

UNIVERSITI MALAYA
UNIVERSITI MALAYA

PEPERIKSAAN IJAZAH SARJANA MUDA SAINS KOMPUTER
EXAMINATION FOR THE DEGREE OF BACHELOR OF COMPUTER SCIENCE

SESI AKADEMIK 2023/2024 : SEMESTER 1
ACADEMIC SESSION 2023/2024 : SEMESTER 1

WIX1002 : Asas-Asas Pengaturcaraan
Fundamentals of Programming

Jan 2024
Jan 2024

Masa: 3.5 jam
Time: 3.5 hours

ARAHAN KEPADA CALON:
INSTRUCTIONS TO CANDIDATES:

Calon dikehendaki menjawab semua soalan.
Candidates should answer all questions.

(Kertas soalan ini mengandungi 5 soalan dalam 10 halaman yang dicetak)
(This question paper consists of 5 questions on 10 printed pages)

1.

- a) Tulis program yang menerima nombor sebagai input pengguna sehingga mereka menekan X untuk berhenti. Sebagai output, ia harus memaparkan kiraan positif, negatif dan sifar yang dimasukkan.

Write a program that accept numbers as user input until they press X to quit. As the output, it should display the count of positive, negative and zeros entered

(7markah/marks)

- b) Tulis program untuk mengira jumlah siri berikut di mana n adalah input oleh pengguna.

$$1 + 1/2 + 1/3 + 1/4 + 1/5 + \dots + 1/n$$

Write a program to calculate the sum of the following series where n is input by the user.

$$1 + 1/2 + 1/3 + 1/4 + 1/5 + \dots + 1/n$$

(3markah/marks)

2.

- a) Tulis program Java yang mentakrifkan Buku kelas. Kelas Buku harus mempunyai tiga atribut peribadi: tajuk (String), pengarang (String), dan yearPublished (int). Sertakan pembina untuk memulakan atribut ini dan kaedah getter yang sepadan untuk setiap satu. Dalam kaedah utama anda, buat contoh Buku dan paparkan butirannya.

Write a Java program that defines a class Book. The Book class should have three private attributes: title (String), author (String), and yearPublished (int). Include a constructor to initialize these attributes and corresponding getter methods for each. In your main method, create an instance of Book and display its details.

(3markah/marks)

- b) Cipta program Java yang menggunakan *custom exception*. Tulis kelas InvalidAgeException yang memanjangkan Exception. Kemudian, buat kaedah checkAge(int age) yang membuang InvalidAgeException jika umur kurang daripada 18 tahun. Dalam kaedah utama anda, panggil checkAge dengan umur yang disediakan pengguna dan gunakan blok try-catch untuk mengendalikan pengecualian tersuai.

Create a Java program that uses custom exceptions. Write a class InvalidAgeException that extends Exception. Then, create a method checkAge(int age) that throws an InvalidAgeException if the age is less than 18. In your main method, call checkAge with a user-provided age and use a try-catch block to handle the custom exception.

(3markah/marks)

- c) Buat program Java yang menunjukkan polimorfisme menggunakan antara muka. Tentukan antara muka Boleh dimainkan dengan kaedah main(). Buat dua kelas Gitar dan Piano yang melaksanakan antara muka ini. Dalam kaedah utama anda, buat tatasusunan objek Boleh Main dan mulakan dengan tikas

Gitar dan Piano. Lelaran melalui tatasusunan dan gunakan kaedah play() pada setiap objek.

Create a Java program demonstrating polymorphism using an interface. Define an interface Playable with a method play(). Create two classes Guitar and Piano that implement this interface. In your main method, create an array of Playable objects and initialize it with Guitar and Piano instances. Iterate through the array and invoke the play() method on each object.

(4markah/marks)

3. Dalam beberapa tahun kebelakangan ini, banyak organisasi antarabangsa menyokong dan mempromosikan prinsip sains terbuka. Sains terbuka menekankan untuk menjadikan penyelidikan saintifik boleh diakses oleh semua peringkat masyarakat umum. Sains Terbuka bukan sahaja mendemokrasikan pengetahuan saintifik penyelidikan, ia juga menggalakkan penyelidikan intensif data, memastikan integriti penyelidikan yang tinggi, dan menggalakkan inovasi terbuka dan sains warganegara.

