

7 Bobby and Kim are discussing databases.

(a) Bobby tells Kim that a file-based approach is usually better than a relational database.

Explain why Bobby is incorrect.

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..... [3]

(b) Bobby has a shop that sells products to customers. His database will store data about his customers, their payment details, orders and the products he sells. Customers will have login details to access their accounts. The database will update customers’ payment and login details without keeping any historical records.

(i) Give **one** example of each of the following relationships from Bobby’s database.

one-to-one

.....

.....

one-to-many

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many-to-many

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..... [3]

(ii) Tick (✓) **one** box to identify the relationship that cannot be directly implemented in a normalised relational database.

Relationship	Tick (✓)
one-to-one	
one-to-many	
many-to-many	

(iii) Bobby wants to name his database `SHOPORDERS`.

Write a Data Definition Language (DDL) statement to define a new database with the name `SHOPORDERS`.

.....

..... [1]

(c) A database has a data dictionary.

Give **three** items that are stored in a data dictionary.

1

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3 [3]

2. Question part 1/2 | 9618 May-June 2021 P1 V2 Q1

- 1 Raj owns houses that other people rent from him. He has a database that stores details about the people who rent houses, and the houses they rent. The database, HOUSE_RENTALS, has the following structure:

```
CUSTOMER(CustomerID, FirstName, LastName, DateOfBirth, Email)
HOUSE(HouseID, HouseNumber, Road, Town, Bedrooms, Bathrooms)
RENTAL(RentalID, CustomerID, HouseID, MonthlyCost, DepositPaid)
```

- (a) Give the definition of the following database terms, using an example from the database HOUSE_RENTALS for each definition.

Term	Definition and example
Field	
Entity	
Foreign key	

[6]

- (b) Tick (✓) **one** box to identify whether the database HOUSE_RENTALS is in Third Normal Form (3NF) or not in 3NF.
Justify your choice using one or more examples from the database HOUSE_RENTALS.

In 3NF	
Not in 3NF	

Justification

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.....

..... [2]

(c) Example data from the table RENTAL are given:

RentalID	CustomerID	HouseID	MonthlyCost	DepositPaid
1	22	15B5L	1000.00	Yes
2	13	3F	687.00	No
3	1	12AB	550.00	Yes
4	3	37	444.50	Yes

(i) Complete the following Data Definition Language (DDL) statement to define the table RENTAL.

```
CREATE ..... (
    RentalID INTEGER NOT NULL,
    CustomerID INTEGER NOT NULL,
    HouseID ..... (5) NOT NULL,
    MonthlyCost ..... NOT NULL,
    DepositPaid BOOLEAN NOT NULL,
    ..... (RentalID)
);
```

[4]

(ii) Write a Data Manipulation Language (DML) script to return the first name and last name of all customers who have **not** paid their deposit.

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..... [4]

7 Bobby and Kim are discussing databases.

(a) Bobby tells Kim that a file-based approach is usually better than a relational database.

Explain why Bobby is incorrect.

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..... [3]

(b) Bobby has a shop that sells products to customers. His database will store data about his customers, their payment details, orders and the products he sells. Customers will have login details to access their accounts. The database will update customers' payment and login details without keeping any historical records.

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one-to-one

.....

.....

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.....

.....

many-to-many

.....

..... [3]

(ii) Tick (✓) **one** box to identify the relationship that cannot be directly implemented in a normalised relational database.

Relationship	Tick (✓)
one-to-one	
one-to-many	
many-to-many	

(iii) Bobby wants to name his database `SHOPORDERS`.

Write a Data Definition Language (DDL) statement to define a new database with the name `SHOPORDERS`.

.....
..... [1]

(c) A database has a data dictionary.

Give **three** items that are stored in a data dictionary.

1
2
3 [3]

4. Question part 1/3 | 9618 Oct-Nov 2021 P1 V1 Q5

- 5 Javier owns many shops that sell cars. He employs several managers who are each in charge of one or more shops. He uses the relational database `CARS` to store the data about his business.

Part of the database is shown:

`SHOP(ShopID, ManagerID, Address, Town, TelephoneNumber)`

`MANAGER(ManagerID, FirstName, LastName, DateOfBirth, Wage)`

`CAR(RegistrationNumber, Make, Model, NumberOfMiles, ShopID)`

- (a) Tick (✓) **one** box in each row to identify whether each field is a primary key or a foreign key.

Table	Field name	Primary key	Foreign key
MANAGER	ManagerID		
SHOP	ManagerID		
CAR	RegistrationNumber		
CAR	ShopID		

[2]

- (b) Describe the ways in which access rights can be used to protect the data in Javier’s database from unauthorised access.

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..... [3]

(c) Javier uses Data Definition Language (DDL) and Data Manipulation Language (DML) statements in his database.

(i) Complete the following DML statements to return the number of cars for sale in each shop.

```
SELECT COUNT (.....)

FROM .....

..... ShopID
```

[3]

(ii) Complete the DML statement to include the following car in the table CAR.

Field	Data
RegistrationNumber	123AA
Make	Tiger
Model	Lioness
NumberOfMiles	10500
ShopID	12BSTREET

```
..... CAR

..... ("123AA", "Tiger", "Lioness", 10500, "12BSTREET")
```

[2]

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Topical questions | 30 questions

5. Question part 1/2 | 9618 Oct-Nov 2021 P1 V2 Q6

- 6** A shop sells plants to customers. The shop manager has a relational database to keep track of the sales.

The database, PLANTSALLES, has the following structure:

PLANT(PlantName, QuantityInStock, Cost)

CUSTOMER(CustomerID, FirstName, LastName, Address, Email)

PURCHASE(PurchaseID, CustomerID)

PURCHASE_ITEM(PurchaseID, PlantName, Quantity)

(a) The database is normalised.

(i) The table lists the following three stages of normalisation:

- The first stage is from a database that is not normalised (0NF) to First Normal Form (1NF).
- The second stage is from 1NF to Second Normal Form (2NF).
- The third stage is from 2NF to Third Normal Form (3NF).

Tick (✓) **one** box in each row to identify the appropriate stage for each task.

Task	Normalisation stage		
	0NF to 1NF	1NF to 2NF	2NF to 3NF
Remove any partial key dependencies			
Remove any repeating groups of attributes			
Remove any non-key dependencies			

[2]

(ii) Draw an entity-relationship (E-R) diagram for the database PLANTSALLES.

PLANT

CUSTOMER

PURCHASE_ITEM

PURCHASE

[3]

(b) The shop manager uses a Database Management System (DBMS).

Describe the purpose **and** contents of the data dictionary in the DBMS.

