$

   ◯ $(\mathbf{X}a - \mathbf{X}b - \mathbf{X}c) + (\mathbf{Y}a - \mathbf{Y}b - \mathbf{Y}c)$

2. To find the nearest customers among **X**, **Y**, **Z** from the table shown, what are the minimum pairwise comparisons required?

   √ 3 (Numerical input)

3. Who are the nearest customers among **X**, **Y**, **Z**?

   ◯ **X**, **Y**

   ◯ **Y**, **Z**

   √ **X**, **Z**

4. What is the Manhattan distance between the nearest customers?

   √ 10 (Numerical input)

5. Who are the farthest customers among **X**, **Y**, **Z**?

   √ **X**, **Y**

   ◯ **Y**, **Z**

   ◯ **X**, **Z**

6. What is the Manhattan distance between the farthest customers?

   √ 25 (Numerical input)

3 Lecture-6.3

1. What is the new data structure introduced in the lecture?
   - ◯ List
   - ◯ Record
   - √ Dictionary
   - ◯ None of the above
2. The values of what all data types can be stored in dictionary dataset?[MSQ]
   - √ Character
   - √ Integer
   - √ List
   - ◯ None of the above.
3. Dictionary and list are identical in its function.
   - ◯ True
   - √ false
4. Dictionary data structure is used only when the number of variables is low.
   - ◯ True
   - √ false

4 Lecture-6.4

1. Each variable in dictionary data structure can be accessed using?

   √ Key

   ◯ Index number

   ◯ Key as well as index number

   ◯ None of the above

2. In dictionary data structure variables must be arranged in alphabetic order.

   ◯ True

   √ False

3. We need nested iteration to check the students with same birthday if we use dictionary data structure.

   ◯ True

   √ False

4. Let N is the number of bills generated in a single shop in a month and the shopkeeper wants to organize the purchase cost of each customer using dictionary data structure. If n is the number of keys required then what is the relationship between n and N?

   ◯ $n > N$

   √ $n <= N$

   ◯ $n >= N$

   ◯ $n = N$

   ◯ None of the above.

5 Lecture-6.5

1. Dictionary data structure can be used for binning.

   √ True

   ◯ False

2. Does the method used in the lecture, of finding pronoun corresponding to the noun, give an accurate result always?

   ◯ Yes

   √ No

3. Once dictionary of pronouns and nouns is created then there is no need of an iteration to find the matching pronouns and nouns.

   ◯ True

   √ False

4. How many iterations are required to create a dictionary with keys, adjective, pronoun and noun from the paragraph dataset?

   √ 1 (Numeriacl input)

6 Lecture-6.6

1. Consider the dictionary **chemMarks** discussed in the lecture. What does **keys(chemMarks)** represents?

   - √ List of keys of the dictionary **chemMarks**
   - ◯ List of keys of the dictionary **chemMarks** in order at which the key is stored.
   - ◯ List of values of the dictionary **chemMarks** in order at which the key is stored.
   - ◯ List of both keys and values of the dictionary **chemMarks** in order at which the key is stored.

2. Consider the dictionary **chemMarks** discussed in the lecture. What will be the output of the procedure **isKey(chemMarks, 48)**?

   - ◯ Found
   - ◯ True
   - √ False
   - ◯ Undefined

3. Consider the dictionary **chemMarks** discussed in the lecture. Find the correct pseudocode block(s) which stores the number of students with marks greater than 50 in variable **N**? [MSQ]

   √
   ```
   N= 0
       foreach Y  in keys(chemMarks) {
           if (chemMarks(Y) > 50) {
               N  = N  + 1
           }
       }
   ```

   ◯
   ```
   N= 0
       foreach Y  in chemMarks {
           if (chemMarks(Y) > 50) {
               N  = N  + 1
           }
       }
   ```

   √
   ```
   N= 0
       foreach key in keys(chemMarks) {
           if (chemMarks(key) > 50) {
               N  = N  + 1
           }
       }
   ```

○
```
N= 0
    foreach key in keys(chemMarks) {
        if (chemMarks(key) > 50) {
            N = N ++ 1
        }
    }
```

4. A Dictionary is used to store the total sum of mathematics marks of students from each city. Identify the mistake(s) in the pseudocode. [MSQ]

```
1 sumMarks = []
2 while(more cards in pile 1){
3    Read the top card X  from pile 1
4    Move card X  to pile 2
5    if (isKey(sumMarks, X.CityTown)) {
6        sumMarks[X.CityTown] = sumMarks[X.CityTown] ++
                                [X.Mathematics]
7    }
8    else {
9        sumMarks[X.CityTown] = X.Mathematics
10    }
11 }
```

√ Error in line 1

○ Error in line 5

√ Error in line 6

○ Error in line 9

○ No error in the pseudocode

7 Lecture-6.7

1. Consider the dictionary **foodD** discussed in the lecture. What will be the output of the procedures **isKey**(**fooD**, "Abhinav") and **isKey**(**fooD**, "Vignesh")?

   √ True, True

   ◯ True, False

   ◯ False, True

   ◯ False, False

2. If **birthdays** is a nested dictionary (**birthdays**[**dob**][**seqno**]) specified in the lecture then what is **birthdays**[**dob**]?

   ◯ List of values of sequence numbers

   √ Dictionary with sequence numbers as keys

   ◯ Either True or False

   ◯ None of the above

3. A pseudocode is written to find out the number of students corresponding to each dob from the nested dictionary **birthdays** (**birthdays**[**dob**][**seqno**]). Identify the mistake(s) in the code. [MSQ]

```
1 number = { }
2 foreach X  in keys(birthdays) {
3     N = 0
4     foreach Y  in birthdays[X]) {
5         N = N + 1
6     }
7     number[dob] == N
8     }
9 }
```

   ◯ Error in line 1

   ◯ Error in line 2

   √ Error in line 4

   √ Error in line 7

   ◯ No error in the pseudocode

8 Lecture-6.8

1. Select the correct statements based on the lecture. [MSQ]

   ◯ Train number cannot be a key for the dictionary as it is a number

   √ Train number can be a key

   √ Stations are the list of values in one of the dictionaries

   √ Stations are keys in one of the dictionaries

   √ Train numbers are the list of values in one of the dictionaries

   √ Train numbers are keys in one of the dictionaries

2. Consider the dictionaries discussed in the class(**Trainwise** and **Stationwise**). What will be the value of variable **D** after the execution of the following pseudocode?
   B= **Trainwise**[12260]
   C= **Stationwise**[first(**B**)]
   D= last(**C**)

   √ 12259 (Numerical input)

3. Consider the following procedure where M and N are the parameters passed to the procedure. What is the condition for which the procedure returns True?

```
Procedure check(M, N)
    A = 0, B =  False
    foreach i  in Trainwise[M] {
        foreach j  in Trainwise[N] {
            if (i == j) {
                A = A + 1
            }
        }
    }
    if (A > 2) {
        B  = True
    }
    return(B)
End check
```

   ◯ If M and N are train numbers then they have at least 2 stations in common

   √ If M and N are train numbers then they have at least 3 common stations

   ◯ If M and N are station names then they have at least 3 trains passing through both stations

   ◯ If M and N are station names then they have at least 2 trains passing through both stations

9 Lecture-6.9

1. **Items** is a procedure that accepts a card **X** as input from the "Shopping Bills" dataset. It returns a dictionary with the following keys: "Apparel", "Food", "Toiletries", "Utilities", "Household". The value corresponding to a key **K** in this dictionary is the number of rows in the card **X** that have **K** as the category. If the categories of item specified in the question are not in the card **X**, the value corresponding to that category should be zero. Which of the following is the correct definition for the procedure **Items**? [MSQ].

