Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

COMPUTER SCIENCE **9608/42**

Paper 4 Written Paper **May/June 2018**

MARK SCHEME

Maximum Mark: 75

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 2018 series for most Cambridge IGCSE™, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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 descriptors 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**:

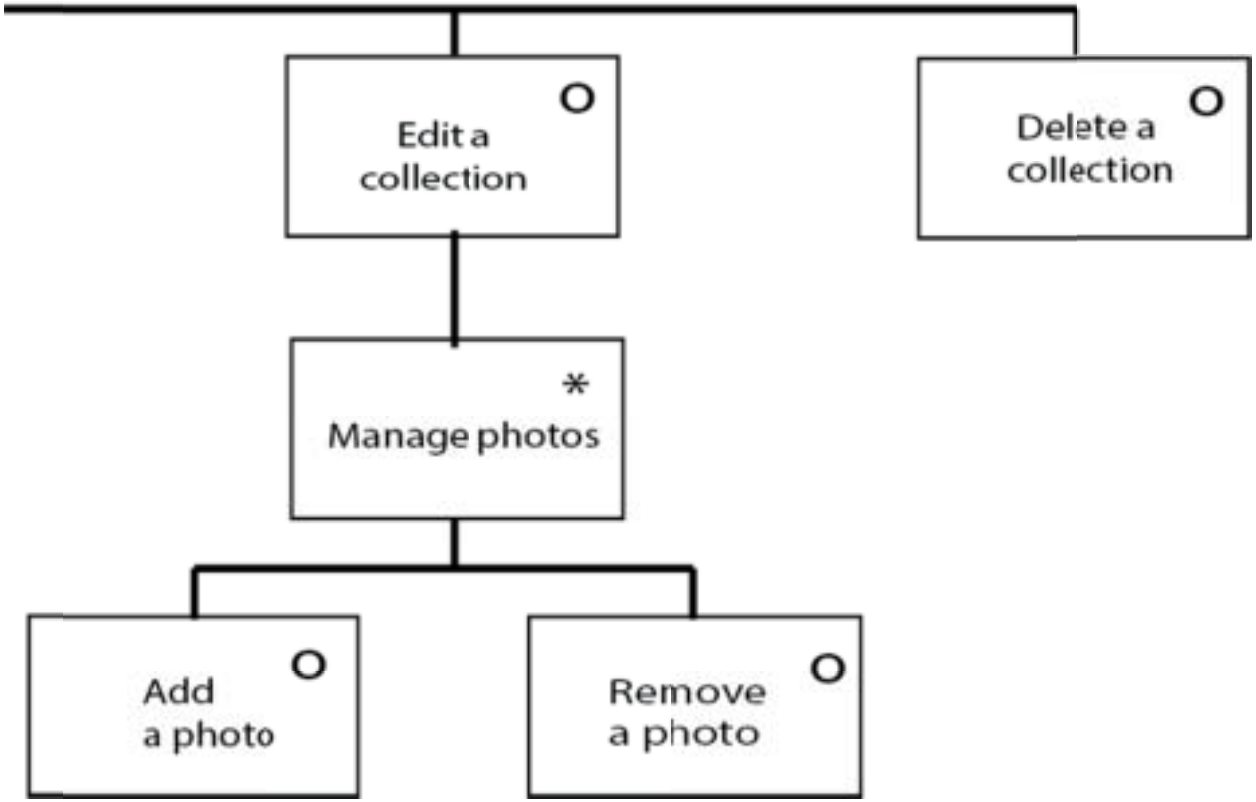
- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can 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.

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.

Question	Answer	Marks
1(a)	1 mark for each correctly completed pseudocode line to max 4 01 REPEAT 02 CALL TakePhoto 03 **CALL AddPhotoToCollection** 04 OUTPUT "Do you want to take another photo?" 05 INPUT AddPhoto 06 UNTIL AddPhoto = "No" 07 REPEAT 08 **CALL AddUser** 09 OUTPUT "Do you want to add another user?" 10 INPUT NewUser 11 UNTIL **NewUser** = "No" 12 OUTPUT "Do you want to create another collection?" 13 **INPUT NewCollection** 14 UNTIL NewCollection = "No"	**4**

