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SUBJECT

Information Technology

DATE

November 2019

GRADE

11

MARKS

120

NAME

DURATION

3 hours + 30 mins printing

USER NAME

PASSWORD

	Maximum Mark	Actual Mark
SQL	40	
JAVA PROGRAMMING	80	
TOTAL	120	

SECTION A

The **ApolloDB** database stores records of the Apollo space missions in one table **tblMission**.
NB: Some of the data in the table is made up.

tblMission has the following fields:

MissionID	Number	The number of the mission
MissionName	Short Text	The name of the mission
MissionType	Short Text	A description of the type of mission
LunarLanding	Yes/No	Indicates if the mission had a successful lunar landing
Commander	Short Text	The astronaut who commanded the mission
LaunchDate	Date/Time	The date the mission launched
LaunchSite	Short Text	The site the mission launched from
EarthRevolutions	Number	Number of earth revolutions completed
LunarRevolutions	Number	Number of lunar revolutions completed
Distance	Number	Total distance in miles

A sample of the data is given below:

MissionID	MissionName	MissionType	LunarLanding	Commander	LaunchDate	LaunchSite	EarthRevolutions	LunarRevolutions	Distance
4	Apollo 7	Crewed Test Flight		Walter Schirra	1968/11/10	LC-34	163	0	4546918
5	Apollo 8	Crewed lunar orbiter		Frank Borman	1968/12/21	LC-39A	1.5	10	579606
6	Apollo 9	Lunar module Test flight		James McDivitt	1969/03/03	LC-39A	151	0	4214543
7	Apollo 10	Lunar module Test flight		Thomas Staffor	1969/05/18	LC-39B	1.5	31	829437
8	Apollo 11	Crewed lunar landing	✓	Neil Armstrong	1969/07/16	LC-39A	1.5	30	953054
9	Apollo 12	Crewed lunar landing	✓	Charles Conrad	1969/12/14	LC-39A	1.5	45	952354
10	Apollo 13	Crewed lunar landing		James Lovell	1970/11/04	LC-39A	1.5	0	622268
11	Apollo 14	Crewed lunar landing	✓	Alan Shepard	1971/01/31	LC-39A	1.5	34	1150321
12	Apollo 15	Crewed lunar landing	✓	David Scott	1971/07/26	LC-39A	1.5	74	1274137
13	Apollo 16	Crewed lunar landing	✓	Eugene Cernan	1972/04/16	LC-39A	1.5	64	1391550
14	Apollo 17	Crewed lunar landing	✓	Alan Shepard	1972/12/07	LC-39A	2	75	1484933
15	Apollo 18	Crewed lunar orbiter		Neal Burger	1970/06/12	LC-39B	3	81	980347
16	Apollo 19	Lunar module Test flight		Daanyaal Ballin	1969/03/03	LC-34	3	73	823482

QUESTION 1

40 MARKS

- 1.1 Display all the commanders with a mission type of 'Crewed lunar landing' sorted according to commander's first name. Do not show any duplicates. Your output should appear as follows:

Commander
Alan Shepard
Charles Conrad
David Scott
Eugene Cernan
Neal Burger
Neil Armstrong

(4)

- 1.2 Display the **MissionName** and **Distance** for the three missions that covered the most distance. Your output should appear as follows:

MissionName	Distance
Apollo 1	4546918
Apollo 3	4214543
Apollo 11	1484933

(4)

- 1.3 Count the number of missions that were launched from each launch site. Name the column to count the number of missions as **NumMission**, also display the name of the launch site. Your output should display the results in descending order of **NumMissions** as shown below:

LaunchSite	NumMissions
LC-39A	9
LC-39B	3
LC-34	2

(6)

- 1.4 Count the number of missions that occurred each year. Display the results as follows using the column headings **Year** and **NumMissions**.

YEAR	NumMissions
1968	2
1969	5
1970	2
1971	2
1972	3

(5)

- 1.5 Calculate the average total revolutions (lunar and earth) for all 'Crewed missions'. Round your answer to 2 decimal places. The result must be the overall average, rather than an average per mission. Your output should appear as follows.

TOTALRevolutions
81.50
5.75
15.75
23.25
0.75
17.75
37.75
32.75
38.50
42.00
32.00

(5)

- 1.6 Create a code for each commander made up of the first 3 letters of their first name and a random number between 500 and 600. List the commander name and the code. Your output should appear as follows (notice that some commanders appear more than once with different codes – this is fine).

Commander	Code
Walter Schirra	Wal595
Frank Borman	Fra511
James McDivitt	Jam572
Thomas Stafford	Tho523
Neil Armstrong	Nei502
Charles Conrad	Cha544
James Lovell	Jam512
Alan Shepard	Ala528
David Scott	Dav503
Eugene Cernan	Eug534
Alan Shepard	Ala558
Neal Burger	Nea590
Daanyaal Ballim	Daa574
Neal Burger	Nea600

(6)

- 1.7 The mission name for Apollo 11 has been incorrectly recorded. Update 'Apolo 11' to 'Apollo 11'.

