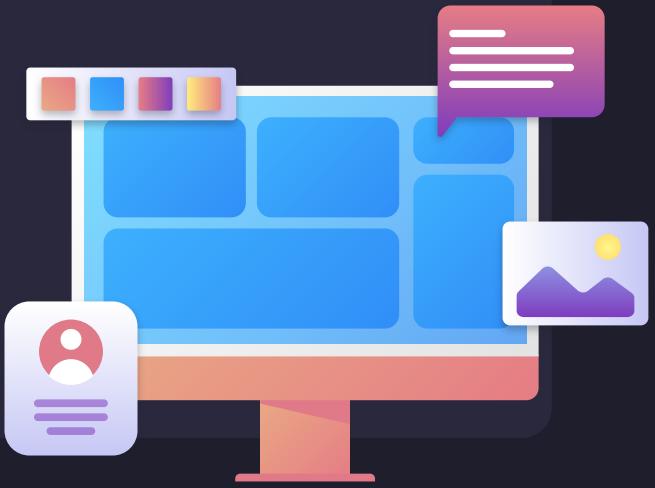


Bases de Datos

Conceptos Fundamentales

Juan Durán

Laura Alonso Alemany





Qué es una Base de Datos?

- contiene información
- datos interrelacionados
- se usan ampliamente
- permiten navegar/consultar las informaciones
- permiten alterar las informaciones

Esquemas e instancias

[analogía: tipos y variables]

Esquema: se usa para describir la estructura de la BD.

Ej: la BD de un banco consiste de clientes, cuentas y la relación tiene_cuentas entre ellos. Los clientes tienen nombre y DNI; las cuentas tienen número y saldo.

Esquemas e instancias

[analogía: tipos y variables]

Esquema: se usa para describir la estructura de la BD.

Instancia: contenido efectivo de la BD en un momento del tiempo.

Ej:: clientes tiene los clientes Juan Pérez con DNI 333 y Diego

González con DNI 444; cuentas tiene las cuentas 1111 de 1000\$ y

Piensen ustedes!



Modelo relacional



Los datos (instancias) se guardan en tablas



Modelo relacional



Los datos (instancias) se guardan en tablas

ID	name	dept_name	salary
22222	Einstein	Physics	95000
12121	Wu	Finance	90000
32343	El Said	History	60000
45565	Katz	Comp. Sci.	75000
98345	Kim	Elec. Eng.	80000
76766	Crick	Biology	72000
10101	Srinivasan	Comp. Sci.	65000
58583	Califieri	History	62000
83821	Brandt	Comp. Sci.	92000
15151	Mozart	Music	40000
33456	Gold	Physics	87000
76543	Singh	Finance	80000

Columnas

Filas



Consultas

Consulta: expresión que describe una colección de datos deseada.

Ej: encontrar salario y nombre de instructores que ganan más de \$ 50000.

Lenguajes de consulta: SQL, XQuery, SPARQL

```
select name, salary  
from instructor  
where salary > 50000
```

Lenguajes de Consulta

- **puros**: álgebra relacional o de tuplas
 - más sencillos y se concentran en menos aspectos
- el sistema gestor de BD procesa consultas, podemos razonar si traducimos una consulta SQL al álgebra relacional

Diseño de BD relacionales

Mal diseño:

Universidad = (instructorID, nombre, nombreDept, salario,
estudianteID)

Almacenar toda la información en una tabla:

Repetición de la información (redundancia)

Ejemplo: dos estudiantes con el mismo
instructor

Diseño de BD relacionales

esquema sin redundancia

descomponer en esquemas más chicos.

$\text{Univ} = (\text{instructorID}, \text{estudianteID})$ $\text{Instructor} = (\text{instructorID},$
 $\text{nombre, nombreDepto, salario})$

Teoría de normalización: cómo diseñar
buenos esquemas de BD relacionales

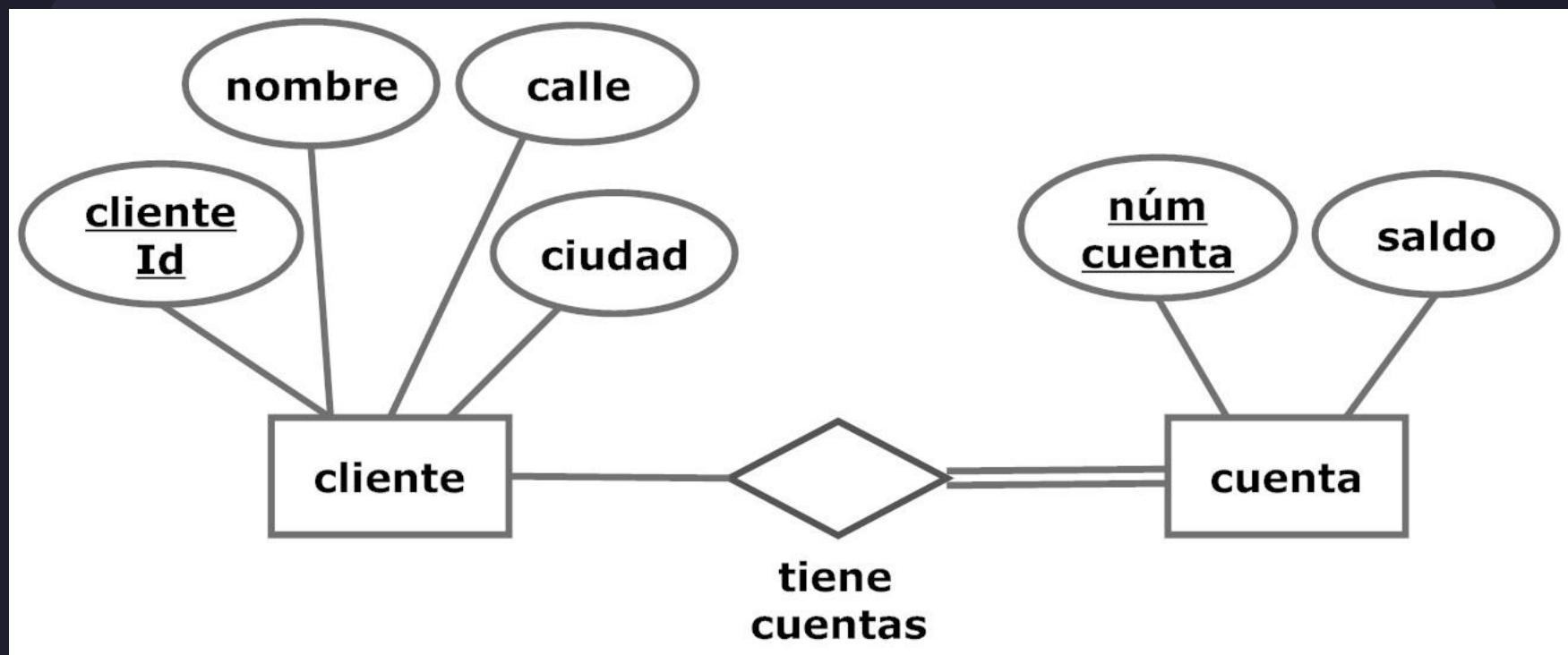
Diseño entidad - relación

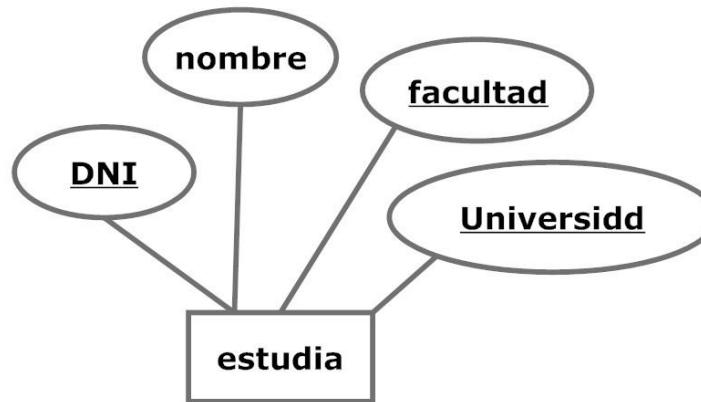
BD = entidades y relaciones

Entidad: objeto en organización
distingible de otros objetos. Descripto
por medio de atributos.