○
```
Procedure Items(X)
    A = { }
    foreach row Y in X.itemlist {
        if (isKey(A, Y.Category)) {
            A[Y.Category] = A[Y.Category] + 1
        }
    }
    return(A)
End Items
```

√
```
Procedure Items(X)
    A = {"Apparel" : 0, "Food" : 0, "Toiletries" : 0,
                "Utilities" : 0, "Household" : 0}
    foreach row Y in X.itemlist {
        if (isKey(A, Y.Category)) {
            A[Y.Category] = A[Y.Category] + 1
        }
    }
    return(A)
End Items
```

○
```
Procedure Items(X)
    A = { }
    foreach row Y in X.itemlist {
        if (isKey(A, Y.Category)) {
            A[Y.Category] = A[Y.Category] + 1
        }
        else {
            A[Y.Category] = 1
        }
    }
    return(A)
End Items
```

◯

```
Procedure Items(X)
    A = { }
    foreach row Y  in X.itemlist {
        if (isKey(A, Y.Category)) {
            A[Y.Category] = A[Y.Category] + 1
        }
        else {
            A[Y.Category] = 1
        }
    }
    return(A)
End Items
```

2. There will not be any side effect in the above procedure as we are passing only one card at a time.

√ True

◯ False

10 Lecture-6.10

1. Undesirable side effects can be avoided by suitably modifying the pseudocode.
   - √ True
   - ◯ False
2. Identify the procedures which creates a side effect.
   - ◯ Finding maximum value in a list.
   - √ Sorting the list in ascending order
   - √ Deleting keys from dictionary
   - ◯ Merging two dictionaries, D1 and D2, and storing it in D3
   - √ Updating a list or dictionary

BSCCS1001: Activity Questions
Week-7

Contents

1 Lecture-7.1

Introduction to graph data structure

1. The given below statements are based on "Scores" dataset explained in the lecture. State whether the following statements are true or false.
   (a) Student A can mentor student B and student B can mentor student C in the same subject.
   - √ True
   - ◯ False

   (b) Student A can mentor student B and student B can mentor student A in different subject.
   - √ True
   - ◯ False

   (c) A cycle can be formed with at least two nodes. (Note: Consider directed graph).
   - √ True
   - ◯ False

   (d) A cycle of three students can be formed for mentoring the same subject.
   - ◯ True
   - √ False

   (e) A cycle can exist within a cycle.
   - √ True
   - ◯ False

2. How many maximum numbers of study cycles can be formed between two students for mentoring or by mentored in three subjects? (Note: Consider directed graph).
   - ◯ 3
   - √ 6
   - ◯ 9
   - ◯ 12

3. Consider a student can mentor another student irrespective of amount of difference in their marks. With this assumption, maximum how many edges a student can have?
   - ◯ $30 * 3$
   - √ $29 * 3$
   - ◯ $28 * 3$
   - ◯ $27 * 3$

2 Lecture-7.2

Introduction to matrices and implementation of matrix using nested dictionary

1. Which of the following statements are correct about matrix of m rows and n columns?

   √ It is a two dimensional table.

   √ It supports random access of elements.

   √ By convention, rows and columns of matrix are numbered from 0.

2. An element of matrix, m rows and n columns, can be represented by matrix[i][j]. Which is/are the correct range(s) of i and j?

   ☐ $0 \leq$ i $\leq$ m and $0 \leq$ j $\leq$ n

   √ $0 \leq$ i $\leq$ m-1 and $0 \leq$ j $\leq$ n-1

   ☐ $0 \leq$ i $<$ m-1 and $0 \leq$ j $<$ n-1

   √ $0 \leq$ i $<$ m and $0 \leq$ j $<$ n

3. What is the default value of elements of created matrix **mat** in the lecture?

   ◯ 1

   √ 0

   ◯ Empty

   ◯ Unknown

4. The procedure **sumMatrix** takes input as a square matrix. A square matrix has same number of rows and columns.

```
Procedure sumMatrix (M)
    Sum = 0
    foreach c in columns (M){
        foreach r in rows (M) {
            if (c == r) {
                Sum = Sum + M[r][c]
            }
        }
    }
    return(Sum)
End sumMatrix
```

   Answer the following questions based on the above pseudocode.

(a) What will **Sum** represent?

- ◯ It will be the summation of all elements of matrix **M**.
- √ It will be the summation of principal diagonal elements of matrix **M**.
- ◯ It will be the summation of all elements of rows of matrix **M**.
- ◯ It will be the summation of all elements of columns of matrix **M**.

(b) Consider if block statement is modified as:

```
if (c > r){
    M[r][c] = 0
}
```

Then which is the correct option?

- √ Matrix **M** will become lower triangular matrix.
- ◯ Matrix **M** will become upper triangular matrix.
- ◯ Matrix **M** will become triangular matrix.
- ◯ Can not say anything.

(c) If we add the **exitloop** statement in the if block immediately after "**Sum = Sum + M[r][c]**". Which of the following statement(s) is/are correct?

- √ It will give the same value of **Sum** as in old pseudocode.
- ☐ It will not give the same value of **Sum** as in old pseudocode.
- √ It will reduce the computing time.
- ☐ None of the above.

3 Lecture-7.3

Undirected graph and cliques

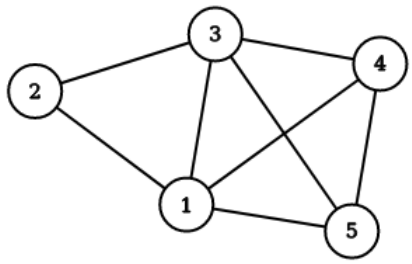
1. The given below statements are based on "Scores" dataset explained in the lecture. State whether the following statements are true or false.
   (a) In a clique elements are connected by undirected edges on the basis of their similarity.
   - √ True
   - ◯ False

   (b) An element should have n number of edges in a clique of n elements.
   - ◯ True
   - √ False

2. How many edges a clique of n vertices will have?
   - ◯ n
   - ◯ $n * (n - 1)$
   - √ $n * (n - 1)/2$
   - ◯ $n - 1$

3. Consider there are 15 telephone booths on an island. Is it possible to connect them with wires so that each telephone booth is connected with exactly 5 other telephone booths?
   - ◯ Yes
   - √ No

4. Consider the given graph and answer the following questions:



   (a) Which of given list(s) represent a clique?
   - √ **L**=[1, 2, 3]
   - ☐ **L**=[1, 2, 3, 4]
   - ☐ **L**=[1, 2, 3, 4, 5]
   - √ **L**=[1, 3, 4, 5]

√ **L**=[1, 4, 3, 5]

(b) How many edges we have to add in order to convert the given graph into a clique of size 5?

- ◯ 1
- √ 2
- ◯ 3
- ◯ 4

4 Lecture-7.4

Concept of popular students using graphs

1. Which of the following is the criteria for choosing the popular student explained in the lecture.
   - ☐ Should have highest number of mentors.
   - ☐ Should mentor highest number of students.
   - √ Should have highest number of mentors and should mentor highest number of students.
   - √ Should have highest number of neighbours.

2. In the process of search of the popular student we found that a student who can not be mentored. Which of following statement(s) is/are true?
   - √ The student has the highest marks in that particular subject.
   - ☐ The student has the lowest marks in that particular subject.
   - ☐ None of the above.

3. In the process of search of the popular student we found that a student can not mentor any student. Which of following statement(s) is/are true?
   - ☐ The student has the highest marks in that particular subject.
   - √ The student has the lowest marks in that particular subject.
   - √ The difference of marks of that student with every other student is less than 10.
   - ☐ None of the above.

