

ARRAY & COLLECTION

PPBØ Ø6



ARRAY



ARRAY

Array adalah tipe data user-defined yang terdiri dari sejumlah elemen bertipe data sejenis. Elemen array bisa berisi tipe data primitif (int, char, float, ...) ataupun reference object (non-primitif) dari sebuah class. Reference atau nama dari array akan disimpan dalam *stack memory*, sedangkan isi array akan disimpan dalam *heap memory* (karena array merupakan object pada Java). Pada tipe data primitif, nilai asli akan disimpan dalam *contiguous memory*, sementara pada tipe data non-primitif, objek asli kemungkinan besar akan disimpan dalam *non-contiguous memory*.

Pada Java, array memiliki beberapa perbedaan jika dibandingkan dengan array pada C/C++. Berikut adalah beberapa hal yang perlu diperhatikan dalam konsep array pada Java :

- Array merupakan subclass langsung dari Object
- Semua array yang dialokasikan secara dinamik.
- Pada Java, panjang array dapat diketahui dengan properti *length* (karena array di Java merupakan objek) , sementara pada C/C++ menggunakan operator *sizeof*
- Index array dimulai dari 0
- Setelah diinisiasi, ukuran array tidak dapat diubah. (Dapat menggunakan ArrayList jika ingin dinamis)
- dst.

Multidimensional Array

Array dapat berupa 1 dimensi (hanya sebuah array) ataupun n dimensi ($n > 1$). Array dengan n dimensi tersebut disebut dengan multidimensional array, yang artinya adalah array di dalam array (bisa banyak). Ketentuan penulisan kode/syntax pada multidimensional kurang lebih sama dengan array 1 dimensi. Penjelasan lebih lanjut ada pada slide-slide selanjutnya ...

- Declaration Array

Deklarasi array memiliki 2 komponen utama, yaitu 'type' yang merupakan tipe data serta 'my-var' yang merupakan nama dari array yang ingin dibuat. Pada java, deklarasi array 1 dimensi dan multidimensional dapat dituliskan dengan notasi sebagai berikut :

```
type my-var[]; atau type[] my-var;  
type[1st dimension][2nd dimension]....[Nth dimension] my-var;  
atau  
type my-var[1st dimension][2nd dimension]....[Nth dimension];
```

Penulisan atau deklarasi kode di atas hanya memiliki arti sebatas memberitahu compiler bahwa array/variabel 'my-var' tersebut akan menyimpan array dengan tipe data 'type'. Untuk memberikan nilai pada array/variabel 'my-var' tersebut dengan array secara utuh, harus dilakukan alokasi pada memori (*heap*) menggunakan sintaks 'new' dan di-assign ke array/variabel 'my-var' tersebut.

CONTOH :

```
// deklarasi  
int[] intArray;
```

```
// deklarasi 2d  
int[][] intArray;
```

- Instantiating Array

Pada java, proses pengalokasian (instantiating) array tersebut dapat dituliskan dengan notasi sebagai berikut :

```
my-var = new type[size];  
my-var = new type[size1][size2]....[sizeN];
```

Pada notasi tersebut, 'my-var' merupakan nama dari array/variabel yang ingin dialokasikan, 'type' merupakan tipe data yang dialokasikan pada memori, serta 'size' merupakan jumlah elemen/panjang array. Setelah dialokasikan, elemen array akan diberi nilai default (0 untuk tipe data numerik, false untuk tipe data boolean, serta null untuk tipe data reference → objek).