Di bawah inisiatif Sains Terbuka UM (UMOS), Pusat Pengkomputeran Intensif Data (DICC) UM telah menubuhkan Repositori Data Penyelidikan Universiti Malaya (UM) untuk penyelidik UM menyimpan dan menerbitkan set data mereka berkenaan penyelidikan mereka. Matlamat inisiatif ini adalah untuk menjadikan data penyelidikan UM sebagai aset negara yang berharga dengan membangunkan platform yang dipercayai yang membolehkan kebolehcapaian dan perkongsian data penyelidikan yang sejajar dengan keutamaan negara dan amalan terbaik antarabangsa.

Untuk meningkatkan kebolehurusan dan kecekapan carian, setiap set data diterangkan dengan metadata. Repositori Data Penyelidikan UM kemudian mengisi metadata melalui Internet dengan Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). Ia kemudiannya boleh dituai oleh Platform Sains Terbuka Malaysia (MOSP) untuk menubuhkan gerbang pengetahuan negara.

Sebagai analisis rutin dan pengemasan, penjaga data DICC telah mengeksport metadata ke dalam fail nilai dipisahkan koma (.csv). Walau bagaimanapun, penjaga telah membuat kesilapan yang mengakibatkan kerosakan dan pertindihan metadata. Sekarang kami memerlukan bantuan anda untuk menyelesaikan masalah ini.

Under the UM Open Science initiative (UMOS), the UM Data Intensive Computing Centre (DICC) has established the Universiti Malaya (UM) Research Data Repository for UM's researchers to store and publish their dataset(s) regarding their research(s). The aim of this initiative is to make UM's research data a valuable national asset by developing a trusted platform that enables accessibility and sharing of research data aligned to national priorities and international best practices.

To increase the manageability and search efficiency, each dataset is described with metadata. UM Research Data Repository then populates the metadata over the Internet with Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH). It can then be

harvested by the Malaysia Open Science Platform (MOSP) to set up the national knowledge gateway.

As a routine analysis and housekeeping, the data custodian of DICC has exported the metadata into a comma-separated value (.csv) file. However, the custodian has made a mistake which results in metadata corruption and duplication. Now we need your help to fix this problem.

Anda perlu menulis satu program Java, Report.java untuk
You have to create a Java program, **Report.java** to

- a) muatkan setiap rekod metadata daripada oaiset.csv ke dalam objek OAIRecord,

*load each of the metadata records from the **oaiset.csv** into an **OAIRecord** object,*

Each record will have 13 attributes, i.e. doi, title, subject, author1, author2, author3, author4, author5, author6, author7, author8, keyword, and status.

(4 markah/marks)

- b) menyusun metadata dengan mengalih keluar masukan metadata yang mengandungi "deleted" dalam lajur status, dan

*curate the metadata by removing the metadata entries which contain "**deleted**" in **status** column, and*

(3 markah/marks)

- c) cipta laporan ringkasan bilangan penerbitan untuk setiap penyelidik dan cetak laporan dalam format berikut, diisih mengikut nama pengarang.

create a summary report of the number of publications for each of the researchers and print the report in the following format, sorted by author name.

Record # DOI "Title" Subject {Author1, Author2,...} Keyword Status

(3 markah/marks)

