

# Cambridge International AS & A Level

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**COMPUTER SCIENCE****9618/41**

Paper 4 Practical

**May/June 2025**

MARK SCHEME

Maximum Mark: 75

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**Published**

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the May/June 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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This document consists of **43** printed pages.

**PUBLISHED****Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptions for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**PUBLISHED****GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**Annotations guidance for centres**

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

**Annotations**

| <b>Annotation</b>                                                                   | <b>Meaning</b>                                                                                      |
|-------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|    | Benefit of the doubt                                                                                |
|    | To indicate where a key word/phrase/code is missing                                                 |
|    | Incorrect                                                                                           |
|   | Follow through                                                                                      |
|  | Indicate a point in an answer                                                                       |
| Highlighted text                                                                    | To draw attention to a particular aspect or to indicate where parts of an answer have been combined |
|  | Ignore                                                                                              |
|  | Not answered question                                                                               |
|  | No benefit of doubt given                                                                           |
|  | No examples or not enough                                                                           |

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| <b>Annotation</b>                                                                 | <b>Meaning</b>                                                                                                                             |
|-----------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
|  | Not relevant or used to separate parts of an answer                                                                                        |
| Off-page comment                                                                  | Allows comments to be entered at the bottom of the RM marking window and then displayed when the associated question item is navigated to. |
|  | Repetition                                                                                                                                 |
|  | Indicates that work or a page has been seen including blank answer spaces and blank pages.                                                 |
|  | Correct                                                                                                                                    |
|  | Too vague                                                                                                                                  |

**Mark scheme abbreviations**

- **Bold** in mark scheme means that idea is required.
- / in mark scheme means alternative.
- // in mark scheme means alternative solution that gains the same mark point.
- ... at the end of one mark point without a ... at the start of the next just means the sentence follows on. There is no dependency.
- ... at the end of one mark point and ... at the start of the next, this means the second cannot be awarded without the first.
- () means what is in the brackets is not required, or it is not required in some languages but may be required in others.

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| Question | Answer                                                                                                                                                                                                                                    | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1(a)     | 1 mark each<br><ul style="list-style-type: none"><li>• (global) Declaration of 1D array Queue, 20 elements initialised with –1</li><li>• (global) HeadPointer and TailPointer initialised to –1, NumberItems initialised with 0</li></ul> | 2     |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>Queue = [-1 for x in range(20)] HeadPointer = -1 TailPointer = -1 NumberItems = 0</pre> <p>VB.NET</p> <pre>Dim Queue(20) As Integer Dim HeadPointer As Integer Dim TailPointer As Integer Dim NumberItems As Integer For x = 0 To 19     Queue(x) = -1 Next HeadPointer = -1 TailPointer = -1 NumberItems = 0</pre> <p>Java</p> <pre>public static Integer[] Queue = new Integer[20]; public static Integer HeadPointer; public static Integer TailPointer; public static Integer NumberItems; public static void main(String args[]){      for(Integer X = 0; X &lt; 20; X++){         Queue[X] = -1;     }     HeadPointer = -1;     TailPointer = -1;     NumberItems = 0; }</pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Marks    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1(b)     | <p>1 mark each</p> <ul style="list-style-type: none"> <li>• Function header (and close) taking 1 (integer) parameter and returning a Boolean value in all cases</li> <li>• Checking if queue is full (<code>NumberItems = 20</code>) and returning <code>FALSE</code></li> <li>• Checking if queue is empty (<code>NumberItems = 0</code>) then and updating <code>TailPointer</code> and <code>HeadPointer</code> appropriately</li> <li>• Incrementing <code>TailPointer</code> and <code>NumberItems</code> in appropriate place ...</li> <li>• ... looping back to 0 for <code>TailPointer</code> if at end of structure</li> <li>• Storing parameter in <code>Queue[TailPointer]</code> (after increment) and returning <code>TRUE</code></li> </ul> | <b>6</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>def Enqueue(InputData):     global Queue     global HeadPointer     global TailPointer     global NumberItems     if NumberItems &gt;= 20:         return False      if TailPointer &lt;= -1:         TailPointer = 0         HeadPointer = 0         Queue[TailPointer] = InputData     else:         TailPointer = TailPointer + 1         if TailPointer == 20:             TailPointer = 0          Queue[TailPointer] = InputData     NumberItems +=1     return True</pre> <p>VB.NET</p> <pre>Function Enqueue(InputData)     If NumberItems &gt;= 20 Then         Return False     End If      If TailPointer &lt;= -1 Then         TailPointer = 0         HeadPointer = 0         Queue(TailPointer) = InputData</pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Marks |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre> Else     TailPointer = TailPointer + 1     If TailPointer = 20 Then         TailPointer = 0     End If     Queue(TailPointer) = InputData End If NumberItems = NumberItems + 1 Return True End Function  Java public static Boolean Enqueue(Integer InputData){     if(NumberItems &gt;= 20){         return false;     }     if(TailPointer &lt;= -1){         TailPointer = 0;         HeadPointer = 0;         Queue[TailPointer] = InputData;     }else{         TailPointer++;         if(TailPointer == 20){             TailPointer = 0;         }         Queue[TailPointer] = InputData;     }     NumberItems++;     return true; } </pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                      | Marks    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1(c)     | 1 mark each <ul style="list-style-type: none"> <li>• Calling Enqueue( ) with 1 to 25 (inclusive) in order</li> <li>• ... storing/using return value in selection ...outputting Successful with integer <b>and</b> outputting Unsuccessful with integer correctly</li> </ul> | <b>3</b> |