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..... [3]

(c) The shop manager uses both Data Definition Language (DDL) and Data Manipulation Language (DML) statements to create and search the database.

(i) Complete the DML statements to return the total number of items purchased with the purchase ID of 3011A.

SELECT SUM(.....)

FROM

WHERE = ...;

[4]

(ii) Write DDL statements to include a field in the table PURCHASE to store the date of the order.

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..... [3]

5 Javier owns many shops that sell cars. He employs several managers who are each in charge of one or more shops. He uses the relational database `CARS` to store the data about his business.

Part of the database is shown:

`SHOP(ShopID, ManagerID, Address, Town, TelephoneNumber)`

`MANAGER(ManagerID, FirstName, LastName, DateOfBirth, Wage)`

`CAR(RegistrationNumber, Make, Model, NumberOfMiles, ShopID)`

(a) Tick (✓) **one** box in each row to identify whether each field is a primary key or a foreign key.

Table	Field name	Primary key	Foreign key
MANAGER	ManagerID		
SHOP	ManagerID		
CAR	RegistrationNumber		
CAR	ShopID		

[2]

(b) Describe the ways in which access rights can be used to protect the data in Javier’s database from unauthorised access.

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..... [3]

(c) Javier uses Data Definition Language (DDL) and Data Manipulation Language (DML) statements in his database.

(i) Complete the following DML statements to return the number of cars for sale in each shop.

```
SELECT COUNT (.....)

FROM .....

..... ShopID
```

[3]

(ii) Complete the DML statement to include the following car in the table CAR.

Field	Data
RegistrationNumber	123AA
Make	Tiger
Model	Lioness
NumberOfMiles	10500
ShopID	12BSTREET

```
..... CAR

..... ("123AA", "Tiger", "Lioness", 10500, "12BSTREET")
```

[2]

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3 Mehrdad has a holiday company database that includes:

- data about holidays, such as the location, date, duration (in days)
- data about the customers and the holidays they have booked.

(a) Mehrdad has **normalised** the database, which has three tables.

(i) Draw an entity–relationship (E–R) diagram for the **normalised** tables.

[3]

(ii) Complete the table to identify the primary key and foreign key(s) for each of the tables you identified in **part (a)(i)**. If the table has no foreign key(s), write ‘None’.

Table name	Primary key	Foreign key

[3]

(iii) Explain why the holiday database is in Third Normal Form (3NF).

[2]

- (b) The holiday company has several members of staff. The database has **two** additional tables to store data about the staff.

STAFF(StaffID, FirstName, SecondName, DateOfBirth, Role, Salary)

SCHEDULE(ScheduleID, StaffID, WorkDate, Morning, Afternoon)

The following table shows some sample data from the table SCHEDULE.

ScheduleID	StaffID	WorkDate	Morning	Afternoon
210520-1	BC	21/05/2020	TRUE	TRUE
210520-2	JB	21/05/2020	TRUE	FALSE
220520-1	BC	22/05/2020	FALSE	TRUE
220520-2	LK	22/05/2020	TRUE	FALSE

- (i) Write an SQL script to display the first name and second name of all staff members working on 22/05/2020.

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..... [4]

- (ii) Write an SQL script to count the number of people working on the morning of 26/05/2020.

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..... [3]

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8. Question part 1/3 | 9618 May-June 2022 P1 V1 Q4

4 A teacher uses a relational database, `MARKS`, to store data about students and their test marks.

The database has the following structure:

STUDENT (StudentID, FirstName, LastName)

TEST(TestID, Description, TotalMarks)

STUDENT_TEST(StudentID, TestID, Mark)

(a) Describe the advantages of using a relational database compared to a file-based approach.

[4]

(b) Give the highest level of Normal Form (NF) the database `MARKS` is in **and** justify your choice.

Normal Form

Justification

[3]

(c) (i) Sample data to be stored in the table STUDENT_TEST is shown.

StudentID	TestID	Mark
12	A1	50
12	P10	100
13	A1	75
14	P10	60

Write a Structured Query Language (SQL) script to create the table STUDENT_TEST.

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..... [5]

(ii) Write a Structured Query Language (SQL) script to find the average mark of students in test A7.

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..... [3]

- (d) The mark a student is awarded in a test will be entered into the database. This mark needs to be a whole number between 0 and the maximum number of marks for that test (inclusive).

Explain how data validation **and** data verification can be used when a mark is entered.

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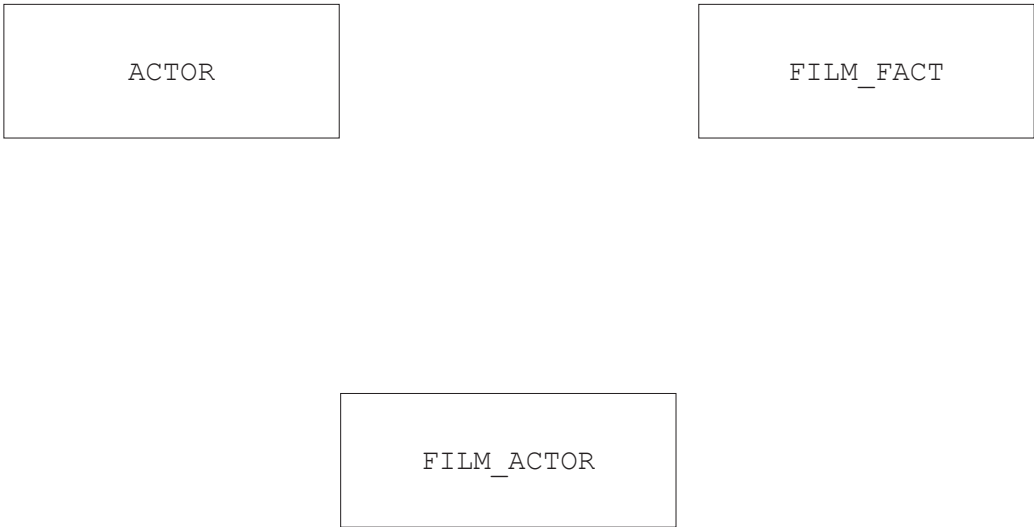
..... [4]

5 A database, FILMS, stores information about films and actors.

Part of the database is shown:

```
ACTOR(ActorID, FirstName, LastName, DateOfBirth)
FILM_FACT(FilmID, FilmTitle, ReleaseDate, Category)
FILM_ACTOR(ActorID, FilmID)
```

(a) Complete the entity-relationship (E-R) diagram.



[2]

(b) A composite primary key consists of two or more attributes that together form the primary key.

Explain why the table FILM_ACTOR has a composite primary key.