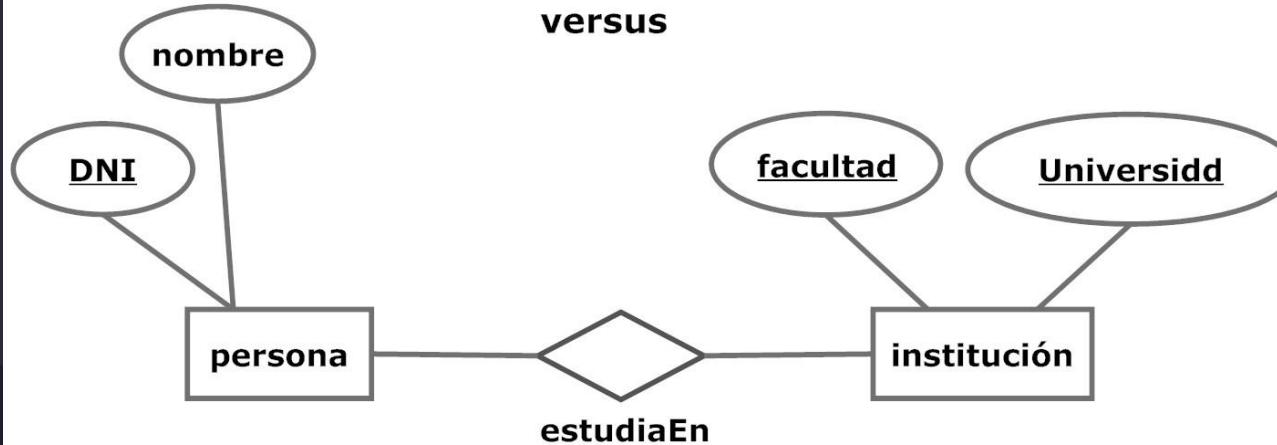
Relación: asociación entre entidades.

Diagrama de entidad-relación





versus







Sistema gestor de BD

- Gestor de almacenamiento
- Procesamiento de consultas
- Gestor de transacciones

Gestión del almacenamiento

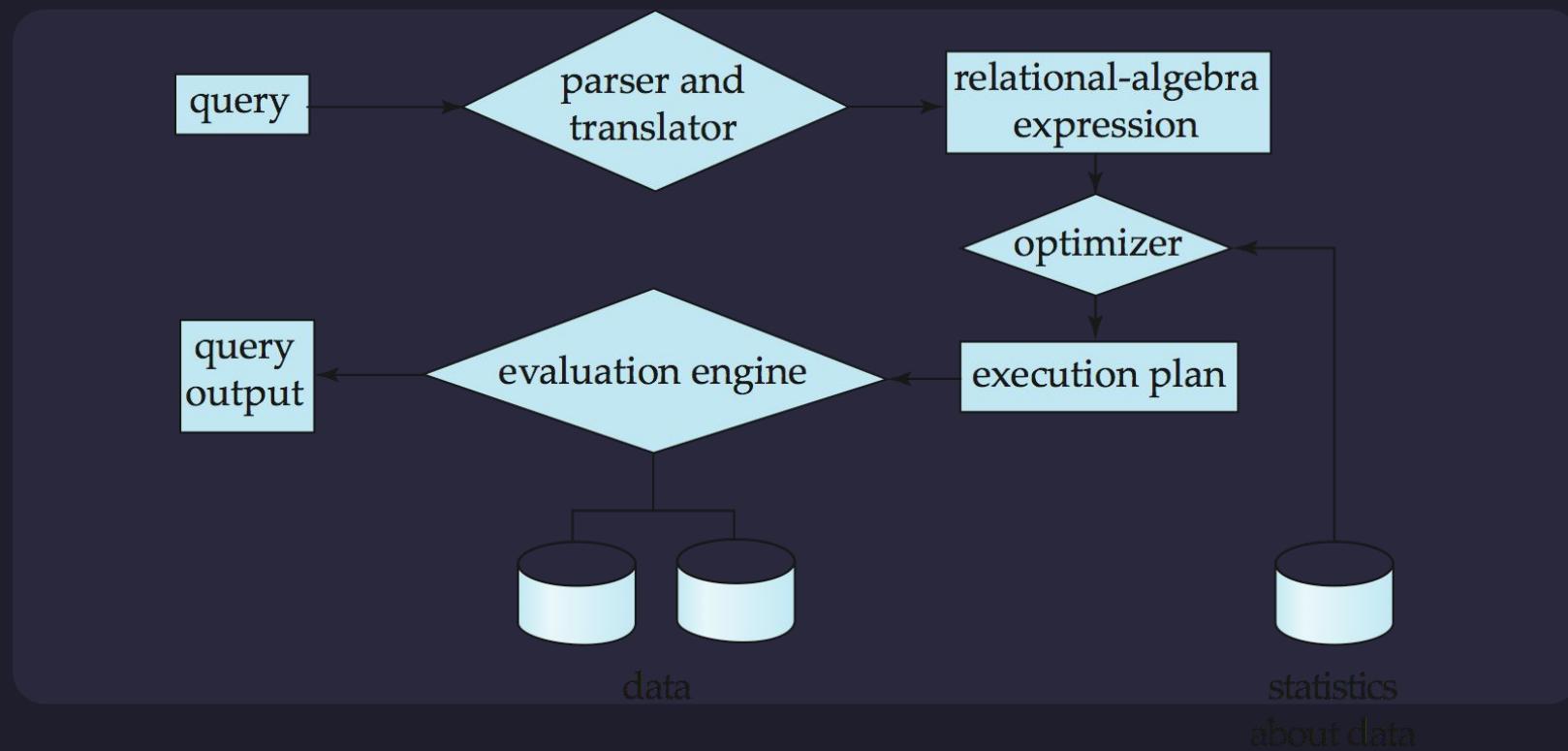
- acceso, modificación y retorno eficiente mediante índices
- registros de datos en archivos

gestor de almacenamiento: interfaz para programas de aplicación y consultas: acceso al almacenamiento, organización en archivos de los datos, indexado.

Procesamiento de consultas

1. Parsing de la consulta y su traducción
(p.ej. a álgebra relacional)
2. Optimización: Encontrar la manera “más eficiente” (o plan) para obtener la información descrita por la consulta.
3. Evaluación

Procesamiento de consultas



Procesamiento de consultas

Una consulta se puede evaluar de maneras alternativas

Expresiones equivalentes

Diferentes algoritmos para cada operación

La diferencia de costo entre una buena y una mala manera de evaluar una consulta puede ser enorme.

Es necesario estimar el costo de las operaciones.

Depende de información estadística acerca de las relaciones que la BD debe mantener.

Hace falta estimar estadísticas para resultados intermedios para computer el costo de expresiones complejas.

Transacciones

Preguntas importantes:

¿Qué pasa si falla el SGBD?

¿Qué pasa si más de un usuario actualiza concurrentemente los mismos datos?

Una transacción es una colección de operaciones que realiza una función lógica simple en una aplicación de BD

Una transacción es una unidad de ejecución que accede y posiblemente actualiza varios ítems de datos.

Ejemplo: Transacción para transferir \$50 de la cuenta A a la cuenta B:

1. read(A)
2. A := A - 50
3. write(A)
4. read(B)
5. B := B + 50
6. write(B)

Transacciones

La componente de manejo de transacciones asegura que BD permanezca en un estado consistente (correcto) a pesar de fallas del sistema (e.g. fallas de energía, caídas de SO) y fallas de transacciones.

Ejemplo: falla de transacción de transferencia bancaria: Sacar dinero de una cuenta sin ponerlo en otra es un error.

Problema: ¿Cómo hacer para que una transacción se ejecute indivisiblemente?

Solución: Aplicar atomicidad.

Atomicidad significa o todas las operaciones de la transacción son reflejadas en la BD o ninguna lo es.

Transacciones

Asegurar la atomicidad es responsabilidad del SGBD, específicamente del gestor de recuperaciones.

En la ausencia de fallas todas las transacciones completan exitosamente y la atomicidad se logra fácilmente.

Debido a los varios tipos de falla una transacción puede no completarse exitosamente.

Para asegurar atomicidad, la falla de una transacción no debe tener efecto en el estado de la base de datos.

O sea, la BD debe restaurarse al estado en que estaba antes que la transacción comenzara su ejecución.