Contoh Output Sample Output

```

Loading Dataset...
The curated record is as follow:
Record 1 doi:10.22452/RD/1UVCJM "Audio recording for: Documentation of Malaccan Portuguese Creole" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics
Record 2 doi:10.22452/RD/2DCTX5 "Image for: Documentation of Malaccan Portuguese Creole" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics
Record 3 doi:10.22452/RD/2LL07U "Related data for: Validation and reliability of the translated Malay version of the psychosocial impact of dental aesthetics questionnaire" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics
Record 4 doi:10.22452/RD/37JYAM "Transcript for: Documentation of Malaccan Portuguese Creole" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics
Record 5 doi:10.22452/RD/3VEUHU "Coding data for: Knowledge representation using Ontology-Based Social Semantic for Malay Manuscript Digital Library Collection" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics
Record 6 doi:10.22452/RD/8FI6U9 "Related data for: Malaysia Ageing and Retirement Survey (MARS) Wave 1-2018/2019" Social Sciences {Social Wellbeing Research Centre (SWRC)}
Record 7 doi:10.22452/RD/98NEAH "Related data for: The formation and characterization of methyl gallate-oleic acid (OMG) liposomes" Chemistry {Tan Hsiao Wei, Nur Farha}
Record 8 doi:10.22452/RD/9MSEBI "Related data for: Scientific Performance of ASEAN Countries in Health and Medicine: Bibliometric Citation and Collaboration" Medicine and Health Sciences {Chan Chee Seng}
Record 9 doi:10.22452/RD/AOWPZC "Related data for: The Sella Turcica Dimensions in 12-Year-Old Southern Chinese: A Cross-Sectional Study" Medicine and Health Sciences {Chan Chee Seng}
Record 10 doi:10.22452/RD/DLBPN1 "Annotated file for: Documentation of Malaccan Portuguese Creole" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics
Record 11 doi:10.22452/RD/ED1RET "Replication Data for: MalayaKew (MK) Leaf dataset" Computer and Information Science {Chan Chee Seng} Earth and Environmental Sciences
Record 12 doi:10.22452/RD/GBFLOW "Related Data for: Exploring the potential of Fe(III)-EGTA and Fe(III)-OTPA as the catalysts to enhance UV/Persulfate in the degradation of a"
Record 13 doi:10.22452/RD/GLHS55 "Related data for: Validity and reproducibility of the 3D VECTRA photogrammetric surface imaging system for the maxillofacial anthropometric"
Record 14 doi:10.22452/RD/GR3FWF "Related data for: Study of the formation and physicochemical properties of chitosan-coated oleic acid liposomes as a potential mucoadhesive"
Record 15 doi:10.22452/RD/HQWCXC "Related data for: Determining the volatiles produced by pathogenic bacteria in raw chicken" Medicine and Health Sciences {Chai Lay Ching}
Record 16 doi:10.22452/RD/JUSQEK "Replication Data for: Exclusively Dark (ExDark) Image Dataset" Computer and Information Science {Chan Chee Seng} low-light imagery
Record 17 doi:10.22452/RD/OQSKDS "Related data for: Pilot scale development of an up-flow anaerobic sludge blanket fixed-film reactor for hydrogen production from palm oil mill"
Record 18 doi:10.22452/RD/OR5SLZ "Related data for: Carbon abatement module for UM eco-campus: addressing urban heat island and climate change impact" Earth and Environmental Sciences
Record 19 doi:10.22452/RD/POABNZ "Replication Data for: Total-Text: Towards Orientation Robustness in Scene Text Detection" Computer and Information Science {Chan Chee Seng}
Record 20 doi:10.22452/RD/PKU6PR "Related data for: Incorporation of green capping agents to reduce silver-mediated dentine staining" Medicine and Health Sciences {Bhat}
Record 21 doi:10.22452/RD/QWNY9V "Related data for: Braille Collection Development Policy: A Case Study of the Malaysian Association of Blinds (MAB) Library." Social Sciences {Chan Chee Seng}
Record 22 doi:10.22452/RD/QZKXPI "Related data for: Study of the formation and physicochemical properties of chitosan-coated oleic acid liposomes as a potential mucoadhesive"
Record 23 doi:10.22452/RD/S4IQLJ "Related data for: Validation and reliability of the Malaysian English version of the psychosocial impact of dental aesthetics questionnaire"
Record 24 doi:10.22452/RD/SJRBER "Related data for: Can personality traits influence the assessment of psychosocial impacts of dental aesthetics among adolescents with self-reported"
Record 25 doi:10.22452/RD/VFGWZ3 "Related data for: Comparing Retainers Constructed on Conventional Stone Models and on 3D Printed Models: A Randomized Crossover Clinical Study"
Record 26 doi:10.22452/RD/WFR1UM "Related data for: Comparing the clinical acceptability of innovatively made Transpalatal Arch (TPA) from 3D reconstructed model and conventional"
Record 27 doi:10.22452/RD/Z4TUCF "The Effects of Music Listening and Progressive Muscle Relaxation (PMR) on the stress levels of novice music teachers during Covid-19 movement"
Record 28 doi:10.22452/RD/Z6M4J3 "Video recording for: Documentation of Malaccan Portuguese Creole" Social Sciences {Pillai Stefanie Shamila} Corpus Linguistics

The summary report is as follow:
Abd Rahim Masruddin: 1
Abdullah Noorhidawati: 1
Ahmad Danial Azzahari: 1
Akhbari Azam: 1
Azanee-Nur Mohd Arif Fadillah: 1
Bhatti Mehmood Asghar: 1
Chai Lay Ching: 1
Chan Chee Seng: 3
Hasanuzzaman Md.: 1
Hussein Hazreena: 1
Ibrahim Shaliza: 1
Lee Yean Kee: 1

