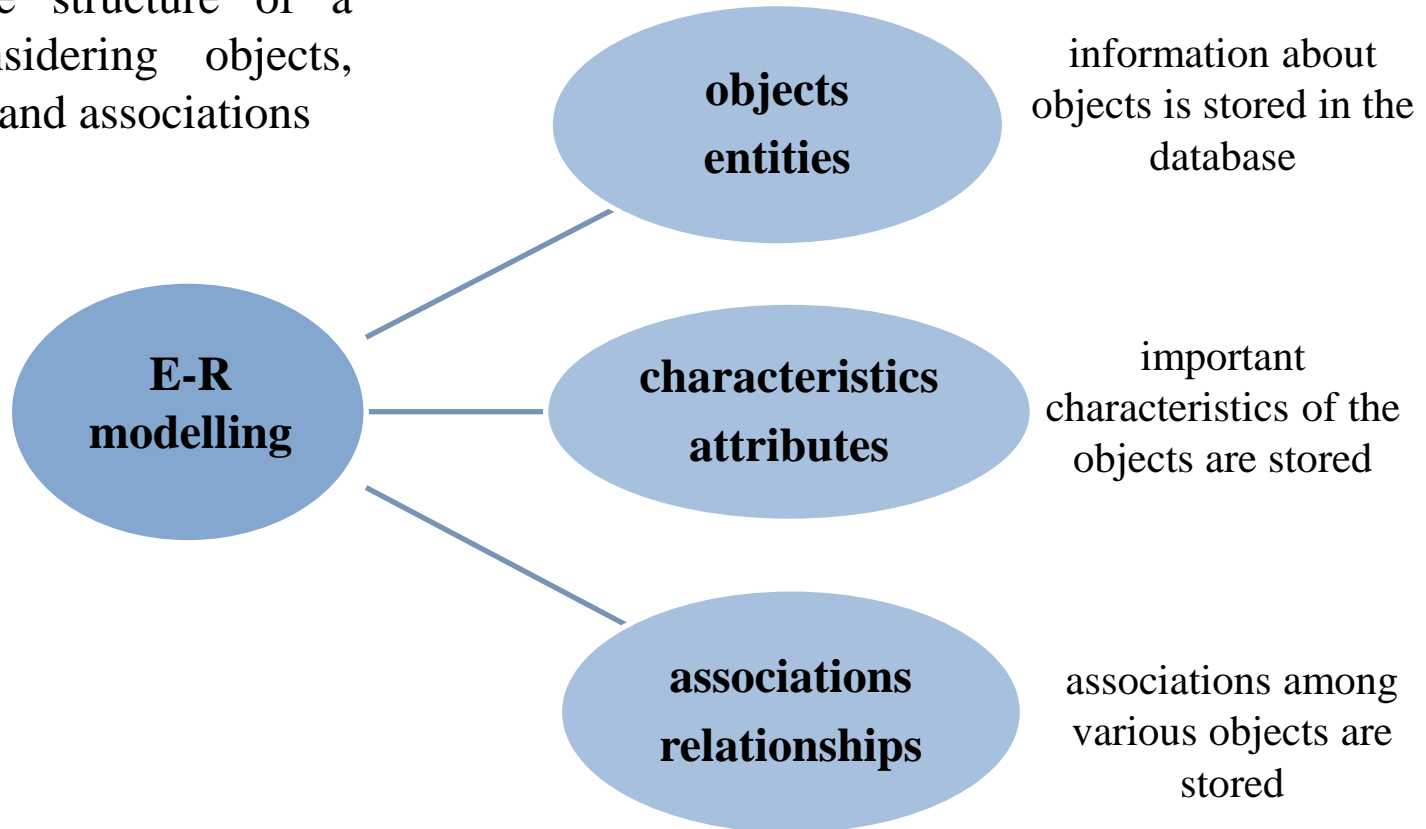# DATABASE
E-R MODELLING

DATABASE $\longrightarrow$ an organised collection of structured information, or data, stored in a computer system

→ one of the main aspects of database is the **organisation of data** in it

→ to understand the organisation of data, you need to know a **modelling approach**

→ the modelling approach you are going to study is **entity relationship (E-R) modelling**

→ E-R modelling is an approach to **semantic modelling**

→ semantic modelling tries to **understand and represent meaning**

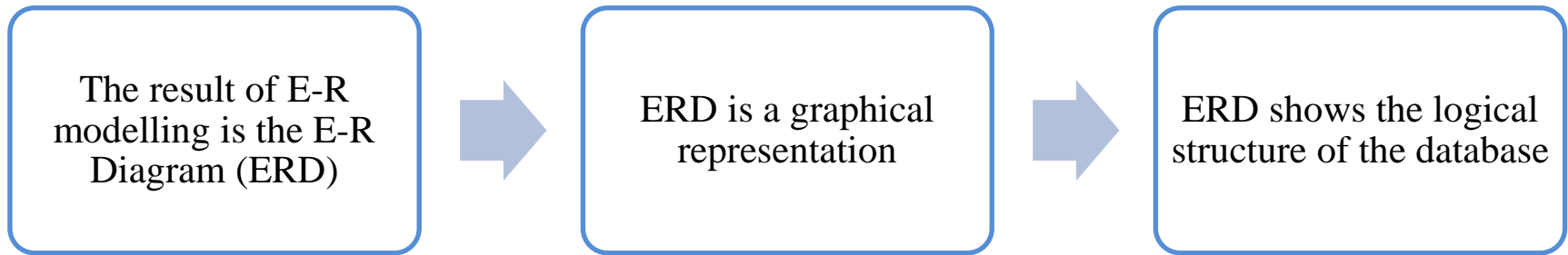→ E-R modelling was introduced by Peter **Chen** in **1976**

DATABASE
E-R MODELLING

E-R modelling consists of a number of activities to help understand the structure of a database, considering objects, characteristics and associations

**objects entities**

information about objects is stored in the database

E-R modelling

characteristics attributes

important characteristics of the objects are stored

associations relationships

associations among various objects are stored

DATABASE
E-R MODELLING

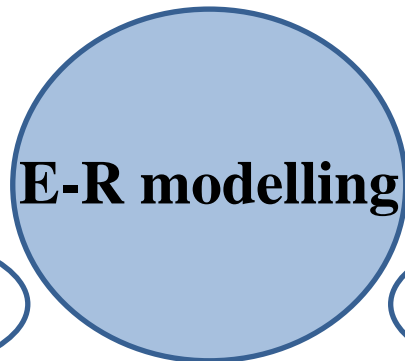| The result of E-R modelling is the E-R Diagram (ERD)	➡	ERD is a graphical representation	➡	ERD shows the logical structure of the database

The ERD is an instrument and it serves several purposes:

- it allows to understand the information contained in the database

- it is a documentation tool

- it communicates the logical structures of the database to users

DATABASE
E-R MODELLING

E-R modelling
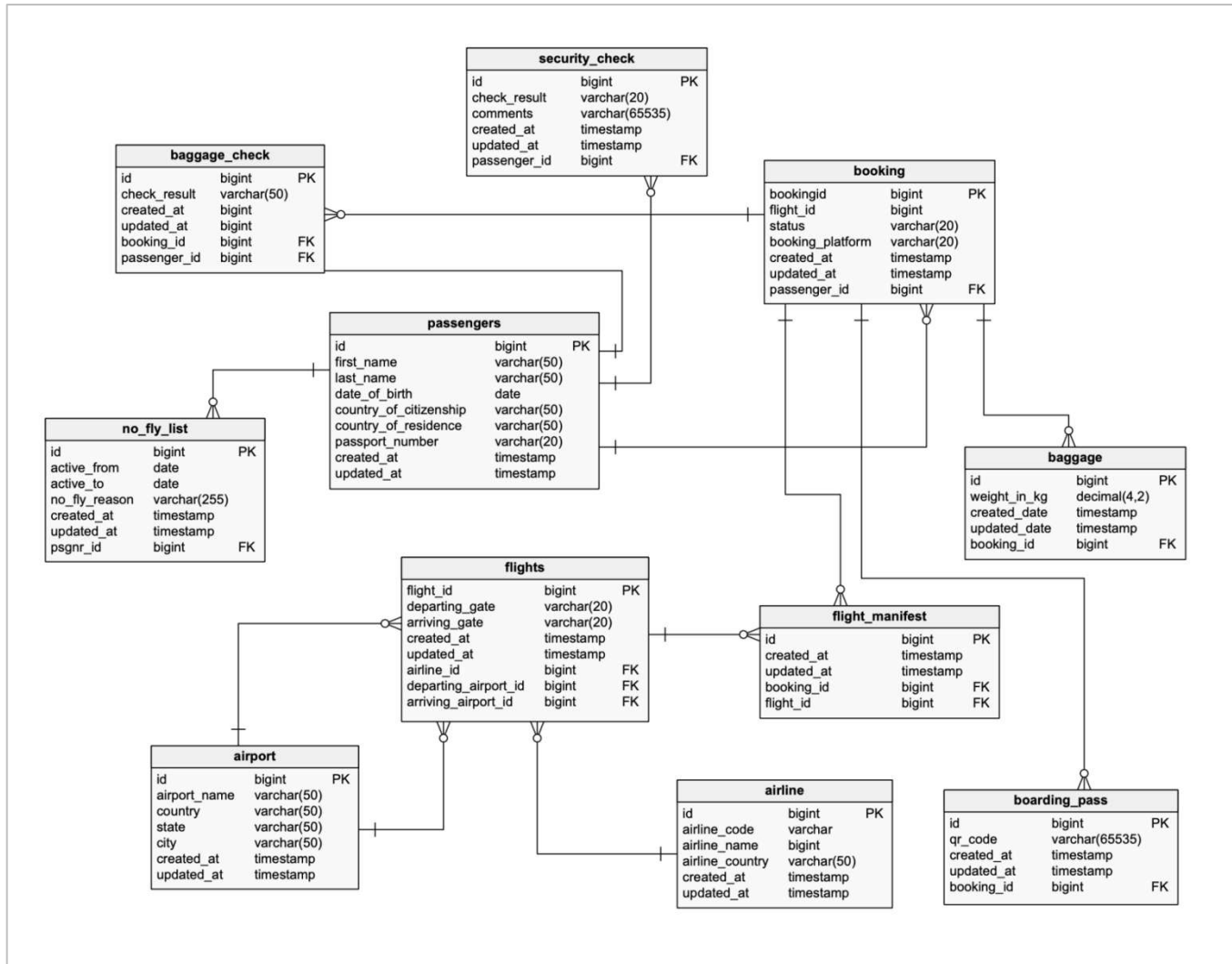
entities

attributes

relationships

The E-R modelling process identifies three basic elements:

- entities
- attributes
- relationships

DATABASE
E-R MODELLING

ENTITIES

"a thing that can be
easily identified"

the things about which the database
stores information:
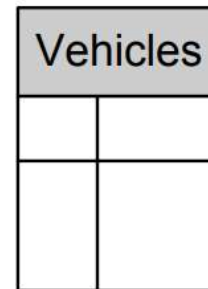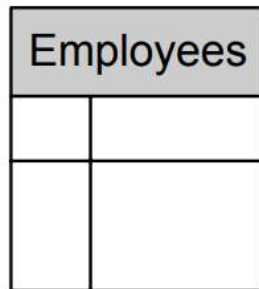- tangible items (equipment)
- concepts (accounts)
- people (employees)
- events (sales)
- places (business locations)

→ **ENTITY TYPE** refers to the <u>general definition</u> of that object (*employee*)

→ **ENTITY INSTANCE** refers to a <u>single occurrence</u> of an entity type (*employee 123-45-6789*)

DATABASE
E-R MODELLING

In the E-R Diagram, entities are represented by <u>rectangles</u>
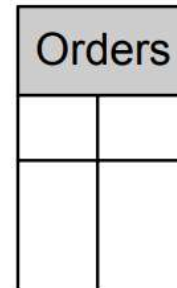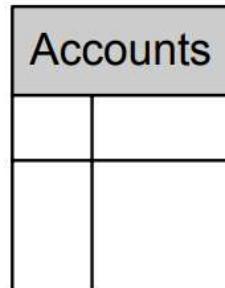
DATABASE
E-R MODELLING

ATTRIBUTES

a single data value that describes a characteristic of an entity

a set of characteristics associated to the entity that define the entity itself

each entity has a corresponding set of attributes that represent the information about the entity

a university may wish to know the name, address, phone number of each student. If STUDENT is the entity put in the database, NAME, ADDRESS, PHONE NUMBER are the attributes of that entity

ATTRIBUTES $\longrightarrow$ PRIMARY KEY
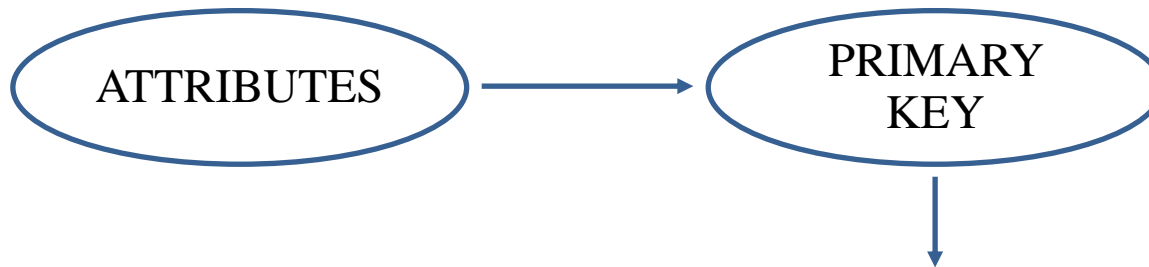
an attribute or combination of attributes that <u>uniquely</u> identifies an instance of the entity
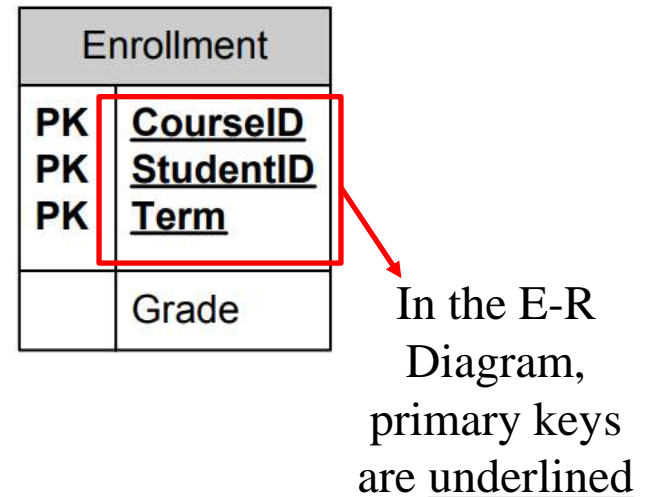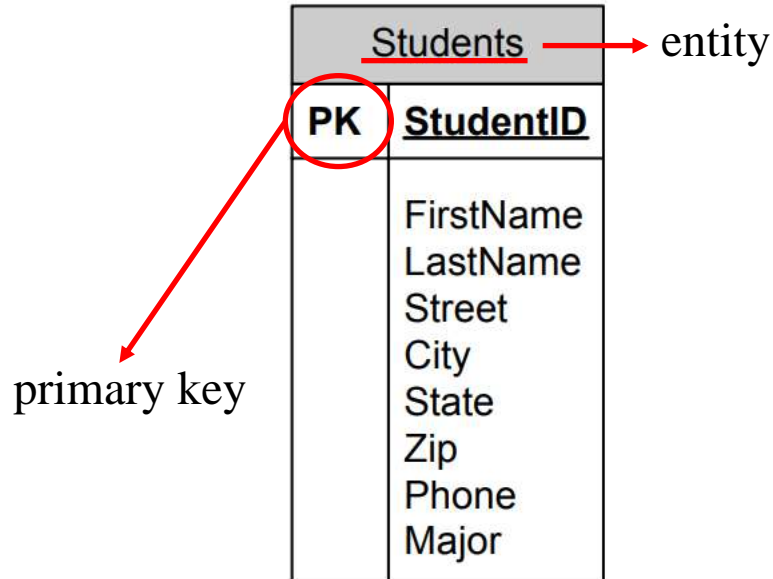
no two instances of an entity may have the same value for primary key

sometimes more than one attribute is used to form a primary key: this is a **composite key** or **compound key**

in this case, it is the **combination** of values for all attributes that must be unique, not the single attribute

For example, the entity ENROLLMENT has a composite primary key comprised of the attributes STUDENT_ID and COURSE_ID. Each instance of ENROLLMENT must contain a unique combination of values for StudentID and CourseID. However, there can be duplications of StudentID or CourseID. So, it is possible for many instances of ENROLLMENT to have the value MIS100 for CourseID, but each of those instances must contain different values for StudentID.