Transacciones

Planificaciones: secuencias que indican el orden cronológico en el cual las instrucciones de transacciones concurrentes son ejecutadas.

Transacciones

T_1	T_2
read (A) $A := A - 50$ write (A)	read (A) $temp := A * 0.1$ $A := A - temp$ write (A)
read (B) $B := B + 50$ write (B) commit	read (B) $B := B + temp$ write (B) commit

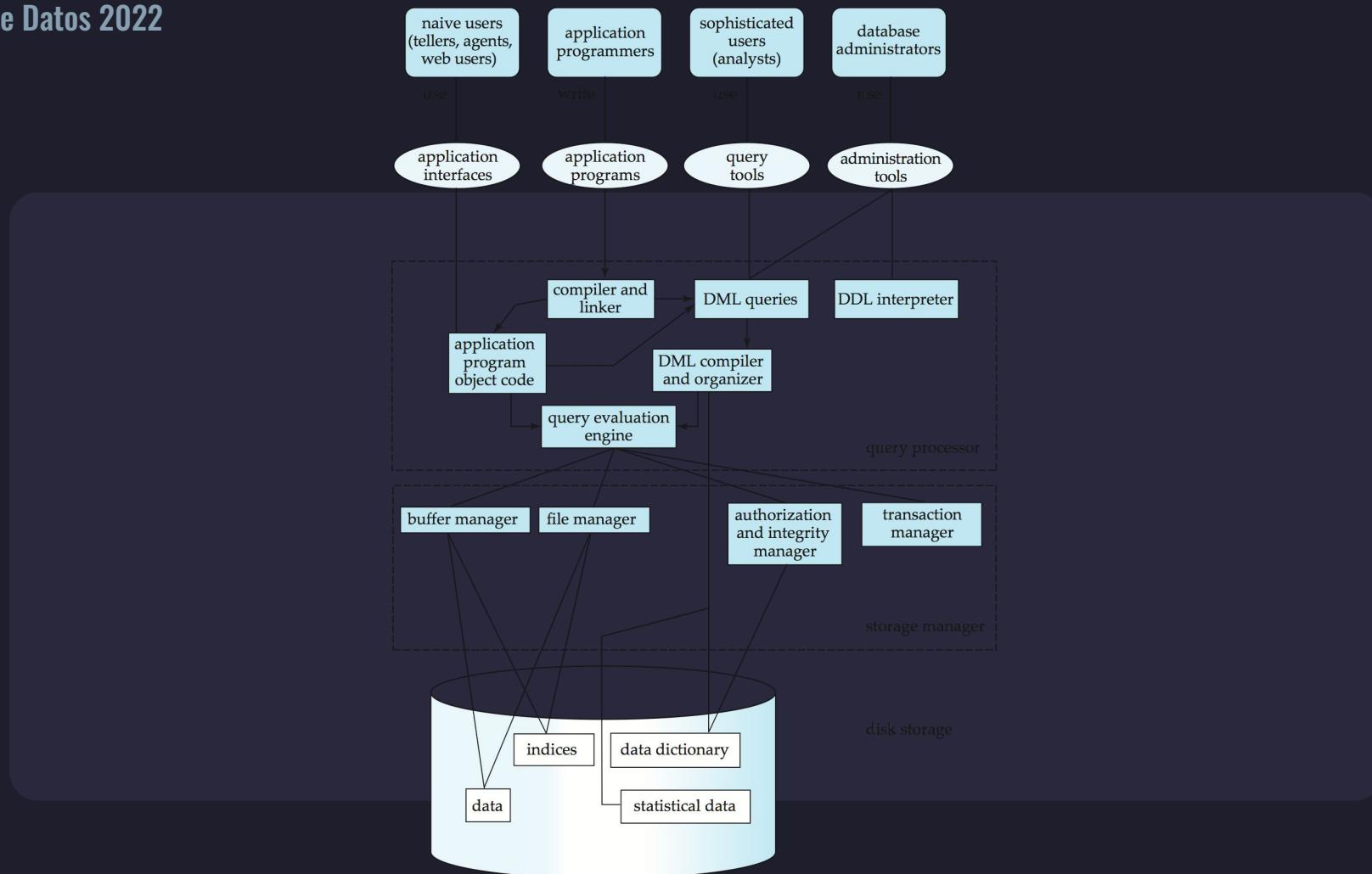
Transacciones

Cuando varias transacciones actualizan la BD concurrentemente, la consistencia de los datos puede dejar de ser preservada, aun cuando cada transacción individual es correcta.

Se debe ejecutar una planificación adecuada que no genere problemas.

Bases de Datos 2022

- □ X



/CONTENTS OF THIS TEMPLATE



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<WHOA!>

> This can be the part of the presentation where you introduce yourself, write your email... <



/WHOA!

This can be the part of the presentation where you introduce yourself, write your email...



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/01 /CONCEPTS

- > You can describe the topic of the section right here

/02 /FEATURES

- > You can describe the topic of the section right here

/03 /TIPS

- > You can describe the topic of the section right here

/04 /EXERCISE

- > You can describe the topic of the section right here





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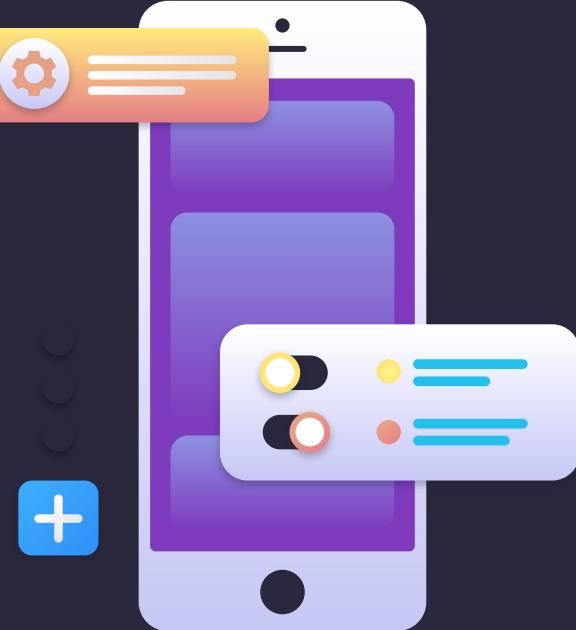
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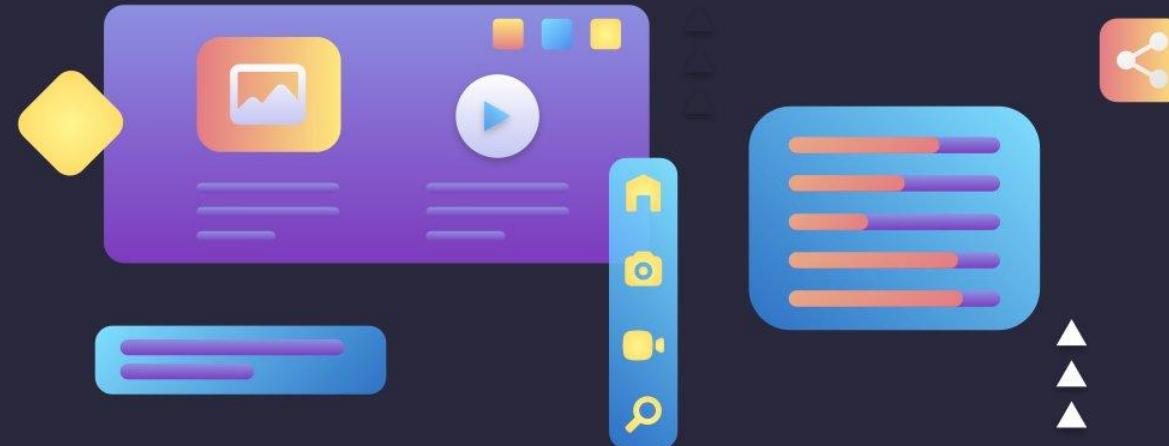
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/THEORY

CONCEPTS

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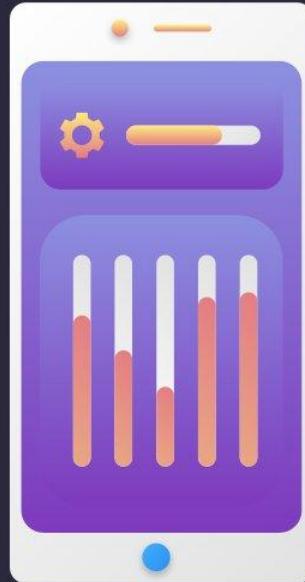