```

Untuk memudahkan kerja anda:

To ease your work:

- Bilangan maksimum rekod ialah 50.
The maximum number of records is 50.
- Bilangan maksimum pengarang ialah 8 orang.
The maximum number of authors is 8.
- Semua entri tidak termasuk koma.
All of the entries do not include comma.
- Kaedah utama kelas Laporan diberikan di bawah.
*The main method of the **Report** class is given below.*

Kaedah utama untuk kelas Laporan

*Main method for the **Report** class*

```

public class Report {
    public static void main(String args[]){
        String inputFile = "oaiset.csv";
        OAIRecord[] data = new OAIRecord[50];
        System.out.println("Loading Dataset...");
        loadRecord(inputFile, data);
        System.out.println("The curated record is as follow:");
        printRecord(cleanRecord(data));
        System.out.println("\nThe summary report is as follow:");
        reportData(cleanRecord(data));
    }
}

```

4. Analisa Pelan Duduk Kelas Dinamik *Dynamic Classroom Seating Plan Analyzer*

Objektif: Mencipta dan menganalisa pelan duduk kelas yang dijana secara dinamik menggunakan array dua dimensi, struktur kawalan, dan kaedah statik.

Objective: Create and analyze a dynamically generated classroom seating plan using a two-dimensional array, control statements, and static methods.

Tugasan/Task

a) Pengawalan Pelan Duduk Dinamik *Dynamic Seating Plan Initialization*

Tulis satu kaedah statik, **initializeSeatingPlan**, yang menggunakan kelas **Random** untuk menjana array dua dimensi yang mewakili pelan duduk kelas. Kerusi perlu ditandakan secara rawak sebagai berpenghuni (1) atau kosong (0).

*Write a static method, **initializeSeatingPlan**, which uses the **Random** class to generate a two-dimensional array representing the classroom seating plan. Seats should be randomly marked as occupied (1) or vacant (0).*

[2 markah/marks]

b) Analisis Pelan Duduk *Seating Plan Analysis*

Cipta satu kaedah statik, **analyzeSeating**, yang mengambil array **seatingPlan** sebagai parameter. Kaedah ini perlu mengira jumlah kerusi yang berpenghuni dan mengenal pasti baris dengan jumlah kerusi berpenghuni yang paling banyak.

*Create a static method, **analyzeSeating**, which takes the **seatingPlan** array as a parameter. The method should calculate the total number of occupied seats and identify the row with the maximum number of occupied seats.*

[3 markah/marks]

c) Pelaksanaan Struktur Kawalan *Implementing Control Structures*

Gunakan gelung bersarang dalam **analyzeSeating** untuk mengiterasi pelan duduk. Gunakan pernyataan bersyarat untuk melakukan pengiraan yang perlu.

*Use nested loops within **analyzeSeating** to iterate through the seating plan. Apply conditional statements to perform the necessary calculations.*

[2 markah/marks]

d) Kaedah Utama *Main Method*

Dalam kaedah utama, panggil **initializeSeatingPlan** untuk mencipta pelan duduk secara rawak. Kemudian, gunakan **analyzeSeating** untuk menganalisa

pelan ini. Cetak jumlah kerusi yang berpenghuni dan baris dengan kerusi berpenghuni paling banyak.

*In the main method, call **initializeSeatingPlan** to create a random seating plan. Then, use **analyzeSeating** to analyze this seating plan. Print the total number of occupied seats and the row with the most occupied seats.*

[2 markah/marks]

- e) Keterbacaan Kod
Code Readability

Pastikan kod mudah dibaca dengan komen yang menjelaskan setiap bahagian. Patuhi amalan pemformatan dan pengkodan yang baik untuk kejelasan.