Example program code:

Python

```
for X in range(1, 26):
    ReturnValue = Enqueue(X)
    if ReturnValue == True:
        print(x,"Successful")
    else:
        print(x,"Unsuccessful")
```

VB.NET

```
Dim ReturnValue As Boolean
For x = 1 To 25
    ReturnValue = Enqueue(x)
    If ReturnValue = True Then
        Console.WriteLine(x & "Successful " )
    Else
        Console.WriteLine(x & "Unsuccessful ")
    End If
Next x
```

Java

```
Boolean ReturnValue;
for(Integer X = 1; X < 26; X++){
    ReturnValue = Enqueue(X);
    if(ReturnValue == true){
        System.out.println(X + "Successful ");
    }else{
        System.out.println(X + "Unsuccessful ");
    }
}
```

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                              | Marks    |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1(d)     | 1 mark each <ul style="list-style-type: none"> <li>• Dequeue( ) header (and close) and checking if queue is empty (NumberItems = 0) and returning –1</li> <li>• Returning data at HeadPointer</li> <li>• Incrementing HeadPointer ...</li> <li>• ... and catching if = 20 to return to 0</li> <li>• Decrementing NumberItems</li> <li>• Resetting HeadPointer <b>and</b> TailPointer when queue is empty</li> </ul> | <b>6</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Marks |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>def Dequeue():     global Queue     global HeadPointer     global TailPointer     global NumberItems     if NumberItems &lt;= 0:         return -1     else:         ReturnValue = Queue[HeadPointer]         HeadPointer +=1         if HeadPointer &gt;= 20:             HeadPointer = 0         NumberItems -=1         if NumberItems == 0:             HeadPointer = -1             TailPointer = -1         return ReturnValue</pre> <p>VB.NET</p> <pre>Function Dequeue()     Dim ReturnValue As Integer     If NumberItems &lt;= 0 Then         Return -1     Else         ReturnValue = Queue(HeadPointer)         HeadPointer = HeadPointer + 1         If HeadPointer &gt;= 20 Then             HeadPointer = 0         End If         NumberItems = NumberItems - 1         If NumberItems = 0 Then             HeadPointer = -1             TailPointer = -1         End If     End If</pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre>         End If         Return ReturnValue     End If End Function  Java public static Integer Dequeue(){     Integer ReturnValue;     if(NumberItems &lt;= 0){         return -1;     }else{         ReturnValue = Queue[HeadPointer];         HeadPointer++;         if(HeadPointer &gt;= 20){             HeadPointer = 0;         }         NumberItems--;         if(NumberItems == 0){             HeadPointer = -1;             TailPointer = -1;         }         return ReturnValue;     } } </pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                           | Marks    |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 1(e)(i)  | 1 mark each <ul style="list-style-type: none"> <li>• Calling Dequeue ( ) twice</li> <li>• ... outputting return value from both calls</li> </ul>                                                                                                                                                                                                                                 | <b>2</b> |
|          | <p>Example program code:</p> <p>Python</p> <pre>NextValue = Dequeue() print(NextValue) NextValue = Dequeue() print(NextValue)</pre> <p>VB.NET</p> <pre>Dim NextValue As Integer NextValue = Dequeue() Console.WriteLine(NextValue) NextValue = Dequeue() Console.WriteLine(NextValue)</pre> <p>Java</p> <pre>System.out.println(Dequeue()); System.out.println(Dequeue());</pre> |          |
| 1(e)(ii) | 1 mark for output showing: <ul style="list-style-type: none"> <li>• 1 to 20 with Successful</li> <li>• 21 to 25 with Unsuccessful</li> <li>• 1 and 2 output</li> </ul>                                                                                                                                                                                                           | <b>1</b> |