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..... [2]

(c) Complete the SQL script to return the IDs of all the actors in the film with the title Cinderella.

```
SELECT .....  
  
FROM FILM_ACTOR  
  
INNER JOIN .....  
  
ON FILM_FACT.FilmID = .....  
  
WHERE FILM_FACT.FilmTitle = ..... ;  
[4]
```

(d) Write an SQL script to count the number of films that were released in January 2022.

```
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.....  
  
.....  
  
.....  
  
.....  
[3]
```

(e) A Database Management System (DBMS) is used to create and manipulate the database.

Complete the descriptions of the features and tools found in a DBMS using the given terms. Not all terms will be used.

- Boolean**
- data dictionary**
- data redundancy**
- field names**
- input**
- interface**
- logical schema**
- normalisation**
- operating system**
- output**
- primary keys**
- query**
- structure**

A DBMS provides data management. This includes the development of a that stores information about the data stored, such as and

The uses methods, such as an E-R diagram, to show the structure of the database and its relationships.

The processor allows a user to perform searches to find specific data. The DBMS also provides a developer that allows the user to create tables, forms and reports.

6 A relational database, TECHNOLOGY, stores data about the staff in a company and the computer devices used by the staff.

The database has the following tables:

```
STAFF(StaffID, FirstName, LastName, DateOfBirth, JobTitle)
```

```
DEVICE(DeviceID, Type, DatePurchased, StaffID)
```

(a) Describe the relationship between the two tables. Refer to the primary and foreign keys in your answer.

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..... [4]

(b) The database uses a Data Definition Language (DDL) and Data Manipulation Language (DML).

(i) Complete the SQL script to return the number of devices stored in the database for the staff member with the first name 'Ali' and last name 'Khan'.

```
SELECT ..... (STAFF.StaffID)

FROM .....

INNER JOIN DEVICE

..... STAFF.StaffID = DEVICE.StaffID

WHERE STAFF.FirstName = 'Ali'

..... STAFF.LastName = 'Khan';
```

[4]

10. Question part 2/2 | 9618 May-June 2022 P1 V3 Q6

- (ii) The table `DEVICE` needs a new attribute to store whether the device has been returned by the staff member, or not.

Write a Structured Query Language (SQL) script to insert the new attribute into the table `DEVICE`.

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..... [2]

- (c) The database is in Third Normal Form (3NF).

Complete the table by describing the three normal forms.

Normal Form	Description
First Normal Form (1NF)	
Second Normal Form (2NF)	
Third Normal Form (3NF)	

[3]

11. Question part 1/4 | 9618 Oct-Nov 2022 P1 V1 Q4

4 A photographer creates a relational database to store data about photographs taken at birthday parties.

The database, PHOTOGRAPHS, stores details of the customer, the party, the photographs taken and the cameras used.

The photographer has several cameras that are used for taking the photographs at the parties.

Each camera has a specific lens type (for example, XY32Z) and lighting type (for example, F1672).

Data about each photograph is stored in the database including the party at which it was taken, the time it was taken and the camera used.

The database has these four tables:

CUSTOMER(CustomerID, FirstName, LastName, Telephone)

PARTY(PartyID, CustomerID, PartyDate, StartTime)

PHOTO_DATA(PhotoID, PartyID, TimeTaken, CameraID)

CAMERA_DATA(CameraID, LensType, LightingType)

(a) Complete the entity-relationship (E-R) diagram for the database PHOTOGRAPHS.



(b) The database is normalised and is in Third Normal Form (3NF).

Describe the characteristics of a database that is in Third Normal Form (3NF).

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..... [3]

(c) The table shows some sample data for the table PHOTO_DATA.

PhotoID	PartyID	TimeTaken	CameraID
ST23-56	BD987	08:34	NIK-02
ST23-57	BD987	08:55	NIK-02
ST23-60	BC08	09:01	CAN-01
ST23-61	BC08	10:23	CAN-12
ST23-62	BC08	10:56	NIK-01

(i) State what is meant by a **tuple**. Give an example of a tuple from PHOTO_DATA.

Tuple

.....

Example

..... [2]

(ii) Complete the Structured Query Language (SQL) script to display the total number of photographs that have been taken using a camera with a camera ID starting with CAN.

SELECT (.....)

FROM

WHERE CameraID LIKE ;

[4]

(d) Write an SQL script to include two new fields in `CAMERA_DATA` to store the number of photographs currently on the camera **and** the date the camera was last used.

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..... [3]

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11. Question part 4/4 | 9618 Oct-Nov 2022 P1 V1 Q4

Question 5 begins on page 10.

5 A relational database, GARDEN, has the following tables:

OWNER(OwnerID, FirstName, TelephoneNo, TreeID, TreePosition)

TREE(TreeID, ScientificName, MaxHeight, FastGrowing)

(a) The database is **not** in Third Normal Form (3NF).

Explain how the database can be normalised to 3NF.

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..... [3]

(b) Write the Structured Query Language (SQL) script to add a new record in the table TREE to store the following data:

Attribute	Value
TreeID	LOW_1276
ScientificName	Salix_Alba
MaxHeight	30.00
FastGrowing	TRUE

.....

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..... [3]

(c) State what is meant by a **candidate key** in a relational database.

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..... [1]

(d) (i) Describe, using an example, what is meant by a **data dictionary**.

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..... [2]

(ii) Describe what is meant by a **logical schema**.

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..... [2]

13. Question part 1/2 | 9618 Oct-Nov 2022 P1 V3 Q2

- 2 The relational database `ASTRONOMY` is used to store data about telescopes, the companies that own the telescopes and the photographs taken by the telescopes.

The database has these three tables:

`COMPANY`(`TelephoneNumber`, `CompanyID`, `CompanyName`)

`PHOTOGRAPH`(`PhotoID`, `TelescopeID`, `DateTaken`, `TimeTaken`, `Elevation`)

`TELESCOPE`(`TelescopeID`, `CompanyID`, `SerialNumber`)

- (a) Complete the following table by writing the correct answer for each item.

Item	Answer
a suitable field for the primary key in <code>COMPANY</code>	
a candidate key in <code>TELESCOPE</code>	
the degree of relationship between <code>TELESCOPE</code> and <code>PHOTOGRAPH</code>	

[3]

- (b) A Database Management System (DBMS) has several features.

Identify the feature that describes the relationship between data and its structure.

..... [1]

- (c) Complete the SQL script to return the total number of telescopes owned by the company whose ID begins with `HW`.

`SELECT` (`.....`)

`FROM TELESCOPE`

`WHERE` `LIKE`

[4]

(d) Write the SQL script to add **one** field to the table `PHOTOGRAPH` to store the resolution of the photograph, e.g. 1920 × 1068.