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/03

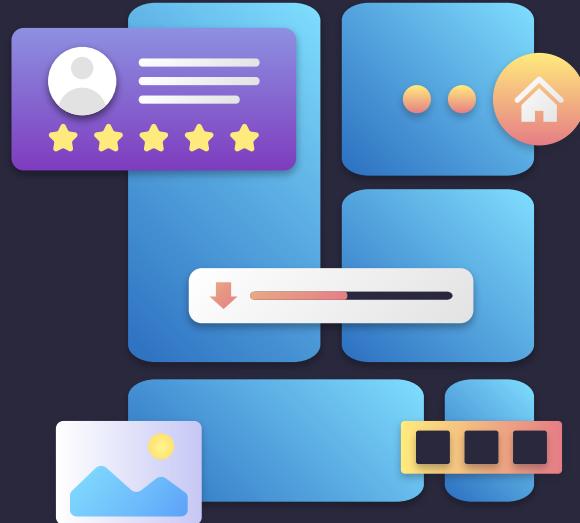
<TIPS>

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/INTRODUCTION

You can give here a brief description of the topic you want to talk about. For example, if you want to talk about Mercury, you can say that it's the smallest planet in the entire Solar System



/INTRODUCTION



Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. Saturn, the ringed planet, is composed mostly of hydrogen and helium



Jupiter is a gas giant and the biggest planet in the Solar System. It's also the fourth-brightest object in the night sky. Venus has a beautiful name, but also very high temperatures



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/CONCEPTS



/LANGUAGE

Mercury is the closest planet to the Sun and the smallest one



/PROGRAM

Venus is terribly hot and is the second planet from the Sun



/ALGORITHM

Despite being red, Mars is actually a cold place full of iron oxide dust

/CONCEPTS



/LANGUAGE

Mercury is the closest planet to the Sun and the smallest one



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Mercury is the closest planet to the Sun



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/ALGORITHM

Mars is actually a very cold place



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**/A PICTURE
IS WORTH A
THOUSAND
WORDS**





/A PICTURE
IS WORTH A
THOUSAND
WORDS →

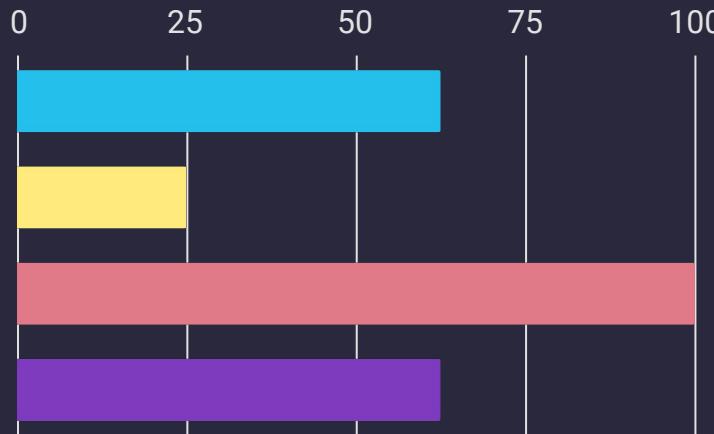


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/PROGRAMMING PARADIGMS



/DECLARATIVE

Jupiter is the biggest planet



/IMPERATIVE

Venus has a beautiful name



/MODULAR

Mars is a very cold planet



/STRUCTURED

Saturn is a gas giant

Follow the link in the graph to modify its data and then paste the new one here. **For more info, click here**



/PROGRAMMING PARADIGMS

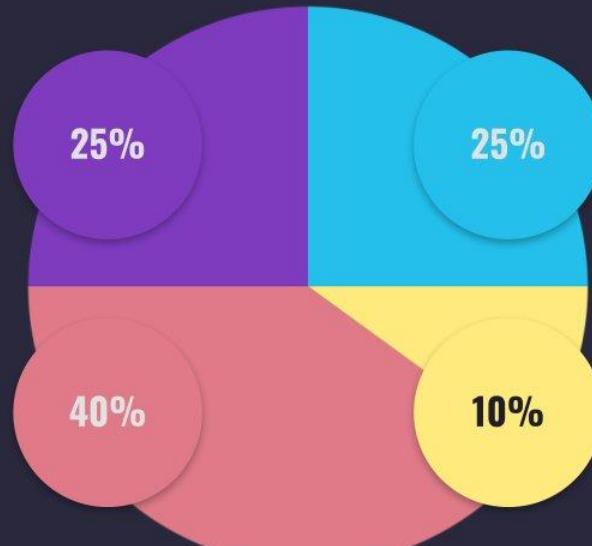


/DECLARATIVE

Jupiter is the biggest planet

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Venus has a beautiful name

/STRUCTURED

Saturn is a gas giant



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/PROGRAMMING PARADIGMS



/PROCEDURAL

Saturn is a gas giant



/FUNCTIONAL

Venus has a beautiful name



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/WHAT IS THIS TOPIC ABOUT?



/RUNNING A PROGRAM is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the

ICON AND ATTRIBUTES has a beautiful name and is the second planet from the Sun. It's hot and has a very poisonous atmosphere

/WHAT IS THIS TOPIC ABOUT?



/RUNNING A PROGRAM

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon



/LEXICON AND OBJECTIVES

Venus has a beautiful name and is the second planet from the Sun. It's hot and has a very poisonous atmosphere



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<150,000>



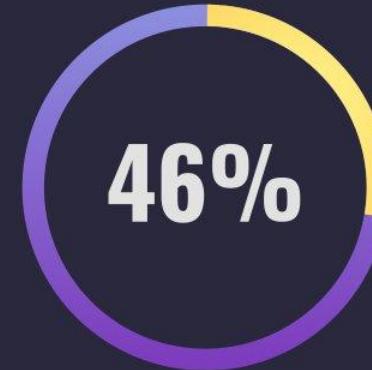
> Big numbers catch your
audience's attention <





VENUS

Venus is the second planet from the Sun



MARS

Mercury is the closest planet to the Sun



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/FEATURES OF THE TOPIC



/CORRECTNESS

Venus is the second planet from the Sun



/CLARITY

Mercury is the smallest planet



/PORTABILITY

Despite being red, Mars is a cold place



/EFFICIENCY

Saturn is a gas giant and has several rings



/FEATURES OF THE TOPIC



/CORRECTNESS

Venus is the second planet from the Sun



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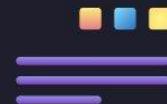
/EFFICIENCY

Saturn is a gas giant and has several rings



/RESPONSIVENESS

Earth is the planet that harbors life



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/FEATURES OF THE TOPIC



50%



/PORTABILITY

Despite being red, Mars is a cold place

43%



/EFFICIENCY

Saturn is a gas giant and has several rings

35%



/CORRECTNESS

Venus is the second planet from the Sun

◎

80%



/CLARITY

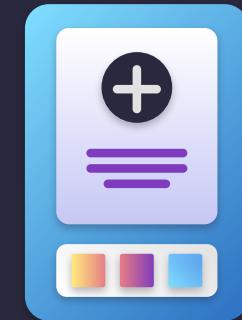
Mars is the smallest planet in the solar system.