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| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Answer | Marks |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------|
| <p>e.g.</p> <div> 1 Successful<br/> 2 Successful<br/> 3 Successful<br/> 4 Successful<br/> 5 Successful<br/> 6 Successful<br/> 7 Successful<br/> 8 Successful<br/> 9 Successful<br/> 10 Successful<br/> 11 Successful<br/> 12 Successful<br/> 13 Successful<br/> 14 Successful<br/> 15 Successful<br/> 16 Successful<br/> 17 Successful<br/> 18 Successful<br/> 19 Successful<br/> 20 Successful<br/> 21 Unsuccessful<br/> 22 Unsuccessful<br/> 23 Unsuccessful<br/> 24 Unsuccessful<br/> 25 Unsuccessful<br/> 1<br/> 2 </div> |        |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Marks    |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 2(a)     | 1 mark each to max 7 <ul style="list-style-type: none"> <li>• Function header (and end)</li> <li>• Prompt to enter filename and reading input</li> <li>• Opening the file (to read) and closing the file in an appropriate place</li> <li>• Looping until EOF ...</li> <li>• ... reading each line in the file ...</li> <li>• ... (removing line break and) inserting in array</li> <li>• Returning populated array</li> <li>• Exception handling try catch with appropriate output</li> </ul> | <b>7</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>def ReadData():     DataList = []     FileName = input("Enter the filename")     try:         File = open(FileName)         for Line in File:             DataList.append(Line)         File.close()     except:         print("Cannot open file")     return DataList</pre> <p>VB.NET</p> <pre>Function ReadData()     Dim DataList(100) As String     Console.WriteLine("Enter the filename")     Dim FileName As String = Console.ReadLine()     NumberItems = 0      Try         Dim FileReader As New System.IO.StreamReader(FileName)         While Not FileReader.EndOfStream             DataList(NumberItems) = FileReader.ReadLine()             NumberItems = NumberItems + 1         End While         FileReader.Close()     Catch ex As Exception         Console.WriteLine("Cannot open or read from file")     End Try     Return DataList End Function</pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre> Java public static String[] ReadData(){     String[] DataList = new String[100];     System.out.println("Enter the filename");     Scanner scanner = new Scanner(System.in);     String FileName = scanner.nextLine();     NumberItems = 0;     try{         FileReader f = new FileReader(FileName);         try{             BufferedReader Reader = new BufferedReader(f);             String Line = Reader.readLine();             Line = Line.replace("\n", "");              while (Line != null){                 DataList[NumberItems] = Line;                 NumberItems++;                 Line = Reader.readLine();                 if(Line != null){                     Line = Line.replace("\n", "");                 }             }             Reader.close();         }catch(IOException ex){         }     }catch(FileNotFoundException e){         System.out.println("File not found");     }     return DataList; } </pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Marks    |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 2(b)     | 1 mark each <ul style="list-style-type: none"> <li>• Procedure header (and end) taking (1D array) DataArray (of strings) as a parameter</li> <li>• Declaration/use of 6 1D arrays (equivalent), one for each colour</li> <li>• Looping through each line in parameter DataArray ...</li> <li>• ... splitting by comma</li> <li>• Comparing 2nd value/colour to each colour to select array ...</li> <li>• ... storing 1st value/integer in correct array</li> </ul> | <b>6</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>def SplitData(DataArray):     Red = []     Green = []     Blue = []     Orange = []     Yellow = []     Pink = []      for Line in DataArray:         SplitLine = Line.split(",")          if SplitLine[1].strip() == "red":             Red.append(SplitLine[0])         elif SplitLine[1].strip() == "green":             Green.append(SplitLine[0])         elif SplitLine[1].strip() == "blue":             Blue.append(SplitLine[0])         elif SplitLine[1].strip() == "orange":             Orange.append(SplitLine[0])         elif SplitLine[1].strip() == "yellow":             Yellow.append(SplitLine[0])         else:             Pink.append(SplitLine[0])</pre> <p>VB.NET</p> <pre>Sub SplitData(DataArray())     Dim Red(30) As String     Dim Green(30) As String     Dim Blue(30) As String     Dim Orange(30) As String     Dim Yellow(30) As String     Dim Pink(30) As String</pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Marks |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre> Dim RedNumber As Integer = 0 Dim GreenNumber As Integer = 0 Dim BlueNumber As Integer = 0 Dim OrangeNumber As Integer = 0 Dim YellowNumber As Integer = 0 Dim PinkNumber As Integer = 0 Dim x As Integer = 0 Dim TempDataFromFile(1) As String Dim DataList(100, 1) As String  For x = 0 To NumberItems - 1     TempDataFromFile = (dataArray(x)).Split(",")     DataList(x, 0) = TempDataFromFile(0)     DataList(x, 1) = TempDataFromFile(1) Next x x = 0 While DataList(x, 0) IsNot Nothing     If DataList(x, 1) = "red" Then         Red(RedNumber) = DataList(x, 0)         RedNumber = RedNumber + 1     ElseIf DataList(x, 1) = "green" Then         Green(GreenNumber) = DataList(x, 0)         GreenNumber = GreenNumber + 1     ElseIf DataList(x, 1) = "blue" Then         Blue(BlueNumber) = DataList(x, 0)         BlueNumber = BlueNumber + 1     ElseIf DataList(x, 1) = "orange" Then         Orange(OrangeNumber) = DataList(x, 0)         OrangeNumber = OrangeNumber + 1     ElseIf DataList(x, 1) = "yellow" Then         Yellow(YellowNumber) = DataList(x, 0)         YellowNumber = YellowNumber + 1     ElseIf DataList(x, 1) = "pink" Then         Pink(PinkNumber) = DataList(x, 0)         PinkNumber = PinkNumber + 1     End If </pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre>         x = x + 1     End While End Sub  Java public static void SplitData(String[] dataArray){     String[] Red = new String[30];     String[] Green = new String[30];     String[] Blue = new String[30];     String[] Orange = new String[30];     String[] Yellow = new String[30];     String[] Pink = new String[30];     Integer RedNumber = 0;     Integer GreenNumber = 0;     Integer BlueNumber = 0;     Integer OrangeNumber = 0;     Integer YellowNumber = 0;     Integer PinkNumber = 0;     Integer x = 0;     String[] TempDataFromFile;     String[][] DataList = new String[100][2];      for(x = 0; x &lt; 72; x++){         TempDataFromFile = dataArray[x].split(",");         DataList[x][0] = TempDataFromFile[0];         DataList[x][1] = TempDataFromFile[1];     }      x = 0;     while(DataList[x][0] != null){         if (DataList[x][1].compareTo("red") == 0) {             Red[RedNumber] = DataList[x][0];             RedNumber = RedNumber + 1;         }else if (DataList[x][1].compareTo("green") == 0) {             Green[GreenNumber] = DataList[x][0];             GreenNumber = GreenNumber + 1;         }     } } </pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Marks |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre>         }else if (DataList[x][1].compareTo("blue") == 0) {             Blue[BlueNumber] = DataList[x][0];             BlueNumber = BlueNumber + 1;         }else if (DataList[x][1].compareTo("orange") == 0) {             Orange[OrangeNumber] = DataList[x][0];             OrangeNumber = OrangeNumber + 1;         }else if (DataList[x][1].compareTo("yellow") == 0) {             Yellow[YellowNumber] = DataList[x][0];             YellowNumber = YellowNumber + 1;         }else if (DataList[x][1].compareTo("pink") == 0) {             Pink[PinkNumber] = DataList[x][0];             PinkNumber = PinkNumber + 1;         }         x = x + 1;     } } </pre> |       |