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..... [2]

(e) The photographs are stored as bitmap images.

Complete the statements about bitmap images by writing the missing words.

The of a bitmap image is the number of bits that are used to store each pixel.

Metadata about the image is stored in the of the file.

[2]

(f) Describe the purpose of a query processor in a DBMS.

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..... [2]

2 An organisation uses a database to store data about the types of bird that people have seen.

(a) The database is managed using a Database Management System (DBMS).

(i) State what is meant by a data dictionary **and** give **one** example of an item typically found in a data dictionary.

Definition
.....

Example
.....

[2]

(ii) State what is meant by data integrity **and** give **one** example of how this is implemented in a database.

Definition
.....

Example
.....

[2]

14. Question part 2/4 | 9618 May-June 2023 P1 V1 Q2

(b) The database, `Birds`, stores information about the types of bird and the people who have seen them.

Data about each bird seen is stored with its location and data about the person who saw the bird.

Database `Birds` has the following tables:

```
BIRD_TYPE(BirdID, Name, Size)

BIRD_SEEN(SeenID, BirdID, Date, Location, PersonID)

PERSON(PersonID, FirstName, LastName, EmailAddress)
```

(i) Complete the table by identifying **two** foreign keys and the database table where each is found.

Foreign key	Database table

[2]

(ii) The database `Birds` has been normalised.

Draw **one** line from each Normal Form to the most appropriate definition.

Normal Form	Definition
First Normal Form (1NF)	All fields are fully dependent on the primary key.
Second Normal Form (2NF)	There are no repeating groups of attributes.
Third Normal Form (3NF)	There are no partial dependencies.

[1]

BirdID	Name	Size
0123	Blackbird	Medium
0035	Jay	Large
0004	Raven	Large
0085	Robin	Small

The database only supports these data types:

- character
- varchar
- Boolean
- integer
- real
- date
- time

Write a Structured Query Language (SQL) script to define the table `Bird_Type`.

[4]

(iv) The database tables are repeated here for reference:

BIRD_TYPE(BirdID, Name, Size)

BIRD_SEEN(SeenID, BirdID, Date, Location, PersonID)

PERSON(PersonID, FirstName, LastName, EmailAddress)

Complete the SQL script to return the number of birds of each size seen by the person with the ID of J_123.

```
SELECT BIRD_TYPE.Size, ..... (BIRD_TYPE.BirdID)

      AS NumberOfBirds

FROM BIRD_TYPE, .....

WHERE ..... = "J_123"

AND BIRD_TYPE.BirdID = .....

..... BIRD_TYPE.Size;
```

[5]

15. Question part 1/3 | 9618 May-June 2023 P1 V2 Q2

2 A horse riding school uses a database, Lessons, to store data about lesson bookings.

This database is created and managed using a Database Management System (DBMS).

(a) The table contains names and descriptions of DBMS features and tools.

Complete the table by writing down the missing names and descriptions.

Name	Description
Data dictionary	
Query processor	
.....	A model of a database that is not specific to one DBMS.
.....	A software tool that allows the user to create items such as tables, forms and reports.

[4]

(b) Explain the reasons why referential integrity is important in a database.

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..... [3]

Topical questions | 30 questions

15. Question part 2/3 | 9618 May-June 2023 P1 V2 Q2

(c) The database `Lessons` has the following tables:

```
HORSE(HorseID, Name, Height, Age, HorseLevel)
STUDENT(StudentID, FirstName, LastName, RiderLevel, PreferredHorseID)
LESSON(LessonID, Date, Time, StudentID, HorseID, LessonContent)
```

Dates in this database are stored in the format #DD/MM/YYYY#.

The fields `RiderLevel` and `HorseLevel` can only have the values: `Beginner`, `Intermediate` or `Advanced`.

(i) Describe **two** methods of validating the field `RiderLevel`.

1

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[2]

(ii) Write a Structured Query Language (SQL) script to return the names of all the horses that have the horse level intermediate or beginner.

[4]

[4]

15. Question part 3/3 | 9618 May-June 2023 P1 V2 Q2

(iii) The following SQL script should return the number of riders that have the rider level beginner and have a lesson booked on 09/09/2023.

```
SELECT SUM(STUDENT.RiderLevel) AS NumberOfRiders

FROM STUDENT, LESSON

WHERE StudentID = StudentID

OR Date = #09/09/2023#

AND STUDENT.RiderLevel = Beginner;
```

There are **four** errors in the script.

Identify **and** correct each error.

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[4]

4 A shop rents cars to customers. The shop uses a relational database to store information about the rentals.

(a) Describe **two** ways in which a relational database addresses the limitations of a file-based approach.

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[4]

(b) Complete the table by writing the missing term or description for each database feature.

Term	Description
.....	An object that data is stored about.
Tuple	
Secondary key	
.....	A field in one table that is linked to a primary key in another table.

[4]

(c) The car rental database is not normalised. The current database design is:

```
BOOKING (CarRegistration, StartDate, EndDate,  
         CarModel, CarColour, CustomerFirstName)  
  
CUSTOMER (CustomerFirstName, CustomerLastName, EmailAddress,  
          TelephoneNumber)
```

Write a normalised database design for this database.

All tables must be in Third Normal Form (3NF).

Use the field names given **and** underline the primary key fields.

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..... [4]

(d) The data is validated and verified when it is entered into the database.

(i) The car registration number must be: 1 letter, followed by 3 numbers, followed by 2 letters.

For example, A123AA is valid but A12AA is invalid.

One way that a registration number can be validated is by using a presence check to make sure the registration number has been entered.

Describe **two other** ways that the car registration number can be validated.

1

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[2]

(ii) Describe **two** ways that the car registration number can be verified when it is entered into the database.

1

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[2]

(iii) State why the car registration number might be incorrect even after it has been validated and verified.