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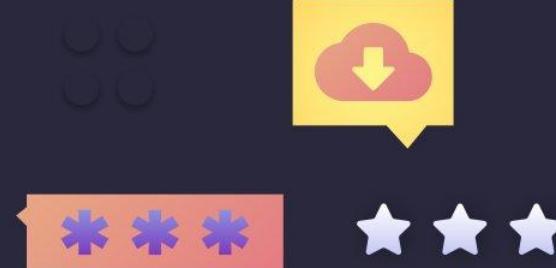
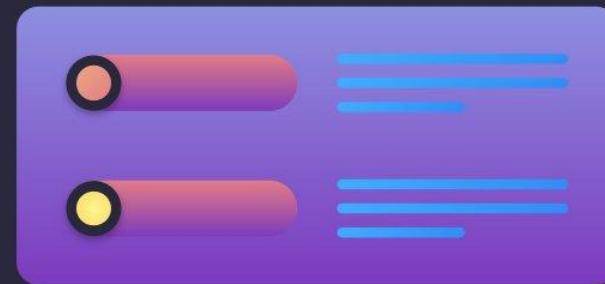


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<AWESOME WORDS>



/AWESOME WORDS/



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/RECOMMENDATIONS

/RECOGNIZE THE NEED

- > Mercury is the closest planet to the Sun

/COLLECT REQUIREMENTS

- > Venus is the second planet from the Sun

/ANALYZE THE PROGRAM

- > Mars is actually a very cold place

/CREATE ARCHITECTURE

- ◎ > Jupiter is the biggest planet of them all

/IMPLEMENT THE PROGRAM

- > Saturn is a gas giant and has several rings

/TEST AND INSTALL

- > Neptune is the farthest planet from the Sun



/RECOMMENDATIONS



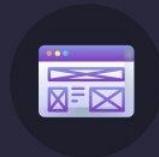
/RECOGNIZE THE NEED

Mercury is the closest planet to the Sun



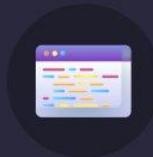
/COLLECT REQUIREMENTS

Venus is the second planet from the Sun



/CREATE ARCHITECTURE

Jupiter is the biggest planet of them all



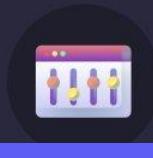
/IMPLEMENT IT

Saturn is a gas giant and has several rings



/ANALYZE THE PROGRAM

Mars is actually a very cold place



/TEST AND INSTALL

Neptune is the farthest planet from the Sun



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/RECOMMENDATIONS



/RECOGNIZE THE NEED



- Mercury is the closest planet to the Sun
- Venus is the second planet from the Sun
- Jupiter is the biggest planet of them all



/COLLECT REQUIREMENTS



- Mars is actually a very cold place
- Saturn is a gas giant and has several rings
- Neptune is the farthest planet from the Sun

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“This is a quote, words full
of wisdom that someone
important said and can make
the reader get inspired.”

—**SOMEONE FAMOUS**



“Jupiter is a gas giant and the biggest planet in the Solar System. It was named after a Roman god”

—MARK MCKANE



“Mercury is the closest planet to the Sun and the smallest one. It's only a bit larger than the Moon”

—SUSAN BONES





/PROGRAMMING TIPS



◎

Mercury is the closest planet to the Sun and the smallest one. It's only a bit larger than the Moon

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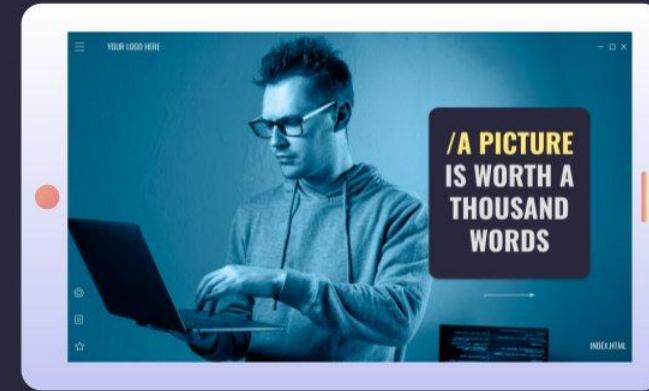
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/TABLET APP

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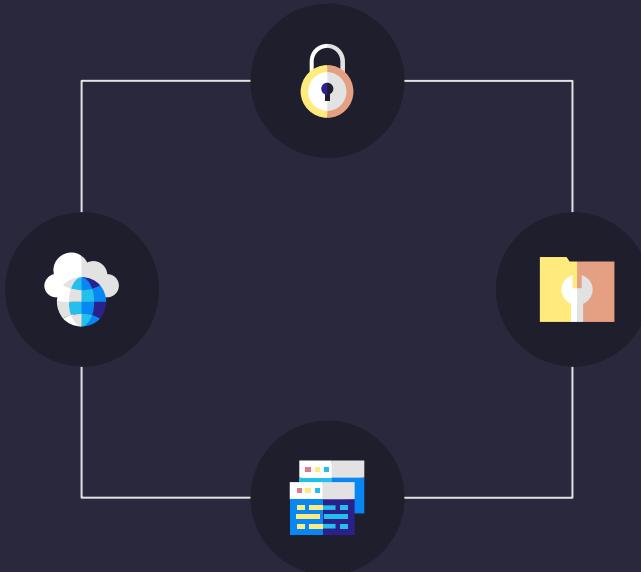
/TECHNICAL EXPLICATION



Do you know what helps you make your point clear? Lists like this one:

- They're simple
- You can organize your ideas clearly and easily
- You'll never forget to buy milk again!

And the most important thing:
the audience won't miss the point of your presentation



/TECHNICAL EXPLANATION



Do you know what helps you make your point clear? Lists like these ones:

- They're simple
- You can organize your ideas clearly
- You'll never forget to buy milk!

◎ > And the most important thing: the audience won't miss the point of your presentation

> Venus has a beautiful name and is the second planet from the Sun. It's hot and has a very poisonous atmosphere

- Mercury is the smallest planet in the Solar System
- It's the closest one to the Sun



/TECHNICAL EXPLANATION



Mercury is the closest planet to the Sun



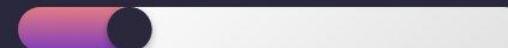
Venus is the second planet from the Sun



Jupiter is the biggest planet of them all



Mars is actually a very cold place



Saturn is a gas giant and has several rings



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/PRACTICAL EXERCISE

Complete the following table about base changes:

/BINARY	/HEXADECIMAL	/DECIMAL
		128.75
10011101.11001		
	BE.A7	



/PRACTICAL EXERCISE



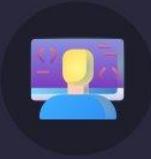
/HELLO WORLD

Mercury is the closest planet to the Sun



/LUCIAN'S LUSCIOUS LASAGNA

Venus is the second planet from the Sun



/SQUEAKY CLEAN

Jupiter is the biggest planet of them all



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/PRACTICAL EXERCISE

/FIELD	/TYPE	/NULL	/KEY	/DEFAULT	/EXTRA
Task_id	Int(11)	No	Pri	Null	_increment
Title	varchar(2)	No		Null	
Start_date	Date	Yes		Null	
Due_date	Date	Yes		Null	
Status	Tinyint(4)	No		Null	
Priority	Tinyint(4)	No		Null	
Created_at	Text	Yes		Null	Default

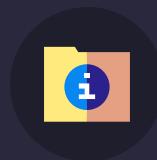


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/SOFTWARE ENGINEERING PROCESS