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| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Answer                                                                                                                                                                                                                                                                                                                                                                                                                          | Marks    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 2(c)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>1 mark each</p> <ul style="list-style-type: none"> <li>• Procedure header taking (1D) array and filename as parameters, opening file to append and closing file (in appropriate place)</li> <li>• Looping through each item in array parameter ...</li> <li>• ... writing to the file</li> <li>• ... with new line break between each line</li> <li>• Using exception handling try and catch with suitable output</li> </ul> | <b>5</b> |
| <p>Example program code:</p> <p>Python</p> <pre>def StoreData(DataToStore, FileName):     try:         File = open(FileName,"a+")         for Item in DataToStore:             File.write(Item)             File.write("\n")         File.close()     except:         print("Cannot create or write to file")</pre> <p>VB.NET</p> <pre>Sub StoreData(DataToStore(), FileName)     Dim FileWriter As IO.StreamWriter = New IO.StreamWriter(FileName, False)     Dim x As Integer = 0     Try         While DataToStore(x) IsNot Nothing             FileWriter.WriteLine(DataToStore(x))             x = x + 1         End While         FileWriter.Close()     Catch ex As Exception         Console.WriteLine("Cannot open or write to file")     End Try End Sub</pre> |                                                                                                                                                                                                                                                                                                                                                                                                                                 |          |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre> Java public static void StoreData(String[] DataToStore, String FileName){     File TheFile = new File(FileName);      try{         FileWriter FW = new FileWriter(TheFile, true);         Integer X = 0;         while(DataToStore[X] != null){             FW.write(DataToStore[X]);             X++;             FW.write("\n");         }         FW.close();     }catch(IOException ex){         System.out.println("Cannot open or write to file");     } } </pre> |       |