Students	
PK	**StudentID**
	FirstName
	LastName
	Street
	City
	State
	Zip
	Phone
	Major

entity

primary key

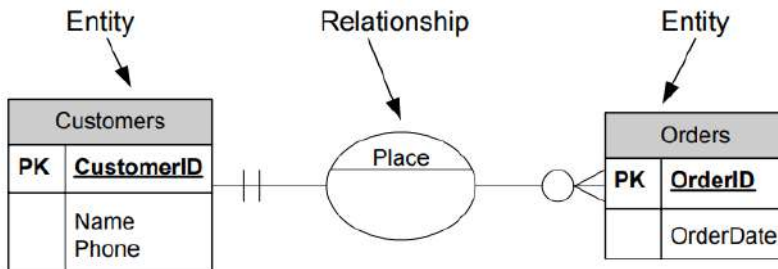| Enrollment	
PK	**CourseID**
PK	**StudentID**
PK	**Term**
	Grade

In the E-R Diagram, primary keys are underlined

RELATIONSHIPS → the associations between two or more entities

in the E-R Diagram, they are represented as an <u>ellipse connected by lines</u> to the related entities

it can be defined according to two criteria:
- **degree**
- **cardinality**

It may happen that ATTRIBUTES are attached to RELATIONSHIPS and not to ENTITIES

In some cases, attributes may be attached to a relationship, rather than an entity. For example, a GRADE attribute is a function of the combination of STUDENTS and COURSES, but is not strictly a function of either entity by itself. Attaching GRADE to STUDENT would not indicate that a STUDENT has a GRADE for a particular COURSE, while attaching GRADE to COURSES doesn't show that the GRADE is for a particular STUDENT. Attaching the GRADE attribute to the relationship between COURSES and STUDENTS shows that a value of GRADE is dependent on an intersection of COURSES and STUDENTS. A similar argument can be made for TERM.
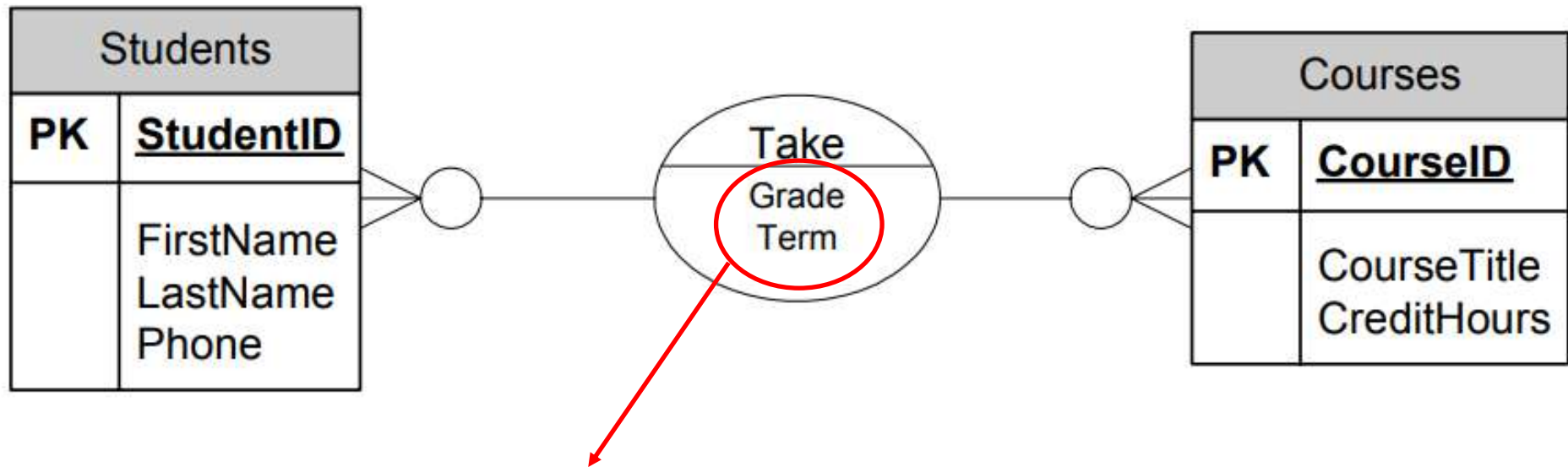
GRADE and TERM are attributes that can be associated to the relationship between the entities STUDENTS and COURSE, and not to the entities themselves.

In the E-R Diagram, these attributes are written in the ellipse containing the relationship they refer to.

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DEGREE: <u>the number of entities involved in a relationship</u>

Unary relationship (recursive): one entity

Binary relationship: two entities

Ternary relationship: three entities

N-ary relationship: n is the number of the entities

This is an example of the **unary** or **recursive relationship**.
It happens when one instance of an entity is related to another instance of the same entity.

In the E-R Diagram, unary or recursive relationship is represented by an <u>ellipse connected to the entity twice</u>
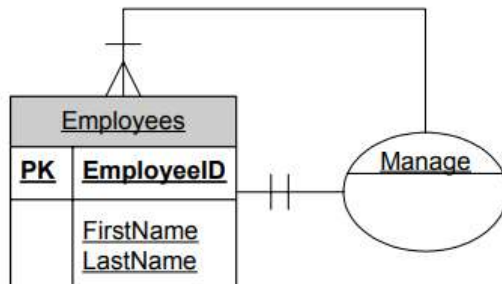
In this example, an EMPLOYEE may manage other EMPLOYEES, or may not manage any.

DATABASE
E-R MODELLING

Maximum cardinality: the <u>maximum number</u> of instances of one entity that <u>can</u> be associated with a single instance of a related entity

Minimum cardinality: the <u>minimum number</u> of instances of one entity that <u>must</u> be associated with a single instance of a related entity
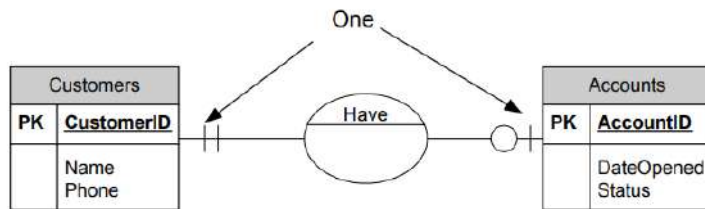
one-to-one (1:1): one CUSTOMER can be related to only one ACCOUNT and one ACCOUNT can be related to only one CUSTOMER
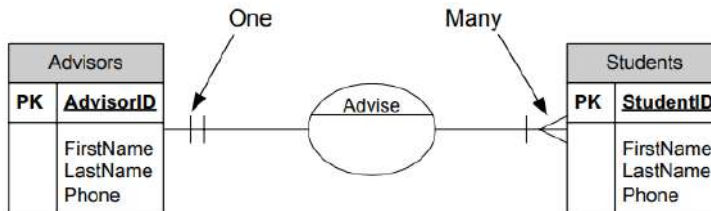
one-to-many (1:N): one ADVISOR can be related to one or more STUDENTS, but a STUDENT can be related to only a single ADVISOR
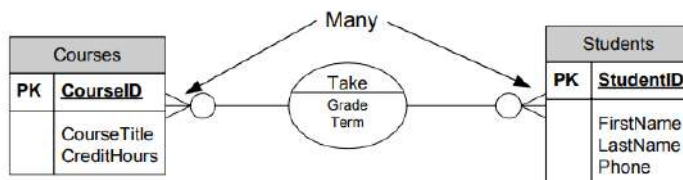
many-to-many (M:N): a single STUDENT can be related to zero or more COURSES and a single COURSE can be related to zero or more STUDENTS

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In the E-R Diagram, cardinality is represented by symbols attached to the relationship line
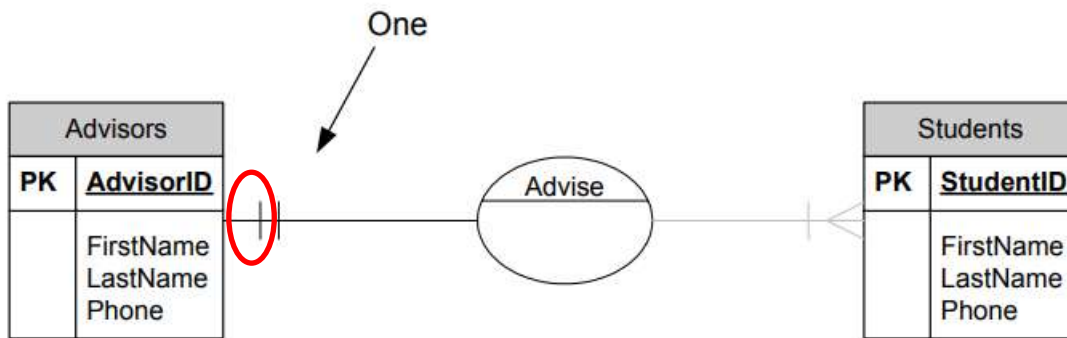
"One" cardinality is represented by <u>a single vertical line</u>
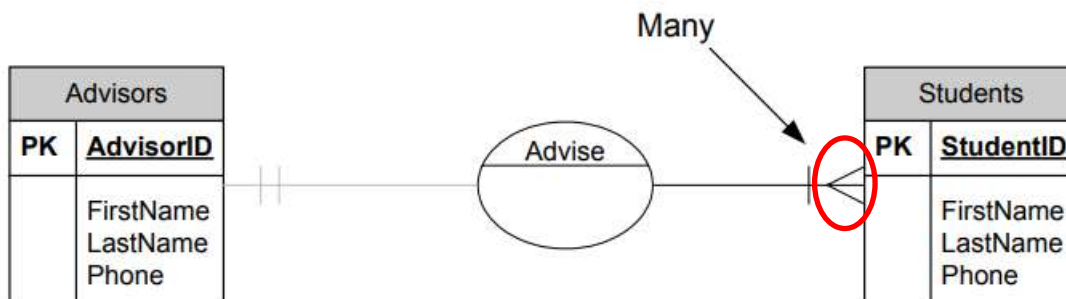
"Many" cardinality is represented by <u>a crowfoot</u>

DATABASE
E-R MODELLING

To create an E-R diagram, some steps are required:

Model Entities & Attributes → Choose Primary Keys → Model Relationships → Determine Cardinalities → Check the Model
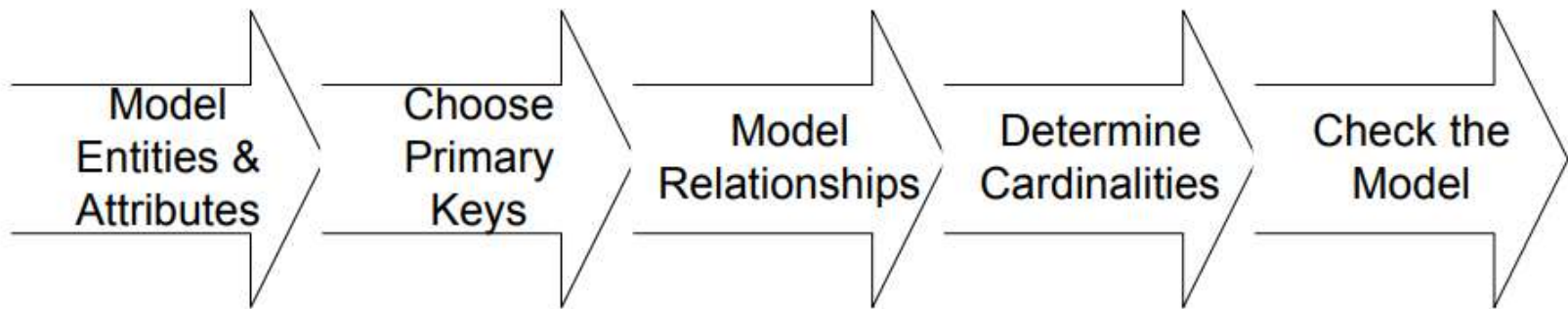
DATABASE
E-R MODELLING

STEP 1 → Model Entities & Attributes

The first thing to do when creating an E-R diagram is to identify the ENTITIES, which are something about which data need to be stored.

As well as ENTITIES, it is also important to define and identifies ATTRIBUTES and for PRIMARY KEYS too.

→ it is mostly important to <u>distinguish</u> ENTITIES from ATTRIBUTES

At this stage, you should include as many ENTITIES as you think are important.
The more the better, because in this way you can be more precise and accurate.
Moreover, it is easier to remove unnecessary ENTITIES later on than to add more ENTITIES at a further stage.

The best way to understand whether an ENTITY is really an ENTITY is to look at its ATTRIBUTES: if an ENTITY has no ATTRIBUTES, it means that it isn't an ENTITY, but possibly an ATTRIBUTE of another ENTITY.

DATABASE
E-R MODELLING

Document

ORDER-NO:	44-44-4444		CUSTOMER-ID:	1002	
DATE:	10/31/98		CUST-NAME:	ABC Inc.	
PROD-ID	DESCRIPTION		PRICE	QTY	EXT
A123	STEREO SYSTEM		375.00	2	750.00
C235	8" SPEAKER		150.00	8	1,200.00
X002	SPEAKER WIRE		10.00	5	50.00
			TOTAL		2,000.00

E-R
diagram
draft

Entity	Attributes
ORDER	ORDER-NO, DATE
PRODUCT	PROD-ID, DESCRIPTION, PRICE
CUSTOMER	CUSTOMER-ID, CUST-NAME

Having as an example an order entry form, those are the possible ENTITIES and ATTRIBUTES identified when creating the E-R diagram.

DATABASE
E-R MODELLING

STEP 2

Choose Primary Keys

PRIMARY KEYS must be chosen for each ENTITY.

For many ENTITIES, the PRIMARY KEY is obvious and well-defined. The only thing to do is to select it.

When PRIMARY KEYS aren't obvious, they must be identified. If they don't exist, a new ATTRIBUTE is to be created. The choice has to respect at least four requirements.

Desirable Primary Key Characteristics

1. Uniquely identifies an entity instance

   for each instance of the ENTITY the value of the ATTRIBUTE must be unique

2. Non-null (always has a value)

   it must always have a unique, valid value for each instance of the ENTITY

3. Data-less

   it contains no useful information and its only function is to identify the ENTITY

4. Never changes

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DATABASE
E-R MODELLING

Document

ORDER-NO:	44-44-4444		CUSTOMER-ID:	1002	
DATE:	10/31/98		CUST-NAME:	ABC Inc.	
PROD-ID	**DESCRIPTION**	**PRICE**	**QTY**	**EXT**	
A123	STEREO SYSTEM	375.00	2	750.00	
C235	8" SPEAKER	150.00	8	1,200.00	
X002	SPEAKER WIRE	10.00	5	50.00	
		TOTAL		2,000.00	

entity

Products	
PK	**ProductID**
	Description RetailPrice

primary key

attributes

entity

Orders	
PK	**OrderID**
	OrderDate

primary key

attributes

entity

Customers	
PK	**CustomerID**
	CustomerName

primary key

attributes

STEP 3

Model Relationships

Some RELATIONSHIPS are very easy to determine, others are more complex.

Anyway, there are some general guidelines that can help recognize RELATIONSHIPS.

The most important is to look at the document that you are working on and select the ENTITIES that appear in the same section: there is a strong possibility that they are related.

The fundamental thing here is to understand how the ENTITIES are related.

When the RELATIONSHIPS have been defined, it is important to assign meaningful names to them. If you can't come up with a name, use the names of the ENTITIES at the two ends of the relationship.
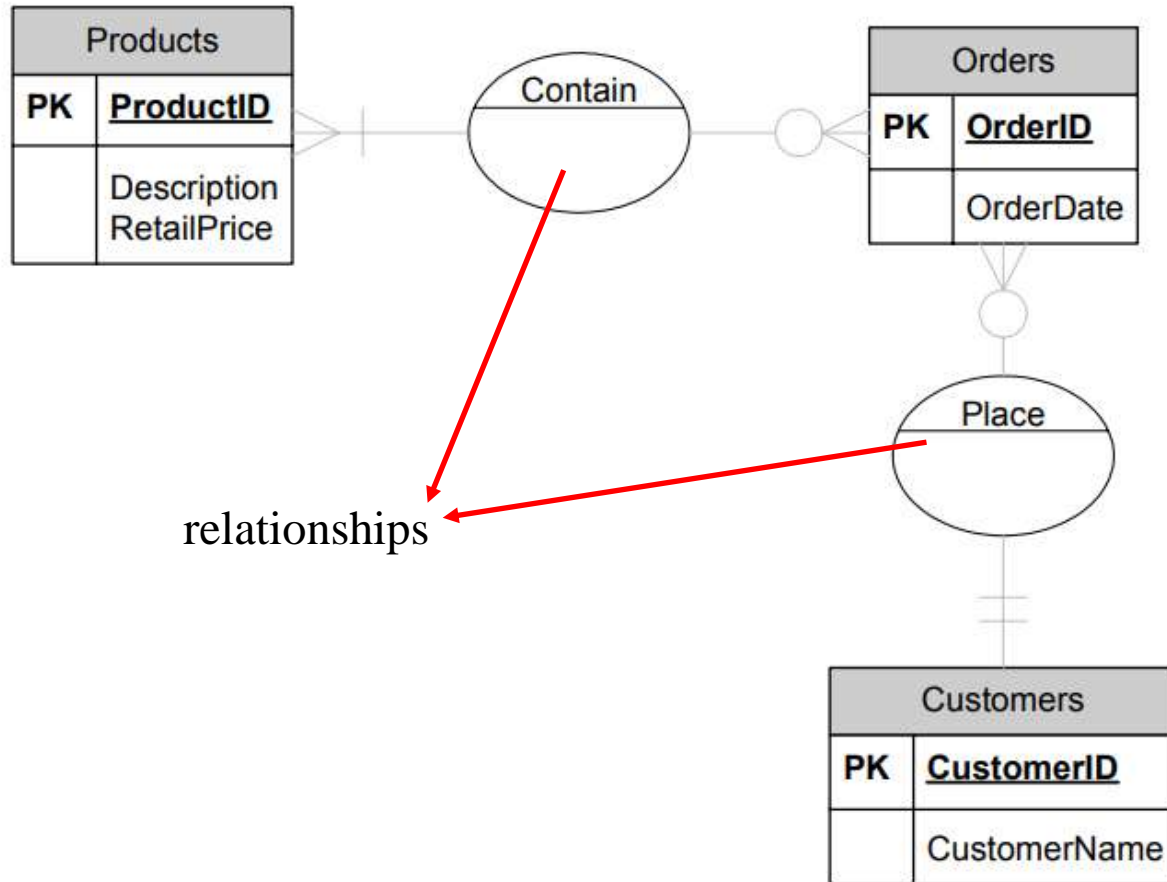
STEP 4

Determine Cardinalities

Cardinalities describe the minimum or maximum number of relationships that single instances of one ENTITY can have.