5 Lecture-7.5

Pseudocodes for real-time examples using graphs

1. A graph is generated using the "Scores" table with the students as nodes. The nodes are labeled using the sequence number, *SeqNo*. Assume that all marks are integers. Study the following pseudocode:

```
math = readMarks(Mathematics)
n = length(keys(math))
A = createMatrix(n, n)
foreach x in keys(math) {
    foreach y in keys(math) {
        if (math[x] - math[y] > 5) {
            A[x][y] = 1
        }
    }
}

Procedure readMarks(subj)
    marks = { }
    while (Table 1 has more rows) {
        Read the first row X in Table 1
        marks[X.SeqNo] = X.subj
        Move X to Table 2
    }
    return (marks)
End readMarks
```

   (a) Given a pair of students (i, j), there is an edge from i to j in the graph if and only if:

   ◯ i has scored less than j in Mathematics.

   ◯ i has scored more than j in Mathematics.

   ◯ i has scored at least five marks more than j in Mathematics

   √ i has scored at least six marks more than j in mathematics

(b) Use the matrix **A** computed in the first question. Given a student **i**, what does the return value of the procedure **proc(A, i)** represent?

```
Procedure proc(A, i)
    count = 0
    foreach c in columns(A) {
        if (A[i][c] == 1) {
            count = count + 1
        }
    }
    return (count)
End proc
```

- ◯ The number of students who have scored exactly five marks more than student i in Mathematics
- √ The number of students who have scored at least six marks less than student i in Mathematics
- ◯ The number of students who have scored more than student i in Mathematics
- ◯ The number of students who have scored the same marks as student i in Mathematics

(c) Using the matrix **A** obtained from the first question, execute the following pseudocode. Given a student **i**, which of the following statements about the return value of the procedure **proc(A, i)** is true?

```
Procedure proc(A, i)
    foreach j in rows(A) {
        foreach k in columns(A) {
            if (A[i][j] == 1 and A[j][k] == 1) {
                return (True)
        }
    }
    return (False)
End proc
```

- ◯ It is True if there is a student who has scored at least eleven marks less than i in Mathematics
- √ It is True if there is a student who has scored at least twelve marks less than i in Mathematics
- ◯ It is True if there is a student who has scored at least six marks less than i in Mathematics
- ◯ It is True if there is no student who has scored less than i in Mathematics

6 Lecture-7.6

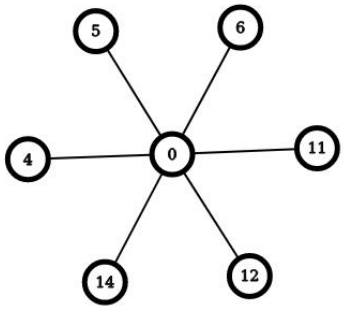
Concept of connected graph to represent the relationship between different nouns in the paragraph

1. State whether the following statements are true or false.
   (a) Nouns within a sentence are always connected to each other.
   ◯ True
   √ False
   (b) A noun from one sentence can be directly connected to a noun from another sentence.
   ◯ True
   √ False
2. Consider the given below table.

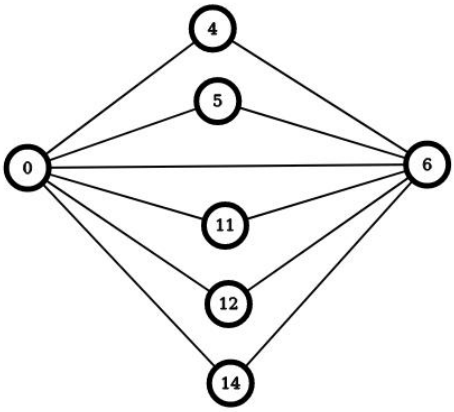
Seq. No.	Word	Parts of Speech
0	Payasam	Noun
1	is	Verb
2	a	Article
3	sweet	Adjective
4	Indian	Noun
5	dish	Noun
6	which	Pronoun
7	is	Verb
8	prepared	Verb
9	from	Preposition
10	boiling	Adjective
11	milk	Noun
12	sugar	Noun
13	and	Conjunction
14	rice	Noun

Answer the following questions.

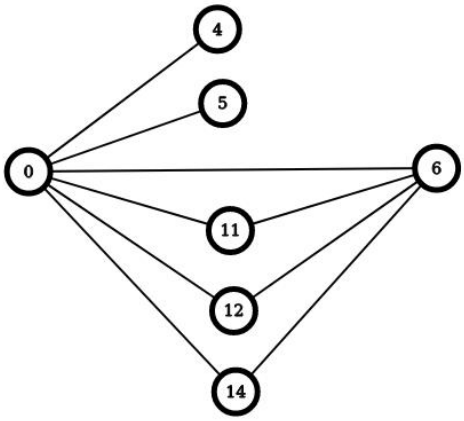
(a) Choose the correct connected graph between nouns and pronouns based on the concept explained in the lecture from the given options.



○



○



√

○ None of the above.

(b) What is the maximum size of clique appeared in the answer of previous question.

- √ 3
- ◯ 4
- ◯ 5
- ◯ 6

(c) How many cliques of size three are present in the answer of question part (a)?

- ◯ 2
- √ 3
- ◯ 4
- ◯ 5

7 Lecture-7.7

Represent direct trains using the graph and find a route using multiple hops

1. The given below statements are based on graph plotted and explained in the lecture. State whether the following statements are true or false..
   (a) There can be more than one label on the edge between the two stations.
   - √ True
   - ◯ False

   (b) A station with best connectivity can be identified from the graph by counting the number of edges.
   - √ True
   - ◯ False

   (c) The plotted graph gives information of running day(s) of the week of trains.
   - ◯ True
   - √ False

2. Assume that there are n different routes to go from Chennai to Delhi. A person wants to go from Chennai to Delhi and return back. Based on this information how many different routes one can choose?
   - ◯ n
   - √ n^2
   - ◯ $n * (n - 1)$
   - ◯ $n - 1$

BSCCS1001: Activity Questions
Week-8

Contents

1 Lecture-8.1

1. State whether the following statements are true or false.

   (a) Adjacency matrix is a square matrix used to represent a graph.

   √ True.

   ◯ False.

   (b) Adjacency matrix is always symmetric.

   ◯ True.

   √ False.

2. Consider the table generated from a graph. Here **A**, **B**, **C** and **D** are the names of stations and entries in each cell are distances covered by trains from starting station to ending station. Here the starting stations for the trains are mentioned in the rows and ending stations are mentioned in columns. Zero represents that there is no direct train between those two stations. Analyse the table and answer the questions below.

From/To	**A**	**B**	**C**	**D**
A	0	100	0	300
B	0	0	0	100
C	600	500	0	0
D	0	100	0	0

Table 1:

   (a) If we convert the above table to a graph then we will obtain a directed graph.

   √ True.

   ◯ False.

   (b) How many edges will be there in the graph?

   ◯ At least 6

   ◯ At most 6

   √ Exactly 6

   ◯ Exactly 4

   ◯ At least 4

   (c) What is the minimum distance a passenger has to travel from station **A** to station **D**?

   √ 200

   ◯ 100

   ◯ 300

   ◯ Travelling from station **A** to station **D** is not possible

(d) What is the minimum distance a passenger have to travel from station **C** to station **A**?

- √ 600
- ◯ 100
- ◯ 800
- ◯ Travelling from station **C** to station **A** is not possible

(e) What is the minimum distance a passenger have to travel from station **D** to station **A**?

- ◯ 500
- ◯ 100
- ◯ 300
- √ Travelling from station **D** to station **A** is not possible

2 Lecture-8.2

1. Consider the graph created in the lecture which represents whether two trains share a common station. If such a common station exists then a directed edge will be added between trains and that edge will be labelled with station name.

   (a) Assume an edge is drawn between the trains **A** and **B**. The train **B** has in-degree 1. Choose the statement(s) is/are correct based on the graph drawn? [MSQ]

   - √ It is possible to switch from train **A** to train **B**.
   - ◯ It is possible to switch from train **B** to train **A**.
   - √ The trains **A** and **B** share only one common station.
   - ◯ The trains **A** and **B** do not have any common station.