CONTOH :

```
// declaration  
int intArray[];  
// instantiating  
intArray = new int[10];
```

```
// deklarasi 2d  
int[][] intArray;  
// instantiate  
intArray = new int[5][5];
```

```
// declaration dan instantiating (sekaligus)  
int[] intArray = new int[20];
```

```
// deklarasi dan instantiate array 2d (sekaligus)  
int[][] intArray = new int[5][5];
```

- Pengisian Array & Array Literal

Pengisian array dapat dilakukan dengan menuliskan nama array yang diikuti dengan '*index*' elemen yang ingin diisi pada LHS. Kemudian beri value pada RHS untuk nilai pada elemen array yang dituliskan :

```
var-name [index] = value;  
var-name [index1] [index2]....[indexN] = value;
```

Value yang dituliskan memiliki tipe data yang sama dengan tipe data arraynya. Jika tipe data yang dituliskan pada value berbeda, maka akan dilakukan convert secara otomatis oleh compiler, jika berhasil maka program akan berjalan dengan normal. Berikut adalah contoh pengisian array multidimensional (3d) :

```
// deklarasi dan instantiate array 3d (sekaligus)  
int[][][] intArray = new int[5][5][3];  
  
intArray[0][3][1] = 1;
```

Pengisian value pada array dapat dilakukan dengan cara lain, yaitu Array literal. Array literal digunakan ketika ukuran dan isi elemen dari array yang ingin dibuat sudah diketahui. Berikut adalah contoh penulisan kode dari pembuatan array literal :

```
int[] intArray = { 1,2,3,4,5,6,7,8,9,10 };
```

- Array of Objects

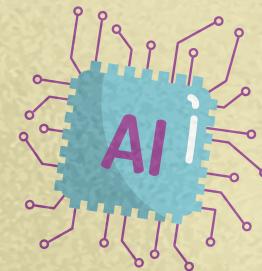
Array object pada java dapat dibuat dengan syntax yang kurang lebih sama dengan penulisan pada array bertipe data primitif (yang paling terlihat berbeda adalah pengisian array, yaitu elemen arraynya merupakan reference objek yang sudah diinisiasi). Berikut adalah syntax penulisan kode dari array object dengan penjelasan di tiap barisnya, antara lain :

```
class Student {  
    public int id;  
    public String name;  
  
    Student(int id, String name){  
        this.id = id;  
        this.name = name;  
    }  
}
```

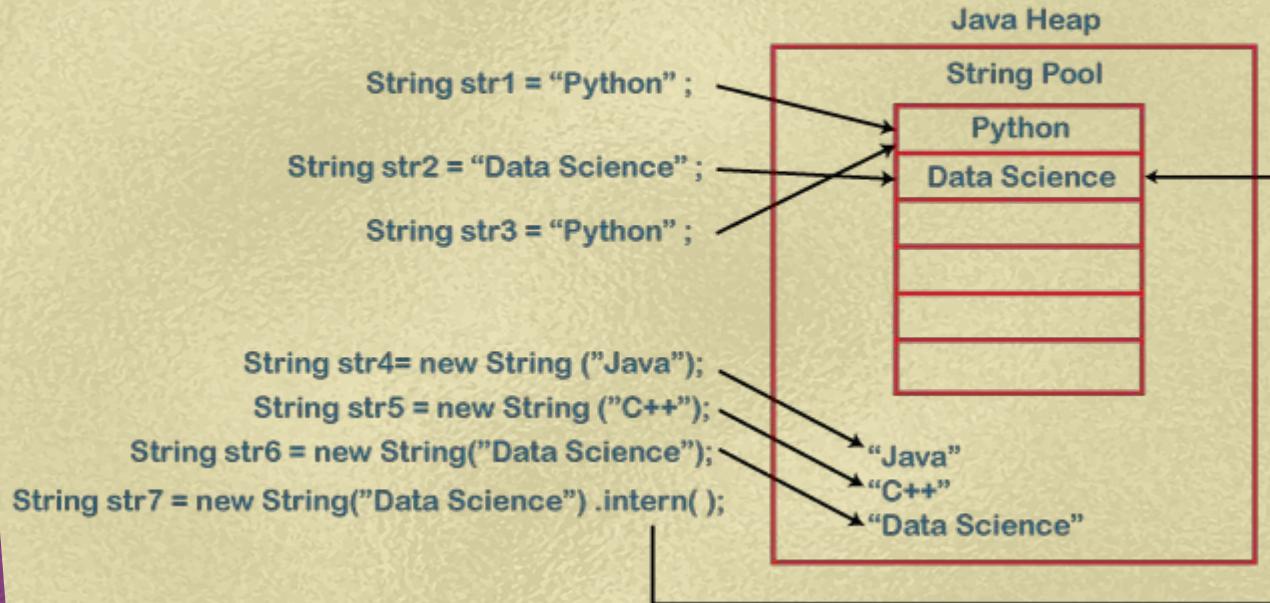
```
// deklarasi (array masih belum terbuat)  
Student[] students;  
// instantiate (array terbuat, bertipe Student dengan panjang 5)  
students = new Student[5];  
// isi array  
students[0] = new Student(id: 1, name: "Andi");  
students[1] = new Student(id: 2, name: "Aldo");
```