Maximum cardinality
The maximum number of relationships that instances <u>can</u> have.

Minimum cardinality
The minimum number of relationships that instances <u>must</u> have.

In the creation of the E-R diagram, maximum cardinalities are generally defined before minimum cardinalities.
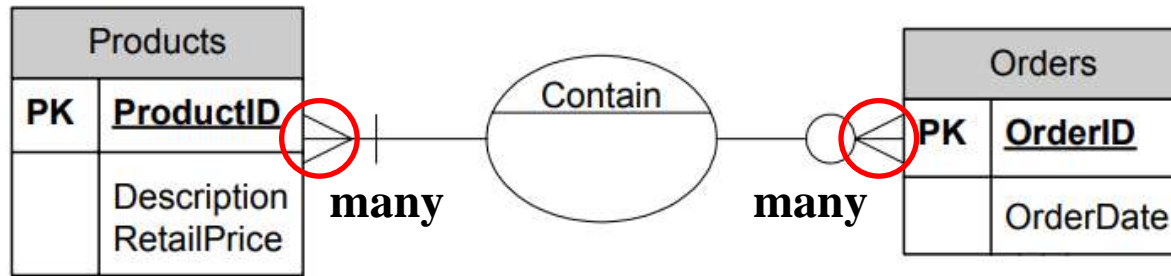
The maximum cardinality between PRODUCTS and ORDERS is shown in the picture above.

One instance of ORDERS can be related to many instances of PRODUCTS, because one order can contain many products. In this case, the cardinality from ORDER to PRODUCT is **many**.

One instance of PRODUCTS can be related to many instances of ORDERS, because one product can be ordered more than once. In this case, the cardinality from ORDER to PRODUCT is **many**.

Between ORDERS and PRODUCTS then there is a **many-to-many** cardinality.
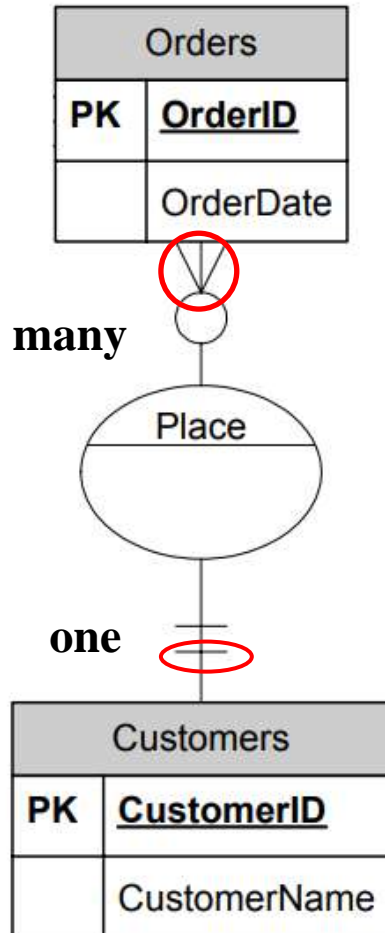
The maximum cardinality between ORDERS and CUSTOMERS is shown in the picture on the left.

A single ORDER can be related to only one CUSTOMER. This means that a single order can only be made by one customer and it can't be made by more customers. In this case, the cardinality between ORDERS and CUSTOMERS is **one**.

On the other side, a single CUSTOMER can place more than one ORDER. In this case, the cardinality between CUSTOMER and ORDER is **many**.

Between ORDERS and CUSTOMERS then there is a **one-to-many** cardinality.

Defining maximum cardinality is easier than defining minimum cardinality.

In this latter case, cardinalities are less obvious if the information and knowledge on the document are not that clear.

A temporary solution is to make **assumptions** and to guess what the minimum cardinalities can be.

Assumptions can be a good starting point, but then the validity of the assumptions must be checked to continue creating the database.

In the case analysed so far, <u>must the CUSTOMER be related to at least one ORDER?</u>

The answer to this question is not clear, because maybe the organisation/shop allows the customers to set up accounts before placing their first order. In this case, the minimum cardinality between CUSTOMER and ORDER is **zero**, because the customer mustn't place at least an order to exist as an entity in the database.

The same happens for the minimum cardinality between PRODUCT and ORDER. It is possible to assume that there are products that haven't been ordered yet. If this kind of situation is allowed, then the minimum cardinality between PRODUCT and ORDER is **zero**.

Products	
PK	**ProductID**
	Description RetailPrice

one

Contain

Orders	
PK	**OrderID**
	OrderDate

zero
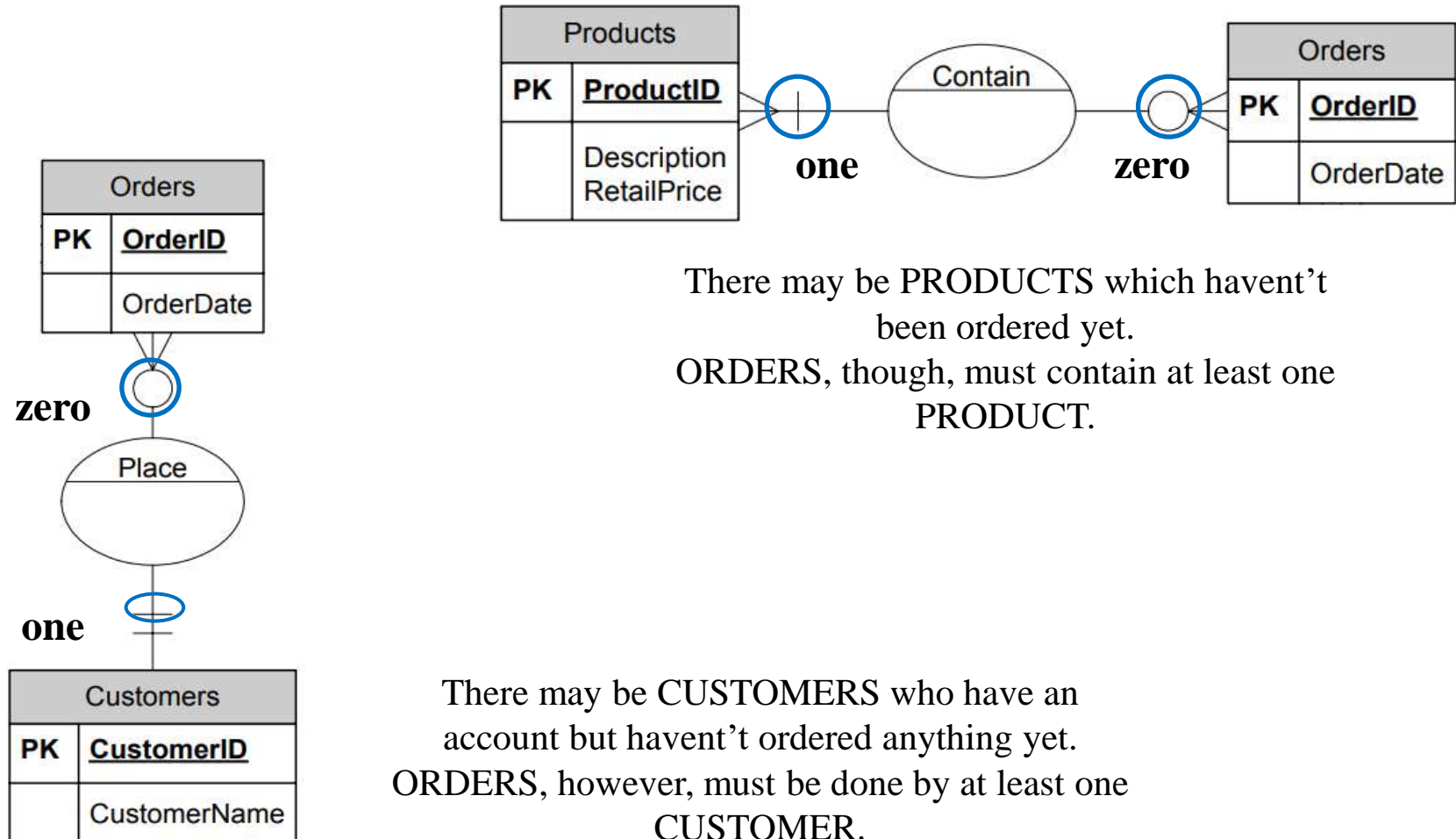
There may be PRODUCTS which havent't been ordered yet.
ORDERS, though, must contain at least one PRODUCT.

Orders	
PK	**OrderID**
	OrderDate

zero

Place

one

Customers	
PK	**CustomerID**
	CustomerName

There may be CUSTOMERS who have an account but havent't ordered anything yet.
ORDERS, however, must be done by at least one CUSTOMER.

DATABASE
E-R MODELLING

STEP 5

Check the Model

The last step is often overlooked, but it is as important as any previous steps.

In this phase, the basic idea is to go back to the original document and make sure that the structure represented in the E-R diagram can satisfy the requirements.

This means that <u>the representation of the E-R diagram must contain all the information of the original document</u>.

ORDER-NO:	44-44-4444		CUSTOMER-ID:	1002	
DATE:	10/31/98		CUST-NAME:	ABC Inc	
PROD-ID	DESCRIPTION	PRICE		QTY	EXT
A123	STEREO SYSTEM	375.00		2	750.00
C235	8" SPEAKER	150.00		8	1,200.00
X002	SPEAKER WIRE	10.00		5	50.00
		TOTAL			2,000.00

Looking back at the original document, it is clear that three items are not represented in the E-R diagram: TOTAL, QTY and EXT.

TOTAL and EXT (EXTENDED: quantity multiplied by price per unit) aren't necessary to store because they are computed. It is not important to store data that can be computed.

QUANTITY, instead, is to be put into the E-R diagram.
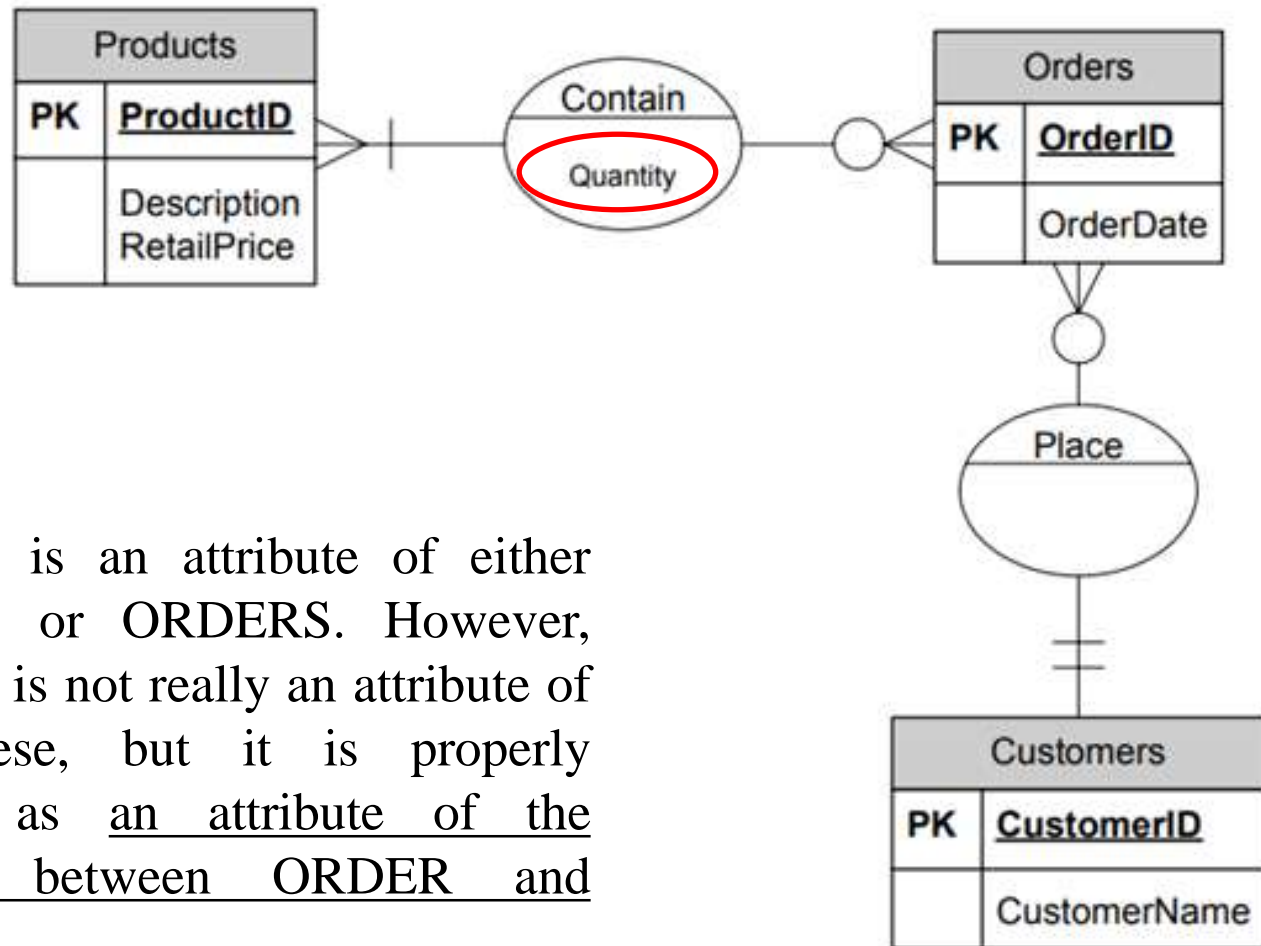
QUANTITY is an attribute of either PRODUCTS or ORDERS. However, QUANTITY is not really an attribute of any of these, but it is properly represented as <u>an attribute of the relationship between ORDER and PRODUCT</u>.

In some cases, a **many-to-many relationship (M:N)** can be <u>resolved</u>, which means replaced by another type of structure.

A many-to-many relationship can be replaced by a new ENTITY, called **associative entity**. This is an entity that associates two instances of the two entities of the many-to-many relationship.

many-to-many relationship → associative entity

When the associative entity has been created, other important steps follow:

1. the definition of the ATTRIBUTES of the associative entity

2. the definition of the PRIMARY KEY

3. the definition of the CARDINALITIES

ATTRIBUTES

The attributes of the M:N relationship become the attributes of the associative entity.

M:N → PRODUCT-ORDER
ATTRIBUTES→ *QUANTITY*

PRIMARY KEY

The standard practice is to select the primary key taking it from the two original entities. We can use the combination of these two primary keys to form the new primary key.

M:N → PRODUCT-ORDER
ATTRIBUTES→ QUANTITY
PRIMARY KEY → *PRODUCTID + ORDERID*
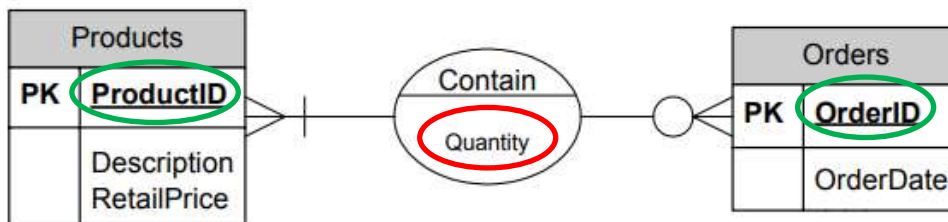
CARDINALITIES

<u>Maximum cardinalities</u> are always the same when converting M:N relationships.

The maximum cardinalities entering both sides of the associative entity are **many**; the maximum cardinalities entering the original entities are **one**. These cardinalities show the same relations shown in the original PRODUCT-ORDER relationship.