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..... [1]

17. Question part 1/2 | 9618 Oct-Nov 2023 P1 V1 Q3

3 A shop manager has designed a relational database to store customer orders.

The database will have the following tables:

```
CUSTOMER(CustomerID, FirstName, LastName, Town)

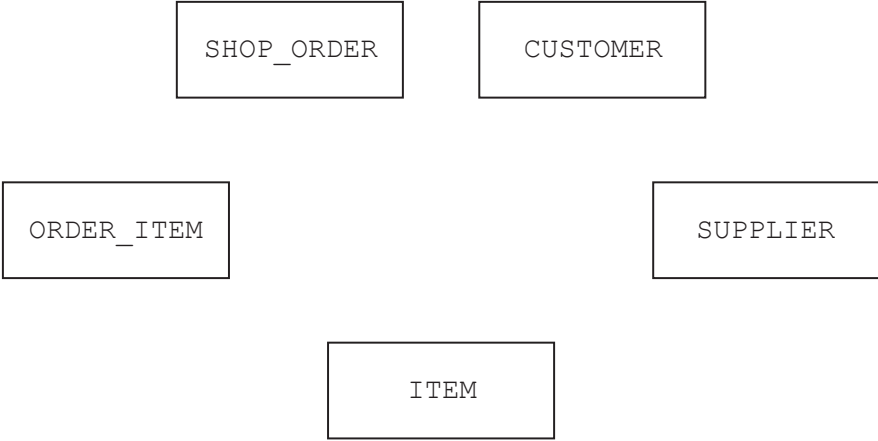
SHOP_ORDER(OrderNo, CustomerID, OrderDate)

SUPPLIER(SupplierID, EmailAddress, TelephoneNumber)

ITEM(ItemNumber, SupplierID, Description, Price)

ORDER_ITEM(ItemNumber, OrderNo, Quantity)
```

(a) Complete the entity-relationship (E-R) diagram for the relational database.



[3]

(b) Identify **three** advantages of a relational database compared to a file-based approach.

- 1
- 2
- 3

[3]

(c) (i) Write a Structured Query Language (SQL) script to define the database called `SHOP`.

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..... [1]

(ii) Write the SQL script to return the total quantity of items that the customer with the ID of HJ231 has ordered.

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..... [4]

2 (a) State what is meant by the following terms in a relational database model.

Entity

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Primary key

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Referential integrity

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[3]

(b) Authentication is one method a Database Management System (DBMS) can use to improve the security of a database.

Describe **other** methods that a DBMS can use to improve the security of a database.

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[4]

Topical questions | 30 questions

(c) The following database table is not normalised.

StudentName	DateOfBirth	TutorGroup	Subject	SubjectCode
Yuwei Chen	01/09/2004	SMH	English, Maths, Computer Science	EN, MA, CS
Claudia Raj	23/02/2005	JMB	Maths, Physics, Art	MA, PY, AR
Aamil Akram	24/01/2005	KMB	Art, Design, English language	AR, DE, EN
Areeba Faraz	21/12/2004	SMH	English language, Chemistry, Design	EN, CH, DE

Explain how to modify the table to put it into First Normal Form (1NF).

[4]

[4]

19. Question part 1/2 | 9618 May-June 2024 P1 V1 Q6

6 A company is developing a website that will allow users to create an account and then play a quiz every day. The data about the users and the quizzes are stored in a database.

A user must select a unique username and enter a valid email address to create an account. All users must be over the age of 16. A new quiz is given to the users every day. Each quiz is stored in its own text file.

The database stores the filename of each quiz and the date it can be played. The user gets a score for each quiz they complete, which is stored in the database. The scores are used to give each user a rating, for example Gold.

(a) Create a 3-table design for this database normalised to Third Normal Form (3NF).

Give your table design in the format:

TableName(PrimaryKey, Field1, Field2, ...)

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..... [6]

(b) The company is using a Database Management System (DBMS) to set up the database.

Describe what is meant by the following DBMS features:

Data dictionary

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Logical schema

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[4]

(c) The company has another database, `FARMING`, for a different game.

The database `FARMING` has a table named `EVENT` which is shown with some sample data.

PlayerID	EventID	Category	Points
000123	3	Build	100
000124	1	Grow	36
000123	4	Grow	22
000123	7	Create	158
000125	3	Grow	85
000125	4	Build	69

(i) The database `FARMING` has a second table created named `PLAYER` that has the primary key `PlayerID`.

The field `PlayerID` in `EVENT` needs to be set up as a foreign key to link to `PlayerID` in `PLAYER`.

Write a Structured Query Language (SQL) script to change the table definition for `EVENT` to link the foreign key to `PLAYER`.

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..... [2]

(ii) Write an SQL script to return the number of events that each player has completed.

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..... [3]

4 An assessment board wants to store the marks students achieved in exams in a database named RECORDS.

Part of the database design includes these two tables:

EXAM(ExamID, Subject, Level, TotalMarks)

EXAM_QUESTION(ExamQuestionID, ExamID, QuestionNumber, Question, MaxMark)

(a) Identify the relationship between EXAM and EXAM_QUESTION.

.....

..... [1]

(b) Sample data for the table EXAM is shown:

ExamID	Subject	Level	TotalMarks
00956124	Computer Science	2	75
00956125	Computer Science	3	120
00956126	Mathematics	2	100
00956127	Mathematics	3	150
00956128	Physics	2	70
00956129	Physics	3	80

Write a Structured Query Language (SQL) script to define the table EXAM.

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..... [3]

- [5]

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21. Question part 1/2 | 9618 May-June 2024 P1 V3 Q4

4 A theatre wants to use a database to store data about the shows that are scheduled, their customers and the seats that the customers have booked.

In the theatre:

- Each show can take place on multiple dates.
- Some dates can have more than one performance.
- There are multiple rows of seats.
- Each seat can be individually booked by its row letter and seat number, for example row E seat 2.

Part of the database design includes these tables:

```
SHOW(ShowID, Title, Duration)
SEAT(SeatID, RowLetter, SeatNumber)
PERFORMANCE(PerformanceID, ShowID, ShowDate, StartTime)
```

(a) Identify the relationship between the tables PERFORMANCE and SHOW.

.....

..... [1]

(b) Sample data for the table PERFORMANCE is shown:

PerformanceID	ShowID	ShowDate	StartTime
0001	MK12	5/5/2025	13:00
0002	MK12	5/5/2025	19:30
0003	MK12	6/5/2025	19:00
0004	OP3	7/5/2025	18:30
0005	OP3	8/5/2025	18:30
0006	OP3	9/5/2025	13:00

Write a Structured Query Language (SQL) script to define the table PERFORMANCE.

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- The result needs to include the show name and a suitable field name for the number of times it is scheduled.

[4]

- (d) Customers give their first name, last name and email address when they are making a booking. One booking can include multiple seats.

Describe the additional tables that will need to be included in the database **and** explain how these tables will be linked within the database.

[5]

22. Question part 1/3 | 9618 Oct-Nov 2024 P1 V1 Q2

2 A shop repairs electronic devices, for example mobile phones and tablet computers. The shop owner stores the data about the repairs using a file-based approach.

(a) Give **one** limitation of using a file-based approach to store the data **and** explain how a relational database addresses this limitation.

Limitation
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Explanation
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.....
.....

[3]

(b) The shop owner creates a relational database called `FIXIT`.

The database stores data about the customers and the devices for repair.

Some devices need new parts that are ordered from suppliers.