addition

String Literal vs String Object



String Pool Concept in Java





COLLECTION



Collection

Collection pada java adalah sebuah framework yang 'merevolusi' sistem grouping pada java. Framework ini dibuat untuk menyelesaikan masalah pada sistem grouping lama (seperti Array, Vector, dan Hashtable) yaitu:

- Setiap sistem grouping tidak memiliki interface yang sama sehingga mengakibatkan masing2 memiliki implementasi, method, dan syntax yang berbeda walau memiliki tujuan yang sama
- Karena alasan di atas, programmer sulit untuk membuat sebuah algoritma yang bekerja untuk setiap sistem grouping

Framework Collection dirilis pada JDK versi 1.2 yang sekaligus mengubah struktur Vector dan Hashtable lama supaya mengikuti framework. Collection interface (`java.util.Collection`) dan Map interface (`java.util.Map`) adalah dua base interface dari framework Collection

Array vs Collection

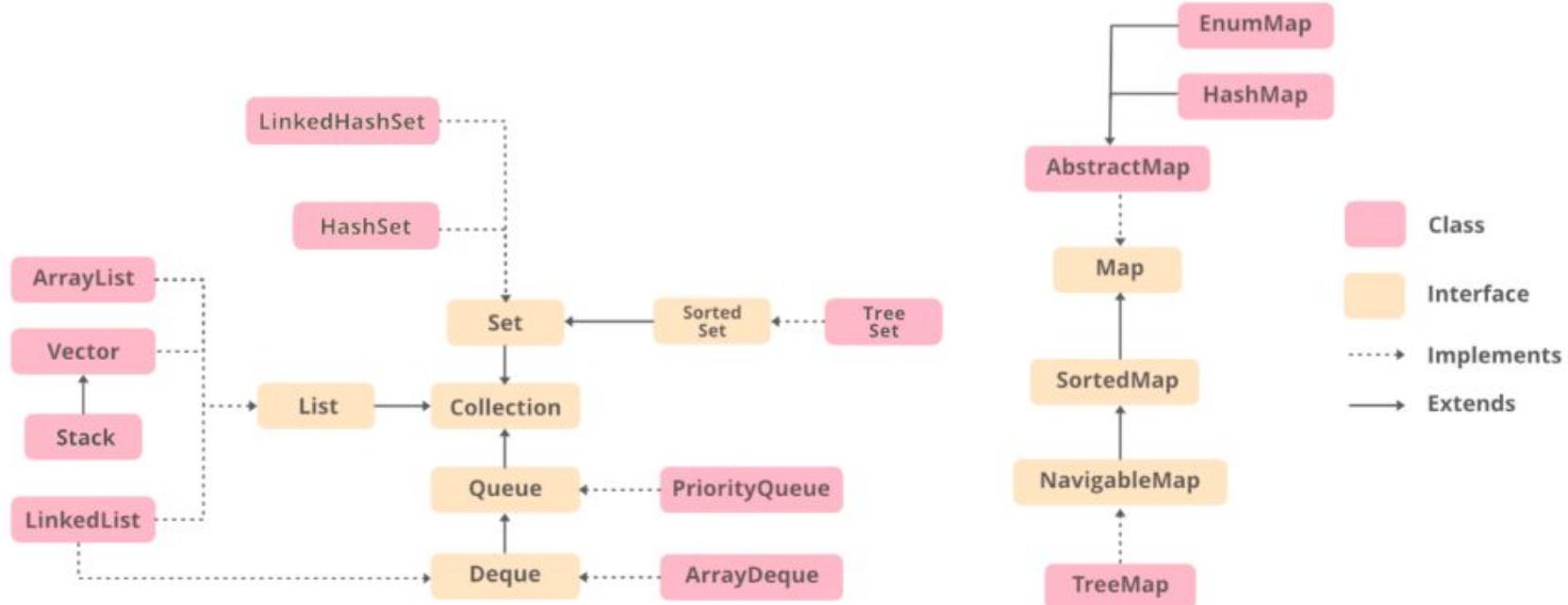
Array

- Ukurannya fixed, tidak dapat ditambah/dikurang setelah dibuat
- Hanya dapat menyimpan tipe data yang sama (homogenous)
- Tidak memiliki pondasi struktur data yang membuat array tidak memiliki method
- Dapat menyimpan objek maupun tipe data primitif

Collection

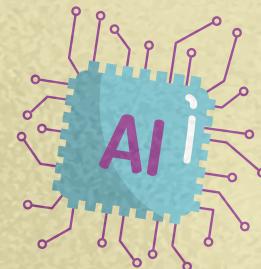
- Secara natural ukurannya dinamis
- Dapat menyimpan tipe data yang sama (homogenous) dan beragam (heterogenous)
- Memiliki pondasi struktur data yang membuat collection memiliki method
- Hanya dapat menyimpan objek, tidak bisa menyimpan tipe data primitif (workaround: menggunakan Wrapper class)

Diagram Collection Framework



Class
Interface
Implements
Extends

ArrayList