/ANALYSIS

Venus is the second planet from the Sun



/DESIGN

Jupiter is the biggest planet in the System



/CODIFICATION

Despite being red, Mars is a cold place



/IMPLANTATION

Saturn is a gas giant with several rings

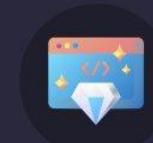


/SOFTWARE ENGINEERING PROCESS



/ANALYSIS

Venus is the second planet from the Sun



/CODIFICATION

Despite being red, Mars is a cold place



/IMPLEMENTATION

Saturn is a gas giant with several rings



/DESIGN

Jupiter is the biggest planet of them all

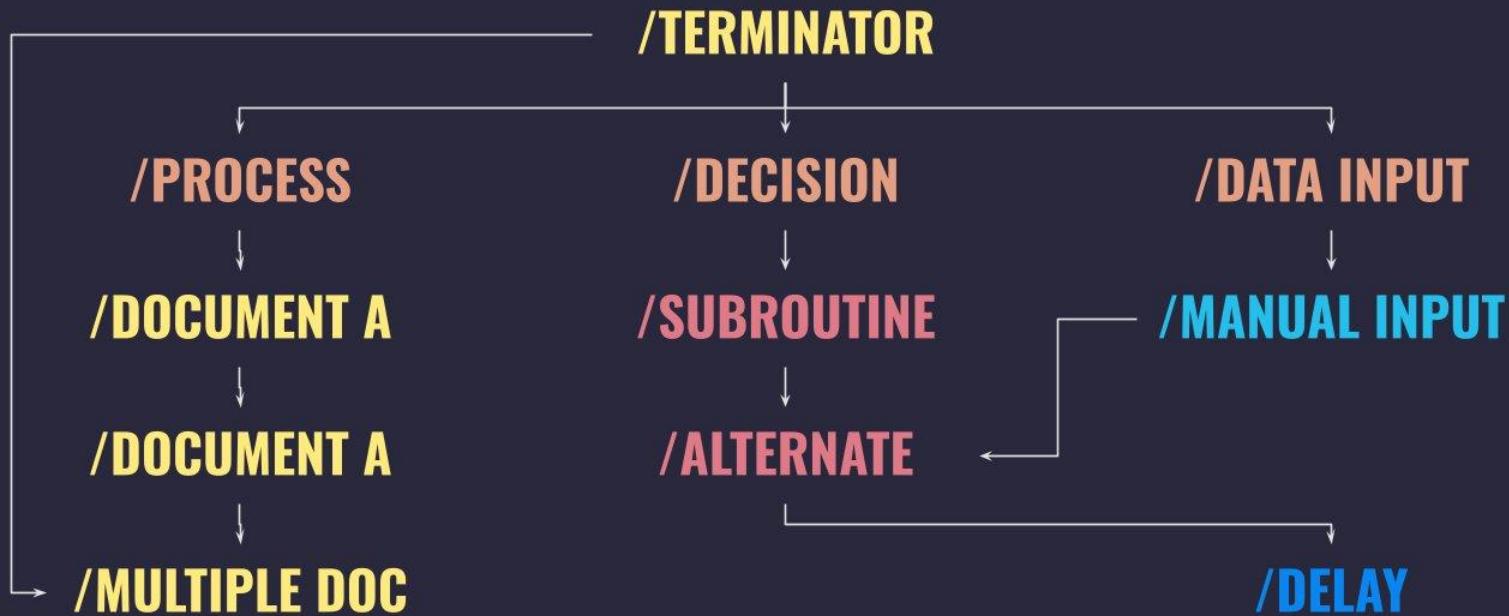


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/SOFTWARE ENGINEERING PROCESS



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/A PICTURE ALWAYS REINFORCES THE CONCEPT

- ◎ > Images reveal large amounts of data, so remember: use an image instead of a long text. Your audience will appreciate it
- ◎
- ◎
- ☆





/A PICTURE ALWAYS REINFORCES THE CONCEPT

➤ Images reveal large amounts of data, so remember: use an image instead of a long text



<9h 55m 23s>

› Jupiter's rotation period



<333,000.000>

› The Sun's mass compared to Earth's

<386,000 km>

› Distance between Earth and the Moon



/A BIG NUMBER TO SUPPORT THE CONCEPT

12,000,000

Mercury is the closest planet to the Sun and the smallest one

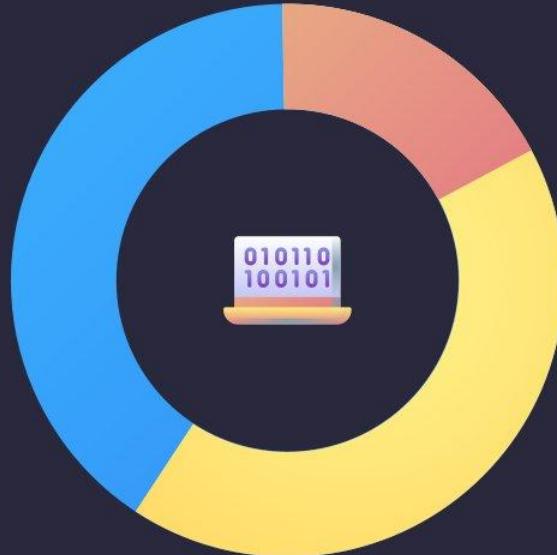


Venus has a beautiful name and is the second planet from the Sun



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/HERE'S A GRAPH



<32%> > Jupiter is the biggest planet

<14%> > Earth is a planet that harbors life

<42%> > Mars is actually a very cold place



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/EXAMPLES



Coding of integer numbers with signs:

		/BINARY	/DECIMAL
Natural binary	223		
	-223		
Sign and magnitude	10100111		
	10100111		
① 2's complement	223		
≡	-223		

/EXAMPLES



```
/* Create a few records in this table */

Insert into names values(1, 'Tom');

Insert into names values(2, 'Lucy');

Insert into names values(3, 'Frank');

Insert into names values(4, 'Jane');

Insert into names values(5, 'Robert');

COMMIT;
```

RESULT



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/EXAMPLES



SHORT TERM



- ◎ > Jupiter is the biggest planet
- ◎ > Mars is a very cold place

LONG TERM



- ◎ > Mercury is a small planet
- ◎ > Saturn has several rings

/PREDOMINANT LANGUAGES



/JAVA

Jupiter is the biggest planet



/C++

Mars is a very cold planet



/PREDOMINANT LANGUAGES



C



40%

C++

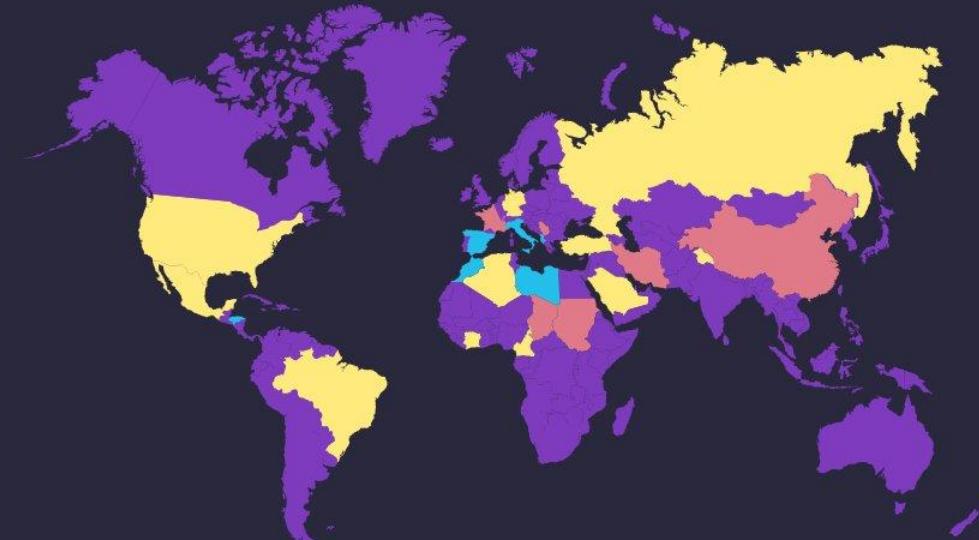


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JAVA



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Saturn is a gas giant and has several rings



/C

Mercury is the closest planet to the Sun



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Despite being red, Mars is a cold place



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Venus is the second planet from the Sun



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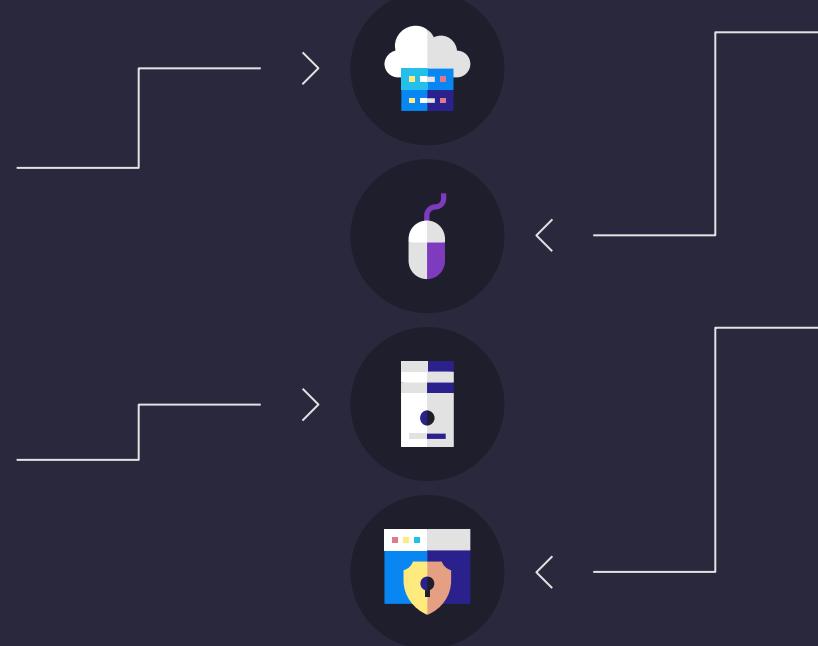
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/INSTALLATION