Question	Answer	Marks
1(b)	1 mark per bullet: • Edit a collection // Choose a collection // Select a collection • Manage photos • Delete a collection • both add and remove a photo // add to collection, delete to collection • appropriate selection and iteration in all boxes  	**5**

Question	Answer	Marks

2(a)	1 mark for each statement
	
	`15 is_a(gecko, lizard).`
	`16 maxsize(gecko, 182).`
		2

2(b)	1 mark for 2 results 2 marks for 3 correct results `green_iguana, cayman, smooth_iguana`	**2**
2(c)	1 mark per bullet • `is_a` used with brackets () • `squamata, X` in correct order `is_a(squamata, X).`	**2**
2(d)	1 mark for each bullet to max 3 • `is_a(X, Z)` • `and // , has(Z, Y).` `is_a(X, Z) AND has(Z, Y).`	**3**
2(e)	`YES`	**1**

Question	Answer	Marks
3(a)	`CardData` is **partially** sorted/ordered // more items in order/sorted	**1**

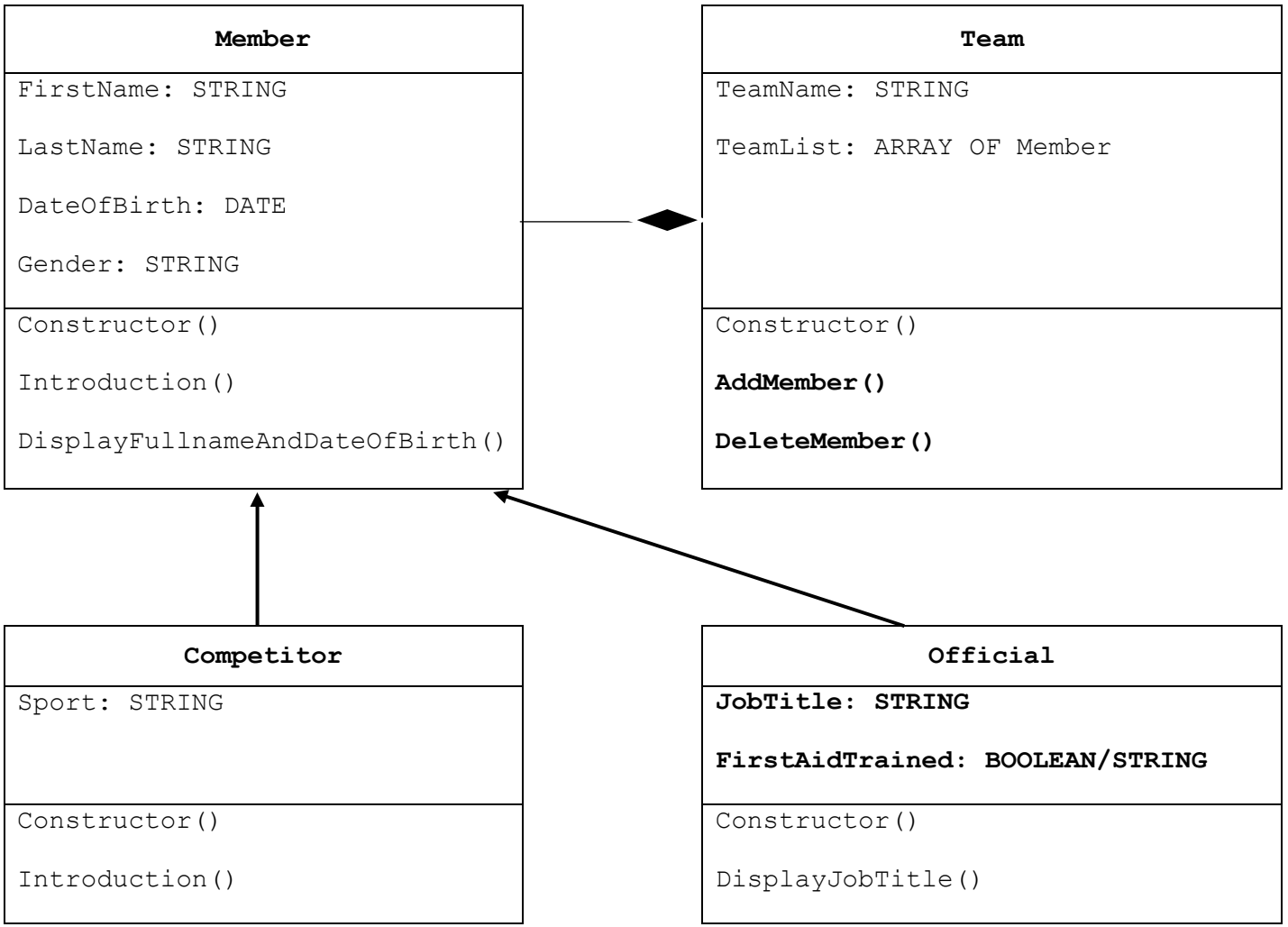
3(b)	1 mark for each correct statement
	
	`01 ArraySize ← 10`
	`02 FOR Pointer ← 2 TO` **`ArraySize // 10`**
	`03  ValueToInsert ← CardData[Pointer]`
	`04  HolePosition ←` **`Pointer`**
	`05  WHILE(HolePosition>1 AND(`**`CardData[HolePosition - 1]`** `>` **`ValueToInsert`**`))`
	`06  CardData[HolePosition] ← CardData[`**`HolePosition – 1`**`]`
	`07  HolePosition ←` **`HolePosition – 1`**
	`08  ENDWHILE`
	`09  CardData[HolePosition] ←` **`ValueToInsert`**
	`10 ENDFOR`
		7

3(c)(i)	1 mark per bullet to max 2 • It doesn't check every value • The midpoint is the middle element, not the middle numerical value • When the higher/lower elements are discarded they will not be the higher/lower elements • It might discard the value you are looking for	**2**
3(c)(ii)	1 mark per bullet to max 4. Max 2 marks if no relation to `CardData` values. • Find mid-point **and** comparison // 25 is smaller than/compared to 52/56 • Discard/ignore greater // change upper bound to 33/52/midpoint - 1 //e.g. right hand side // only use array elements 1 - 4/5 • Find **and** compare to mid-point of new list e.g. 12/25 • Value is the midpoint // Continue until value found	**4**