ArrayList adalah salah satu class dari Collection interface yang merupakan dynamic array.
Kelebihan ArrayList daripada array biasa antara lain:

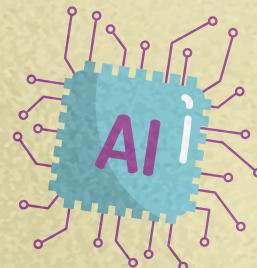
- Dynamic array, ukuran dapat ditambah dan dikurang
- Memiliki method-method pendukung

Beberapa method dari ArrayList:

- `add(Object o)` ⇒ menambah elemen di akhir index
- `add(int index, Object o)` ⇒ menambah elemen pada suatu index, jika setelah index tersebut terisi maka akan tergeser
 - `remove(int index)` ⇒ menghapus elemen pada index tersebut
 - `remove(Object o)` ⇒ menghapus elemen objek o yang ditemukan pertama kali, jika ada
- `toString()` ⇒ mengembalikan representasi ArrayList dalam bentuk string



HashMap



HashMap adalah salah satu class dari Map interface. Seperti struktur data map pada umumnya, HashMap menyimpan data dalam format pasangan Key-Value di mana Key haruslah unique (jika terjadi duplikasi maka yang baru akan mengoverwrite yang lama) tetapi Value tidak harus unique

Beberapa method dari HashMap:

- `put(K key, V value)` ⇒ menambah pasangan key value
- `remove(K key)` ⇒ menghapus pasangan key value berdasarkan key
- `containsKey(K key)` ⇒ mengembalikan TRUE jika terdapat key tersebut pada map
- `containsValue(V value)` ⇒ mengembalikan TRUE jika terdapat value tersebut pada map
- `toString()` ⇒ mengembalikan representasi HashMap dalam bentuk string





...

01

Vector

Mengimplementasi interface List.
Menggunakan array dinamis untuk menyimpan elemen. Mirip dengan ArrayList (Vector tersinkron dan memiliki banyak method di luar framework Collection)

...

02

Stack

Merupakan subclass/ekstensi dari Vector bertipe LIFO.