Venus is the second planet from the Sun



/COMMANDS

Earth is the third planet from the Sun

/HARDWARE

Despite being red, Mars is a cold place

/SECURITY

Saturn is a gas giant and has rings

/PRICING



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- Characteristic
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	Subtask 1	Subtask 2	
	Subtask 3	Subtask 4	



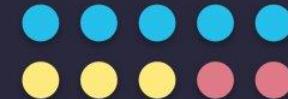
TASK 2

	Subtask 1	Subtask 2	
	Subtask 3	Subtask 4	



TASK 3

	Subtask 1	Subtask 2	
	Subtask 3	Subtask 4	



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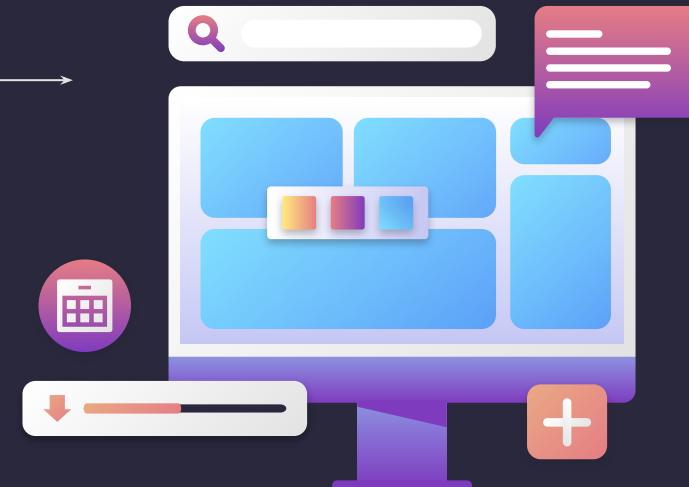
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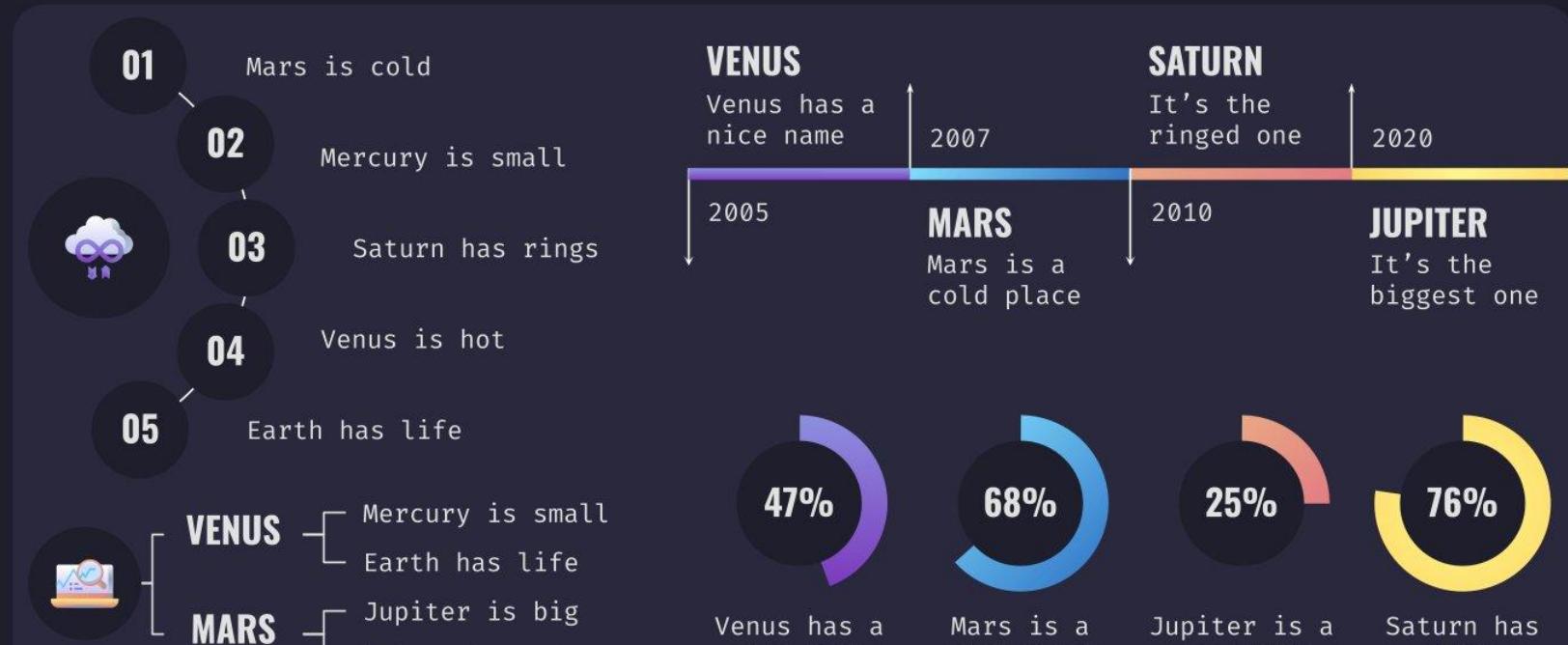
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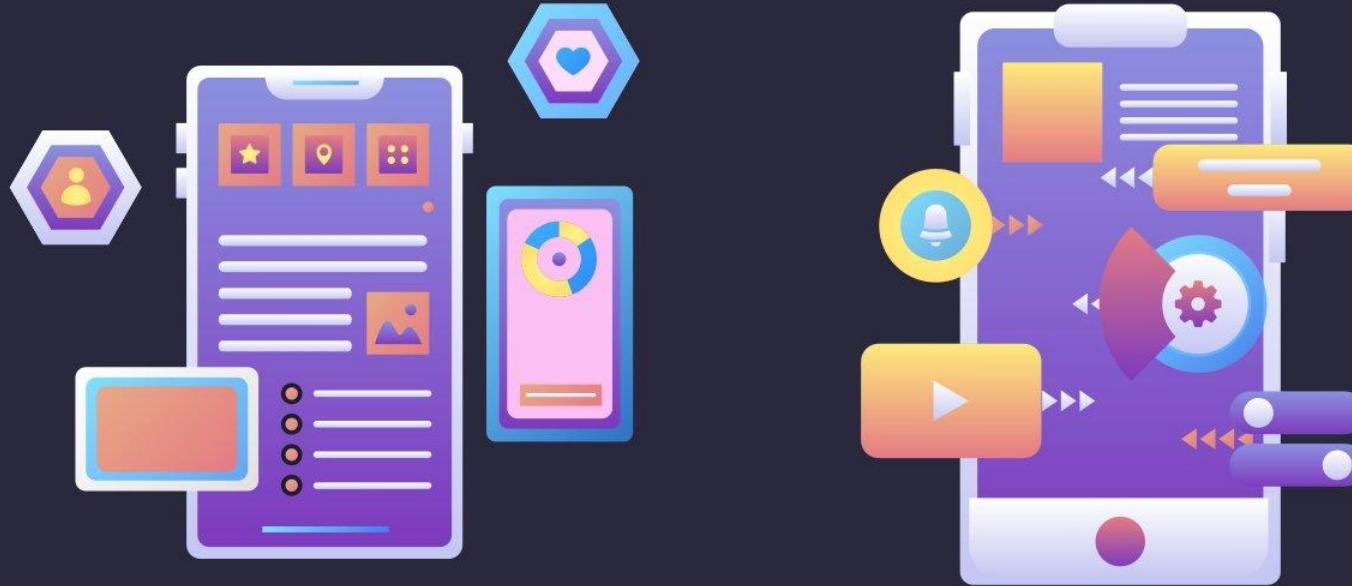
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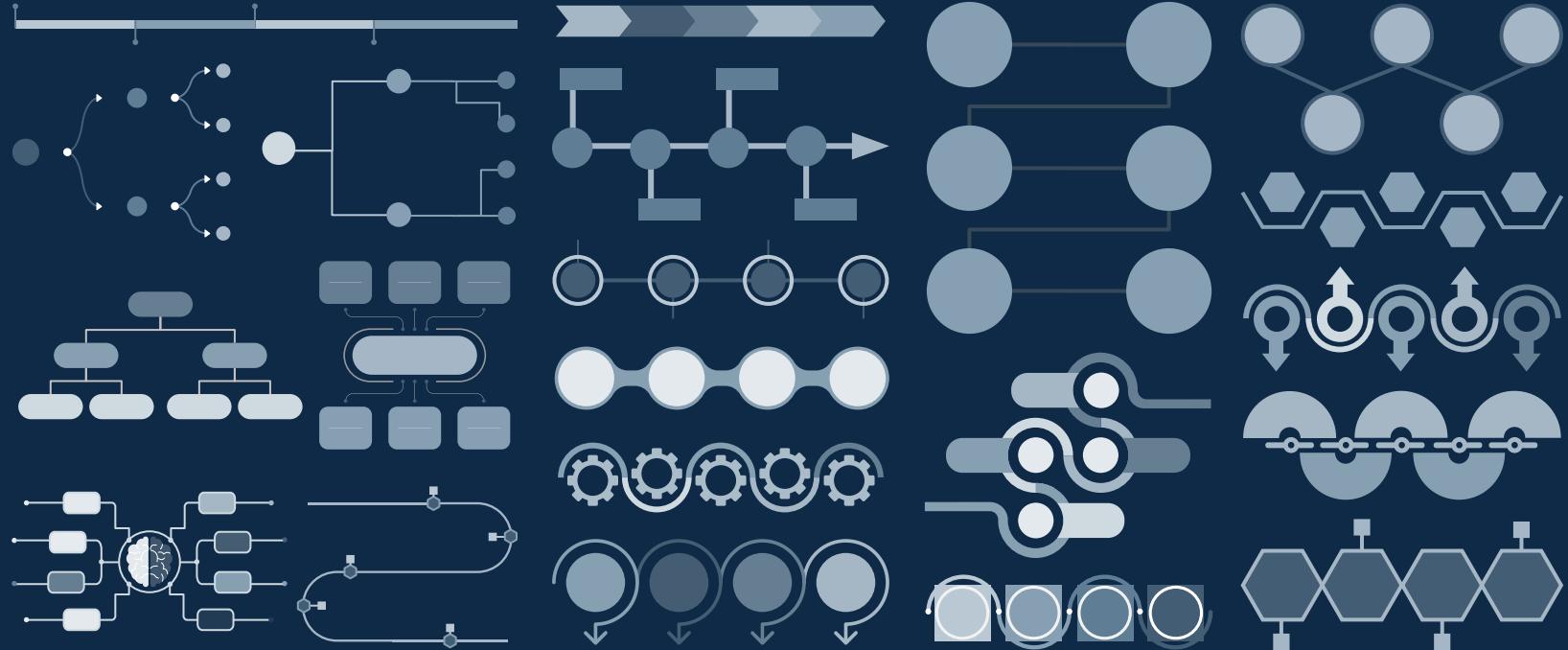
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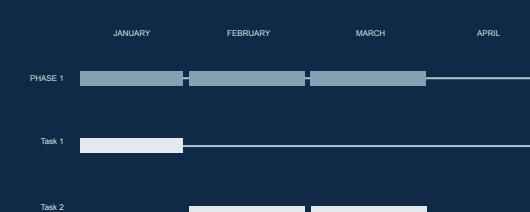
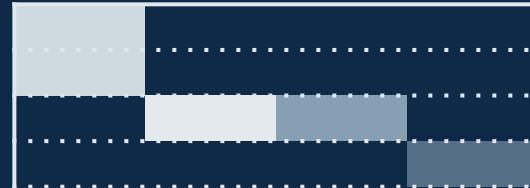
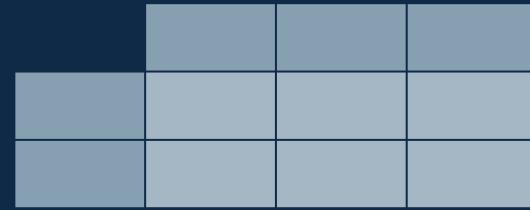
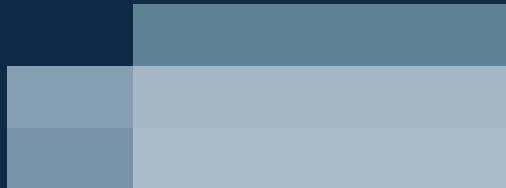
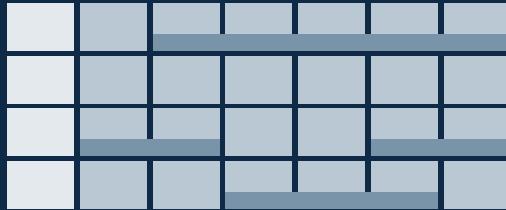
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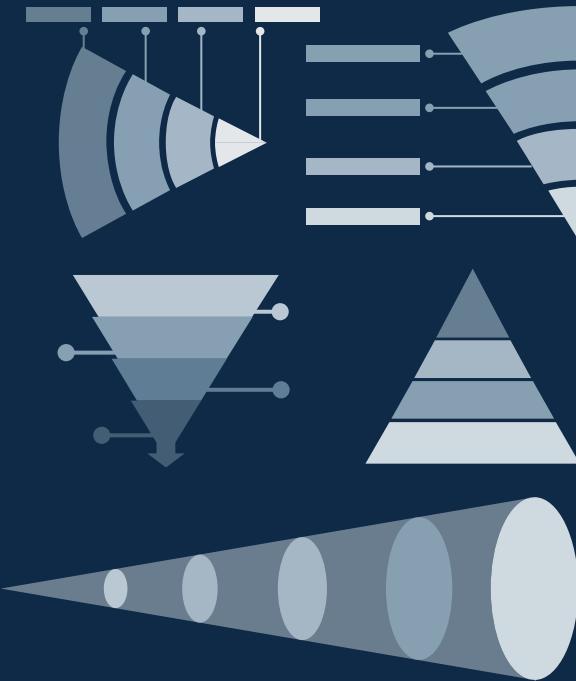
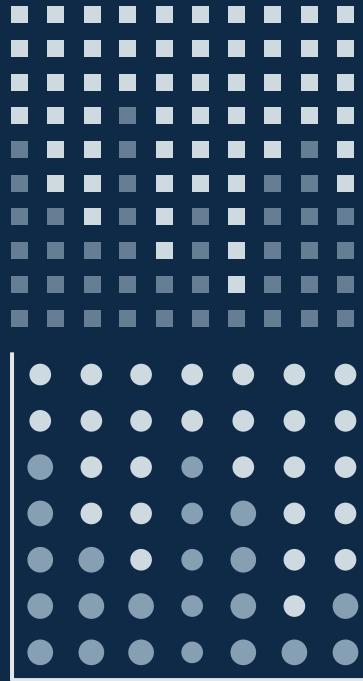