   (b) A passenger travels on the train 02214 and switches to 12222 from a common station. Which is the common station from which the passenger can switch the train ?

   - ◯ Patna
   - √ Kolkata
   - ◯ Asansol
   - ◯ Pune

   (c) In the previous question, What is the maximum number of stations a passenger can visit?

   - √ 10 (Numerical)

2. Graphs can also be used to predict the delay of trains.

   - √ True
   - ◯ False

3. A graph is made with trains as nodes and an edge is drawn between trains when they share a common station. If the graph contains only the trains which are passing through Nagpur then answer the following questions based on the graph.

   (a) What is the number of nodes in the graph?

   √ 10 (Numerical)

   (b) What is the number of edges in the graph?

   √ 45 (Numerical)

   (c) Is this graph a clique?

   √ Yes

   ◯ No

3 Lecture-8.3

1. Consider the procedure **DirectRoutes** explained in the lecture. What are the keys of the dictionary, **stations** used in the same procedure? [MSQ]

   ◯ All the stations in the stations dataset

   √ All the stations which are either a starting point or an ending point of any train

   √ Only the stations which are starting points of trains

   √ Only the stations which are ending points of the trains

2. How many keys are there in the dictionary, **trains**[12259] used in the procedure **DirectRoutes** ?

   √ 2 (Numerical Input)

3. If **n** is the **length**(**keys**(**stations**)) then what will be the value of **A** after the execution of the following pseudocode? Here **stnindex** is the dictionary which is described in the procedure **DirectRoutes**.

```
A = 0
foreach Y in keys(stnindex) {
    A = A + stnindex[Y]
}
```

   ◯ **n**

   ◯ **n** - 1

   √ **n** (**n** - 1)/2

   ◯ **n** (**n** + 1)/2

   ◯ None of the above

4. Consider the matrix **direct** discussed in the procedure **DirectRoutes**. Choose the correct statement(s) about the matrix ?[MSQ]

   - √ If **direct**[**i**][**j**] is 1, then there is a direct connection from station **i** to station **j**.
   - ◯ If **direct**[**i**][**j**] is 1, then there is a direct connection from station **j** to station **i**.
   - √ **direct**[**i**][**j**] will be zero if there is no direct connection from station **i** to station **j**.
   - √ **direct**[**i**][**j**] == **direct**[**j**][**i**]

5. Consider the procedure **OneMoreHop**(**direct**, **nhops**) discussed in the lecture. If the value of **onemorehop**[**i**][**j**] is 1 then choose the correct statement about the matrix ?

   - ◯ The passenger can travel from station **i** to station **j** in at least **n** trains
   - ◯ The passenger can travel from station **i** to station **j** in at most **n** trains
   - ◯ The passenger can travel from station **i** to station **j** in exactly **n** trains
   - √ The passenger can travel from station **i** to station **j** in at most **n** - 1 trains
   - ◯ The passenger can travel from station **i** to station **j** in exactly **n** - 1 trains

6. Consider the following pseudocode, if condition is not satisfied for **i** = 2 and **j** = 4 then what will be the output of the statement, **isKey**(**onemorehop[2], 4**), executed after the if condition?

```
foreach k in columns(direct) {
  if (nhops[i][k] == 1 and
        direct[k][j] == 1) {
    onemorehop[i][j] = 1
  }
}
```

Figure 1:

   - √ True
   - ◯ False
   - ◯ Undefined
   - ◯ Invalid key

4 Lecture-8.4

1. Consider the procedure **LabelledDirectRoutes** used in the lecture. What does it store in the matrix **direct** ?

   ◯ List of trains

   √ Dictionary with train numbers as keys

   ◯ Either 0 or 1

   ◯ None of the above

2. Consider the matrix **directdist** which is used in the procedure **DirectDistance**. Find the pseudocode block to store the list of farthest stations from **X**, with direct train connectivity, in variable **A**?

   ◯
   ```
   A = [ ], B = 0
   foreach Y in keys(directdist[X]) {
       if (B == directdist[X][Y]) {
           A = A ++ [Y]
       }
       if (B > directdist[X][Y]) {
           B = directdist[X][Y]
           A = [Y]
       }
   }
   ```

   ◯
   ```
   A = [ ], B = 0
   foreach Y in keys(directdist[X]) {
       if (B < directdist[X][Y]) {
           A = A ++ [Y]
       }
       if (B == directdist[X][Y]) {
           B = directdist[X][Y]
           A = [Y]
       }
   }
   ```

   ◯
   ```
   A = [ ], B = 0
   foreach Y in keys(directdist[X]) {
       if (B > directdist[X][Y]) {
           A = A ++ [Y]
       }
       if (B == directdist[X][Y]) {
           B = directdist[X][Y]
           A = [Y]
       }
   }
   ```

√
```
A  = [ ], B = 0
foreach Y  in keys(directdist[X]) {
    if (B == directdist[X][Y]) {
        A  = A ++ [Y]
    }
    if (B < directdist[X][Y]) {
        B  = directdist[X][Y]
        A  = [Y]
    }
}
```

3. The procedure **OneHopDistance** finds the minimum distance between two stations which has only direct connection.

   ◯ True

   √ False

4. The procedure **OneHopDistance** finds the path between two stations which has at most one hope route.

   ◯ True

   √ False

BSCCS1001: Activity Questions
Week-9

Contents

1 Lecture-9.1

Depth First Search (DFS) and recursion procedure call (Part 1)

1. Which of the following statement(s) is/are correct about Depth First Search (DFS)? It is a Multiple Select Question (MSQ).
   - √ It is a recursive algorithm.
   - √ It uses the idea of backtracking.
   - √ It explores all possible searches at each node before backtracking.
   - ☐ None of the above

2. State whether the following statements are true or false.
   (a) A standard Depth First Search (DFS) implementation puts each vertex of the graph into one of the two categories: visited and not visited.
   - √ True
   - ◯ False

   (b) A Depth First Search (DFS) tree may contain cycles.
   - ◯ True
   - √ False

   (c) Some trains can be seen more than once in DFS tree of explored stations in the lecture.
   - √ True
   - ◯ False

3. In Depth First Search (DFS) technique if all searches exhaust at one of the node, it goes back to which of the following node?
   - ◯ Root of the DFS tree
   - √ Just previous node
   - ◯ First node of branching of DFS tree
   - ◯ None of the above

4. Which of the information not available in the DFS tree of explored stations in the lecture? It is a Multiple Select Question (MSQ).
   - ☐ Train number
   - ☐ Departure time
   - √ Arrival time
   - √ Distance travelled
   - ☐ Day of travel
   - √ Travel time

☐ Order of visited stations

5. Which of the following situations referring to terminate a branch of DFS tree of explored stations in the lecture? It is a Multiple Select Question (MSQ).

   √ Visited stations

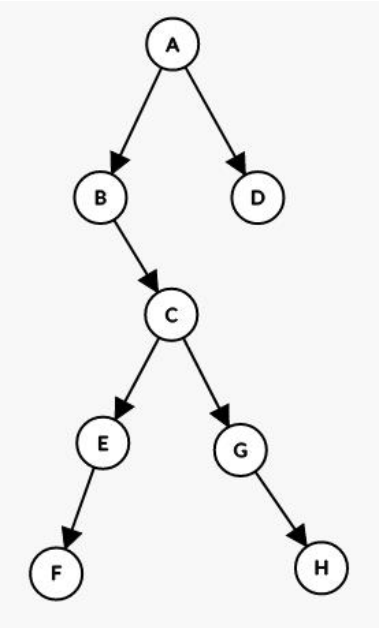
   √ Exceeds the given time limit to explore stations

   ☐ Availability of more than one train

   √ Unavailability of trains at that station

   ☐ None of the above

6. Consider the given tree.



   Which is/are the longest possible path(s) of nodes in the given tree. (Note: Longest path is defined as the path with maximum number of vertices.)