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| Question | Answer                                                                                                                                                                          | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2(d)     | 1 mark each <ul style="list-style-type: none"> <li>• Calling StoreData with one array and filename</li> <li>• Calling StoreData with remaining 5 arrays and filename</li> </ul> | 2     |

Example program code:

Python

```
StoreData(Red, "Red.txt")
StoreData(Green, "Green.txt")
StoreData(Blue, "Blue.txt")
StoreData(Orange, "Orange.txt")
StoreData(Yellow, "Yellow.txt")
StoreData(Pink, "Pink.txt")
```

VB.NET

```
StoreData(Red, "Red.txt")
StoreData(Green, "Green.txt")
StoreData(Blue, "Blue.txt")
StoreData(Orange, "Orange.txt")
StoreData(Yellow, "Yellow.txt")
StoreData(Pink, "Pink.txt")
```

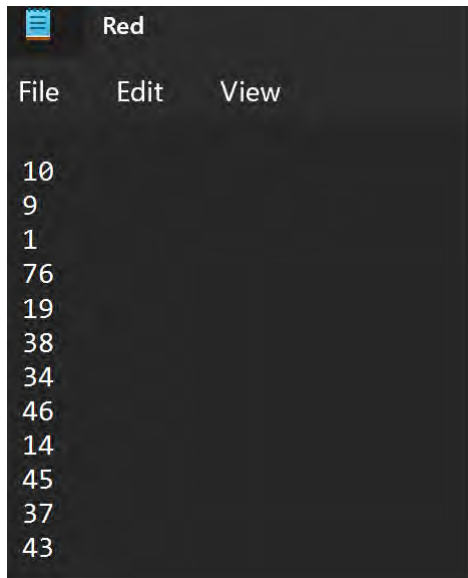
Java

```
StoreData(Red, "Red.txt");
StoreData(Green, "Green.txt");
StoreData(Blue, "Blue.txt");
StoreData(Orange, "Orange.txt");
StoreData(Yellow, "Yellow.txt");
StoreData(Pink, "Pink.txt");
```