...

03

LinkedList

Mengimplementasi interface List. Berbentuk linked list, dapat menyimpan elemen duplikat.

...

04

LinkedHashSet

Merupakan ekstensi dari class HashSet dan mengimplementasikan interface Set.

...

05

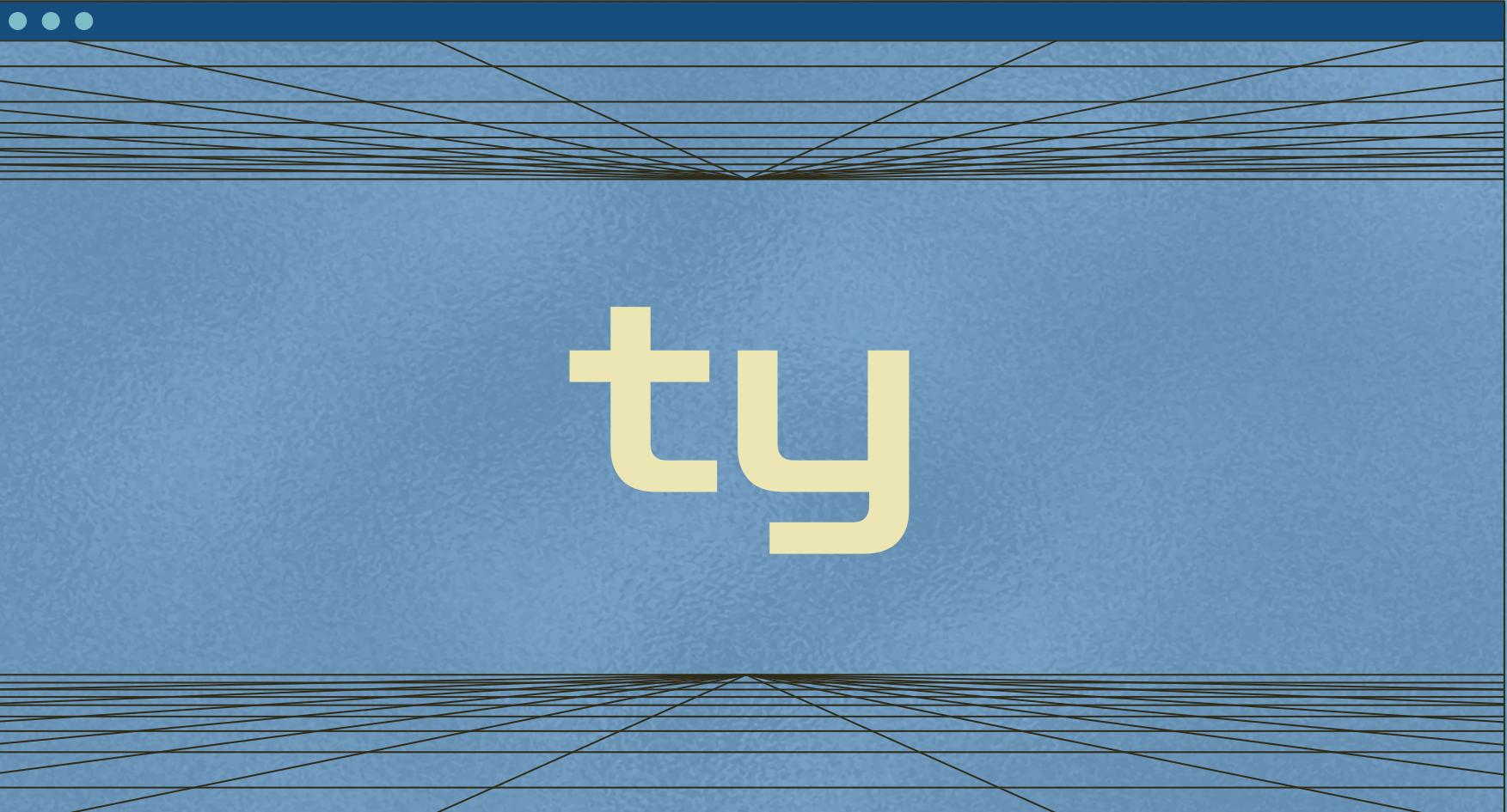
TreeSet

Mengimplementasikan interface Set yang menggunakan tree. Elemen pada TreeSet disimpan secara urut (ascending).

