(ii) During testing of the search facility, the following list of articles is produced.

Article Title	Summary	Date	Issue
Processors	Recent processor development	06/05/2016	214
Printers	Inkjet or Laser?	25/03/2016	208
Smartphones	Control your phone by thought	13/05/2016	215

Describe how an insertion sort would reorder the three articles above, listing the articles in chronological order with the most recent article first.

✱ now item 1

The insertion sort will move item 1, with date 06/05/2016, into a new list. This list is now sorted. Then it will insert item ✱ into the new list, placing it before the previous item as the date is earlier. The sort will then check the smartphone article and place at the end of the sorted list,

1. (c) (continued)

(ii) Having received the HTML form data, the server-side script "subscription.php" then executes a number of processes. The script

1. assigns the HTML username and password to server-side variables
2. creates a connection with the database server
3. adds data to "member" table of the "subscribedata" database
4. closes the connection

The name of the database server is "magserver" and the username is "subscribe" with the corresponding password "subpass".

Using pseudocode or a server-side scripting language with which you are familiar, write code for processes 1, 2, 3 and 4 described above.   **5**

```
<?php
GET Username$ = GET (username)
    password$ = GET (password)

Access database magserver using Username=subscribe
and password = (subpass)

SELECT
USE "subscribedata"

Append username$ & password$
to "member" table.

Close SQL Connection
```

2. Radio Lowden plays songs from the years 1990 to 1999 inclusive. The songs played by the radio station must have featured in the official UK top 40 singles chart from these years.

   (a) Using the above example, explain the terms scope and constraints.   **2**

   The scope of the songs is from years 1990 to 1999. The constraints of these songs is that they have to have featured in the official UK top 40 single charts from these years.

   (b) The management of Radio Lowden has commissioned a developer to create a new website for the radio station. One of the pages of the new website will give access to playlists from recent radio programmes.

       (i) The developer suggests that the layout and interface of the website belonging to a rival radio station could be copied and used by Radio Lowden.

       Discuss whether this is acceptable practice.   **2**

   This practice would infringe the Copyrights, Designs & Patents act of 1998. The rival radio station might have successfully applied for a patent of their website design which could potentially create a legal battle if Radio Lowden copied it. It is possible that Radio Lowden could use the same layout of their page if this hasn't been patented by the other website.

2. (continued)

(c) A PlayList table is used to store details of all playlists created by Radio Lowden and details of each song are stored in a separate table called Song. These tables are part of a relational database.

Sample data for the PlayList and Song tables are shown.

Local

Attribute	Sample
ProgrammeID	1
SongID	A34213
DatePlayed	27/05/15
TimePlayed	09:00

PlayList Table

Local

Attribute	Sample
SongID	A34213
Title	Jack & Dee
Artist	Soozie – L
Year	1997

Song Table

Local — Foreign key handwritten annotation pointing to SongID of PlayList Table

(i) Write the SQL statement which will create the structure of the PlayList table.   4

CREATE PLay list Table
Programme ID (Integer, Local key)
Song ID (Text, Foreign key)
Date Played (Date)
Time Played (Time)
CREATE Song Table
Song ID (Text, Local key)
Title (Text)
Artist (Text)
Year (date)

(ii) Write the SQL query which will list the title of each song played on 26 May 2016.   2

SELECT SongTable. Title

WHERE PlayList Table. SongID = SongTable. SongID
AND PlayList Table. DatePlayed
= #26/05/16#

2. (continued)

(d) The titles of the songs in one of the playlists are exported to a program for processing using a queue structure. The queue has been implemented as a 1-D array.