The database `FIXIT` is designed to include the following tables:

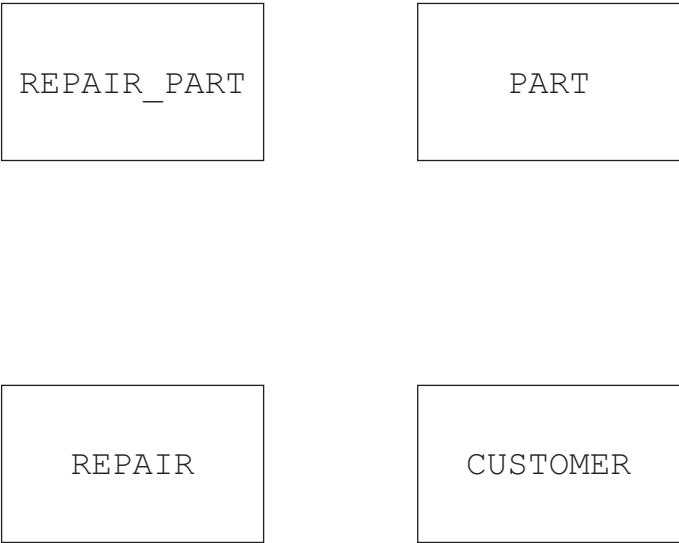
```
PART(PartID, Description, Price, SupplierID)

CUSTOMER(CustomerID, FirstName, LastName, ContactNumber)

REPAIR(RepairNumber, StartDate, EndDate, CustomerID, Device)

REPAIR_PART(PartID, RepairNumber, Quantity)
```

(i) Complete the entity-relationship (E-R) diagram for the given tables.



[3]

Topical questions | 30 questions

22. Question part 2/3 | 9618 Oct-Nov 2024 P1 V1 Q2



(ii) The table shows sample data for the table `REPAIR_PART`.

PartID	RepairNumber	Quantity
ACD128SA	0022	3
PPOR543DWW	0022	1
TR453	0023	1
PPOR543DWW	0023	2
WED5	0024	5

Write a Structured Query Language (SQL) script to define the table `REPAIR_PART`.

Include constraints (restrictions) on the data that can be entered into each field where appropriate.

[5]

22. Question part 3/3 | 9618 Oct-Nov 2024 P1 V1 Q2



(iii) Suppliers send invoices to the company for the parts that are used. A new table, INVOICE, stores the data about each invoice and whether it has been paid or not.

The design for the table INVOICE is shown:

```
INVOICE(InvoiceID, SupplierID, AmountDue, Paid, DatePaid)
```

The table shows sample data for the table INVOICE.

InvoiceID	SupplierID	AmountDue	Paid	DatePaid
000001	JK675	22.50	TRUE	01/01/2024
000002	WR443	358.99	FALSE	
000003	JK675	10.21	FALSE	

Write an SQL script to return the total amount due to the supplier with the ID of JK675 for all the invoices that have **not** currently been paid.

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..... [3]

(c) Complete the table by writing a definition for each of the database terms.

Term	Definition
Referential integrity	
Candidate key	
Tuple	

Topical questions | 30 questions

6 A company uses a relational database to store data about its customers, employees and the individual repair jobs that customers have booked.

[3]

The database is normalised and includes these tables:

- **CUSTOMER** stores personal data about each customer
- **EMPLOYEE** stores personal data about each employee
- **LOGIN_DATA** stores the username and password for each employee
- **JOB** stores the data about each repair job
- **JOB_EMPLOYEE** stores the employees that are working on each repair job.

[6]

23. Question part 2/2 | 9618 Oct-Nov 2024 P1 V2 Q6



(ii) The database also has the table `INVOICE` that stores data about each invoice that is sent to a customer.

Example data from the table `INVOICE` is given.

InvoiceID	DateSent	Amount	Paid	JobID
29262	12/12/2023	105.20	Y	221
26765	11/11/2023	200.00	Y	315
13290	02/01/2024	50.00	Y	315
34090	05/02/2024	25.95	N	569

Write a Structured Query Language (SQL) script to return the total amount of all the invoices sent in the year 2023 that have been paid.

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..... [3]

4 A company makes ice cream and sells it to shops.

The ice cream is made in batches: a large quantity of one type and flavour of ice cream that is then split into smaller quantities for sale.

The company’s owner has designed a relational database, ICECREAM, to store data about their ice cream and customers.

Some of the tables in the database are given. The database is not normalised.

BATCH(BatchID, Type, Flavour, Size, SellingPrice, EndDate)

CUSTOMER(CustomerID, CompanyName, EmailAddress, TelephoneNumber)

SALE(SaleID, BatchID, CustomerID, Quantity, Date)

(a) Identify **two** foreign keys in the table SALE **and** the table that each foreign key references.

Foreign key 1

Table name 1

Foreign key 2

Table name 2

[2]

(b) Write an SQL script to return the total quantity of ice cream sold to the customer with the ID of 0034E in the year 2023.

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..... [3]

Topical questions | 30 questions

24. Question part 2/4 | 9618 Oct-Nov 2024 P1 V3 Q4



BATCH(BatchID, Type, Flavour, Size, SellingPrice, EndDate)

BatchID	Type	Flavour	Size	SellingPrice	EndDate
KIV12	Plain	Vanilla	1	2.20	12/12/2024
RIC14	Plain	Chocolate	0.5	1.80	12/12/2024
TYL1	Non-dairy	Lemon	0.5	2.10	01/02/2025
FYV2	Non-dairy	Vanilla	0.25	1.50	02/02/2025
BIV13	Plain	Vanilla	1	2.20	02/02/2024

Include constraints (restrictions) on the data that can be entered into each field where appropriate.

[5]

Topical questions | 30 questions

24. Question part 3/4 | 9618 Oct-Nov 2024 P1 V3 Q4



(ii) The table `BATCH` is not normalised.

Normalise the database table BATCH.

Write the table definitions for your new tables.

Identify any primary and foreign keys in your tables.

Do **not** change or include the tables CUSTOMER and SALE.

[4]

[4]

(d) Complete the following table by defining each database term.

Database term	Definition
Entity	
Attribute	

[2]

24. Question part 4/4 | 9618 Oct-Nov 2024 P1 V3 Q4



(e) A Database Management System (DBMS) supports data integrity.

Explain how a DBMS supports data integrity.

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..... [3]

25. Question part 1/2 | 9618 May-June 2025 P1 V1 Q5

5 A company builds and sells furniture to customers. The company stores data about customers, their payment cards and their furniture orders in a database.