   √ A-B-C-E-F

   ◯ A-B-C-G-F

   √ A-B-C-G-H

   ◯ A-B-C-E-H

2 Lecture-9.2

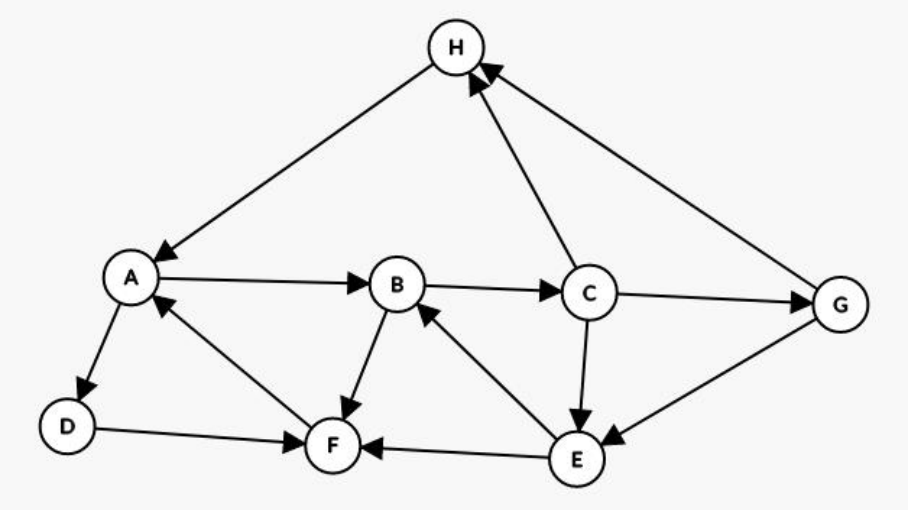
Depth First Search (DFS) and recursion procedure call (Part 2)

1. State whether the following statements are true or false.
   (a) As we move from root to one of the end of DFS tree of mentoring problem in the lecture, the marks obtained by the student, irrespective of subject, are in decreasing order.
   - ◯ True
   - √ False

   (b) Two adjacent nodes of DFS tree in the lecture represent the mentoring of student in two different subjects.
   - √ True
   - ◯ False

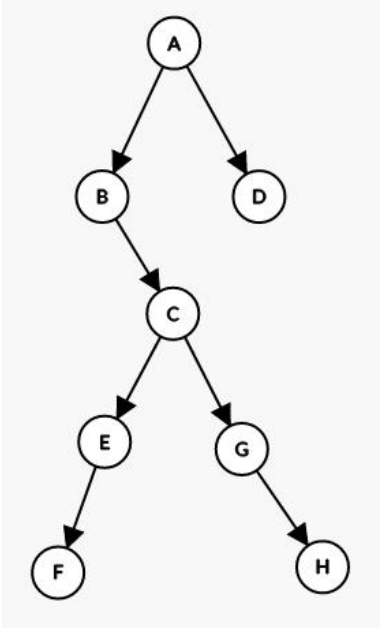
2. Assume the length of each edge of DFS tree of mentoring problem in the lecture is 10 units. What would be the possible maximum length of any branch of DFS tree?
   - ◯ Less than 30 units
   - √ 30 units
   - ◯ More than 30 units
   - ◯ Can not predict

3. Consider the graph given below.

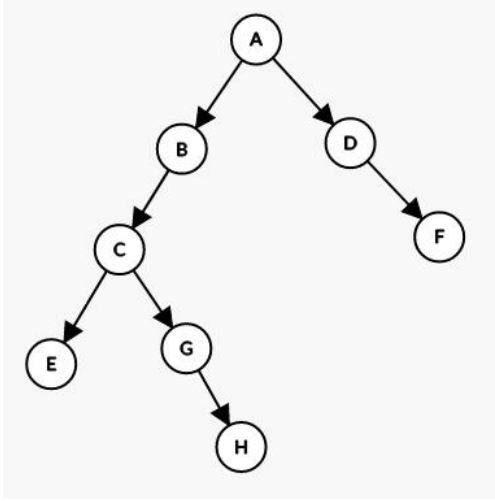


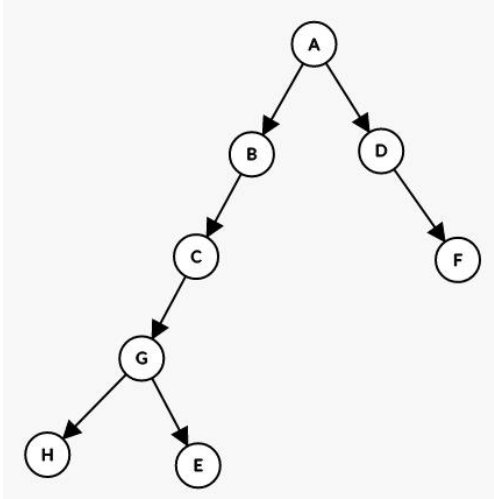
Which of the following tree can be drawn in order to consider all the nodes of the graph starting from node **A**, by using depth first search (DFS) algorithm?

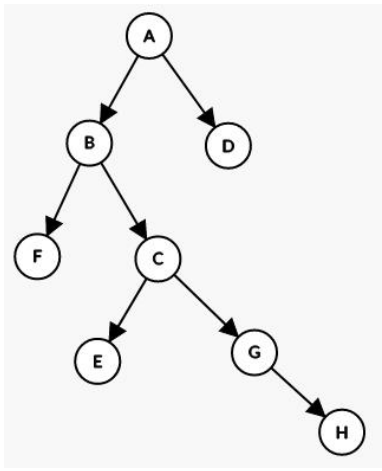
√

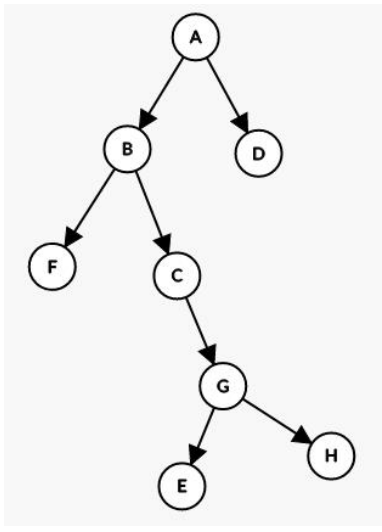


○



○ 
A
B
D
C
F
G
H
E

√ 
A
B
D
F
C
E
G
H

√ 
A
B
D
F
C
G
H
E

3 Lecture-9.3

Depth First Search (DFS) and recursion procedure call (Part 3)

1. State whether the following statements are true or false.
   (a) Same station can be seen more than once in DFS tree of explored trains in the lecture.
   - √ True
   - ◯ False

   (b) The DFS tree of explored trains in the lecture gives information of order in which trains are seen?
   - √ True
   - ◯ False

2. Which of the following situations are referring to terminate a branch of DFS tree of explored trains in the lecture? It is a Multiple Select Question (MSQ).
   - ☐ Visited stations
   - √ Visited trains
   - √ Exceeds the given time limit to explore trains
   - ☐ Availability of more than one train
   - √ Unavailability of trains at that station
   - ☐ None of the above

4 Lecture-9.4

Depth First Search (DFS) and recursion procedure call (Part 4)

1. State whether the following statements are true or false.
   (a) The neighbours of the stations are trains and vice versa in DFS tree drawn in the lecture.
   - √ True
   - ◯ False

   (b) A mutual recursion is a form of recursion in which two objects are defined in terms of each other.
   - √ True
   - ◯ False

2. Assume that there are 11 nodes in the longest path of a DFS tree drawn according to the concept used in the lecture. Answer the following questions.
   (a) The end node of the longest path will be
   - ◯ Station
   - ◯ Train
   - ◯ Both station and train
   - √ Depending upon starting node

   (b) How many train nodes can be visited while traversing through the longest path if starting node is a station?
   - ◯ 11
   - ◯ 10
   - ◯ 6
   - √ 5

5 Lecture-9.5

Pseudocode for recursion

1. Choose the correct statement(s) about recursion from the given options. It is a Multiple Select Question (MSQ).

   √ It is a process in which a function calls itself until termination condition is not true.