(3)

- 1.8 Calculate the total distance travelled by each commander. List the commander name and total distance. Only show the commanders who covered more than 1000000kms (one million). Your output should appear as follows:

Commander	TotalDist
Alan Shepard	2635254
David Scott	1274137
Eugene Cernan	1391550
James McDivitt	4214543
Neal Burger	2214903
Walter Schirra	4546918

(7)

SECTION B

80 MARKS

50 Years Ago: Apollo Astronauts Land, Take First Steps on Moon

NASA are celebrating the 50 years anniversary of the first Lunar Walk. You will be reorganising the astronaut's data into the Apollo missions.

You have been given a text file **Astronauts.txt**. The file lists the information relative to each astronaut. The field separator is a comma ",". There are 4 fields which are detailed below

- Mission number – this is the number of the Apollo mission
- Dates of the mission
- Lunar Mission (whether the mission went to the moon or not)
- Astronaut's full name

Sample of Astronauts.txt

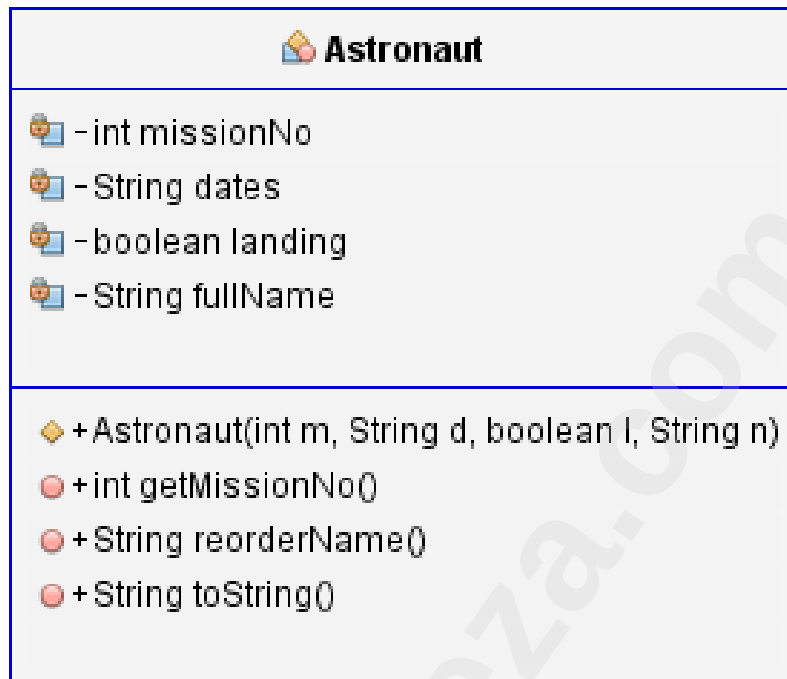
```
12,Nov 14-24:1969,TRUE,Alan Bean
14,Jan 31-Feb 9:1971,TRUE,Alan Shepard
15,Jul 26-Aug 7:1971,TRUE,Alfred Worden
11,Jul 16-24:1969,TRUE,Buzz Aldrin
12,Nov 14-24:1969,TRUE,Pete Conrad
16,Apr 16-27:1972,TRUE,Charles Duke
9,Mar 3-13:1969,FALSE,David Scott
15,Jul 26-Aug 7:1971,TRUE,David Scott
7,Oct 11-22:1968,FALSE,Donn Eisele
14,Jan 31-Feb 9:1971,TRUE,Edgar Mitchell
10,May 18-26:1969,FALSE,Eugene Cernan
17,Dec 7-19:1972,TRUE,Eugene Cernan
8,Dec 21-27:1968,FALSE,Frank Borman
13,Apr 11-17:1970,TRUE,Fred Haise
17,Dec 7-19:1972,TRUE,Harrison Schmitt
```

Some astronauts have taken part in more than one mission and are listed more than once in the text file. For example, Eugene Cernan was on Apollo 17 and Apollo 10.

The dates of the mission consists of the start date separated by the end date by a hyphen "-", followed by a colon ":" and the year.