Question	Answer	Marks

3(d)	1 mark for each complete statement
	
	`PROCEDURE BinarySearch(CardData, SearchValue)`
	`  DECLARE Midpoint : INTEGER`
	`  First ← 1`
	`  Last ← ARRAYLENGTH(`**`CardData`**`)`
	`  Found ← FALSE`
	`  WHILE (First <= Last) AND NOT(Found)`
	`  Midpoint ←` **`(First + Last) \ 2`**
	`  IF CardData[Midpoint] = SearchValue`
	`  THEN`
	`  Found ← TRUE`
	`  ELSE`
	`  IF SearchValue < CardData[Midpoint]`
	`  THEN`
	`  Last ←` **`Midpoint - 1`**
	`  ELSE`
	`  First ←` **`Midpoint + 1`**
	`  ENDIF`
	`  ENDIF`
	`  ENDWHILE`
	`ENDPROCEDURE`
		4

Question	Answer	Marks
4(a)	1 mark per bullet: • Team methods • Official attributes • Two inheritance arrows **or** containment	**3**



Question	Answer	Marks

4(b)	1 mark per bullet to max 5
	
	• class declaration
	• `FirstName`, `LastName`, `DateOfBirth` and Gender all defined as private
	
	• constructor declaration
	• …all four attributes assigned values from parameters
	
	• (Public) method for `Introduction`
	• …outputs message with `FirstName` and `LastName` attributes
	// returns `FirstName` and `LastName`
	
	• Public method for `DisplayFullNameAndDateofbirth`
	• … outputs message with `FirstName`, `LastName` and `DateOfBirth`
	// returns `FirstName`, `LastName`, `DateOfBirth`
	
	Python example code:
	
	`class Member:`
	
	`  def __init__(self, Fname, Lname, DOB, GenderVal):`
	`  self.__FirstName = Fname`
	`  self.__LastName = Lname`
	`  self.__DateOfBirth = DOB`
	`  self.__Gender = GenderVal`
	
	`  def Introduction(self):`
	`  return "Hello, I am ", self.__FirstName, " ",`
	`  self.LastName`
	
	`  def DisplayFullnameAndDateofbirth(self):`
	`  print self.__FirstName, self.__LastName,`
	`  self.__DateOfBirth`
		5