The database, FURNITURE, has the following tables:

```
CUSTOMER(CustomerID, Name, Phone)

CUSTOMER_CARD_DATA(CardID, CustomerID, CardType, CardNumber, EndDate)

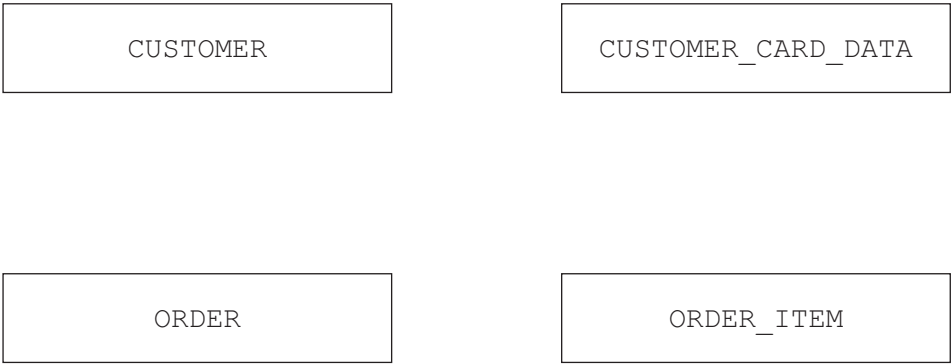
ORDER(OrderID, CustomerID, TotalCost, Paid, OrderDate, Complete)

ORDER_ITEM(OrderItemID, OrderID, Type, Height, Width, Depth, Details)
```

The primary keys are underlined in each table.

The attribute Complete in the table ORDER stores the Boolean value TRUE if the order has been built and FALSE if the order has not been built.

(a) Complete the entity-relationship (E-R) diagram for the database.



[3]

(b) Identify **one** attribute in the table CUSTOMER_CARD_DATA that could be a candidate key.

..... [1]

(c) Identify **two** tables in the database that contain one or more foreign keys.
Give **one** attribute that is a foreign key in each table.

	Table	Foreign key
1		
2		

[2]

25. Question part 2/2 | 9618 May-June 2025 P1 V1 Q5



(d) Explain the reasons why the data in the table `ORDER_ITEM` cannot be stored in the table `ORDER`

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..... [3]

(e) Write an Structured Query Language (SQL) script to output the customer ID, the customer’s name and the total cost of the customer’s orders that have **not** been paid.

The output of the total cost must have an appropriate title.

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..... [4]

26. Question part 1/3 | 9618 May-June 2025 P1 V2 Q5

- 5 An online game has a database that stores data about users and the characters each user creates in the game. Each user can create multiple characters and purchase multiple items for each character.

The normalised database has the following design:

```
USER (Username, Password, DateOfBirth)

CHARACTER (CharacterName, CharacterID, Username, Level, Money)

ITEM (ItemName, MinimumLevel, Cost)

CHARACTER_ITEM (CharacterID, ItemName)
```

- (a) Explain the purpose of the table CHARACTER_ITEM in the database.

.....

.....

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..... [2]

- (b) Underline the attribute, or attributes, that form the primary key in each of the tables.

```
USER (Username, Password, DateOfBirth)

CHARACTER (CharacterName, CharacterID, Username, Level, Money)

ITEM (ItemName, MinimumLevel, Cost)

CHARACTER_ITEM (CharacterID, ItemName)
```

[2]

26. Question part 2/3 | 9618 May-June 2025 P1 V2 Q5



(c) A Database Management System (DBMS) provides data security.

(i) Identify **two** methods the DBMS can use to protect the data in the table `USER` from unauthorised access.

Explain how each method protects the data.

Method 1

Explanation

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Method 2

Explanation

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[4]

(ii) The DBMS also supports data integrity.

Give **two** ways that a DBMS can support data integrity.

1

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2

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[2]

26. Question part 3/3 | 9618 May-June 2025 P1 V2 Q5



(d) (i) Write a Structured Query Language (SQL) script to count the number of items purchased by the user with the username "KAT123".

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..... [3]

(ii) The following changes need to be made to the character with the ID "0002":

- level changed to 3
- money changed to 10000.00

Write an SQL script to change the character's data.

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..... [3]

27. Question part 1/3 | 9618 May-June 2025 P1 V3 Q6

6 A shop sells pens to customers. Customers place an order with the shop and collect the items the next day. The shop uses a database to store the information about the orders.

The database contains the following tables:

```
CUSTOMER(CustomerID, CustomerName, Email)

ORDER(OrderID, CustomerID, Date, Collected)

ORDER_PRODUCT(OrderID, ProductID, Quantity)

PRODUCT(ProductID, ProductName, QuantityInBox, Cost, SupplierID)

SUPPLIER(SupplierID, SupplierName, SupplierEmail)
```

The primary keys are underlined.

(a) Complete the entity-relationship (E-R) diagram for the database.



27. Question part 2/3 | 9618 May-June 2025 P1 V3 Q6



- (b) A new product needs to be entered into the database. The product has the ID 002323, the product name ‘Blue ball point 2mm’, there are 50 in a box, the product costs \$5.00 and the supplier has the ID SFX223.

Write a Structured Query Language (SQL) script to enter the new product into the table `PRODUCT`.

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..... [4]

- (c) The attribute `Collected` in the table `ORDER` stores the Boolean value `TRUE` if the order has been collected and `FALSE` if the order has not been collected.

Write an SQL script to return the customer name for each customer that has orders they have not collected. Include the number of orders each customer has not collected with an appropriate title.

An example output might be:

CustomerName	NotCollected
Jack Wright	2
Lin Cho	1
Santaya Yui	1

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..... [4]

27. Question part 3/3 | 9618 May-June 2025 P1 V3 Q6



(d) The shop uses a Database Management System (DBMS).

(i) One feature provided by a DBMS is a data dictionary.

The data dictionary stores the attribute names, table names, foreign keys and primary keys in the database.

Identify **three** other items stored in a data dictionary.

- 1
- 2
- 3

[3]

(ii) The DBMS provides a developer interface.

Explain how a database designer can make use of the developer interface.

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..... [3]

28. Question part 1/3 | 9618 Oct-Nov 2025 P1 V1 Q2

- 2 A relational database, `WORKEXP`ERIENCE, stores data about students and the companies where they complete work experience.

Students can complete multiple work experience placements but can only complete one placement at a time.

Students can complete more than one placement at the same company.