   ☐ Iterative processes are more efficient than recursion.

   √ It requires a base case and an inductive step to complete the process.

   √ It makes tree traversal easier.

2. Consider the given pseudocode written for finding the summation of **n** natural numbers. Choose the correct code fragment to complete the pseudocode.

```
A = summation(n)
Procedure summation(x)
    if (x ≠ 0) {
        *** Statement 1 ***
    }
    else {
        return(x)
    }
End summation
```

   ◯ return(**(x + summation(x))**)

   √ return(**(x + summation(x-1))**)

   ◯ return(**summation(x)**)

   ◯ return(**(n + summation(n-1))**)

3. The following pseudocode is executed on a list **L**.

```
L = [1, 2, 3, 4, 5, ..., n]
S = listSum(L)
Procedure listSum(L)
    if (length(L) == 0) {
        return(0)
    }
    else {
        return(last(L) + listSum(init(init(L))))
    }
End listSum
```

What will the value of **S** represent at the end of the execution?

- ◯ Summation of all numbers up to n.
- √ Summation of all even numbers when n is an even number.
- √ Summation of all odd numbers when n is an odd number.
- ◯ None of the above.

6 Lecture-9.6

Pseudocode for Depth-First Search

1. Choose the correct statement(s) about Depth First Search algorithm from given options. It is a Multiple Select Question (MSQ).

   √ Start from node i, visit a neighbour node j

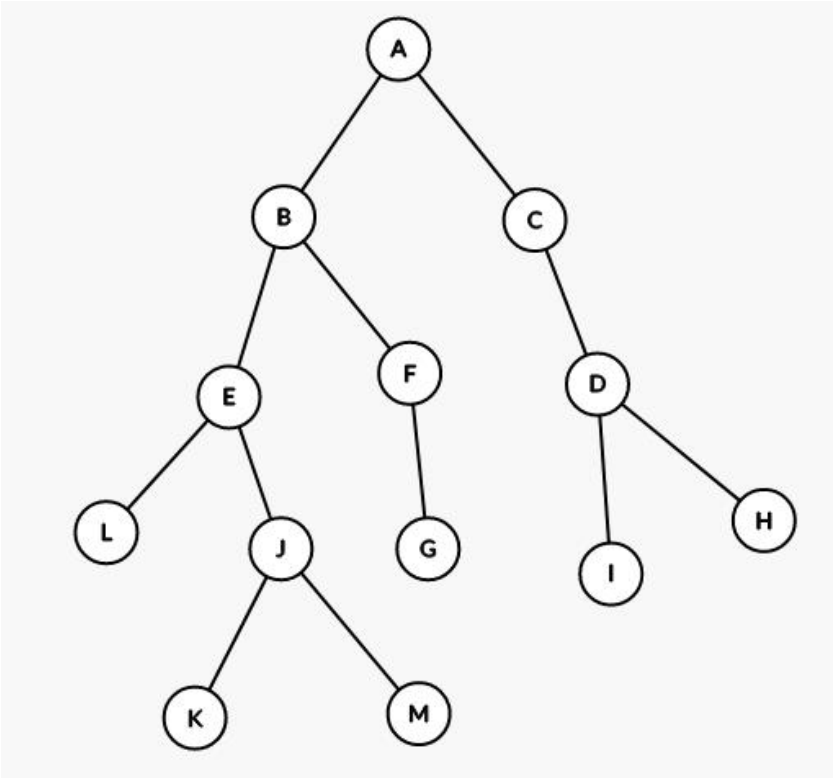
   ☐ Explore all neighbours of node i before exploring neighbour j

   √ Suspend the exploration of node i and explore node j instead

   √ Keep track of visited vertices in a dictionary

   √ Recursively update visited each time we explore an unvisited neighbour.

2. Consider the following tree given in the figure.



   (a) Starting from the node **A**, which algorithm will visit the least number of nodes before visiting node **D**? Assume that if there is a choice of multiple nodes, algorithms will choose the node which comes alphabetically first.

   ◯ Depth First Search (DFS) algorithm

   √ Breath First Search (BFS) algorithm

   ◯ Both DFS and BFS algorithms will visit same number of nodes

   ◯ It can not be determined.

(b) Starting from the node **A**, which algorithm will visit the least number of nodes before visiting node **E**? Assume that if there is a choice of multiple nodes, algorithms will choose the node which comes alphabetically first.

- √ Depth First Search (DFS) algorithm
- ◯ Breath First Search (BFS) algorithm
- ◯ Both DFS and BFS algorithms will visit same number of nodes
- ◯ None of the above

(c) Starting from the node **A**, in what order will the nodes be visited using a Depth First Search (DFS) algorithm to reach the node **F**? Assume that if there is a choice of multiple nodes, algorithms will choose the node which comes alphabetically first.

- ◯ **AB**
- ◯ **ABE**
- √ **ABEJKML**
- ◯ **ABELJKM**

(d) Starting from the node **A**, in what order will the nodes be visited using a Breath First Search (BFS) algorithm to reach the node **F**? Assume that if there is a choice of multiple nodes, algorithms will choose the node which comes alphabetically first.

- ◯ **AB**
- ◯ **ABC**
- ◯ **ABCDIME**
- √ **ABCDE**

BSCCS1001: Activity Questions
Week-10

Contents

1 Lecture-10.1

State whether the following statements are true or false.

1. All the procedures written for Scores dataset can also be used for other datasets.
   - ◯ True.
   - √ False.
2. The procedures and the corresponding datasets can be clubbed together using encapsulation.
   - √ True.
   - ◯ False.
3. The data or procedures inside an encapsulation unit cannot share information among themselves.
   - ◯ True.
   - √ False.
4. The data or procedures inside an encapsulation unit cannot share information outside the encapsulation unit.
   - ◯ True.
   - √ False.
5. The idea of encapsulation is derived from object oriented programming paradigms.
   - √ True.
   - ◯ False.
6. An object should contain at least one procedure.
   - ◯ True.
   - √ False.
7. A single card from Scores dataset cannot be consider as an object.
   - ◯ True.
   - √ False.
8. Same dataset can be a member of multiple objects.
   - √ True.
   - ◯ False.

2 Lecture-10.2

1. Which are the objects introduced in the lecture?
   - √ Trains
   - √ Stations
   - ◯ Scores dataset.
   - ◯ Paragraph dataset
2. Which object can be used to find the direct connection between two stations easily ?
   - ◯ Train.
   - √ Station
3. Which object can be used to find the stations visited by a train easily ?
   - √ Train.
   - ◯ Station
4. Class is used to create an object
   - √ True.
   - ◯ False
5. Class can create multiple objects
   - √ True.
   - ◯ False
6. All the objects created by a class are identical
   - ◯ True.
   - √ False

3 Lecture-10.3

1. Consider the objects Class teacher (**C**), Physics teacher (**P**), Chemistry teacher (**Ch**), and Mathematics teacher (**M**), discussed in the lecture. State whether the following statements are true or false.
   (a) If the four objects are created by a person **X**, then **X** have direct access to the object **C**.
   - √ True
   - ◯ False

   (b) If the four objects are created by a person **X**, then **P** can only be accessed using the object **C**.

◯ True

√ False

2. Consider the objects Class teacher (**C**), Physics teacher (**P**), Chemistry teacher (**Ch**), and Mathematics teacher (**M**), discussed in the lecture. If **P** is created by **C** and **Ch** and **M** are created by **P** then what is the sequence of objects to be called for accessing details of **M**?