M:N → PRODUCT-ORDER
ATTRIBUTES→ QUANTITY
PRIMARY KEY → PRODUCTID + ORDERID
MAX. CARDINALITIES → *1:M (one-to-many)* in both ways

CARDINALITIES

<u>Minimum cardinalities</u> are more complex.

The minimum cardinalities for the original entities are always **one**.

The minimum cardinalities going into the associative entity depend on the minimum cardinalities going into the original entities.

The minimum cardinality on the PRODUCT side of the associative entity is **zero**; the minimum cardinality of the ORDER side of the associative entity is **one**.

M:N → PRODUCT-ORDER
ATTRIBUTES→ QUANTITY
PRIMARY KEY → PRODUCTID + ORDERID
MAX. CARDINALITIES → 1:M (one-to-many) in both ways
MIN. CARDINALITIES → *1:1 (one to one)* and *0:1 (one to zero)*

Explanation, with examples, of the minimum cardinalities:

In the ERD, the minimum cardinality going into ORDER is a zero, while the minimum cardinality going into PRODUCT is a one. This means that an instance of ORDER must be related to at least one PRODUCT, but an instance of PRODUCT does not have to be related to an ORDER. It is helpful to think of the associative entity as being an intersection of PRODUCT and ORDER. Since it is possible for an instance of PRODUCT to not be related to any instances of ORDER, it is also possible for a PRODUCT to not be related to any intersections of PRODUCT and ORDER. In other words, the minimum cardinality on the PRODUCT side of the associative entity is zero. Following the same logic, since each instance of ORDER must be related to at least one instance of PRODUCT, the minimum cardinality of the ORDER side of the associative entity is one. Figure 16 shows an annotated example of converting a many-to-many relationship to an associative entity.

Orders

PK	OrderID
	OrderDate

Contain
Quantity

Products

PK	ProductID
	Description
	RetailPrice

same relation
same relation

Arrows show conversion of cardinalities.

1:M
1:1

1:M
0:1

Orders

PK	OrderID
	OrderDate

ProductOrder

PK	ProductID
PK	OrderID
	Quantity

Products

PK	ProductID
	Description
	RetailPrice

Relationship becomes an associative entity.

Include any attributes on the original relationship.
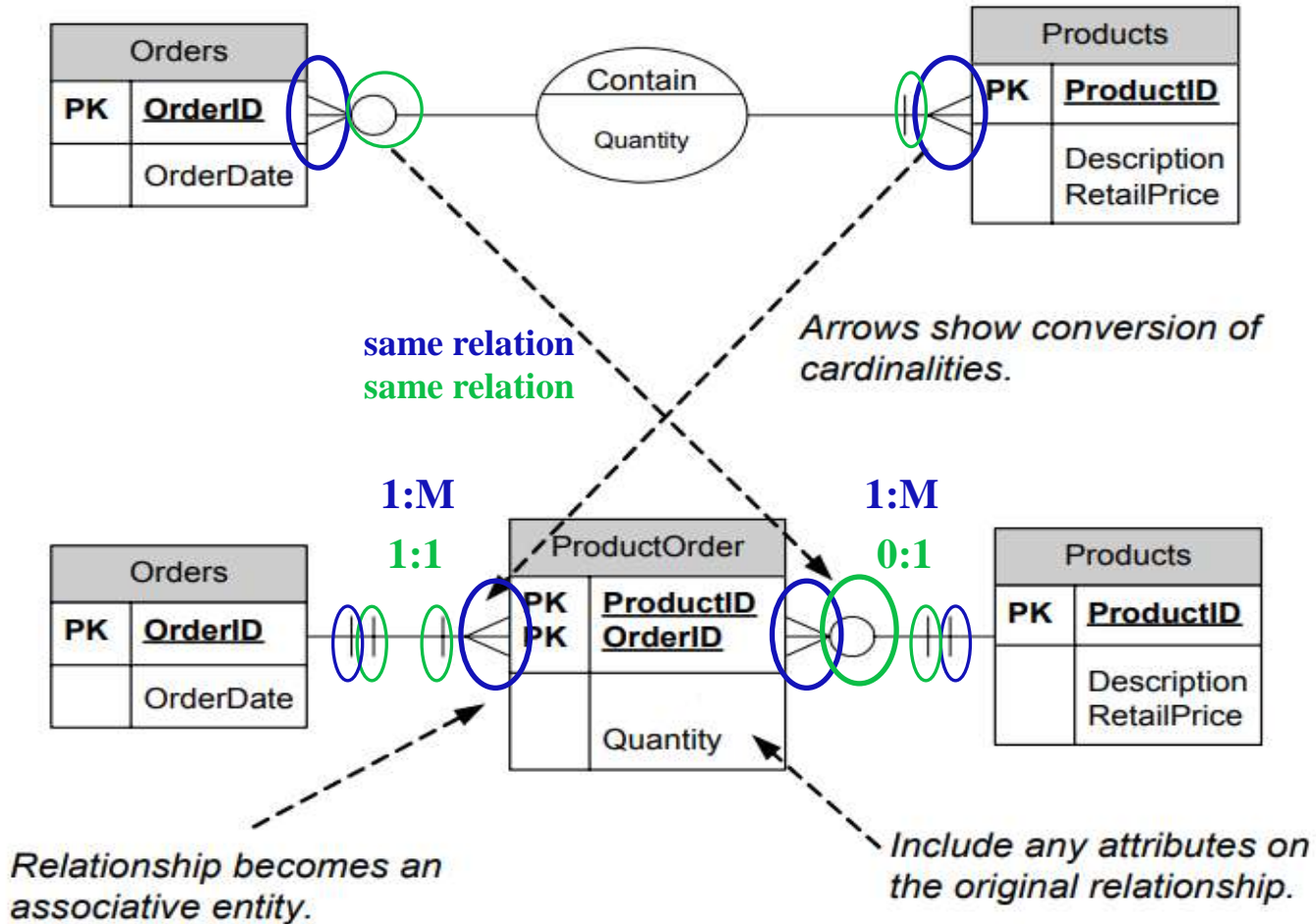
The concept of **subtypes** and **supertypes** can be introduced. They are taken into account in two situations:

1. when some attributes refer only to some instances of an entity and not to all the instances of that entity
2. when some instances of an entity participate in a relationship and some other instances of that entity don't.

In these cases, it is useful to use a subtype/supertype structure, also called **generalisation/specialisation hierarchy**.

A key concept to associate to subtypes and supertypes is **inheritance**: each subtype inherits all the attributes of the supertype.

For each CUSTOMER, we need to store an ID, and the customer's name. However, for retail customers we also need to track the sales tax rate. For wholesale customers there is no need to store the sales tax rate, but two additional attributes, discount and credit limit, need to be stored. Notice how each type of reference needs to have some common and some special information. This necessitates the use of a supertype/subtype structure.
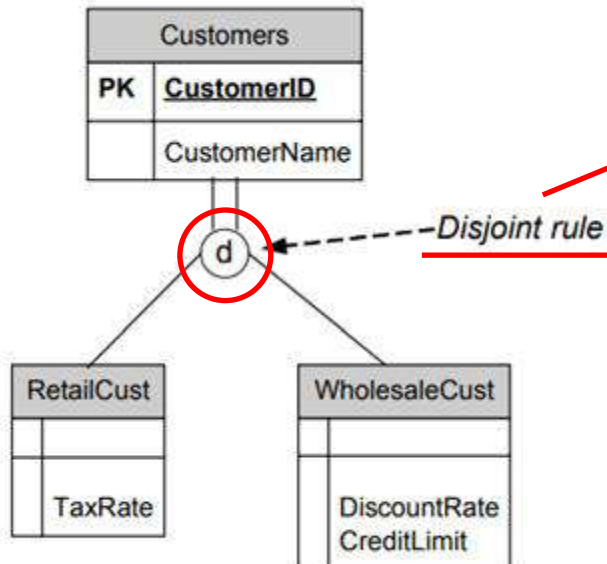
The supertype can ONLY be one of the subtypes (either RETAILCUST or WHOLESALECUST).

In the E-R Diagram, it is represented by a "d" into a circle.

The opposite is the overlap rule, when the supertype can be both (or more) subtypes (not this case).

In the E-R Diagram, it is represented by a "o" into a circle.

40

Let's consider the following types of operating system:

- Multitasking (or multiprogramming); it allows several application programs to be in RAM at one time. Each of them will be allowed (1) .... time as needed, even though only one of them is 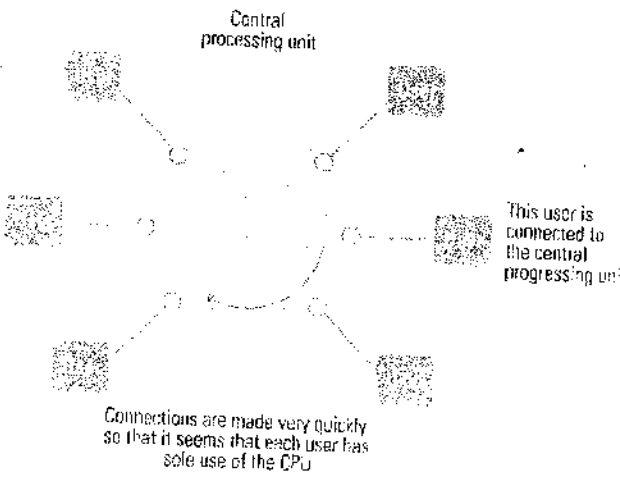currently being used by the person at the keyboard. All of this is controlled by the operating system. We can say that multitasking means the ability of a computer to run two or more programs at the same time. For (2) .... it would be difficult to do more than one task at once. The computer can, however, for example, print out, a document of 30 pages while continuing to use the word processor to type in a new letter. The operating system takes care of the printing and the word processing simultaneously.

- Multiuser (or multi-access); it permits several users to access the same data at the same time. A multiuser operating system needs to be used with most (3) .... ; so the technique that allows many users (4) .... computer resources at the same time is called "time-sharing".

- Real-time processing; it is a system which is automatically updated when a change is made due to a transaction. In the fast world we now live in, it is important that data is kept bang up-to-date so real-time systems have to be used. Since in a real-time system the (5) .... must be connected to the computer, you can see that a real-time system must also be an (6) .... system.

- Real-time processing is essential for computer control that may include traffic lights, robots, process control (e.g. steel works and chemical processes) and flight simulators. Real-time processing in the business world is computing that involves humans interacting with the computer in a situation in which quick or timely return of results is important. One example from the business world is the automated teller machine (ATM).

- Batch processing; it is a system of collecting all the inputs together and putting them into the computer in one go or "batch". The main (7) ....

with batch processing is that the computer operator can load the data in only one operation; the programs in the computer go through the various processes and the final result (for example: for the production of electricity bills) is a pile of bills to be sent out to costumers and an updated master file with the (8) ....information added.

Central processing unit

This user is connected to the central progressing unit

Connections are made very quickly so that it seems that each user has sole use of the CPU

3 Operating Systems for Personal Computers 🎧 35

There are many operating systems that you can install on a personal computer, but there are three main ones: Linux, Mac OS and Windows.

Linux

Linux is a family of operating systems whose architecture is very similar to **Unix's**, a **well-known** network operating system implementing the TCP/IP network Internet protocol.

'Linux' is named after Linus Torvalds, a student at Helsinki University who started to write this **free** operating system and who sent an invitation e-mail to a large community of programmers asking them to help in its development. The final X in the name is a reference to the close links between Linux and Unix.

Linux is a **free software** and an open source development. It is not restricted by property code, i.e. no company or individual owns this operating system and anyone is free to make copies and redistribute it. Moreover, Linux is an open source program and people can make changes to its source code to suit their own **needs** and these source code modifications are licensed under a General Public License (GPL).

Not only is Linux a single operating system with a free licence, it is a family OS and it is even possible to choose the most suitable distribution (Ubuntu, Debian, Red Hat...) according to the user's needs.
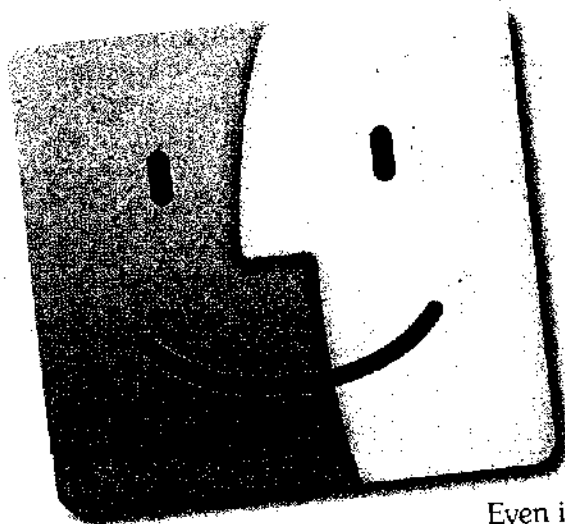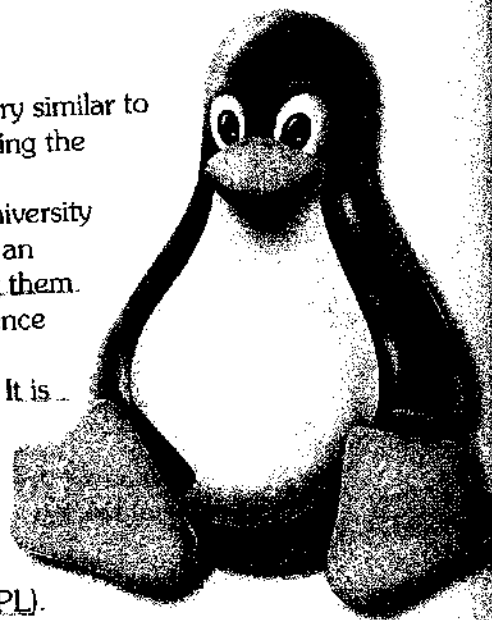
Mac OS

On 24 January 1984, Apple Computer Inc. introduced the Macintosh personal computer, known as the Macintosh 128K model. The operating system of the early Macintosh was called 'System Software' or 'System', and its **ensuing** series was later renamed Mac OS after System 7. The Macintosh platform is credited with having popularised the concept of the graphical user interface.

Nowadays, the Mac OS X version is the preinstalled operating system on Apple personal computers.

Even if the modern Mac's hardware is not different from another type of PC and the Mac OS X can run smoothly on typical PCs, the Apple licence agreement and the way they limit their software **discourage** people from installing it on a computer other than Apple.

The most important element of this operating system is the **powerful and easy-to-use graphical interface** that allows the user to manage and configure every resource and peripheral without being a computer expert. The latest versions of Mac OS are closely related to Linux, in fact they are Unix-compatible and they can run Unix applications. Such operating systems with this feature are called 'Posix systems'.

GLOSSARY

well-known: noto, conosciuto
free: gratuito, libero
need: bisogno, esigenza, necessità
ensuing: relativo, derivante
discourage (v.): scoraggiare, dissuadere

Windows

The first independent version of Microsoft Windows – version 1.0, released on 20 November 1985 – was originally going to be called 'Interface Manager', but Rowland Hanson, the head of marketing at Microsoft, convinced the company that the name 'Windows' would be more **appealing** to customers.

Windows 1.0 was not a complete operating system, but rather an 'operating environment' requiring the text-based MS-DOS operating system and extending it with a graphical user interface.

Microsoft had worked with Apple Computer to develop applications for Apple's new Macintosh computer, which featured a graphical user interface. As part of the related business negotiations, Microsoft had licensed certain aspects of the Macintosh user interface from Apple; in a later **lawsuit**, a district court summarised these aspects as 'screen displays'. In the development of Windows 1.0, Microsoft intentionally limited its borrowing of certain GUI elements from the Macintosh user interface, to **comply with** its licence.

The first version of Windows running on a workstation as a fully operating system and not as an operating environment was **Windows 95** in 1995.

Many versions have been developed since 1995 not only for workstations, but also for servers with network configuration and administration features.

Windows 10 is **currently** installed on personal computers. It is an improved version of Windows 8 which allows the user to choose between a standard graphic interface and the same interface of a Windows Mobile smartphone or tablet. Choosing this second interface is convenient for non-expert users and whenever a computer is equipped with a touch screen.

GLOSSARY

appealing: accattivante, invitante, di interesse
lawsuit: azione legale
comply with (v.): osservare, rispettare
currently: attualmente
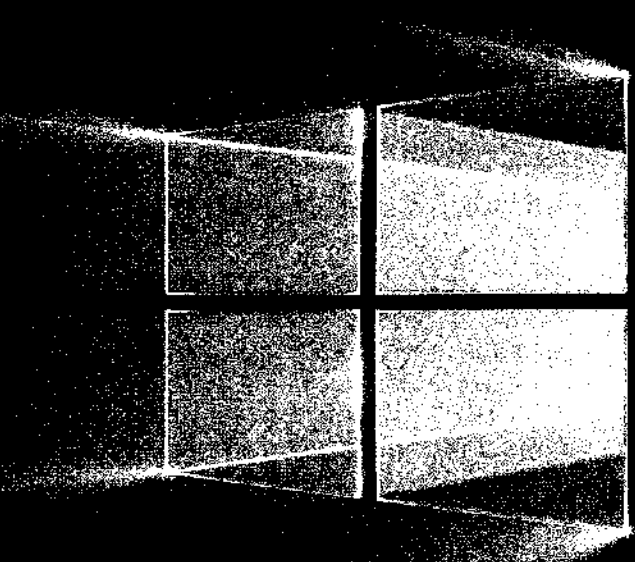
READING COMPREHENSION

1. Quickly scan the passage again and take notes on the pros and cons of the OSs mentioned, including their development.

Operating system	Pros	Cons
Linux		
Mac OS		
Windows		

VIDEO   5

2. Watch the video The Story of Linux and fill in the blanks.

This video is about the story of **1.** ...., on the occasion of its 20th anniversary.