Ensure the code is well-documented with comments explaining each part. Adhere to good formatting and coding practices for clarity.

[1 markah/mark]

- f) Output yang dijangkakan
Expected Output

Cetakan pelan duduk yang dijana secara dinamik dan jumlah kerusi yang berpenghuni serta bersama dengan baris dengan kerusi berpenghuni paling banyak.

A printout of the dynamically generated seating plan and total number of occupied seats together with the row with the most occupied seats.

Contoh Output
Example Output:

Total Occupied Seats: 15
Row with Most Occupied Seats: Row 3
Seating Plan:
1 0 1 0 1
0 1 1 1 0
1 1 0 1 1
1 0 0 1 0
0 1 0 0 1

Total Occupied Seats: 16
Row with Most Occupied Seats: Row 1
Seating Plan:
1 0 1 1 1
1 0 0 1 1
0 1 1 1 0
1 0 0 0 1
1 1 0 1 1

5. Mahjong ialah permainan strategi abstrak 4 pemain, yang tersilap dianggap sebagai perjudian oleh sesetengah orang. Seperti kata presiden *International*

Mahjong Association (IMA), “Mahjong tidak berbeza dengan sukan lain seperti bola sepak dan e-sport. Perjudian bukanlah sifat mereka, dan kemahiran adalah yang paling penting dalam permainan ini.” Untuk membersihkan nama mahjong, IMA telah memutuskan untuk menganjurkan pertandingan mahjong.

Mahjong is a 4-player abstract strategy game, which is mistakenly considered as gambling by some people. As the president of the International Mahjong Association (IMA) says, “Mahjong is no different from other sports like football and e-sports. Gambling is not the nature of them, and skills are the most important ones in these games.” In order to clear the name of mahjong, the IMA has decided to host a mahjong competition.



Pertandingan ini mengikut semua peraturan standard yang digunakan untuk pertandingan lain yang serupa kecuali satu: IMA menghendaki empat peserta dalam permainan berada dalam bentuk dua pasangan. Tambahan pula, peserta dalam pasangan tidak boleh duduk bersebelahan semasa permainan, mereka mesti bersemuka. Untuk mengenal pasti sama ada dua peserta berada dalam pasangan, IMA mengambil pendekatan yang sangat mudah - rujuk kepada alamat dan jantina mereka. Jika mereka mempunyai alamat yang sama tetapi berbeza dalam jantina, mereka membentuk pasangan, jika tidak, mereka tidak.

IMA memerlukan kepakaran anda dalam pengaturcaraan untuk membantu mereka mengesahkan kelayakan peserta dan menjana fail kumpulan untuk setiap kumpulan yang sah. Tetapi sebelum anda mula, anda perlu memahami apa yang IMA akan berikan kepada anda. Untuk setiap kumpulan 4 peserta, program komputer IMF menjana fail teks bernama “*participants.txt*” (contoh diberikan dalam folder). Panjang fail teks ini adalah tepat empat baris, di mana setiap baris merekodkan maklumat seorang peserta. Untuk setiap baris dalam fail ini, anda boleh mencari nama, jantina, umur dan alamat peserta yang dipisahkan dengan tepat 3 koma. Angka yang diberikan di bawah adalah contoh kandungan fail:

The competition follows all the standard rules that apply to other similar competitions except one: IMA requires that the four participants in a game are in two pairs form. Furthermore, the participants in a pair cannot sit next to each other during the game, they must be face to face instead. To identify whether two participants are in a pair, IMA takes a very simple approach - refer to their addresses and genders. If they have the same address but different in gender, they form a pair, otherwise, they are not.