   ◯ **P→ M**

   ◯ **C→P→Ch →M**

   ◯ **P→M**

   ◯ **C→M**

   √ **C→P→M**

4 Lecture-10.4

1. Can an object access the details in another object or class?

   √ Yes

   ◯ No

2. What is the maximum number of instances needs to be generated by a class Train to find the one hop route (if it exists) from Kanpur to Jhansi on Monday?

   √ 4

   ◯ 5

   ◯ 6

   ◯ 8

5 Lecture-10.5

1. Identify the correct statement(s) based on the lecture. [MSQ]

   √ Train 12259 is a class from Train box.

   ◯ Train 12259 is an object from Train box.

   ◯ Station Kharagpur is a class from Station box.

   √ Station Kharagpur is an object from Station box.

2. How many train objects can be created from the class 12262 in a week?

   ◯ 1

   ◯ 2

√ 4

◯ 7

3. What is the maximum number of train objects that can be created from a class, train number in a week?

◯ 1

◯ 2

◯ 4

√ 7

4. Identify the correct statement(s) based on the lecture. [MSQ]

◯ The procedures used for mutual recursion are from Station box.

◯ The procedures used for mutual recursion are from, Train box.

◯ The exploreStation procedure is from Train box

√ The exploreTrain procedure is from Train box

√ The exploreStation procedure is from Station box

◯ The exploreTrain procedure is from Station box

6 Lecture-10.6

1. Identify the object(s) discussed in the lecture. [MSQ]

◯ Scores dataset

√ Mathematics Teacher

√ Physics Teacher

◯ City

√ Chemistry Teacher

√ Class Teacher

2. Which all objects knows the top three students of subject Physics. [MSQ]

◯ Scores dataset

◯ Mathematics Teacher

√ Physics Teacher

◯ City

◯ Chemistry Teacher

√ Class Teacher

3. Which all objects knows the top three students of class. [MSQ]

◯ Scores dataset

◯ Mathematics Teacher

◯ Physics Teacher

◯ City

◯ Chemistry Teacher

√ Class Teacher

7 Lecture-10.7

1. Conider an object **X** and a procedure **Y**(**A**,**B**) inside the object where **A** and **B** are integers . Identify the correct way to call the procedure.

   ◯ **Y**(1,2)

   ◯ **X**[**Y**(1,2)]

   √ **X**.**Y**(1,2)

   ◯ **X**(**Y**(1,2))

   ◯ **XY**(1,2)

2. Identify the object(s) of the the datatype **ClassAve** discussed in the lecture. [MSQ]

   √ CT

   √ PhT

   ◯ average ()

   ◯ aValue

   √ MaT

   √ ChT

3. The procedures inside an object have access to all variables inside the object.

   √ True

   ◯ False

4. There will not be any side effects for the procedures inside the object.

   ◯ True

   √ False

5. Identify the correct statement(s) about the private and public fields in a Class. [MSQ]

   ◯ Both public and private fields are accessible to the outside world.

   ◯ Both public and private fields are not accessible to the outside world.

   √ Public fields are accessible to the outside world.

√ Only procedures of the class can access its private fields.

6. Identify the public field(s) of the Class **ClassAve** discussed in the lecture. [MSQ]

◯ aValue

√ average

◯ marklist

√ addStudent

7. Identify the private field(s) of the Class **ClassAve** discussed in the lecture. [MSQ]

√ aValue

◯ average

√ marklist

◯ addStudent

BSCCS1001: Activity Questions
Week-11

Contents

1 Lecture-11.1

Concept of message passing using Remote Procedure Call (RPC)

1. State whether the following statements are true or false.
   (a) In the Remote Procedure Call (RPC) the internal implementation of the called Object is not dictated by the call.
   - √ True
   - ◯ False

   (b) The internal message passing mechanism of RPC is known to the client/user.
   - ◯ True
   - √ False

   (c) An RPC is initiated by the client/user which sends a message to a procedure with valid set of parameters.
   - √ True
   - ◯ False

   (d) Internet browsing is an example of RPC.
   - √ True
   - ◯ False

2. The events involved in a Remote Procedure Call (RPC) are given below.

   (i) Caller sends message to callee which contains remote procedure parameters.
   (ii) Callee receives message and start procedure execution.
   (iii) Callee sends reply which contains procedure execution result.
   (iv) Caller waits for reply from callee.
   (v) Caller starts working with returned result from callee.

   Choose the correct sequence of events of RPC from the given options.
   - ◯ (i) → (ii)→ (iii)→ (iv)→ (v)
   - ◯ (i) → (ii)→ (iv)→ (iii)→ (v)
   - ◯ (i) → (iv)→ (iii)→ (ii)→ (v)
   - √ (i) → (iv)→ (ii)→ (iii)→ (v)
   - ◯ None of the above

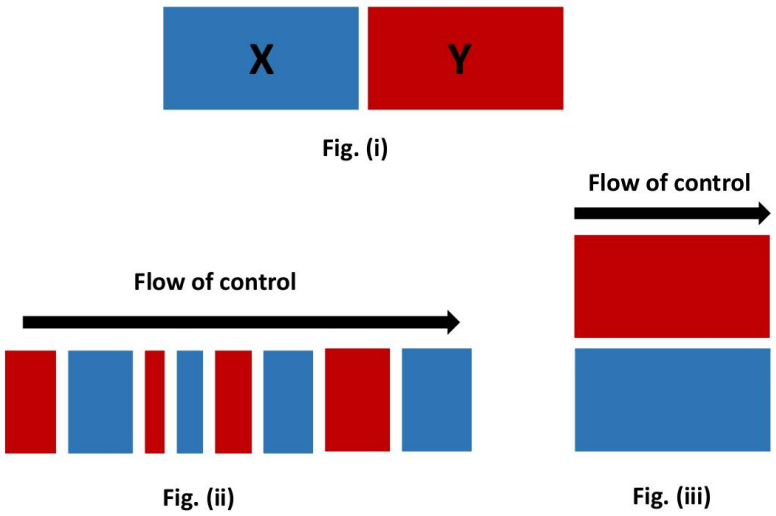
2 Lecture-11.2

Concept of concurrent execution using polling and preemption

1. State whether the following statements are true or false.
   (a) There can be more than one active procedure executing in the concurrent manner.
   - √ True
   - ◯ False

   (b) There is no interference between two procedures in executing in concurrent manner.
   - √ True
   - ◯ False

2. Let **X** and **Y** are the two tasks executed in two different ways, first in a concurrent manner and second using parallel execution. Amount of work for tasks **X** and **Y** are represented as area shaded by colour blue and red respectively as shown in Fig. (i). The amount of completeness of task with respect to flow of control is shown in Figs. (ii) and (iii).



Statement I: Fig. (ii) represents work done using concurrent execution process.
Statement II: Fig (iii) represents work done using parallel execution process.

- √ Both statements are correct.
- ◯ Both statements are incorrect.
- ◯ Statement I is correct but Statement II is incorrect.
- ◯ Statement II is correct but Statement I is incorrect.

3 Lecture-11.3

Producer-Consumer Problem

1. State whether the following statements are true or false.
   (a) In producer consumer problem the producer produces items and enters them into the buffer and the consumer removes the items from the buffer and consumes them.
   - √ True
   - ◯ False

   (b) There is a fixed size buffer in the producer consumer problem.
   - ◯ True
   - √ False

   (c) The producer and the consumer can access the buffer simultaneously.
   - ◯ True
   - √ False

   (d) The producer consumer problem is an example of synchronization problem.
   - √ True
   - ◯ False

   (e) A producer can produce items into the buffer when the consumer is consuming an item from the buffer and vice versa.
   - ◯ True
   - √ False

   (f) **Read** and **Write** are the two operations of Producer-Consumer problem which are atomic in nature.
   - √ True
   - ◯ False

2. Assume the buffer of a producer-consumer problem can contain maximum five data elements. Currently there are three data elements in the buffer. Answer the following questions based on given information.
   (a) How many different situations are possible when only producer is allowed to access the buffer?
   - ◯ 1
   - ◯ 2
   - √ 3
   - ◯ 4

(b) How many different situations are possible when only consumer is allowed to access the buffer?