Name   Linus Torvalds
Occupation   Computer science **2.** ....
In those days, he lived in **3.** ....

On 8th August **4.** ...., Linus wrote a post that has become one of the most famous entries in computer history, telling about his **5.** ....

Later on, this **6.** .... source project started spreading around the **7.** ...., with a large number of developers contributing to its improvement. Linus called his OS kernel Linux and chose a penguin as a **8.** ....

Torvalds decided to use a penguin because of a little incident at the **9.** ....

He also made a crucial decision, choosing the **10.** .... created by Richard Stallman. This licence allows very important freedoms, such as:

• the freedom to use the software for any **11.** .... ;

• the freedom to **12.** .... the software to suit your needs;

• the freedom to share the software with your **13.** .... and neighbours;

• the **14.** .... to share the changes you make.

Linux has had an outstanding success since 1991 and a lot of companies, such as Red Hat and **15.** ...., have adopted it.

The speaker's opinion is that Linux has revolutionised computing and is still doing it: every three months, another version of Linux is **16.** ....

The final part of the video shows how Linux is now being used and spread in different fields of our lives, i.e. the Internet, phones, **17.** ...., computers as well as in many devices we use every day.

LOW-LEVEL AND HIGH-LEVEL LANGUAGES AND TRANSLATION PROGRAMS

An algorithm is a detailed sequence of actions to perform or accomplish a task.

Most commercial programs are sold compiled, so that they will run faster and it will be difficult for others to change the program since it is now in machine code, thus protecting the manufacturer's intellectual property.

Lisp was the first example of an interpreter. It was first defined in 1958 by Steve Russell.

■ Machine language

Computers are devices which follow instructions, but they only understand **machine language** (or machine code). Machine language is made up of a sequence of 0s and 1s that the computer interprets electrically as instructions. Programmers plan the set of instructions using an **algorithm** •, and they then have to write them in a language that the computer can understand. However, it is almost impossible for humans to program using a machine language since it is very difficult to remember long sequences of binary code. For this reason, other **programming languages** were invented; they are easier for humans to write, but computers cannot understand them, so, special translation programs are needed.

Programming languages can be classified into low-level and high-level languages.

"Hello World" in binary

01001000 01100101 01101100 01101100
01101111 00100000 01010111 01101111
01110010 01101100 01100100

■ Low-level and high-level languages

Low-level languages (LLL) are considered closer to computers and their primary function is to operate, manage and manipulate the computer hardware and components. Programs and applications written in a low-level language are directly executable on the computer hardware without any further translation. **Machine language** and **assembly language** are examples of machine-dependent, low-level languages.

High-level languages (HLL) were created with the programmer in mind and their syntax is closer to a natural language like English; for example, they have words and a sentence-like structure. For this reason, they are easier to learn and use. Moreover, they are not machine-dependent and a program, once written, can be used on different types of computers.

■ Translation programs

There are three types of **translation programs**: compilers and interpreters are used for high-level languages, and assemblers for assembly language.

- A **compiler** •• converts the whole program in one go, i.e. all at once. It converts it into an **object file,** and a second, related program, called **linker**, converts the object file into an **executable file**.

- An **interpreter** ••• takes each line of instruction from the source code in turn, converts it into machine code and executes it one by one.

- An **assembler** translates assembly language into machine code. One instruction in assembly language corresponds to one machine code instruction.

110010
100110
00111

to add: *aggiungere*
source code: *codice sorgente*
syntax: *sintassi*
time-consuming: *lungo*
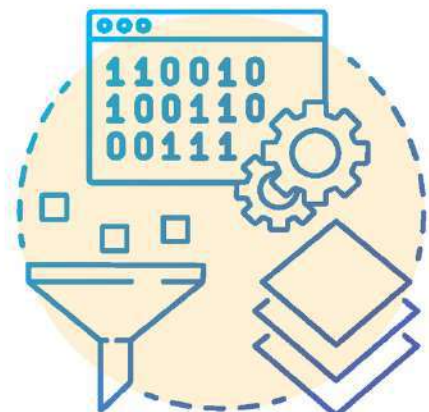
FIRST AND SECOND GENERATION LANGUAGES

The evolution of programming languages can be studied by dividing them into different generations, strictly connected to computer hardware development. There are five generations, starting from machine language to languages that are similar to natural languages.

Independently from the language used for programming, the algorithm has to be represented graphically and **flowcharts** are the most common tools.

■ First generation

The **first generation** of programming languages (1940s) was called **machine language**● or machine code. This is the only language a computer really understands, a binary sequence of 0s and 1s that the CPU interprets as commands. Each instruction consists of two parts, both in binary digits: an **operation code**, which specifies the action to be carried out, and an operand, or **memory address**, relevant to the instruction. A typical program looks like two or three columns of 1s and 0s, intelligible only to computer experts.

Before the invention of machine language, skilled engineers had to manipulate some parts of computer hardware with their own fingers by positioning electrical relay switches in either the on or off position. The invention of machine language was a revolution, although a program written in machine code is **machine-dependent**, i.e. programmers have to completely rewrite the program if the same program is needed on another computer. Moreover, even though the language is easily executed by the computer, it is subject to errors because people find it difficult to decipher it. This language was used with vacuum tube computing machines.

■ Second generation

The **second generation** was called **assembly language**● and it was used to program transistor-based computers. It appeared in the 1950s and represented a step forward because it made it possible to program with macroinstructions. In fact, assembly language turns the sequences of 1s and 0s into alphabetic abbreviations of English words called **mnemonics,** or **memory aids**, to represent operation codes and **abstract symbols** for the operands. The result is still two or three lines of code, but more intelligible than machine language and less subject to errors. Examples of mnemonics include words such as *add*, *load* and *store*, while symbolic operands include *num1*, *num2* and *sum.*

Assembly is still popular among programmers because it creates compact, fast code. However, like machine language, it is **machine-dependent**, and a low-level language. Therefore, it is still more difficult than high-level languages.

Assembly Language

```
mov ecx, ebx
mov esp, edx
mov edx, r9d
mov rax, rdx
```

Programmer

Assembler + Linker →

Machine Language

```
100101011001
010011111011
111010101101
01010101010
```

Processor
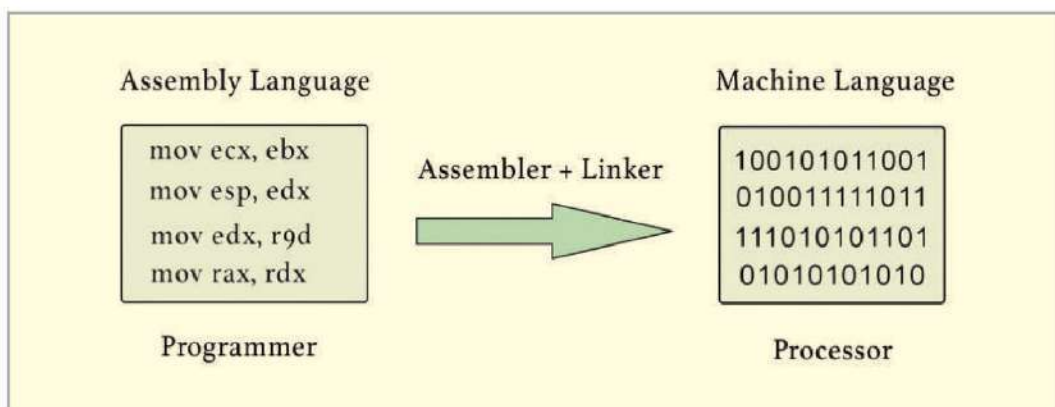
THIRD GENERATION LANGUAGES

The **third generation** of programming languages developed after integrated circuits were designed. These languages were called high-level languages and were designed around the ease of use for the programmer with the aim of reducing bugs and the ability to reuse the codes, i.e. creating languages which were not machine-dependent.

High level languages are meant for general purpose programming and show a great enhancement in logical structure over assembly language. The instructions, called **statements**, are a combination of English-like phrases and mathematical terms to express a problem or task. Both the syntax, i.e. the sentence structure, and the semantics, i.e. word meaning, do not reflect the internal machine code of any particular computer, so they can be used on any machine.

Third-generation languages are also procedural languages and the first examples of modular programming.

■ Procedural languages

A procedure is a sequence of steps performed in a particular order; a **procedural language** is one that expresses a computer problem both as a series of discrete tasks and the instructions needed to accomplish them.

Procedural languages can be classified as: **business, scientific** or **multipurpose.** COBOL is an example of language used to create business systems, while FORTRAN (Formula Translator) is still a popular scientific language. PASCAL• and BASIC are examples of multipurpose languages•.

to accomplish: *compiere*
branch: *diramazione*
discrete: *separato*
ease: *facilità*
enhancement: *miglioramento*
nesting: *annidato*
to reuse: *riutilizzare*
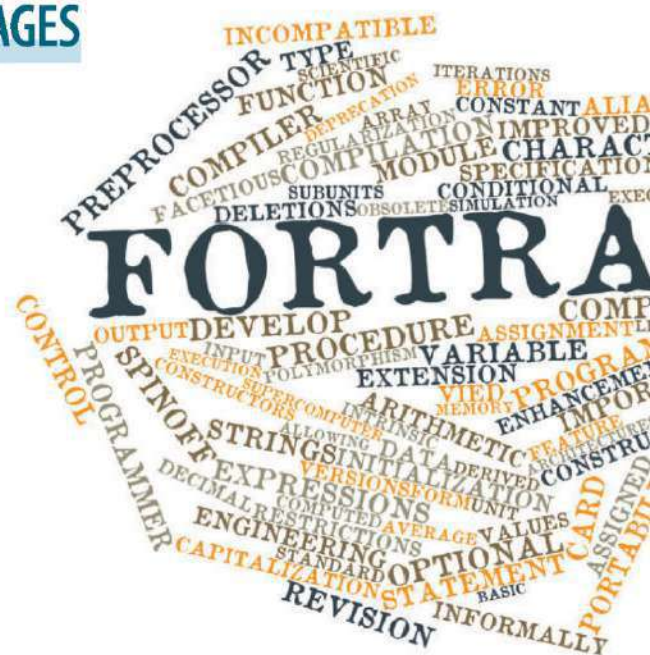
■ Modular and structured programming

Modular programming means that programs can be written in modules, otherwise known as subroutines, which are independent and modifiable.

Such **subroutines** are independent sections of a program which can be incorporated into a complete one. A subroutine can be added at any point in the main program and is usually built so that, when the instructions have been performed, a return branch is automatically made to the instruction immediately following. The instructions performed by the subroutine can be modified by the use of parameters that may be specified in the main program.

Apart from independent subroutines, it is also possible to have **nesting subroutines:** a series of subroutines arranged at different levels, i.e. one written within another.

The concept of modular programming leads to another aspect of high-level languages that is **structured programming**. Structured programming refers to any program that consists of blocks of code whose internal details are independent.

FOURTH GENERATION LANGUAGES

The **fourth generation** of languages, those of microprocessors, are even more human-like than previous languages. These languages are even more programmer-friendly and allow for the use of a graphical user interface (GUI) to move the cursor over an object and move it to a new location (e.g. *drag and drop*). They are **non-procedural languages**, which means that the program specifies what to do, but not how to do it, and are mainly used to retrieve and format data for reporting.

They include three categories, which are all related to database management and markup languages.

■ Database management languages

- **Query languages** are primarily used for creating, accessing and modifying data in and out of a database management system (DBMS). They typically require the user to input a structured command that is similar to an English-like querying construct, such as SELECT FROM•. As the contexts of use are simple, query languages are easy to learn and use. There are different types of QL and the most popular is SQL (Structured Query Language).

- **Report writers** take the information retrieved from a database, or from an existing application, and format it in an appealing output. They can also perform a limited number of calculations such as totals, subtotals, and averages, and some provide custom calculation formulae. Report writers enable the user to create virtually any print or on-screen report that is too complex or time-consuming to create by hand.

- **Application generators** enable the user to specify a problem and describe the desired results. One statement or descriptive line may generate a huge routine or an entire program, usually in assembly language or binary code••.

■ Markup languages

Markup languages are not programming languages in a strict sense: they do not run routines (i.e. repetitive operations) and do not do logical operations. They are **declarative languages** that focus on data presentation and structure and are used to explain, or declare, how texts are to be edited, as, for example, when a word has to be displayed in italics or in bold.•••

The most common markup language is **HTML (HyperText Markup Language)** which is used to display web pages.

appealing: *accattivante*
average: *media*
bold: *grassetto*
custom: *standard*
italics: *corsivo*
to retrieve: *recuperare*

HIGHER ABSTRACTION FOURTH GENERATION LANGUAGES

The first object-oriented language was *Simula* in 1965.

With encapsulation it is possible to alter an object without changing the rest of the program.

Two further categories of languages which belong to the fourth generation, but which show a higher level of abstraction, are object-oriented languages and visual languages.

■ Object-oriented languages

Object-oriented languages are used in **Object-Oriented Programming (OOP)** and are often described as the opposite of procedural languages since programs are built around objects and their interactions rather than on actions. Each **object** is a series of instructions to simulate a real-world object, for example the object *car* is a series of instructions to simulate a real *car*. An object belongs to a **class,** which is a set of procedures and data definitions from which many objects of the same kind can be created according to the principle of inheritance. For example, *vehicle* is a class to which the object *car* belongs. An **instance** of a class or of an object is the actual object created in run time (during the execution of the program), for example a real car, while the **methods** are the object's capabilities, that is what it can do, for example *move forward*. So, in OOP, a programmer tells the object what to do according to the characteristics that have been attributed to the object.

to belong to: *appartenere*
inheritance: *ereditarietà*
pattern: *schema*
run time: *tempo di esecuzione*
wheel: *ruota*

■ Features of OOP

Two important features of OOP are encapsulation and abstraction. **Encapsulation** is the technique by which all the data concerning the object are kept together. **Abstraction** is the process of identifying common patterns with only systematic variations. For example, for the class *vehicle* a common pattern is wheels because they are present in the class as a whole but can vary according to the object. In fact, there are two in a motorcycle, four in a car and many more in a lorry. Thanks to this process of generalisation the amount of information which needs to be memorised can be reduced.

OBJECT ORIENTED PROGRAMMING

CLASS
◇ DOG

OBJECTS
◇ NAME

ATTRIBUTES
◇ HEIGHT
◇ WEIGHT
◇ FOOD

METHODS
◇ RUN
◇ PLAY
◇ EAT
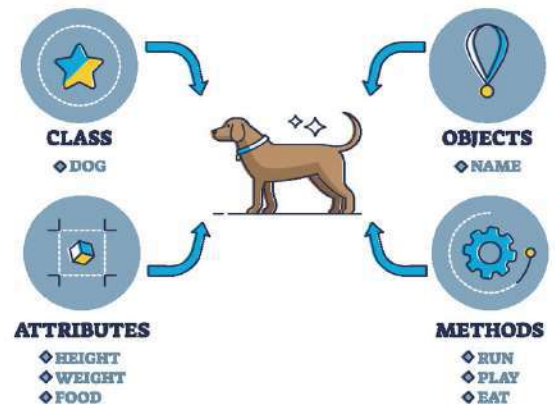
■ Visual languages

With **visual programming languages (VPL)**, programs are created through a **GUI** (graphical user interface) which interacts with windows, icons and menus in order to execute commands such as copying, deleting, and moving files. The advantage is that it is no longer necessary to write a program using syntax. In fact, visual programming uses one or more **IDEs** (Integrated Development Environment), an applications package with interfaces providing a series of functions such as a code editor, a compiler or interpreter, a debugger and automation tools to assist the program developer. Today, there are many VPLs and some of them are hybrid, i.e. also text based, like the popular Visual Basic.
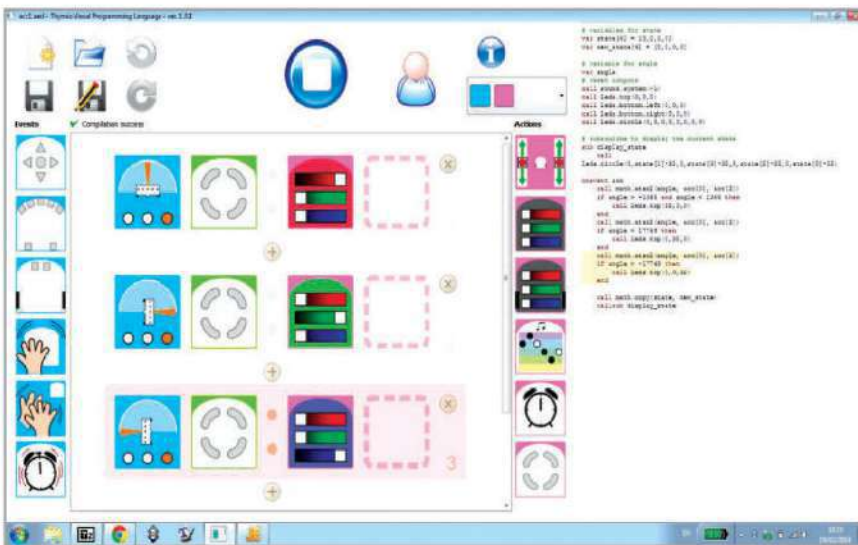
15 ▶ 🖊 **Watch the video and answer the questions.**

▶ What is Object-Oriented Programming (OOP)? *posted by* Treehouse

1. What are the advantages of OOP?
2. What can you encapsulate with OOP?
3. What are the properties of the object *card*?
4. How can new objects be created?
5. What do objects have?
6. What are actions called in OOP?