QUESTION 2

15 MARKS



- 2.1 Create a new class named **Astronaut** with fields to store the **missionNo**, **dates**, **landing** and the **fullName** of the astronaut. (3)
- 2.2 Code a parameterised constructor that will assign values to each of the fields. (2)
- 2.3 Code an accessor method for the **missionNo** field. (1)
- 2.4 Code a typed method called **reorderName** to change the name to list the surname first.
For example, Alan Bean will become Bean, Alan. (5)
- 2.5 Code a **toString** method that will return the fields combined as a string separated by tabs in the format shown in the example. The **missionNo** must have the word "Apollo" before it. If the mission involved a lunar landing then the string must be prefixed with "Lunar Mission". Use the **reorderName** method to change the format of the astronaut's name. Use tabs to separate your fields. (4)

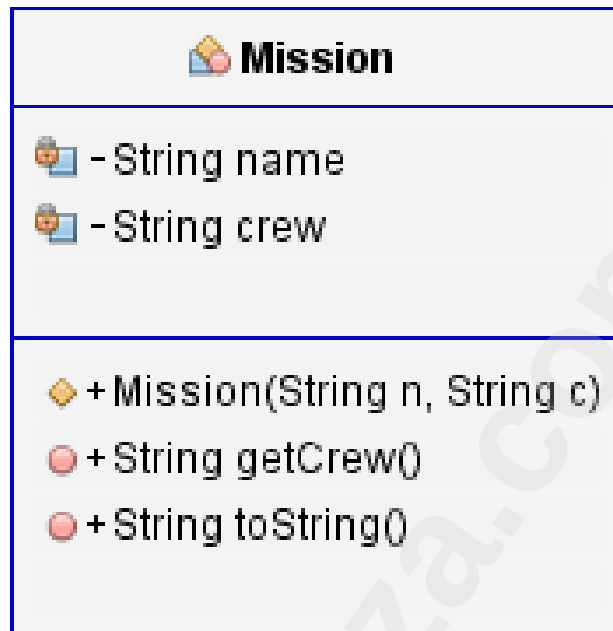
For example:

```

Lunar Mission Apollo 11      Jul 16-24:1969      Aldrin, Buzz
Apollo 8      Dec 21-27:1968      Anders, William
  
```

QUESTION 3

8 MARKS



- 3.1 Create a new class named **Mission** with fields to store the **name** of the mission and the **crew** on the mission. (2)
- 3.2 Code a parameterised constructor that will assign values to the **name** of the mission and the **crew** fields. (2)
- 3.3 Code an accessor method for the **crew** field. (1)
- 3.4 Code a **toString** method that will return the mission followed by the crew on one line in the format:

```
Mission:" <space> mission <tab> "Crew:" <space> crew
```

For example:

```
Mission: Apollo 13    Crew: Haise, Fred; Lovell, James; Swigert, Jack;
```

(3)

QUESTION 4

14 MARKS

 MissionArray
 - Mission[] mArr  - int mSize
 + MissionArray()  + void addMission(String n, String c)  + int countMissions(String n)  + String toString()

- 4.1 Create a class called **MissionArray**. (1)
- 4.2 Create an array **mArr** to store 20 **Mission** objects. Include a field **mSize** to record the number of elements in the array. (3)
- 4.3 Code an empty constructor method. (1)
- 4.4 Code a method to add a Mission object to the array and increase the number of elements in the array. (4)
- 4.5 Code a **toString** method to build up a string with each mission in the format of the **toString** of the Mission class. Each Mission must appear on a new line. (5)

Sample Output:

```

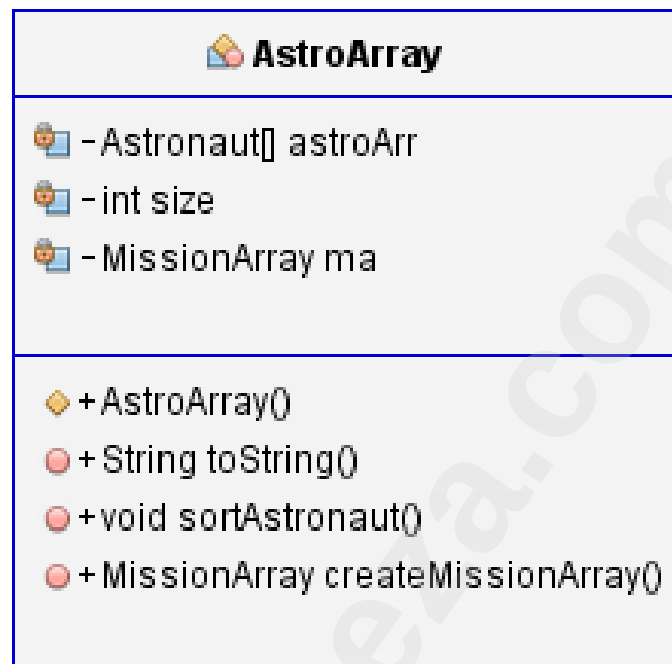
Mission: Apollo 7      crew: Cunningham, Walt; Eisele, Donn; Schirra, Wally;
Mission: Apollo 8      crew: Anders, William; Borman, Frank; Lovell, James;
Mission: Apollo 9      crew: McDivitt, James; Schweickart, Russell; Scott, David;
Mission: Apollo 10     crew: Cernan, Eugene; Stafford, Thomas; Young, John;
Mission: Apollo 11     crew: Aldrin, Buzz; Armstrong, Neil; Collins, Michael;
Mission: Apollo 12     crew: Bean, Alan; Conrad, Pete; Gordon, Richard;

```

The **countMissions** method will be coded in Question 8.