The contents of the queue are shown.

front ———→ My Name is Lynnie

Jack & Dee

Moviestar Monster

back ———→ Draughty Man Blues
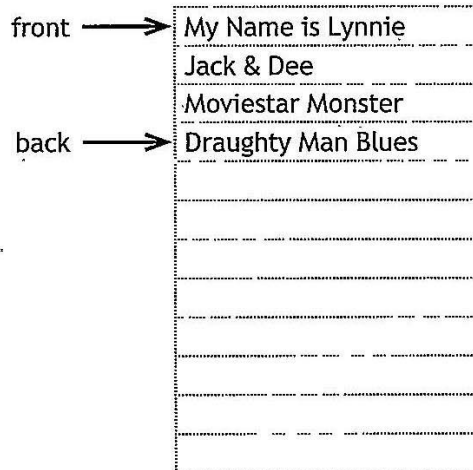
Array start
at 1 not 0
item

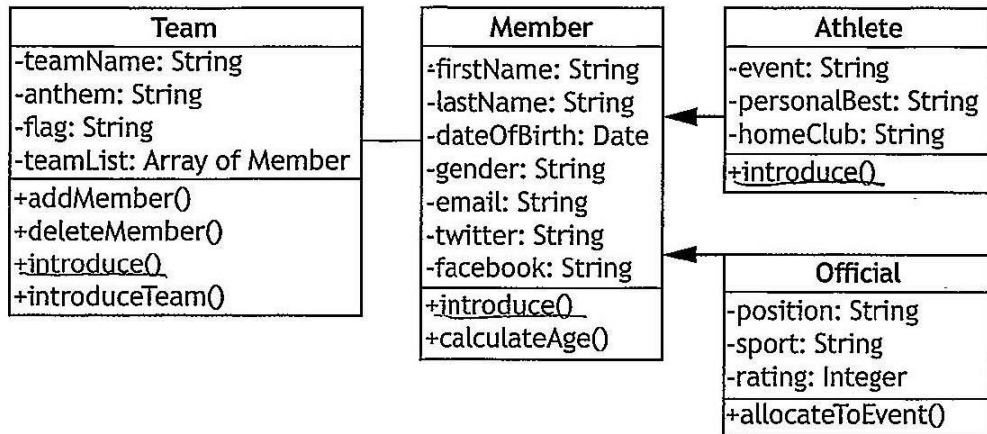Use pseudocode to write an algorithm to remove a played song from the top of the playlist queue.

3

Delete contents of Array$(1)

For i = 1 To (Length of Array - 1)

    LET Array$(i) = Array$(i+1)

NEXT i

LET Array$(Length of Array) = "   "

3. A program is to be written to process the results of different events in the 2016 Olympic Games.

(a) A simplified version of the UML class diagram for the program is shown.

Team
-teamName: String
-anthem: String
-flag: String
-teamList: Array of Member
+addMember()
+deleteMember()
+introduce()
+introduceTeam()

Member
-firstName: String
-lastName: String
-dateOfBirth: Date
-gender: String
-email: String
-twitter: String
-facebook: String
+introduce()
+calculateAge()

Athlete
-event: String
-personalBest: String
-homeClub: String
+introduce()

Official
-position: String
-sport: String
-rating: Integer
+allocateToEvent()

(i) By referring to the class diagram above, explain:
   • the difference between a class and an object
   • encapsulation
   • inheritance   4

Team is a class which has its own instance variables and objects methods, objects are individuals that inherits instance variables and methods for classes & sub classes. Encapsulation is when instance variables & methods are protected from unauthorised access and changes. A member sub-class only inherits the introduce() method and is protected from changing the person addMember() method. Inheritance is when sub-classes can access data from they own super-classes.

3.   (continued)

(d)   The names of the top 10 medal winning teams are held in a stack. Part of the stack is shown.

	1	Brazil
	2	United Kingdom
	3	Germany
	4	France
→	5	Australia
	6	
	7	
	8	
	9	
	10	

(i)   The USA wins enough medals to be fourth on the table. Write down the sequence of stack operations required to produce the new table.   2

	1	Brazil
	2	United Kingdom
	3	Germany
	4	USA
	5	France
→	6	Australia
	7	
	8	
	9	
	10	

Pop 'Australia' & 'France' and held them in
Memory. Push 'USA' to the stack and then
Push 'France' and 'Australia' from memory
back onto the stack.

3. (d) (continued)

(ii) The stack storing the medal winning teams could be implemented using a linked list.