16 🖊 FIRST **Read the sentences, then complete the second so that it means the same as the first. Use no more than three words.**

1. A programmer can use a top-down approach to develop a program. ➡
   A top-down approach can .... a programmer to develop a program.

2. Objects with the same characteristics are grouped into classes that have important similarities. ➡
   Classes are .... with the same characteristics.

3. Class attributes are owned and shared by every object of the class. ➡
   An object .... the same attributes with all the other objects of the class.

4. Subroutines are combined and nested in one another by programmers. ➡
   Programmers .... subroutines in one another.

5. Once programmers have learnt OOP, they become more productive. ➡
   Learning OOP .... become more productive.

17 🖊 **Look at the diagrams showing the different characteristics of procedural and object-oriented languages. Write a short text comparing the two.**

PROCEDURAL LANGUAGES
- top-down instructions to accomplish a task
- procedures, routines, subroutines
- risks of spaghetti code
- more bugs, more debugging time

OBJECT-ORIENTED LANGUAGES
- interaction with objects to accomplish a task
- objects and classes of objects
- attributes and variables to define state, methods to define actions
- modifiable, reusable
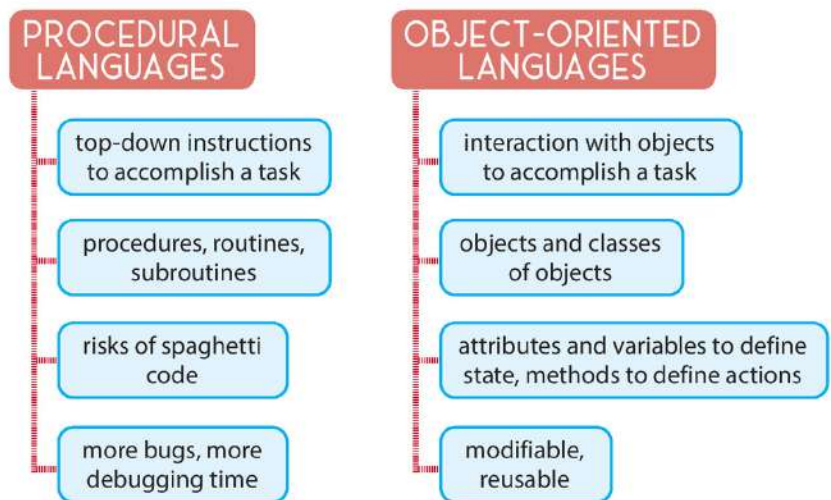
18 👥 **Look at the diagram and describe the uses of visual programming languages.**

VISUAL PROGRAMMING LANGUAGES

GUI interacts with
- windows, icons, menus
- to execute commands

IDE facilitates
- programmer's needs
- to highlight errors
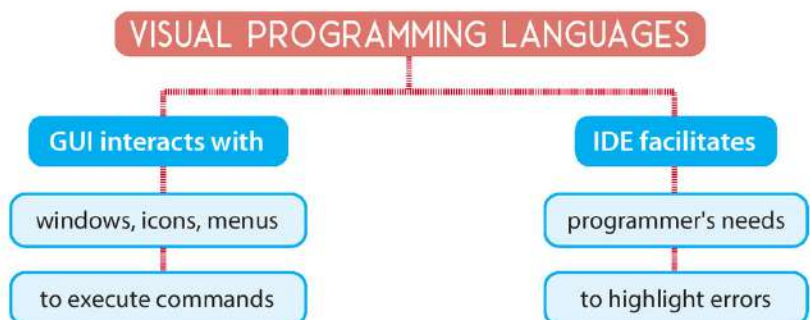
FIFTH AND SIXTH GENERATION LANGUAGES

■ Fifth generation languages

Rather than using an algorithm written by a programmer (imperative programming), a **fifth generation programming language** (**5GPL**) • is based on solving problems using given constraints without the programmer, who only needs to worry about what problems need to be solved and what conditions need to be met without worrying about how to implement a routine or algorithm to solve them. This kind of programming is also called constraint-based programming, but 5GPLs also include logic programming languages (which use a form of mathematical logic to solve queries on a programmer-given database of facts and rules), and some declarative languages.

■ Limits

Fifth generation languages are used mainly in artificial intelligence research. Some examples are: Prolog (acronym for PROgramming LOGic), OPS5, and Mercury.

In the 1980s, fifth-generation languages were considered the future, and some predicted that they would replace all other high-level languages. However, as larger programs were built, the flaws of the approach became more apparent. Starting from a set of constraints to define a particular problem is in fact very difficult. This step cannot yet be automated and still requires the insight of a human programmer.

■ Sixth generation languages

A **sixth generation programming language** (**6GPL**) is a very high-level programming language with extreme abstraction •• which usually consists of a set of human-readable instructions. It may be domain-specific or general-purpose and often applies natural language processing in order to function.

Basically, the operating system uses a natural language processor to analyse a command and determine its meaning. After determining the meaning, the natural language processor invokes an interlanguage decompiler (ILD) to rewrite the command in a common high-level language. Once the ILD decompiles the command, a low decompiler rewrites the command into assembly language or machine code. Then, the central processing unit executes the command.

---

constraint: *vincolo*
to deploy: *distribuire*
flaw: *difetto*
to implement: *implementare*
insight: *intuizione*
menial: *umile*

CHARLOTTE BRONTË'S *JANE EYRE* AND JEAN RHYS'S *WIDE SARGASSO SEA*
1.1

The Victorian Age and the role of women, the British Empire and mental health

The Victorian Age (1837-1901)

The Victorian Age derives its names from Queen Victoria, who ruled from 1837 to 1901, one of the longest reigns in the English history

Some of the most important aspects of the Victorian society were:
- family
- reforms
- technological progress
- British Empire

The Victorian Age (1837-1901)

FAMILY

Queen Victoria was married to Prince Albert and they had nine children.

They were the example of the **traditional patriarchal family**, where the woman is the **"angel of the hearth"**, which basically means a good mother who takes care of her children and of her house

REFORMS

Many **social** reforms were enacted, especially those which helped and supported the poors.

Workhouses were built: these were institutions where poor people received food and lodging in return for food.

The Victorian Age (1837-1901)

TECHNOLOGICAL PROGRESS

These are the years of the (first) **Industrial Revolution**, whose achievement are shown thanks to the **Great Exhibition** of 1851.

In 1860, the first works for the **London Underground** started.

THE BRITISH EMPIRE

During the Victorian Age, the British Empire reached its greatest expansion and Queen Victoria became **Empress of India** in 1876.

4

The Victorian Age (1837-1901)

THE VICTORIAN COMPROMISE

An age of **contradictions**:
- technological progress, social reforms and political stability
- poverty, diseases, injustice

philanthropy and charities

to appear a good person > to be a good person

respectability

morality and hypocrisy: negative aspects were hidden under this veil of good appearance

to appear a good person = to be a good person

sex

general attitudes to sex were a crucial aspect of respectability, with an intense concern for female chastity, and single women with a child were marginalised as "fallen women"

Sexuality was generally repressed in both its public and private forms prudery became the most respectable attitude

The Victorian Age (1837-1901)
The British Empire

CONQUEST → to take over the resources of another country
to control politically and economically another country

COLONISATION → to impose your way of living on others
to force other people to become you

The British both conquered and colonised!

Trevor Noah on immigrants in the UK:
https://www.youtube.com/shorts/8OKhZWfD7sg

The British wanted to replace the cultural and national identity of the colonies with their own: they wanted the other people to become British, they wanted to export the British lifestyle all over the world
The reason why they did that was that they believed that this was **their mission as superior beings**

The Victorian Age (1837-1901)
The British Empire

The White Man's Burden, Rudyard Kipling

[…]
Take up the White Man's burden
no tawdry rule of kings,
but toil of serf and sweeper
the tale of common things.
the ports ye shall not enter,
the roads ye shall not tread,
go mark them with your living,
and mark them with your dead.
[…]

Rudyard Kipling was the spokesman of the British Empire

The white race is morally obliged to civilise the non-white peoples of planet Earth, and to encourage their progress (economic, social, and cultural) through colonialism.

The implication, of course, was that the Empire existed not for the benefit - economic or strategic or otherwise - of Britain, itself, but in order that primitive peoples, incapable of self-government, could, with British guidance, eventually become civilized (and Christianized).

The Victorian Age (1837-1901)
The role of women

The Victorian Age (1837-1901)
The role of women

→ women were secondary citizens to men in the Victorian society
→ women didn't have the chance to advance or make progress in their lives

→ TWO SEPARATE SPHERES: women were considered to have different natural characteristics to men
• women were passive, weak, morally superior
• men were active, strong, intellectually superior

Men spent their days outside, facing the reality of the world so that they were exposed to **corruption**; women, who spent their days at home, had the duty to provide **moral cleansiness** and to pass that attitude on to the future generations

It was unnatural for women to pursue intellectual activities, because in doing do they could usurp men's "natural" intellectual superiority
Women then had to devote themselves to **accomplishements**, such as painting, music, embroidery, French,…

Obviously, women had no access to **jobs, university** or **vote**

The Victorian Age (1837-1901)
The role of women

IF YOU WERE A RICH GIRL,…

→ **MARRIAGE**

• Marriage was a social and economic act: by marrying, a woman could maintain or improve her social position; a woman would generally accept the husband chosen by her parents (well, father)

• Women over 25 were considered too old to get married and they often became **spinsters**; being an unmarried woman was a disgrace

• Women couldn't show much interest in finding a man, because that would reveal sexual appetite which "didn't exist" in women at the time (women had sex only because they had to have children)

• Women had no rights in a marriage: they didn't even have rights on their children! They couldn't rely on divorce and if they were unfaithful, they were severely punished. Guess what happened if a man was unfaithful? Nothing.

• Women couldn't work: their job was to take care of the family and of the house

The Victorian Age (1837-1901)
The role of women

IF YOU WEREN'T A RICH GIRL,…

→ **WORK**

• **Factory workers**
Those were the years of the Industrial Revolution and women formed the 60%-80% workforce. They weren't paid as much as men, but worked many hours all the same and did wearing and exhausting jobs. This resulted in unhealthy lives and ugly appearance, so that the possibility of getting married became rarer and rarer

• **Governesses**
Middle class girls, whose social condition allowed them to be educated but not to "buy" a husband, had the possibility to work as governesses in the rich houses. Their job was to teach children, especially girls, all the accomplishments rich women should possess. They were extremely lonely because they belonged neither to the family nor to the servants.

• **Prostitutes**
Many women worked as prostitutes as a part-time job because they didn't earn enough money to support themselves and their families. They were considered a threat to the family and the society, because they were seen as unhealthy individuals incapable of being saved (they were far beyond redemption).
The irony lays on the fact that if women had been paid more, prostitution would not have been a problem anymore. Moreover, many respectable fathers visited prostitutes more than their own wifes.

The Victorian Age (1837-1901)
Mental health issue

Mental health is a very important issue and still today, despite evident advancements and improvements, it is an aspect of society that needs development and further studies

In the past, mental illnesses didn't have the same status as physical illnesses and so both treatment and regard of the patients was very different from that of today

→ People were kept in asylums or madhouses

→ Apart form mentally ill people, there were also criminals, poors and homeless people

→ Asylums were mostly used to segregate and isolate unwanted people, who didn't receive any medical treatment which could really help them

→ The most common medical treatments were chains, bloodletting, purging and exorcism (people with mental illnesses were thought to be possessed by demons or the devil)

→ Starting from the 18th century, more appropriate treatments were introduced (no more segregation, recreations and amusement were promoted, as well as fresh air and physical exercise); unfortunately, because of the lack of funds and an increasing number of patients, most of these innovative techniques failed

The Victorian Age (1837-1901)
Mental health issue

In Victorian times, asylums were still used to shut unwanted individuals out from society, keeping them hidden away from public view.

Women, especially, were confined to institutions in great numbers, often simply for failing to adhere to society's strict expectations of women at the time.

Scientists believed that women were prone to a condition called "hysteria" and the only way to alleviate it was for a married woman to have intimate relations with her husband. If a woman was unmarried, her hysteria could be relieved by going to the doctor for a "pelvic massage." The stimulation would alleviate the condition the woman suffered from. But fun fact, the vibrator was created to give doctors' hands a break.

It should also be noted that if an unmarried man was suffering from hysteria, it was better for him to see a prostitute than to masturbate.

Charlotte Brontë's *Jane Eyre* (1847)

Anne (1820), Emily (1818) and Charlotte (1816) Brontë (*right*) spent most of their lives in isolation in a remote part of Yorkshire, in northern England. They did not receive a formal education. Apart from brief periods at school, they were mainly self-educated, reading widely from their father's library.

Like many female writers of the period, they decided to use <u>pseudonyms</u>: they were Currer, Ellis and Acton Bell. It was under these pen names that each of the sisters published their novels: Charlotte (Currer) published *Jane Eyre*, Emily (Ellis) *Wuthering Heights*, and Anne (Acton) *Agnes Grey*. Only Jane Eyre was immediately successful. Anne and Emily died at the end of the 1840s. Charlotte lived until 1855 when she died after marrying a reverend.

Charlotte Brontë's *Jane Eyre*

Jane is a penniless **orphan**, brought up at Gateshead by her cold and hostile aunt, Mrs Reed. Jane is then sent to Lowood School, **a very strict school** where she is not given enough food and clothing. When she grows up, she becomes a teacher there, but finally she decides to accept a job as a **governess** at Thornfield Hall, where she soon falls in love with **Mr Rochester**, its owner. Her stay at the Hall is disturbed by strange noises and frightening events.