Question	Answer	Marks
4(b)	Visual Basic example code:	

```
Class Member
  Private  Firstname As String
  Private  Lastname As String
  Private  DateOfBirth As Date
  Private  Gender As String

  Public Sub New(ByVal Fname As String,ByVal Lname As String,
                 ByVal DOB As Date, ByVal GenderVal As String)
    Firstname = Fname
    Lastname = Lname
    DateOfBirth = DOB
    Gender = GenderVal
  End Sub

  Public Function Introduction() As String
    Dim Message As String
    Message = "Hello, I am " + Firstname + " " + Lastname + " " +
              DateOfBirth
    Return Message
  End Function

  Public Function DisplayFullNameAndDateOfBirth As String
    DisplayFullNameAndDateOfBirth = Firstname + " " + Lastname +
                                    " " + DateOfBirth
  End Function
End Class
```

Question	Answer	Marks
4(b)	Pascal example code:	

```
type
Member = class
private
  Firstname : string;
  Lastname : string;
  DateOfBirth : date;
  Gender : string;

public
  constructor Create(Fname, Lname, Gend, DBirth : string);
  function Introduction() : string;
  function DisplayFullNameAndDateOfBirth() : string;

constructor Member.Create(Fname, Lname, Gend, DBirth : string);
  begin
    Firstname := Fname
    LastName := Lname
    Gender := Gend
    DateOfBirth := DBirth
  end;

function Member.Introduction() : String;
  begin
    Introduction :=  "Hello, I am " + Firstname + " " + Lastname
  end;

function Member.DisplayFullNameAndDateOfBirth As String;
  begin;
    DisplayFullNameAndDateOfBirth = Firstname + " " + Lastname +
                                    " " + DateOfBirth
  end;
```

Question	Answer	Marks

4(c)	1 mark per bullet to max 5
	
	• Class declaration that inherits from Member
	• Constructor declaration taking all five parameters
	• …that inherits from Member
	• Declaration of Sport as private String
	• …. and assigning to parameter
	• Introduction method declaration (with polymorphism)
	• …returning/outputting message with `FirstName`, `LastName` and `Sport` variables
	
	Python example code:
	
	`class Competitor(Member):`
	`  def __init__(self, Fname, Lname, DOB, GenderVal, MySport):`
	`  Member.__init__(self, Fname, Lname, DOB, GenderVal)`
	`  self.__Sport = MySport`
	
	`  def Introduction(self):`
	`  print "Hello, I am %s %s and my sport is %s" % (self.FirstName,`
	`  self.LastName, self.__Sport)`
		5

Question	Answer	Marks

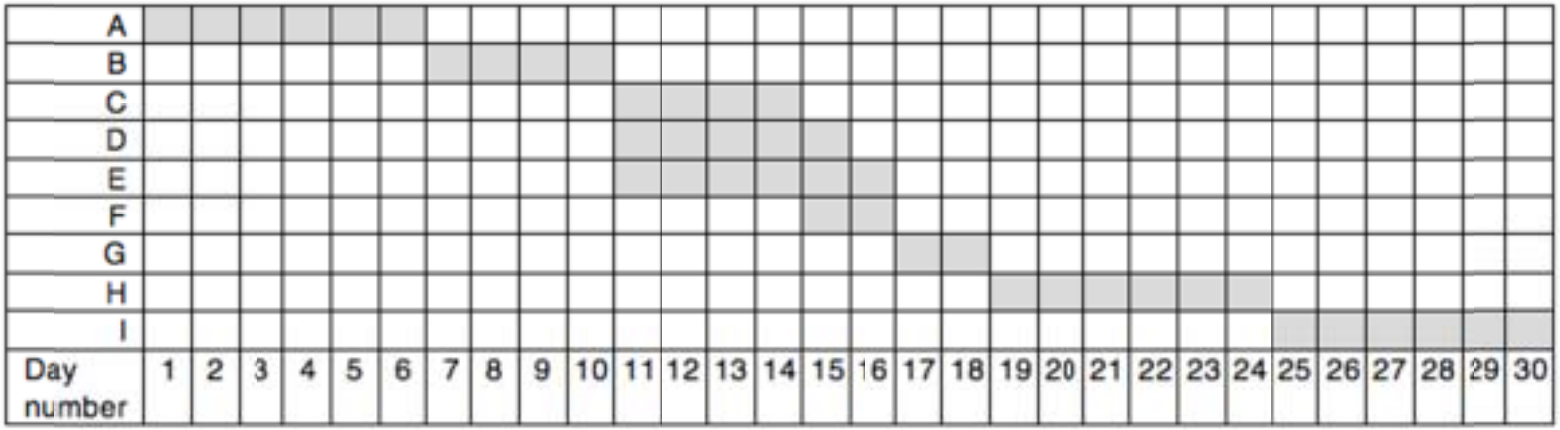
4(c)	Visual Basic example code:
	