QUESTION 5

20 MARKS



- 5.1 Create a class called **AstroArray**. (1)
- 5.2 Create an array **astroArr** to store 50 **Astronaut** objects. Include a field **size** to record the number of elements in the array. Include a **MissionArray** object. (3)
- 5.3 Code a constructor to instantiate the array of **Astronaut** objects using the text file
The method must:
- Open the file and cater for any exceptions.
 - Read in each line of the file
 - Separate the line into the mission number, dates, lunar landing and full name.
 - Add the astronaut object to the **Astronaut** array called **astrArr**.
 - Increment size (7)
- 5.4 Code a **toString** method to build up a string with each astronaut in the format of the **toString** of the **Astronaut** class. Each **Astronaut** must appear on a new line. (3)
- 5.5 Code a **sortAstronaut** method to sort the array of astronauts called **astrArray** according to the surname of the astronaut. Use the method **reorderName** from the **Astronaut** class (Question 2.4) to help you. (6)

The **createMissionArray** method will be coded in Question 7.

QUESTION 6**4 MARKS**

- 6.1 Create a class called **AstroUI**. This class must have a main method. (1)
- 6.2 Add code to instantiate an **AstroArray** object called **aArr**. (1)
- 6.3 Add code to sort the astronauts according to surname and then display the astronauts. (2)

Sample output of the first few lines

```
Astronauts sorted by surname
Lunar Mission Apollo 11      Jul 16-24:1969  Aldrin, Buzz
Apollo 8                     Dec 21-27:1968  Anders, William
Lunar Mission Apollo 11      Jul 16-24:1969  Armstrong, Neil
Lunar Mission Apollo 12      Nov 14-24:1969  Bean, Alan
Apollo 8                     Dec 21-27:1968  Borman, Frank
Lunar Mission Apollo 17      Dec 7-19:1972   Cernan, Eugene
Apollo 10                    May 18-26:1969  Cernan, Eugene
Lunar Mission Apollo 11      Jul 16-24:1969  Collins, Michael
Lunar Mission Apollo 12      Nov 14-24:1969  Conrad, Pete
Apollo 7                     Oct 11-22:1968  Cunningham, Walt
```

QUESTION 7**11 MARKS**

The astronauts need to be rearranged into missions. Some astronauts have been in more than one Apollo mission.

- 7.1 Return to the **AstroArray** class. Code a method called **createMissionArray** to return a **MissionArray** object. (8)
- The purpose of this method is to instantiate a Mission object using the name of the mission and the crew. The crew will be a list of all astronauts that were on that particular mission.
- 7.2 Add code to the **AstroUI** class to call the **createMissionArray** method and display the output. (3)

Your output should be as follows (although it may be in a different order):

```
Mission: Apollo 7      Crew: Cunningham, Walt; Eisele, Donn; Schirra, Wally;
Mission: Apollo 8      Crew: Anders, William; Borman, Frank; Lovell, James;
Mission: Apollo 9      Crew: McDivitt, James; Schweickart, Russell; Scott, David;
Mission: Apollo 10     Crew: Cernan, Eugene; Stafford, Thomas; Young, John;
Mission: Apollo 11     Crew: Aldrin, Buzz; Armstrong, Neil; Collins, Michael;
Mission: Apollo 12     Crew: Bean, Alan; Conrad, Pete; Gordon, Richard;
Mission: Apollo 13     Crew: Haise, Fred; Lovell, James; Swigert, Jack;
Mission: Apollo 14     Crew: Mitchell, Edgar; Roosa, Stuart; Shepard, Alan;
Mission: Apollo 15     Crew: Irwin, James; Scott, David; Worden, Alfred;
Mission: Apollo 16     Crew: Duke, Charles; Kenneth, T.; Young, John;
Mission: Apollo 17     Crew: Cernan, Eugene; Evans, Ronald; Schmitt, Harrison;
```

QUESTION 8**8 MARKS**

We need to be able to count the number of missions that an astronaut has been part of given the name of the astronaut.

- 8.1 In the **MissionArray** class, code a typed method called **countMissions** to count the number of missions in which an astronaut is listed as the crew. The name of the astronaut will be sent as a parameter in the format surname, first name (e.g. Cernan, Eugene). (6)
- 8.2 Add code to the **AstroUI** class to count the number of missions for Eugene Cernan call the **countMissions** method using "Cernan, Eugene" as a parameter and display the result in the format shown in the example below:

The number of missions for Cernan, Eugene : 2 (2)