After spending some time at her aunt's deathbed, Jane returns to Thornfield and Rochester proposes to her. She agrees to marry him, but two nights before the wedding she wakes up and sees a figure standing by her bed and her wedding veil torn into two pieces. The wedding is interrupted by a stranger who declares that Rochester has already a wife, **Bertha Mason**, **a madwoman** he married in the West Indies and who lives in the attic of the house, looked after by Grace Poole. Rochester asks Jane to stay with him, but she leaves Thornfield and goes to live with her cousins at Moor House. There she meets St John Rivers, a religious man who plans to become a missionary and proposes to her. Jane refuses and one night she hears Rochester's voice calling her. She returns to Thornfield Hall, but the house has been destroyed by a fire caused by Bertha, who then threw herself downstairs and died. Mr Rochester lost his sight and a hand in the attempt to save his wife from the fire. He now lives in Ferndean, where Jane visits him and agrees to marry him. He finally recovers his sight when their first child is born.

https://www.youtube.com/watch?v=-JBAivTU1vw&ab_channel=CourseHero

Charlotte Brontë's *Jane Eyre*

☑ the story is told by the **perspective of a woman**
• Jane speaks frankly about her **passions and emotions**
• the sexual tension between Jane and Rochester is evident
• she opens new possibilities for women at the time

☑ Jane fights for **equality between man and woman**
• she refuses to marry Rochester when she realises that he is already married and doesn't want to become his mistress
• she refuses to marry St John Rivers because she doesn't love him
• she marries only when she is on the same level as Rochester: she is now rich because she inherited her uncle's money → she maintains her **dignity** intact
• Jane and Rochester love each other because they are intellectual and emotional equals

☑ this novel is a **Bildungsroman**, a novel of growing up
• as Jane grows older, she shows **independence** and an ability to survive, even if she is not a privileged subject

Charlotte Brontë's *Jane Eyre*

❌ Jane stands for the modern heroine who goes against the traditions for the whole novel and in the end she marries Rochester, embodying the figure of the **angel of the house**

❌ Charlotte Brontë writes about a modern woman and deals with themes that revolve around women's independence, their role in the society and in the family. Unfortunately, she persists in comparing the modern and good Jane to the savage and villain Bertha, promoting the discrimination that women suffered (and suffer) in the society
➔ intersectional feminism*

❌ Edward Rochester is always presented as the good hero, who takes care of Bertha by keeping her safe on the third floor. The words and expressions used to describe him, promote the discriminating glance of the time, both against women and against the "inferior" colonial subjects

❌ Charlotte Brontë blindly believed in certain principles of the Victorian society, such as that of the racial superiority of British people over people from the colonies. Hers is a **colonial gaze**, which reflects in the involuntary treatment of colonial themes, generally accepted and not questioned:
- the inferiority of Bertha, because of her origins
- the legitimation of Jane's inheritance, coming from a colonies' exploiter
➔ All this is on the background and is accepted by the readers of the time and the writer herself

Charlotte Brontë's *Jane Eyre*
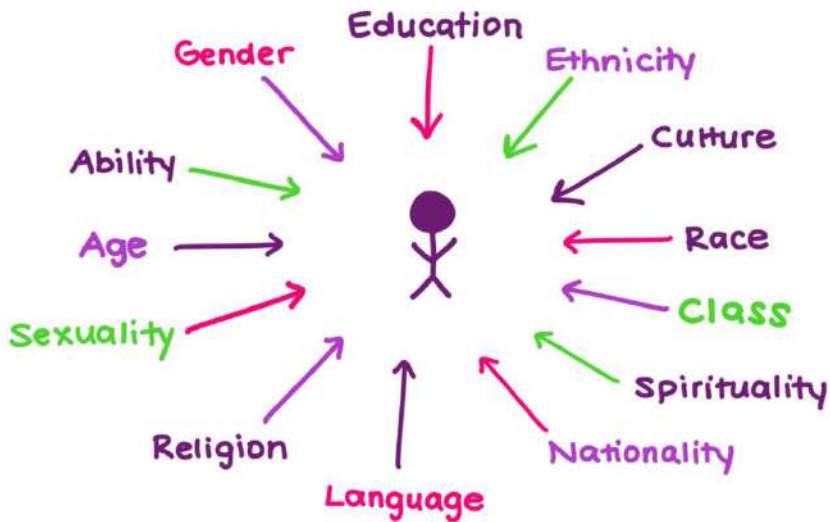
*INTERSECTIONAL FEMINISM

"The interconnected nature of social categorizations such as race, class, and gender as they apply to a given individual or group, regarded as creating overlapping and interdependent systems of discrimination or disadvantage"

→ **people's social identities can overlap, creating compounding and multiple experiences of discrimination**

White straight man

PRIVILEGE

Black/Asian LGBTQIA+ woman

Charlotte Brontë's *Jane Eyre*
The character of Bertha Mason

→ **gothic element**: it shows the darkest fears, often used to represent the life of the soul, the inner life of characters

→Bertha Mason is a colonial subject: she comes from the West Indies and has been married to Rochester for 15 years

→she never speaks English, or any other human languages: she makes animal noises and is identified at the beginning of the novel because of her demonic laugh

→ she is commonly **dehumanised**, because she is <u>different</u>:
- a woman (physically bigger and stronger than other women)
- from the colonies (her complexion is darker)
- mentally ill

→ Bertha is always described by Jane, who sees her a threat

→ people at the time would sympathise for Jane and Rochester, because of their cultural environment, and tey would justify Bertha's treatment and the violence against her

CHARLOTTE BRONTË'S *JANE EYRE* AND JEAN RHYS'S *WIDE SARGASSO SEA*
1.2

The Victorian Age and the role of women, the British Empire and mental health

Decolonisation and Postcolonial Studies
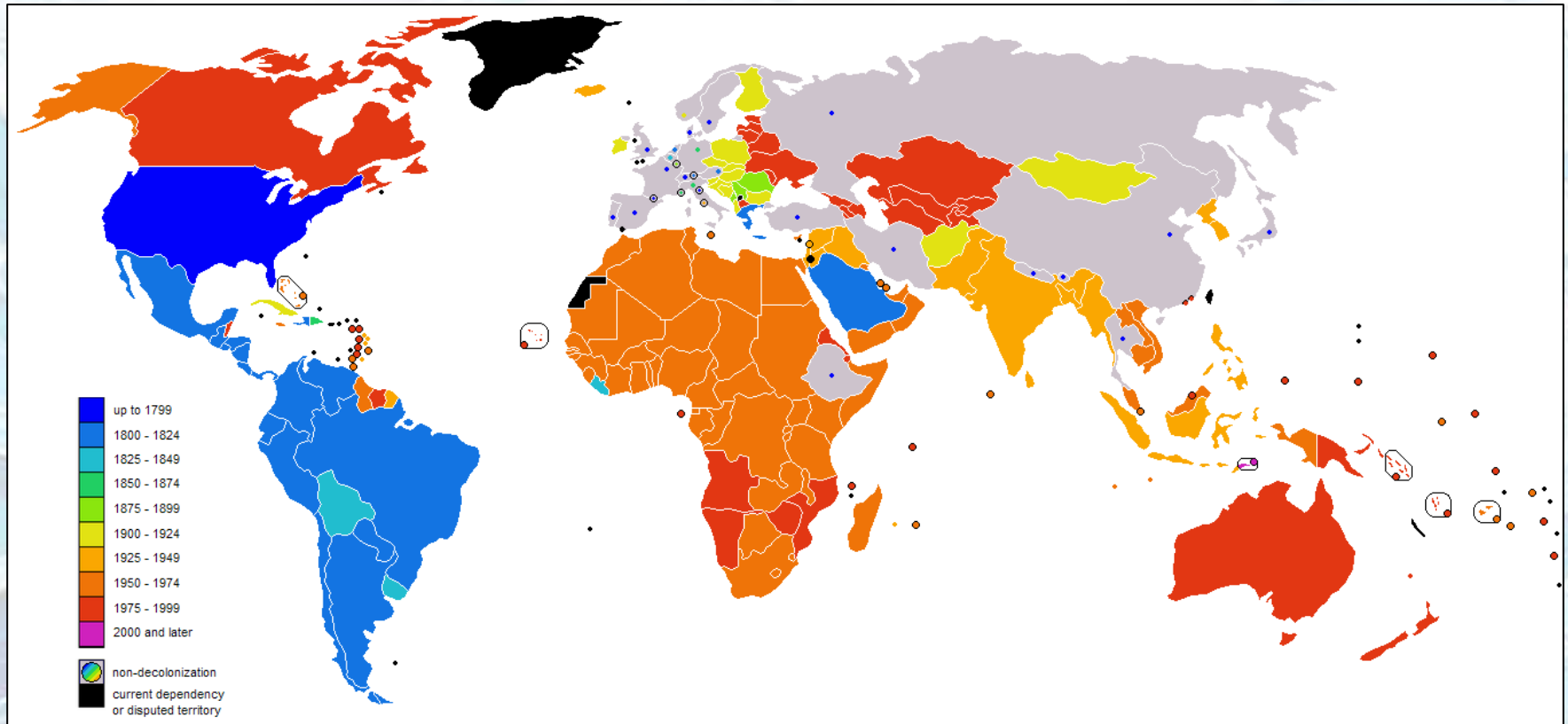
DECOLONISATION → especially after the WWII, many colonies got independence from the motherlands that had ruled over them for centuries. Among the reasons that led the colonies to such a change, there was the self-determination of countries, which is the right to define their own government, based on a common national identity

Decolonisation and Postcolonial Studies
What is Postcolonialism?

"Postcolonialism's concerns are centred on <u>geographic zones of intensity that have remained largely invisible</u>, but which prompt or involve questions of history, ethnicity, complex cultural identities and questions of representation, of refugees, emigration and immigration, of poverty and wealth - but also, importantly, the energy, vibrancy and creative cultural dynamics that emerge in very positive ways from such demanding circumstances. <u>Postcolonialism offers a language of and for those who have no place, who seem not to belong, of those whose knowledges and histories are not allowed to count.</u> It is above all this preoccupation with the oppressed, with the subaltern classes, with minorities in any society, with the concerns of those who live or come from elsewhere, that constitutes the basis of postcolonial politics and remains the core that generates its continuing power."

Robert Young

Postcolonialism focuses on the marginalised areas of the world, which have never had the chance to speak for themselves, because the colonising Western power was their only voice.

Postcolonial studies offer these people the possibility
• to define their own cultural identity
• to use a language to speak about themselves
• to have control over their representation
• to promote a different perspective from those given by the Western people.

Decolonisation and Postcolonial Studies
What is Postcolonialism?
Some theorists

Frants Fanon
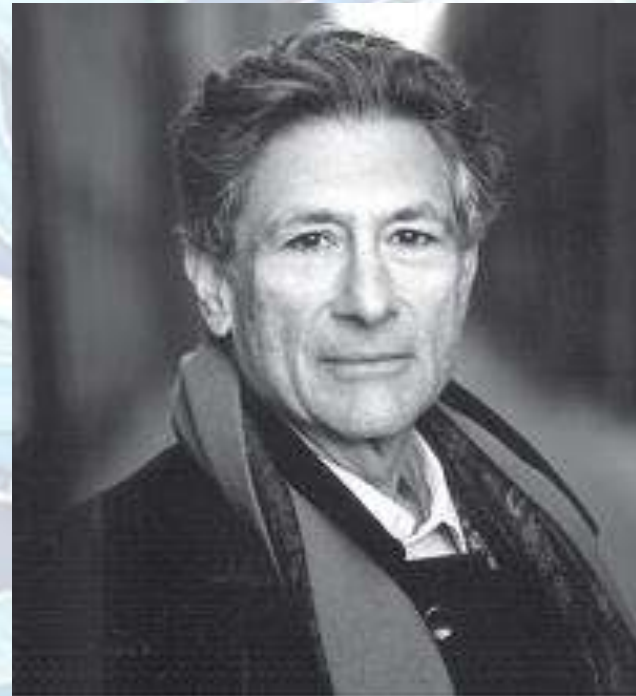
Edward Said

Decolonisation and Postcolonial Studies
What is Postcolonialism?
Some theorists

Edward Said

Edward Said introduced the concept of **contrapuntal reading** in his book *Culture and Orientalism* (1993), which is reading considering the perspectives of both the colonizer and the colonized.

It is reading with *"awareness both of the metropolitan history that is narrated and of those other histories against which (and together with which) the dominating discourse acts"*.

Contrapuntal reading means reading a text *"with an understanding of what is involved when an author shows, for instance, that a colonial sugar plantation is seen as important to the process of maintaining a particular style of life in England"*.

Contrapuntal reading takes in both accounts of an issue; it addresses both the perspective of imperialism and the resistance to it.

Decolonisation and Postcolonial Studies
What is Postcolonialism?
The use of the language

Language is often a central question in postcolonial studies.

During colonization, colonizers usually imposed or encouraged the dominance of their native language onto the peoples they colonized, even forbidding natives to speak their mother tongues.

Many writers educated under colonization recount how students were demoted, humiliated, or even beaten for speaking their native language in colonial schools.

In response to the systematic imposition of colonial languages, some postcolonial writers and activists advocate a complete return to the use of indigenous languages.

Others see the language (English) imposed by the colonizer as a more practical alternative and the reasons are as follows:

1. the colonial language can simplify the communication between people who live in various parts of the world and the message would reach farther distances and spread widely

2. to use the language of the colonisers stands for a reverse process in which the colonial subjects (resistance to the colonial power at the level of language)
• would rethink and remodel the language of the ruler
• would have control over the language of the ruler
• would permeate the language of the ruler with sounds and patterns and traditions typical of their own cultural identities

Linton Kwesi Johnson, *Inglan is a bitch*
https://www.youtube.com/watch?v=Zq9OpJYck7Y&ab_channel=thecatkeaton

6

Jean Rhys's *Wide Sargasso Sea* (1966)
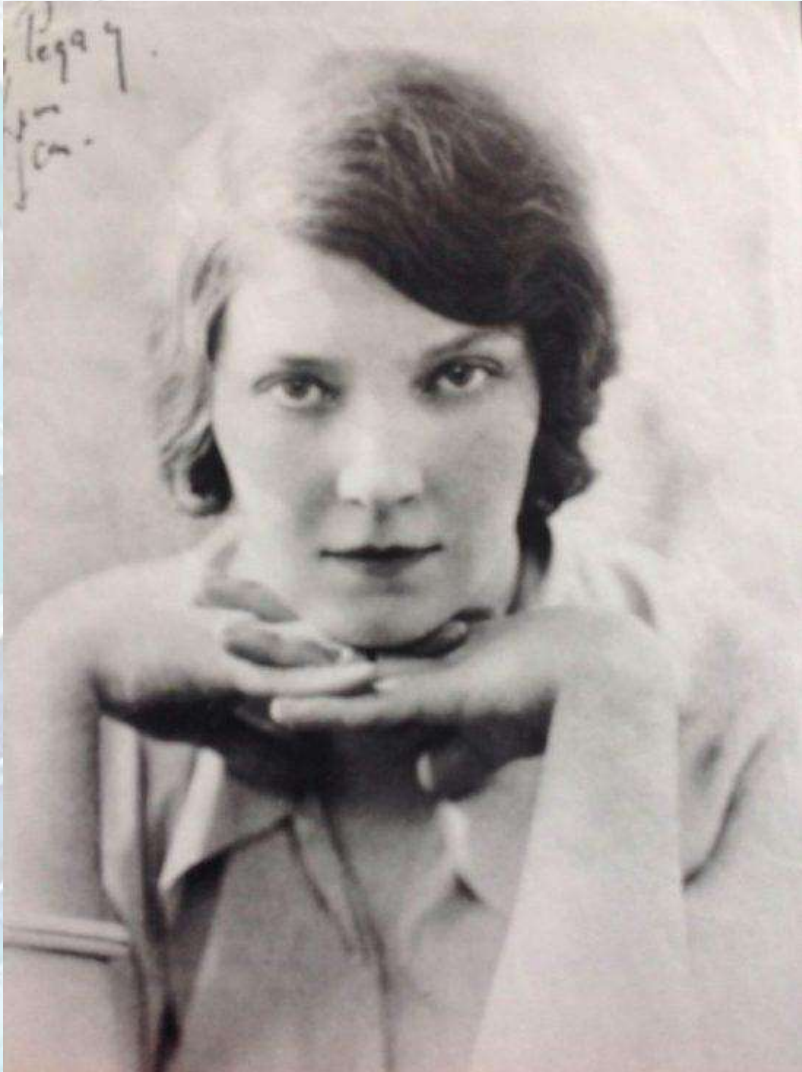
Jean Rhys was born in 1890 in Dominica, one of the West Indies islands.
Her father was a Welsh and his mother a **Creole*** of Scottish origins.

She was sent to England to study, but she struggled a lot with the English language.
She had various relationships and marriages.

She worked different jobs: chorus singer, actress, and then started writing.
She became successful only in the 1960s, when she published *Wide Sargasso Sea* in 1966.
She continued to live in England and died in 1979.

*Creole: person who is part of the Caribbean culture and has either African, Asian, European or Indian origins

Jean Rhys's *Wide Sargasso Sea* (1966)

PART ONE (First person narration: Antoinette)
Antoinette Cosway is a beautiful young Creole in Jamaica just after the Emancipation Act of 1833. Her parents were slave-owners but now she only lives with her mother, Annette, a depressed woman. She remarries to a Mr. Mason, who wants to keep control over the black slaves. As a result, the former slaves rebel and set fire to the house. Annette has a nervous breakdown and Antoinette is sent to a convent school.

PART TWO (First person narration: Mr Rochester)
Antoinette is now married to an unnamed Englishman (Mr. Rochester), who just married her for her money.
His relationship with Antoinette is unstable. It becomes worse after he receives a letter where he finds out that Antoinette and her family are insane. He then begins to see what he thinks are signs of her madness. They argue and he begins calling her Bertha because it is a name he likes. He finally decides to leave for England and take Antoinette with him.

PART THREE (First person narration: Antoinette)
Antoinette is locked in the attic of the man's home in England. Grace Poole is the woman hired to watch her. Antoinette goes from violent to melancholy. She doesn't realize she is in England and has nostalgic memories of Jamaica. She dreams of sneaking downstairs and setting the house on fire. Finally, she takes a candle descends the stairs.
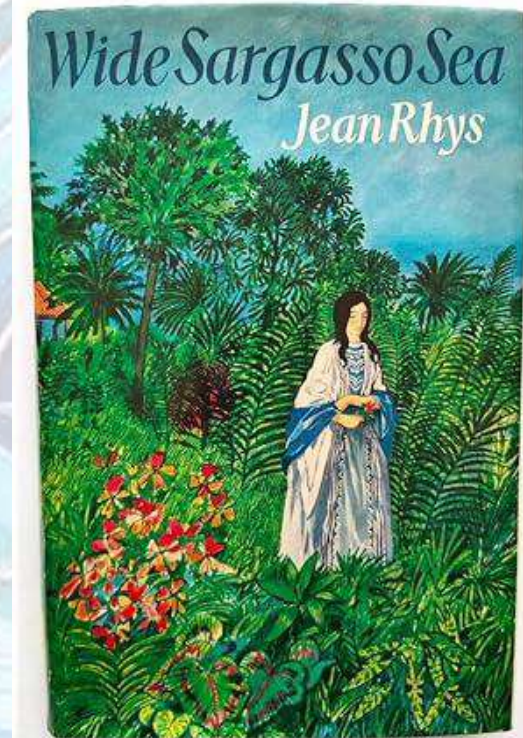
Jean Rhys's *Wide Sargasso Sea* (1966)

This novel is an account of the woman whom Rochester married and kept in his attic in *Jane Eyre*.