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| Question                                                                                                                                                                                                                                                                                                                                                     | Answer                                                                                                                                                                                                               | Marks    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 2(e)(i)                                                                                                                                                                                                                                                                                                                                                      | 1 mark each <ul style="list-style-type: none"> <li>• Calling ReadData( ) ...</li> <li>• ... and storing/using return value</li> <li>• Calling SplitData( ) with returned array as a parameter</li> </ul>             | <b>3</b> |
| Example program code:<br><br>Python<br>DataFromFile = ReadData()<br>SplitData(DataFromFile)<br><br>VB.NET<br>Sub Main(args As String())<br>Dim DataFromFile(,) As String = ReadData()<br>SplitData(DataFromFile)<br>End Sub<br><br>Java<br>public static void main(String args[]){<br>String[][] DataFromFile = ReadData();<br>SplitData(DataFromFile);<br>} |                                                                                                                                                                                                                      |          |
| 2(e)(ii)                                                                                                                                                                                                                                                                                                                                                     | 1 mark screenshots showing <ul style="list-style-type: none"> <li>• Prompt and input of filename TheData.txt</li> <li>• Screenshot of data in red file. Filename must be shown in same screenshot as data</li> </ul> | <b>2</b> |

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| Question                                                                          | Answer | Marks |
|-----------------------------------------------------------------------------------|--------|-------|
|  |        |       |

| Question | Answer                                                                                                                                                                                                                                                                                                                                                                            | Marks    |
|----------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(a)(i)  | <p>1 mark each</p> <ul style="list-style-type: none"> <li>• Class header (and end where appropriate)</li> <li>• Constructor header (and end where appropriate) with (min) one parameter (integer) within class</li> <li>• 3 attributes with correct data types</li> <li>• NodeData has parameter assigned, LeftNode and RightNode are assigned null within constructor</li> </ul> | <b>4</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>class Node:     def __init__(self, pNodeData):         self._NodeData = pNodeData #integer         self._LeftNode = None #node         self._RightNode = None #node</pre> <p>VB.NET</p> <pre>Class Node     Private NodeData As Integer     Private LeftNode As Node     Private RightNode As Node     Sub New(pNodeData)         NodeData = pNodeData         LeftNode = Nothing         RightNode = Nothing     End Sub End Class</pre> <p>Java</p> <pre>class Node{     public Integer NodeData;     public Node LeftNode;     public Node RightNode;     public Node(Integer pNodeData){         NodeData = pNodeData;         LeftNode = null;         RightNode = null;     } }</pre> |       |

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| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Answer                                                                                                                                                                               | Marks    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(a)(ii)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 1 mark each <ul style="list-style-type: none"> <li>• 1 get method with no parameter ...</li> <li>• ... returning correct value</li> <li>• 2nd and 3rd correct get methods</li> </ul> | <b>3</b> |
| <p>Example program code:</p> <p>Python</p> <pre>def GetLeft(self):     return self._LeftNode def GetRight(self):     return self._RightNode def GetData(self):     return self._NodeData</pre> <p>VB.NET</p> <pre>Function GetLeft()     Return LeftNode End Function Function GetRight()     Return RightNode End Function Function GetData()     Return NodeData End Function</pre> <p>Java</p> <pre>public Integer GetData(){     return NodeData; } public Node GetLeft(){     return LeftNode; } public Node GetRight(){     return RightNode; }</pre> |                                                                                                                                                                                      |          |

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| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Answer                                                                                                                                                                                         | Marks    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(a)(iii)                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 1 mark each <ul style="list-style-type: none"> <li>• 1 set method taking parameter of type Node ...</li> <li>• ... assigning to correct attribute</li> <li>• 2nd correct set method</li> </ul> | <b>3</b> |
| <p>Example program code:</p> <p>Python</p> <pre>def SetLeft(self, NewNode):     self._LeftNode = NewNode def SetRight(self, NewNode):     self._RightNode = NewNode</pre> <p>VB.NET</p> <pre>Sub SetLeft(NewNode)     LeftNode = NewNode End Sub Sub SetRight(NewNode)     RightNode = NewNode End Sub</pre> <p>Java</p> <pre>public void SetLeft(Node NewNode){     LeftNode = NewNode; } public void SetRight(Node NewNode){     RightNode = NewNode; }</pre> |                                                                                                                                                                                                |          |