The diagram below represents a linked list after the first six teams have been added to the medal table.
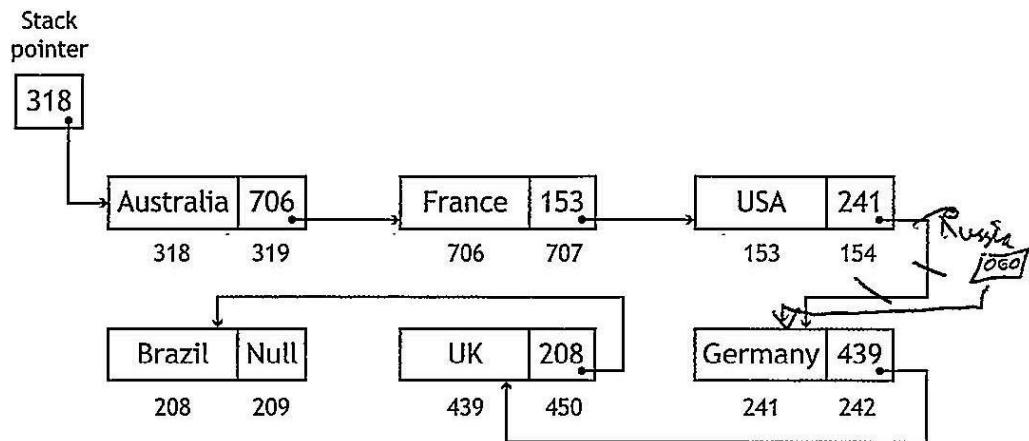
Team Russia is to be added to the medal table between Germany and the USA.

Describe how team Russia would be added to the correct place in the linked list.   **2**

The program would find 'USA's score data location, it would store the current link to storage item 241 in memory a variable, replace the link from 'USA's score at item 154 to the location of Russia is storage and replace its link from Russia's storage to 'Germany' at data item '241'

4. Dawid Mahyne is studying Advanced Higher Computing Science. His teacher has asked him to compare the computational constructs provided by a procedural programming language with those provided by a database.

Dawid starts by creating a database file called "pupils.db". The file contains one table called "pupildata" which stores the pupil data shown.

PupilID	FirstName	LastName	DateOfBirth	RegClass
112211	Joan	Simpson	23/02/1999	6A
112212	John	Adam	12/04/1998	6B
112213	Alison	Brown	30/10/1998	6A
112214	Brian	Morgan	18/11/1998	6C
112215	Bilal	Ali	12/09/1998	6C
112216	Lian	Wong	27/05/1998	6A
112217	Charles	West	23/06/1998	6B
112218	Janet	Smith	18/02/1999	6B
112219	Raymond	Thomas	07/12/1998	6B
112220	Theresa	Cameron	29/01/1999	6A

Dawid writes a program to import the pupil data from the database file and store it in an array of records called "details". His program then applies a binary search to the array of records to display the details of the pupil with PupilID 112213.

4. (a) (continued)

(ii) Use pseudocode to refine the binary search used to display the details of the pupil with PupilID 112213.

```
! Array ( row, Column )

SET target to 112213
    SET Soun$ = "Fake"
    SET start = Array()/
    SET end = 10

DO
    SET middle = Int ((start + end)/2)
    IF array$(middle, 1) = str$(target)
        LET Soun$ = TRUE/
    IF array$(middle, 1) > str$(target)
        LET start = middle

    IF array$(middle, 1) < str$(target)
        Let end = middle

Loop Until Soun$ = "TRUE" or [ array all search ]
```

4.   (continued)

(b)   During testing of the program, Dawid changes the registration class of the pupil with PupilID 112213 from 6A to 6B.

Using pseudocode or a language you are familiar with, write the code needed to edit the required details in the external database file called "pupil.db".

OPEN "pupil.db"

Read in data from 'pupildata' table
Store data in Array (row, Column)

Use binary search to find item in
record where PupilID = 112213
            PupilID

Save rownumber where correct data is found

Update Array (found row number, 5) as '6B'
       to