	`Class Competitor`
	`  Inherits Member`
	`  Private Sport As String`
	`  Public Sub New(ByVal Fname As String,ByVal Lname As String,`
	`  ByVal DOB As Date, ByVal GenderVal As String, ByVal`
	`  SportVal As String)`
	`  MyBase.New(Fname, Lname, DOB, GenderVal)`
	`  Sport = SportVal`
	`  End Sub`
	
	`  Public Overloads Function Introduction() As String`
	`  Dim Message As String`
	`  Message = "Hello, I am " + Firstname + " " + Lastname + " and my`
	`  sport is " + Sport`
	`  Return Message`
	`  End Function`
	`End Class`	

Question	Answer	Marks
4 (c)	Pascal example code:	

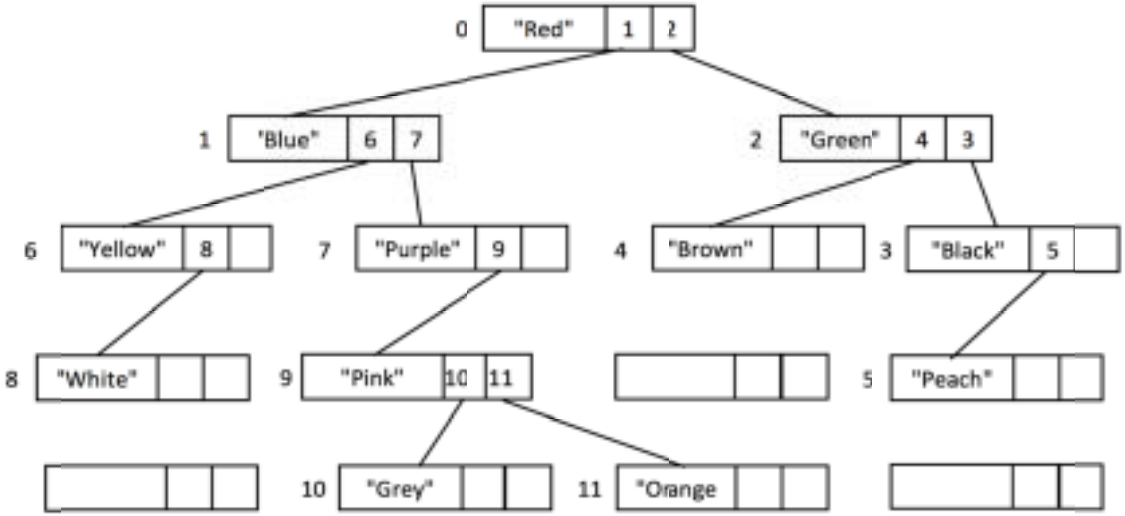
```
type
  Competitor = class(Member)
  private
    Sport : String;
  public
    Constructor init(Fname, Lname: String; DOB: Date; GenderVal,
                     Sport:String);
    Function Introduction() : String;
end;

Constructor Competitor.initFname, Lname: String; DOB: Date; GenderVal, SportVal:String);
begin
  inherited init(Fname, Lname, DOB, GenderVal);
  Sport := SportVal;
end;

Function Competitor.Introduction();
begin
  Result:= "Hello, I am " + Firstname + " " + Lastname + " and my sport
            is " + Sport
end;
```

Question	Answer	Marks

4(d)	1 mark per bullet
	
	• variable BMXJudge assigned value
	• call Official
	• with all 6 parameters assigned correctly
	
	Python example code:
	
	`BMXJudge = Official("Omar", "Ellaboudy", "17/03/1993", "Male", true, "Judge")`
	
	Visual Basic example code:
	