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| Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Answer                                                                                                                                                                       | Marks    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(b)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 1 mark each <ul style="list-style-type: none"> <li>• Creating 1 instance of Node with a correct value and storing the node ...</li> <li>• ... remaining 4 correct</li> </ul> | <b>2</b> |
| <p>Example program code:</p> <p>Python</p> <pre>FirstNode = Node(10) SecondNode = Node(20) ThirdNode = Node(5) FourthNode = Node(15) FifthNode = Node(7)</pre> <p>VB.NET</p> <pre>Dim FirstNode As Node = New Node(10) Dim SecondNode As Node = New Node(20) Dim ThirdNode As Node = New Node(5) Dim FourthNode As Node = New Node(15) Dim FifthNode As Node = New Node(7)</pre> <p>Java</p> <pre>Node FirstNode = new Node(10); Node SecondNode = new Node(20); Node ThirdNode = new Node(5); Node FourthNode = new Node(15); Node FifthNode = new Node(7);</pre> |                                                                                                                                                                              |          |

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| Question                                                                                                                                                                                                                                                                                                                                                                                                                                | Answer                                                                                                                                                                                                                                                      | Marks    |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(c)(i)                                                                                                                                                                                                                                                                                                                                                                                                                                 | 1 mark each <ul style="list-style-type: none"> <li>Class Tree header (and end) no inheritance and constructor header (and end) taking 1 node parameter within class ...</li> <li>... storing parameter in FirstNode declared as a Node data type</li> </ul> | <b>2</b> |
| <p>Example program code:</p> <p>Python</p> <pre>class Tree:     def __init__(self, FirstNode):         self._FirstNode = FirstNode #node</pre> <p>VB.NET</p> <pre>Class Tree     Private FirstNode As Node     Sub New(pFirstNode)         FirstNode = pFirstNode     End Sub End Class</pre> <p>Java</p> <pre>class Tree{     private Node FirstNode;      public Tree(Node pFirstNode){         FirstNode = pFirstNode;     } }</pre> |                                                                                                                                                                                                                                                             |          |

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| Question                                                                                                                                                                                                                                                            | Answer                                                                                                                                         | Marks    |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(c)(ii)                                                                                                                                                                                                                                                            | 1 mark for <ul style="list-style-type: none"> <li>• Get method header (and end) with no parameter, returning <code>FirstNode</code></li> </ul> | <b>1</b> |
| <p>Example program code:</p> <p>Python</p> <pre>def GetRootNode(self):     return self._FirstNode</pre> <p>VB.NET</p> <pre>Function GetRootNode()     Return FirstNode End Function</pre> <p>Java</p> <pre>public Node GetRootNode(){     return FirstNode; }</pre> |                                                                                                                                                |          |