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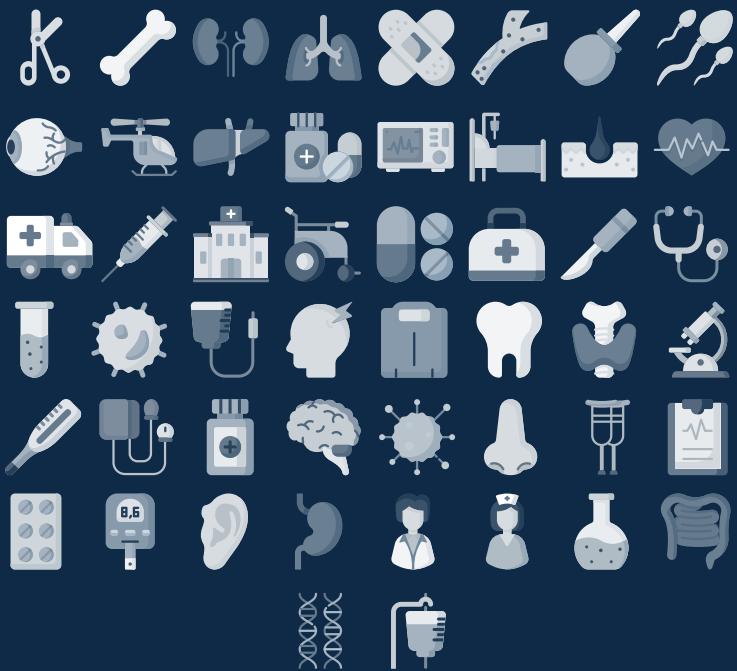
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