- ◯ 1
- ◯ 2
- ◯ 3
- √ 4

3. Let **n** is the maximum buffer size of food container in a street-food shop. Shopkeeper fills the food container whereas customer takes out food items from container. Assume customer and shopkeeper can not access the container simultaneously. Consider the given pseudocode written for accessing the food container.

```
bufferSize = 0
while( *** Statement 1 ***){
    Access the food container
    bufferSize = *** Statement 2 ***
}
```

(a) Consider the above pseudocode is written for customer to access the food container. Choose the correct code fragment to complete the pseudocode.

- ◯ Statement 1: **bufferSize** > **n**
  Statement 2: **bufferSize** - 1
- ◯ Statement 1: **bufferSize** ≥ 0
  Statement 2: **bufferSize** - 1
- √ Statement 1: **bufferSize** > 0
  Statement 2: **bufferSize** - 1
- ◯ Statement 1: **bufferSize** ≥ **n**
  Statement 2: **bufferSize** - 1
- ◯ None of the above

(b) Consider the above pseudocode is written for shopkeeper to access the food container. Choose the correct code fragment to complete the pseudocode.

- √ Statement 1: **bufferSize** < **n**
  Statement 2: **bufferSize** + 1
- ◯ Statement 1: **bufferSize** ≤ **n**
  Statement 2: **bufferSize** + 1
- ◯ Statement 1: **bufferSize** > n
  Statement 2: **bufferSize** + 1
- ◯ Statement 1: **bufferSize** ≥ **n**
  Statement 2: **bufferSize** + 1
- ◯ None of the above

4 Lecture-11.4

Real time applications of concurrency and drawbacks of the same

1. Which of following cases where concurrency of events is present? It is a multiple select question (MSQ).

   √ Banking system

   √ Railway Network

   √ Daily routine of a person

   √ Working of human brain

   √ Applications on a computer system

   √ Devices connected to WiFi

2. State whether the following statements are true or false.

   (a) Deadlock is a situation where two or more processes wait for the resource(s) hold by the other process(s).

   √ True

   ◯ False

   (b) A race condition occurs when two users/clients send request for the same resource.

   √ True

   ◯ False

3. Consider there are two ATM cards issued for a single bank account. The transactions done by the two ATM cards are referred as **transOfMoney1** and **transOfMoney2**. Consider the given table of transaction details. Function Read( ) reads the value of a variable from database and function Write( ) updates the value of a variable to the database.

   (a) Assume that the initial total amount, **A**, in the bank account is 1000.

Time	**transOfMoney1**	**transOfMoney2**
t1	Read(**A**)	Read(**A**)
t2	—	**A** = **A** + 300
t3	—	Write(**A**)
t4	Read(A)	—

   What will be the amount after the completion of transactions **transOfMoney1** and **transOfMoney2** respectively?

   ◯ 1000 and 1350

   ◯ 1300 and 1300

   ◯ 1000 and 1000

   √ Transactions will not execute

(b) Assume that the initial total amount, **A**, in the bank account is 1000.

Time	**transOfMoney1**	**transOfMoney2**
t1	Read(A)	—
t2	—	Read(**A**)
t3	—	**A** = **A** + 300
t4	—	Write(**A**)
t5	Read(**A**)	—

What will be the amount after the completion of transactions **transOfMoney1** and **transOfMoney2** respectively?

- ◯ 1000 and 1350
- √ 1300 and 1300
- ◯ 1000 and 1000
- ◯ Transactions will not execute

(c) Assume that the initial total amount, **A**, in the bank account is 1000.

Time	**transOfMoney1**	**transOfMoney2**
t1	Read(**A**)	—
t2	—	Read(**A**)
t3	—	**A** = **A** + 300
t4	Read(**A**)	—
t5	—	Write(**A**)

What will be the amount after the completion of transactions **transOfMoney1** and **transOfMoney2** respectively?

- √ 1000 and 1300
- ◯ 1300 and 1300
- ◯ 1000 and 1000
- ◯ Transactions will not execute

(d) Assume that the initial total amount, **A**, in the bank account is 1000.

Time	**transOfMoney1**	**transOfMoney2**
t1	Read(**A**)	—
t2	**A** = **A** - 250	—
t3	Write(**A**)	—
t4	—	Read(**A**)
t5	—	**A** = **A** + 300
t6	—	Write(**A**)

What will be the amount after the completion of transactions **transOfMoney1** and **transOfMoney2** respectively?

- √ 750 and 1050
- ◯ 750 and 1300

◯ 1050 and 1050

◯ 1050 and 1300

(e) Assume that the initial total amount, **A**, in the bank account is 1000.

Time	**transOfMoney1**	**transOfMoney2**
t1	Read(**A**)	—
t2	**A** = **A** - 250	—
t3	—	Read(**A**)
t4	—	**A** = **A** + 300
t5	Write(**A**)	—
t6	—	Write(**A**)

What will be the amount after the completion of transactions **transOfMoney1** and **transOfMoney2** respectively?

◯ 750 and 1050

√ 750 and 1300

◯ 1050 and 1050

◯ 1050 and 1300

5 Lecture-11.5

Applications of concurrency to speedup the execution process

6 Lecture-11.6

Concept of message broadcasting

1. Which of the following case(s) in which concept of message broadcasting is/are followed? It is a multiple select question (MSQ).
   - √ Sending mails to students from IIT Madras Online Degree admin
   - √ Sales offers
   - √ Seasonal messages
   - √ Live telecasting
2. State whether the following statements are true or false.
   (a) There is a need of message broadcasting when a large group of audience is involved.
   - √ True
   - ◯ False

   (b) In case of message broadcasting callee has to send acknowledgement for received message.
   - ◯ True
   - √ False

7 Lecture-11.7

Concurrency involved in input/output operations

1. Which of following case(s) is/are example(s) of input/output operations where concurrency is involved? It is multiple select question (MSQ).
   - √ Filling an application online
   - √ Online ticket bookings
   - √ Social media chat room
2. State whether the following statements are true or false.
   (a) There is a standard protocol which has to be followed while giving input values to the program.
   - √ True
   - ◯ False

   (b) Multistage inputs are required in input/output operations in which concurrency is involved.
   - √ True
   - ◯ False

   (c) Atomicity of Read( ) and Write( ) is followed in input/output operations.
   - √ True
   - ◯ False

8 Lecture-11.8

Formalized notations and summary of concurrency

1. Consider a procedure **P( )**, inside an Object **X**, which is called by passing a parameter **A**. Answer the following questions.
   (a) Which of the following notation will be used to call the procedure?
   - ◯ **P.X(A)**
   - √ **X.P(A)**
   - ◯ **X(A).P**
   - ◯ **P(A).X**

   (b) Which of the following notation will be used to start the procedure?
   - ◯ **X**start**.(P, A)**
   - ◯ **X.**start**.(P, A)**
   - √ **X.**start**(P, A)**
   - ◯ **X.**start**P(A)**

2. State whether the following statements are true or false.
   (a) **X.**ready**(P)** is defined as a Boolean datatype.
   - √ Yes
   - ◯ No

   (b) wait(**X.**ready**(P)**) makes the caller wait for the result of **P** to be ready.
   - √ Yes
   - ◯ No

3. Consider the procedure **average** discussed in the lecture. Which of the following notations are used to make the procedure **average** concurrent?
   - ◯ start(**average**)
   - ◯ ready(**average**)
   - ◯ result(**average**)
   - √ All of the above