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| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Marks    |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(c)(iii) | 1 mark each to max 6 <ul style="list-style-type: none"> <li>• Insert method header (and end) taking 1 node parameter</li> <li>• If parameter &lt; first node, checking if there is a left node ...</li> <li>• ... storing node in left node if it is null</li> <li>• If parameter &gt;= first node, checking if there is a right node ...</li> <li>• ... storing node in right node if it is null</li> <li>• Looping until correct position is found // recursive calls</li> </ul> | <b>6</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Marks |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <p>Python</p> <pre>def Insert(self, NewNode):     CurrentNode = self._FirstNode     Inserted = True     while Inserted:         if NewNode.GetData() &lt; CurrentNode.GetData():             if CurrentNode.GetLeft() == None:                 CurrentNode.SetLeft(NewNode)                 return True             else:                 CurrentNode = CurrentNode.GetLeft()         else:             if CurrentNode.GetRight() == None:                 CurrentNode.SetRight(NewNode)                 return True             else:                 CurrentNode = CurrentNode.GetRight()</pre> <p>VB.NET</p> <pre>Function Insert(NewNode)     Dim CurrentNode As Node     CurrentNode = FirstNode     Dim Inserted As Boolean = True     While Inserted         If NewNode.GetData() &lt; CurrentNode.GetData() Then             If CurrentNode.GetLeft() Is Nothing Then                 CurrentNode.SetLeft(NewNode)                 Return True             Else                 CurrentNode = CurrentNode.GetLeft()             End If         End If     End While</pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Marks |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <pre> Else     If CurrentNode.GetRight() Is Nothing Then         CurrentNode.SetRight(NewNode)         Return True     Else         CurrentNode = CurrentNode.GetRight()     End If End If End While End Function  Java public Boolean Insert(Node NewNode){     Node CurrentNode = FirstNode;     Boolean Inserted = true;     while(Inserted){         if(NewNode.GetData() &lt; CurrentNode.GetData()){             if(CurrentNode.GetLeft() == null){                 CurrentNode.SetLeft(NewNode);                 return true;             }else{                 CurrentNode = CurrentNode.GetLeft();             }         }else{             if(CurrentNode.GetRight() == null){                 CurrentNode.SetRight(NewNode);                 return true;             }else{                 CurrentNode = CurrentNode.GetRight();             }         }     }     return false; } </pre> |       |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                         | Marks    |
|----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(d)     | <p>1 mark each</p> <ul style="list-style-type: none"><li>• Procedure header (and end) taking node as parameter, that is <b>recursive</b></li><li>• Checking if left is null and <b>recursive</b> call if not null</li><li>• Outputting node's data</li><li>• Checking if right is null and <b>recursive</b> call if not null</li><li>• Correct order</li></ul> | <b>5</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Marks    |
|----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|          | <p>Example program code:</p> <p>Python</p> <pre>def OutputInOrder(RootNode):     if RootNode.GetLeft() != None:         OutputInOrder(RootNode.GetLeft())     print(RootNode.GetData())     if RootNode.GetRight() != None:         OutputInOrder(RootNode.GetRight())</pre> <p>VB.NET</p> <pre>Sub OutputInOrder(RootNode)     If RootNode.GetLeft() IsNot Nothing Then         OutputInOrder(RootNode.GetLeft())     End If     Console.WriteLine(RootNode.GetData())     If RootNode.GetRight() IsNot Nothing Then         OutputInOrder(RootNode.GetRight())     End If End Sub</pre> <p>Java</p> <pre>public static void OutputInOrder(Node RootNode){     if(RootNode.GetLeft() != null){         OutputInOrder(RootNode.GetLeft());     }     System.out.println(RootNode.GetData());     if(RootNode.GetRight() != null){         OutputInOrder(RootNode.GetRight());     } }</pre> |          |
| 3(e)(i)  | <p>1 mark each</p> <ul style="list-style-type: none"> <li>• Creation of Tree object with the Node with value 10 as parameter</li> <li>• Calling method Insert ( ) for tree with the nodes for 20, 5, 15 and 7 in order</li> <li>• Calling OutputInOrder ( ) with tree's root node as parameter</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <b>3</b> |

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| Question | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
|          | <p>Example program code:</p> <pre> Python FirstNode = Node(10) SecondNode = Node(20) ThirdNode = Node(5) FourthNode = Node(15) FifthNode = Node(7) MyTree = Tree(FirstNode) MyTree.Insert(SecondNode) MyTree.Insert(ThirdNode) MyTree.Insert(FourthNode) MyTree.Insert(FifthNode) OutputInOrder(MyTree.GetRootNode())  VB.NET Sub Main(args As String())     Dim FirstNode As Node = New Node(10)     Dim SecondNode As Node = New Node(20)     Dim ThirdNode As Node = New Node(5)     Dim FourthNode As Node = New Node(15)     Dim FifthNode As Node = New Node(7)     Dim MyTree As Tree = New Tree(FirstNode)     MyTree.Insert(SecondNode)     MyTree.Insert(ThirdNode)     MyTree.Insert(FourthNode)     MyTree.Insert(FifthNode)     OutputInOrder(MyTree.GetRootNode()) End Sub </pre> |       |

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| Question                                                                            | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                | Marks    |
|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                                     | <pre> Java public static void main(String args[]){     Node FirstNode = new Node(10);     Node SecondNode = new Node(20);     Node ThirdNode = new Node(5);     Node FourthNode = new Node(15);     Node FifthNode = new Node(7);      Tree MyTree = new Tree(FirstNode);     MyTree.Insert(SecondNode);     MyTree.Insert(ThirdNode);     MyTree.Insert(FourthNode);     MyTree.Insert(FifthNode);     OutputInOrder(MyTree.GetRootNode()); } </pre> |          |
| 3(e)(ii)                                                                            | <p>Output of</p> <pre> 5 7 10 15 20 </pre>                                                                                                                                                                                                                                                                                                                                                                                                            | <b>1</b> |
|  |                                                                                                                                                                                                                                                                                                                                                                                                                                                       |          |