In Wide Sargasso Sea, Bertha is <u>humanised</u>: here, the madness is not genetically inherited, but it derives from
- the colonial gaze
- the patriarchal attitude
- the cultural displacement
The mental instability of Bertha is given by the way she was treated, according to the canons of the society of the time

"why should she [C. Bronte] think Creole women are lunatics and all that? What a shame to make Rochester's wife, Bertha, the awful madwoman, and I immediately thought I'd write a story as it might really have been"
Rhys, cit. in T. O'Connor, *Jean Rhys: the West Indian Novels*, 1986

Jean Rhys's *Wide Sargasso Sea* (1966)

- the colonial gaze
- the patriarchal attitude   → all these elements define Antoinette's IDENTITY
- the cultural displacement

→ **Hybrid identity**
- she is a Creole living in Jamaica → coloured, exotic, "other" for the white people
- she comes from family of slave-owners → enemy, western, white for the black people
*Antoinette doesn't know where she belongs, her <u>cultural identity</u> is uncertain:

→ **The power of naming (or re-naming)**
- change of the name = change of personality = change of <u>personal identity</u>
Mr Rochester changes the name of Antoinette into Bertha and so her identity starts to tremble until her breakdown at the end of the novel
1. Rochester is the coloniser and his role is to define the inferior subjects'identity by naming them
2. Rochester is deep into the patriarchal ideology and Antoinette doesn't correspond to the canons of the quiet and submissive English woman: by changing her name, he hopes he can turn her into a traditional woman, the one he is used to
3. Rochester changes the name because he wants to distance the daughter from the mother, whose names are so similar: the likeness in the names can lead to a likeness in madness

Antoinette/Bertha's problem with her identity has always existed: since her childhood, she hasn't really known who she was and then meeting Rochester worsens her situation so much that she doesn't even recognise the woman she has become.

Jean Rhys's *Wide Sargasso Sea* (1966)

The following passages are taken from Part Three of the novel

There is one window high up – you cannot see out of it. My bed had doors but they have been taken away. There is not much else in the room. Her bed, a black press, the table in the middle and two black chairs carved with fruit and flowers. They have high backs and no arms. The dressing-room is very small, the room next to this one is hung with tapestry. Looking at the tapestry one day I recognized my mother dressed in an evening gown but with bare feet. She looked away from me, over my head just as she used to do. I wouldn't tell Grace this. Her name oughtn't to be Grace. Names matter, like when he wouldn't call me Antoinette, and I saw Antoinette drifting out of the window with her scents, her pretty clothes and her looking-glass.

There is no looking-glass here and I don't know what I am like now. I remember watching myself brush my hair and how my eyes looked back at me. The girl I saw was myself yet not quite myself. Long ago when I was a child and very lonely I tried to kiss her. But the glass was between

us – hard, cold and misted over with my breath. Now they have taken everything away. What am I doing in this place and who am I?

The door of the tapestry room is kept locked. It leads, I know, into a passage. That is where Grace stands and talks to another woman whom I have never seen. Her name is Leah. I listen but I cannot understand what they say.

So there is still the sound of whispering that I have heard all my life, but these are different voices.

When night comes, and she has had several drinks and sleeps, it is easy to take the keys. I know now where she keeps them. Then I open the door and walk into their world. It is, as I always knew, made of cardboard. I have seen it before somewhere, this cardboard world where everything is coloured brown or dark red or yellow that has no light in it. As I walk along the passages I wish I could see what is behind the cardboard. They tell me I am in England but I don't believe them. We lost our way to England. When? Where? I don't remember, but we lost it. Was it that evening in the cabin when he found me talking to the young man who brought me my food? I put my arms round his neck and asked him to help me. He said, 'I didn't know what to do, sir.' I smashed the glasses and plates against the porthole. I hoped it would break and the sea come in. A woman came and then an older man who cleared up the broken things on the floor. He did not look at me while he was doing it. The third man said drink this and you will sleep. I drank it and I said, 'It isn't like it seems to be.' – 'I know. It never is,' he said. And then I slept. When I woke it was a different sea. Colder. It was that night, I think, that we changed course and lost our way to England. This cardboard house where I walk at night is not England.

Jean Rhys's *Wide Sargasso Sea* (1966)

The following passages are taken from Part Three of the novel

All the people who had been staying in the house had gone, for the bedroom doors were shut, but it seemed to me that someone was following me, someone was chasing me, laughing. Sometimes I looked to the right or to the left but I never looked behind me for I did not want to see that ghost of a woman whom they say haunts this place. I went down the staircase. I went further than I had ever been before. There was someone talking in one of the rooms. I passed it without noise, slowly.

the room but my own candle had burned down and I took one of the others. Suddenly I was in Aunt Cora's room. I saw the sunlight coming through the window, the tree outside and the shadows of the leaves on the floor, but I saw the wax candles too and I hated them. So I knocked them all down. Most of them went out but one caught the thin curtains that were behind the red ones. I laughed when I saw the lovely colour spreading so fast, but I did not stay to watch it. I went into the hall again with the tall candle in my hand. It was then that I saw her – the ghost. The woman with streaming hair. She was surrounded by a gilt frame but I knew her. I dropped the candle I was carrying and it caught the end of a tablecloth and I saw flames shoot up. As I ran or perhaps floated or flew I called help me Christophine help me and looking behind me I saw that I had been helped. There was a wall of fire protecting me but it was too hot, it scorched me and I went away from it.

Jane Eyre, Charlotte Brontë (1947)

😊

This scene takes place soon after Jane's arrival at Thornfield Hall.

I climbed the three staircases, raised the trap-door of the attic, and having reached the leads, looked out afar over sequestered field and hill, and along dim sky-line - that then I longed for a power of vision which might overpass that limit; which might reach the busy world, towns, regions full of life I had heard of but never seen - that then I desired more of practical experience than I possessed; more of intercourse with my kind, of acquaintance with variety of character, than was here within my reach. I valued what was good in Mrs. Fairfax, and what was good in Adele; but I believed in the existence of other and more vivid kinds of goodness, and what I believed in I wished to behold.

Who blames me? Many, no doubt; and I shall be called discontented. I could not help it: the restlessness was in my nature; it agitated me to pain sometimes. Then my sole relief was to walk along the corridor of the third storey, backwards and forwards, safe in the silence and solitude of the spot, and allow my mind's eye to dwell on whatever bright visions rose before it - and, certainly, they were many and glowing; to let my heart be heaved by the exultant movement, which, while it swelled it in trouble, expanded it with life; and, best of all, to open my inward ear to a tale that was never ended - a tale my imagination created, and narrated continuously; quickened with all of incident, life, fire, feeling, that I desired and had not in my actual existence.

It is in vain to say human beings ought to be satisfied with tranquillity: they must have action; and they will make it if they cannot find it. Millions are condemned to a stiller doom than mine, and millions are in silent revolt against their lot. Nobody knows how many rebellions besides political rebellions ferment in the masses of life which people earth. Women are supposed to be very calm generally: but women feel just as men feel; they need exercise for their faculties, and a field for their efforts, as much as their brothers do; they suffer from too rigid a restraint, too absolute a stagnation, precisely as men would suffer; and it is narrow-minded in their more privileged fellow-creatures to say that they ought to confine themselves to making puddings and knitting stockings, to playing on the piano and embroidering bags. It is thoughtless to condemn them, or laugh at them, if they seek to do more or learn more than custom has pronounced necessary for their sex.

~·

This scene happens between Jane and Rochester while they are falling in love with each other.

"Do you think I can stay to become nothing to you? Do you think I am an automaton? - a machine without feelings? and can bear to have my morsel of bread snatched from my lips, and my drop of living water dashed from my cup? Do you think, because I am poor, obscure, plain, and little, I am soulless and heartless? You think wrong! - I have as much soul as you, - and full as much heart! And if God had gifted me with some beauty and much wealth, I should have made it as hard for you to leave me, as it is now for me to leave you. I am not talking to you now through the medium of custom, conventionalities, nor even of mortal flesh; - it is my spirit that addresses your spirit; just as if both had passed through the grave, and we stood at God's feet, equal, - as we are!"

~:~

In this scene, Jane has just discovered that Rochester is already married to a madwoman, Bertha Mason. Although she loves him, she feels that her only choice is to leave Thornfield Hall and start a new life.

This was true: and while he spoke my very conscience and reason turned traitors against me, and charged me with crime in resisting him. They spoke almost as loud as Feeling: and that clamoured wildly. "Oh, comply!" it said. "Think of his misery; think of his danger - look at his state when left alone; remember his headlong nature; consider the recklessness following on despair - soothe him; save him; love him; tell him you love him and will be his. Who in the world cares for YOU? or who will be injured by what you do?"

Still indomitable was the reply – "I care for myself. The more solitary, the more friendless, the more unsustained I am, the more I will respect myself. I will keep the law given by God; sanctioned by man. I will hold to the principles received by me when I was sane, and not mad - as I am now. Laws and principles are not for the times when there is no temptation: they are for such moments as this, when body and soul rise in mutiny against their rigour; stringent are they; inviolate they shall be. If at my individual convenience I might break them, what would be their worth? They have a worth - so I have always believed; and if I cannot believe it now, it is because I am insane - quite insane: with my veins running fire, and my heart beating faster than I can count its throbs. Preconceived opinions, foregone determinations, are all I have at this hour to stand by: there I plant my foot."

I did. Mr. Rochester, reading my countenance, saw I had done so. His fury was wrought to the highest: he must yield to it for a moment, whatever followed; he crossed the floor and seized my arm and grasped my waist. He seemed to devour me with his flaming glance: physically, I felt, at the moment, powerless as stubble exposed to the draught and glow of a furnace: mentally, I still possessed my soul, and with it the certainty of ultimate safety. The soul, fortunately, has an interpreter - often an unconscious, but still a truthful interpreter - in the eye. My eye rose to his; and while I looked in his fierce face I gave an involuntary sigh; his gripe was painful, and my over-taxed strength almost exhausted.

~:~

🥴

This scene takes place at the end of the novel, when Jane goes back to Thornfield Hall to assist Rocherster after the accident that maimed him.

I have now been married ten years. I know what it is to live entirely for and with what I love best on earth. I hold myself supremely blest - blest beyond what language can express; because I am my husband's life as fully is he is mine. No woman was ever nearer to her mate than I am: ever more absolutely bone of his bone and flesh of his flesh. I know no weariness of my Edward's society: he knows none of mine, any more than we each do of the pulsation of the heart that beats in our separate bosoms; consequently, we are ever together. To be together is for us to be at once as free as in solitude, as gay as in company. We talk, I believe, all day long: to talk to each other is but a more animated and an audible thinking. All my confidence is bestowed on him, all his confidence is devoted to me; we are precisely suited in character - perfect concord is the result.

Mr. Rochester continued blind the first two years of our union; perhaps it was that circumstance that drew us so very near - that knit us so very close: for I was then his vision, as I am still his right hand. Literally, I was (what he often called me) the apple of his eye. He saw nature - he saw books through me; and never did I weary of gazing for his behalf, and of putting into words the effect of field, tree, town, river, cloud, sunbeam - of the landscape before us; of the weather round us - and impressing by sound on his ear what light could no longer stamp on his eye. Never did I weary of reading to him; never did I weary of conducting him where he wished to go: of doing for him what he wished to be done. And there was a pleasure in my services, most full, most exquisite, even though sad because he claimed these services without painful shame or damping humiliation. He loved me so truly, that he knew no reluctance in profiting by my attendance: he felt I loved him so fondly, that to yield that attendance was to indulge my sweetest wishes.

~.

In this scene, Jane and Rochester's wedding is interrupted by Richard Mason and his lawyer because they claim that Rochester is already married to Bertha, Richard's sister. At this point, Rochester admits that the two men are right and show them Bertha.

"She is now living at Thornfield Hall," said Mason, in more articulate tones: "I saw her there last April. I am her brother."

"At Thornfield Hall!" ejaculated the clergyman. "Impossible! I am an old resident in this neighbourhood, sir, and I never heard of a Mrs. Rochester at Thornfield Hall."

I saw a grim smile contort Mr. Rochester's lips, and he muttered -

"No, by God! I took care that none should hear of it - or of her under that name." He mused - for ten minutes he held counsel with himself: he formed his resolve, and announced it -

[…]

"…what this lawyer and his client say is true: I have been married, and the woman to whom I was married lives! You say you never heard of a Mrs. Rochester at the house up yonder, Wood; but I daresay you have many a time inclined your ear to gossip about the mysterious lunatic kept there under watch and ward. Some have whispered to you that she is my bastard half-sister: some, my cast- off mistress. I now inform you that she is my wife, whom I married fifteen years ago, - Bertha Mason by name; sister of this resolute personage, who is now, with his quivering limbs and white cheeks, showing you what a stout heart men may bear. Cheer up, Dick! - never fear me! - I'd almost as soon strike a woman as you. Bertha Mason is mad; and she came of a mad family; idiots and maniacs through three generations? Her mother, the Creole, was both a madwoman and a drunkard! - as I found out after I had wed the daughter: for they were silent on family secrets before. Bertha, like a dutiful child, copied her parent in both points. I had a charming partner - pure, wise, modest: you can fancy I was a happy man. I went through rich scenes! Oh! my experience has been heavenly, if you only knew it! But I owe you no further explanation. Briggs, Wood, Mason, I invite you all to come up to the house and visit Mrs. Poole's patient, and MY WIFE! You shall see what sort of a being I was cheated into espousing, and judge whether or not I had a right to break the compact, and seek sympathy with something at least human. This girl,' he continued, looking at me, 'knew no more than you, Wood, of the disgusting secret: she thought all was fair and legal and never dreamt she was going to be entrapped into a feigned union with a defrauded wretch, already bound to a bad, mad, and embruted partner! Come all of you - follow!"

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He lifted the hangings from the wall, uncovering the second door: this, too, he opened. In a room without a window, there burnt a fire guarded by a high and strong fender, and a lamp suspended from the ceiling by a chain. Grace Poole bent over the fire, apparently cooking something in a saucepan. In the deep shade, at the farther end of the room, a figure ran backwards and forwards. What it was, whether beast or human being, one could not, at first sight, tell: it grovelled, seemingly, on all fours; it snatched and growled like some strange wild animal: but it was covered with clothing, and a quantity of dark, grizzled hair, wild as a mane, hid its head and face.

"Good-morrow, Mrs. Poole!" said Mr. Rochester. "How are you? and how is your charge to-day?"

"We're tolerable, sir, I thank you," replied Grace, lifting the boiling mess carefully on to the hob: "rather snappish, but not 'rageous.'"

A fierce cry seemed to give the lie to her favourable report: the clothed hyena rose up, and stood tall on its hind-feet.

"Ah! sir, she sees you!" exclaimed Grace: "you'd better not stay."

"Only a few moments, Grace: you must allow me a few moments."

"Take care then, sir! - for God's sake, take care!"

The maniac bellowed: she parted her shaggy locks from her visage, and gazed wildly at her visitors. I recognised well that purple face, - those bloated features. Mrs. Poole advanced.

"Keep out of the way," said Mr. Rochester, thrusting her aside: "she has no knife now, I suppose, and I'm on my guard."

"One never knows what she has, sir: she is so cunning: it is not in mortal discretion to fathom her craft."

"We had better leave her," whispered Mason.

"Go to the devil!" was his brother-in-law's recommendation.

"'Ware!" cried Grace. The three gentlemen retreated simultaneously. Mr. Rochester flung me behind him: the lunatic sprang and grappled his throat viciously, and laid her teeth to his cheek: they struggled. She was a big woman, in stature almost equalling her husband, and corpulent besides: she showed virile force in the contest - more than once she almost throttled him, athletic as he was. He could have settled her with a well-planted blow; but he would not strike: he would only wrestle. At last he mastered her arms; Grace Poole gave him a cord, and he pinioned them behind her: with more rope, which was at hand, he bound her to a chair. The operation was performed amidst the fiercest yells and the most convulsive plunges. Mr. Rochester then turned to the spectators: he looked at them with a smile both acrid and desolate.

"That is MY WIFE," said he. "Such is the sole conjugal embrace I am ever to know - such are the endearments which are to solace my leisure hours! And THIS is what I wished to have" (laying his hand on my shoulder): "this young girl, who stands so grave and quiet at the mouth of hell, looking collectedly at the gambols of a demon, I wanted her just as a change after that fierce ragout. Wood and Briggs, look at the difference! Compare these clear eyes with the red balls yonder - this face with that mask - this form with that bulk; then judge me, priest of the gospel and man of the law, and remember with what judgment ye judge ye shall be judged! Off with you now. I must shut up my prize."