IMA requires your expertise in programming to help them to confirm the eligibility of participants, and generate a grouping file for each valid group. But before you start, you need to understand what IMA will provide you. For every group of 4 participants, IMF's computer program generates a text file named "participants.txt" (an example is given in the folder). The length of this text file is exactly four lines, where each line records the information of one participant. For every line in this file, you can find the name, gender, age and address of a participant separated by exactly 3 commas. The figure given below is an example of the file content:

```
James Bond,F,43,No.67 Jalan BP10/12 Kelang
Madeleine,M,36, No . 67Jalan BP 10 / 12 KELANG
Evelyn Wang,F,57,12 Jalan PM10 Bandar Baru Sepang
WaymondWang,M,49,12 jalan pm 10 bandarbarusepang
```

Tugas anda ialah menulis program "CheckPairing.java" yang membaca dan memeriksa fail ini, diikuti dengan menghasilkan output yang diperlukan yang menjadikan pendaftaran peserta selesai. Tugas-tugas tersebut adalah seperti berikut:

Your task is to write a program "CheckPairing.java" that reads and examines this file, followed by producing the required outputs that make the registration of participants complete. The tasks are as follows:

- a) Baca fail teks "participants.txt" dan simpan maklumatnya ke dalam tatasusunan rentetan dua dimensi 4x4. Cetak tatasusunan seperti berikut. Cetak "File not found" jika ia tidak dapat membaca fail.

Read the text file "participants.txt" and store its information in a 4x4 two-dimensional string array. Print out the array like the following. Print "File not found" if it is not able to read the file.

```
James Bond F 43 No.67 Jalan BP10/12 Kelang
Madeleine M 36 No . 67Jalan BP 10 / 12 KELANG
Evelyn Wang F 57 12 Jalan PM10 Bandar Baru Sepang
WaymondWang M 49 12 jalan pm 10 bandarbarusepang
```

(3 markah/marks)

- b) Tugas seterusnya ialah membandingkan alamat dan mengesahkan sama ada kumpulan peserta membentuk dua pasangan. Sebelum anda mula membandingkan alamat sebagai rentetan, anda sepatutnya menyedari bahawa disebabkan oleh tabiat semasa menaip, beberapa rentetan alamat datang dengan huruf besar dan ruang yang tidak konsisten. Tetapi ini tidak sepatutnya menjadi isu kepada anda kerana ia hanya berbeza dari segi pemformatan, bukan alamatnya. Setelah anda melengkapkan penukaran ini, mulakan membandingkan rentetan alamat untuk mengetahui sama ada peserta berada dalam dua pasangan. Jika peserta membentuk dua pasangan, cetak "Participants are in pairs", cetak "Participants are not in pairs, cannot proceed" jika tidak.

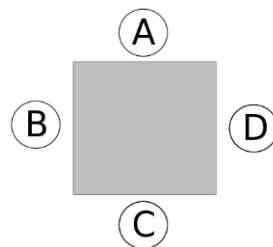
The next task is to compare addresses and verify if the group of participants forming two pairs. Before you start comparing the addresses as strings, you should have

noticed that due to habits during typing, some of the address strings come with inconsistent capital letters and spaces. But this should not be an issue to you since it is just different in terms of formatting, not the addresses. Once you have completed this conversion, start comparing the address strings in order to find out whether the participants are in two pairs. If the participants form two pairs, print "Participants are in pairs", print "Participants are not in pairs, cannot proceed" otherwise.

(4 markah/marks)

- c) Untuk kes dua pasangan, berikan tempat duduk kepada setiap peserta dan simpan maklumat itu ke dalam fail. Dalam permainan mahjong standard, 4 pemain, A, B, C dan D duduk mengelilingi meja persegi seperti berikut:

For the case of two pairs, assign a seat to each participant and save the information to a file. In a standard mahjong game, 4 players, A, B, C and D sit around a square table as follows:



Untuk permainan mahjong berpasangan ini, IMO memerlukan peserta yang membentuk pasangan duduk berhadapan antara satu sama lain, contohnya A dan C, atau B dan D. Susun peserta mengikut keperluan ini dan simpan maklumat ke fail teks bernama "*grouping.txt*". Fail hendaklah merekodkan tempat duduk, nama dan umur setiap peserta seperti berikut:

For this pairing mahjong game, IMO requires participants who formed a pair sit facing each other, for example, A and C, or B and D. Arrange the participants following this requirement and save the information to a text file named "grouping.txt". The file should record the seat, name and age of each participant as follows:

```

Seat A : James Bond, 43 years old
Seat B : Evelyn Wang, 57 years old
Seat C : Madeleine, 36 years old
Seat D : Waymond Wang, 49 years old
  
```

(3 markah/marks)

TAMAT / END