	`BMXJudge = New Official("Omar", "Ellaboudy", "17/03/1993", "Male, true, "Judge")`
	
	Pascal example code:
	
	`BMXJudge := Official("Omar", "Ellaboudy", "17/03/1993", "Male", true, "Judge")`
		3

Question	Answer	Marks
5(a)	1 mark per bullet • **C**/**D**/**E** in parallel starting after **B**, with correct durations. • **F** with dependency on **C** and correct duration • **G** with dependency on **D** and **E** with correct duration • **H** with correct dependency on **F** and **G** • **I** with dependency on **H**  	**5**
5(b)(i)	**C, D, E**	**1**
5(b)(ii)	**E, F**	**1**

Question	Answer	Marks
5(c)	1 mark per bullet to max 2 For example: • Check if the project is on track • …so the project manager can intervene if behind • lets you identify slack time to • …reallocate resources to support the process • find critical path • …to ensure activities are given correct priority • see when tasks end • ...to plan the next tasks • see which tasks can run in parallel • set milestones/goals • check correct tasks are being carried out on current day • Calculate latest start time • Calculate earliest finish time • Calculate latest start time for a task	**2**

Question	Answer	Marks
6(a)	1 mark per bullet • Brown left and black right from node 2 • Yellow left and Purple right from node 1 • Peach left comes from 3 • White left from 6 **and** Pink left from 7 • Grey left from 9 and orange right from 9  	**5**

Question	Answer	Marks

6(b)	1 mark for outputting all the leaf data values
	
	• Outputting `BinaryTree[CurrentNode].DataValue` **only** when both `LeftPointer` and `RightPointer` are -1
	
	1 mark per bullet to max 7
	
	• Function declaration
	• …taking `CurrentNode` or equivalent as parameter
	
	• Check if `BinaryTree[CurrentNode].LeftPointer` is not -1 …
	• … recursive call …
	• …with left pointer value as parameter
	
	• Check if `BinaryTree[CurrentNode].RightPointer` is not -1…
	• … recursive call…
	• … with right pointer value as parameter
	
	Python example code:
	
	`def FindLeaves(CurrentNode):`
	`  global BinaryTree`
	`  if(BinaryTree[CurrentNode].LeftPointer != -1):`
	`  FindLeaves(BinaryTree[CurrentNode].LeftPointer)`
	
	`  if(BinaryTree[CurrentNode].RightPointer != -1):`
	`  FindLeaves(BinaryTree[CurrentNode].RightPointer)`
	
	`  if((BinaryTree[CurrentNode].RightPointer == -1) and`
	`  (BinaryTree[CurrentNode].LeftPointer == -1)):`
	`  print BinaryTree[CurrentNode].DataValue`
	`  return`
		8

Question	Answer	Marks

6(b)	Visual Basic example code:
	
	`Procedure FindLeaves(CurrentNode):`
	
	`  if(BinaryTree[CurrentNode].LeftPointer <> -1) then`
	`  FindLeaves(BinaryTree[CurrentNode].LeftPointer)`
	`  End if`
	`  if(BinaryTree[CurrentNode].RightPointer <> -1) then`
	`  FindLeaves(BinaryTree[CurrentNode].RightPointer)`
	`  end if`
	`  if ((BinaryTree[CurrentNode].RightPointer = -1) and`
	`  (BinaryTree[CurrentNode].LeftPointer = -1)) then`
	`  Console.WriteLine(BinaryTree[CurrentNode].DataValue)`
	`  End if`
	`End Procedure`
	
	Pascal example code:
	
	`Procedure FindLeaves(CurrentNode);`
	`Begin`
	`  if(BinaryTree[CurrentNode].LeftPointer <> -1) then`
	`  FindLeaves(BinaryTree[CurrentNode].LeftPointer);`
	
	`  if(BinaryTree[CurrentNode].RightPointer <> -1):`
	`  FindLeaves(BinaryTree[CurrentNode].RightPointer);`
	
	`  if((BinaryTree[CurrentNode].RightPointer = -1) and`
	`  (BinaryTree[CurrentNode].LeftPointer = -1)) then`
	`  print (BinaryTree[CurrentNode].DataValue);`
	`End;`	