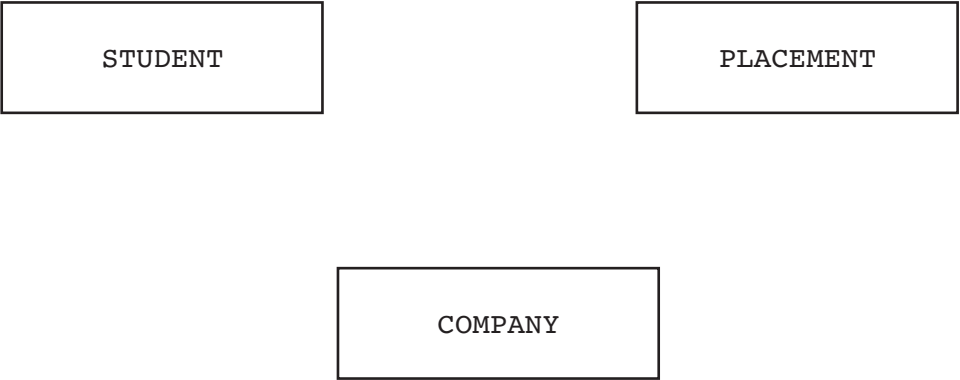
Part of the database is shown:

`STUDENT`(`StudentID`, `FirstName`, `TelephoneNumber`, `UniversityName`)

`PLACEMENT`(`PlacementID`, `StudentID`, `CompanyID`, `StartDate`, `EndDate`, `Complete`)

`COMPANY`(`CompanyID`, `CompanyName`, `MaxStudentsPerPlacement`)

- (a) Complete the entity-relationship (E-R) diagram for the database `WORKEXP`ERIENCE.



[2]

- (b) Explain why the database `WORKEXP`ERIENCE is in Third Normal Form (3NF).

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..... [2]

28. Question part 2/3 | 9618 Oct-Nov 2025 P1 V1 Q2



(c) Some example data from the `PLACEMENT` table is shown:

PlacementID	StudentID	CompanyID	StartDate	EndDate	Complete
PC001	LDEA01	MSCM	01/01/2023	12/07/2023	TRUE
PC002	LDEA01	MSCM	01/04/2024	08/05/2024	FALSE
PC003	ALAU02	NEAM	09/03/2020	10/03/2021	FALSE
PC004	LOLI75	GOUZ	07/06/2018	11/09/2018	TRUE

(i) Write a Structured Query Language (SQL) script to delete all placements that have been completed.

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..... [2]

(ii) Write an SQL script to return the total number of placements completed by the student with ID `LDEA01` at the company with ID `NEAM`. The total should be given an appropriate name.

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..... [4]

28. Question part 3/3 | 9618 Oct-Nov 2025 P1 V1 Q2



(d) The database tables are repeated here:

```
STUDENT(StudentID, FirstName, TelephoneNumber, UniversityName)

PLACEMENT(PlacementID, StudentID, CompanyID, StartDate, EndDate,
          Complete)

COMPANY(CompanyID, CompanyName, MaxStudentsPerPlacement)
```

Explain what is meant by referential integrity, and how it applies to this database.

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..... [3]

29. Question part 1/2 | 9618 Oct-Nov 2025 P1 V2 Q4

4 A relational database, `SHIPPING`, stores data about the ships in a company and the containers that are carried on the ships.

The database has the following tables:

`CONTAINER`(`ContainerID`, `Type`, `Weight`, `OwnerName`, `ShipID`)

`SHIP`(`ShipID`, `Type`, `Capacity`, `ShipName`)

(a) Describe the relationship between the two tables. Refer to the primary and foreign keys in your answer.

.....

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..... [2]

(b) The table `CONTAINER` needs an additional field to store the data for the last inspection date.

Write a Structured Query Language (SQL) script to add **one** field to the table `CONTAINER` to store the date of last inspection of the container, for example 08/07/2019.

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..... [2]

(c) Write an SQL script to return the number of containers stored in the database for the ship with the name Caledonia.

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..... [4]

29. Question part 2/2 | 9618 Oct-Nov 2025 P1 V2 Q4



(d) Describe the purpose of a developer interface in a Database Management System (DBMS).

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..... [2]

30. Question part 1/4 | 9618 Oct-Nov 2025 P1 V3 Q5

5 A company creates a relational database to store data about its customers.

The database, `REVIEWS`, stores data about the customers, products, complaints and staff.

The database has four tables:

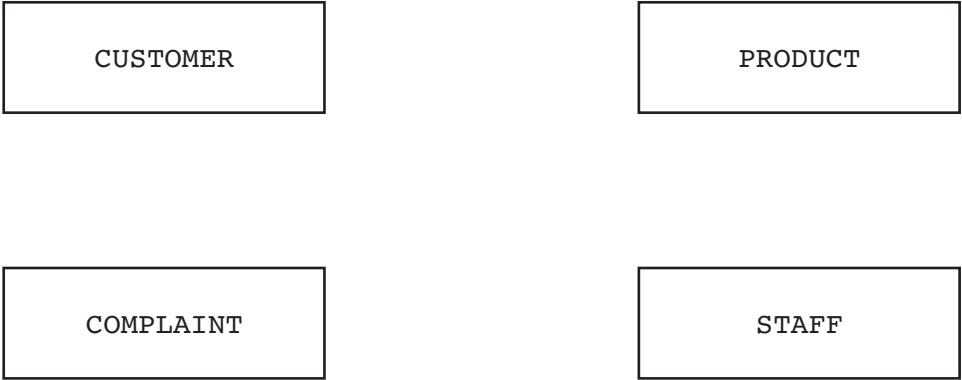
`CUSTOMER`(`CustomerID`, `CustomerFirstName`, `CustomerLastName`, `CustomerEmail`)

`PRODUCT`(`ProductID`, `ProductName`, `ProductDetail`, `Price`, `Rating`)

`COMPLAINT`(`ComplaintID`, `ProductID`, `CustomerID`, `ComplaintDetails`, `StaffID`)

`STAFF`(`StaffID`, `StaffFirstName`, `StaffLastName`, `Department`, `RemoteWorker`)

(a) Complete the entity-relationship (E-R) diagram for the database `REVIEWS`.



StaffID	StaffFirstName	StaffLastName	Department	RemoteWorker
1	Ralph	Jura	E	Yes
2	Luca	Emcee	A	Yes
3	Darwin	Acula	F	No

[4]

Write an SQL script to return only the ProductID, ProductName and ComplaintDetails for all products with a rating of 5 or less. The results need to be displayed in descending order of rating.

..... [5]

30. Question part 3/4 | 9618 Oct-Nov 2025 P1 V3 Q5



(d) A Database Management System (DBMS) is used to maintain and manage the database.

Describe **two** ways in which the DBMS can be used to ensure the security of the customer data.

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30. Question part 4/4 | 9618 Oct-Nov 2025 P1 V3 Q5



Question 6 starts on the next page.