...

...

dll.





01

Introduction

You can describe the topic of
the section here



02

Computers

You can describe the topic of
the section here



03

Science

You can describe the topic of
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04

Degree

You can describe the topic of
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05

College IT

You can describe the topic of
the section here



06

Conclusion

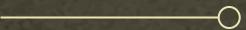
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01

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06

Conclusion

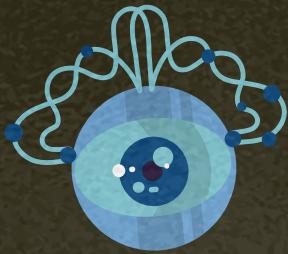
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INTRODUCTION

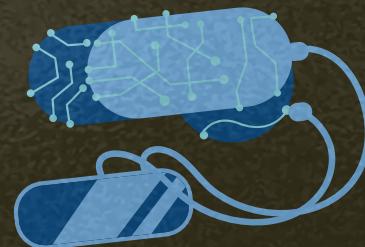
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Introduction

Here you can give 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





Explore computer science



Theory & design

Neptune is the farthest planet from the Sun. It's also the fourth-largest

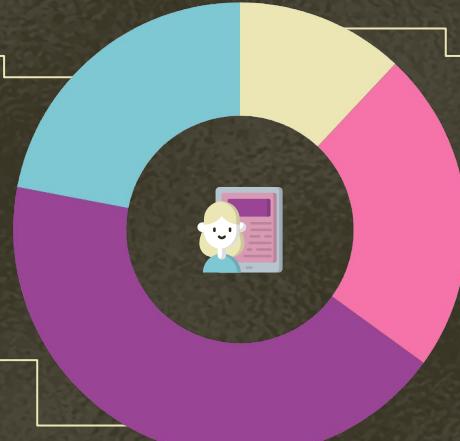


System application

The **Sun** is the star at the center of the Solar System

Most popular programs

• • •
Harper - 22%
Mars is red and cold



• • •
Stanford - 12%
Mercury is very small

• • •
Harvard - 43%
Earth is where we live on

• • •
Georgia - 23%
Venus has a nice name

Follow the link in the graph to modify its data and then paste the new one here. [For more info, click here](#)

Prerequisites for entering

Do you know what helps you make your point clear?

Lists like this one:

- 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!





Flexible program options

• • •

Science

Jupiter is a gas giant and the biggest planet



• • •

Marketing

Saturn is a gas giant and has several rings

• • •

Psychology

Neptune is the farthest planet from the Sun

Degree timeline

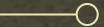


• • •
Year #01
Earth is where we all live on

• • •
Year #02
Venus has a nice name, but it's hot

• • •
Year #03
Pluto is considered a dwarf planet

• • •
Year #04
Saturn is a gas giant and has rings



Next steps



Request info

Earth is the third planet from the Sun



Ask around

Venus has a beautiful name, but it's very hot



Study

Despite being red, **Mars** is actually a cold place



Take exam

Jupiter is the biggest planet of them all



Receive letter

Ceres is located in the main asteroid belt



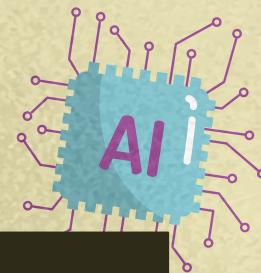
Join us!

Saturn is a gas giant and has several rings

Pictures reinforce the concept

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





• • •

2,405.8

Big numbers catch your audience's attention



Resources



Course catalog

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



Faculty

Earth is the only known planet to harbor life



Student org.

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



Job center

Saturn is a gas giant and has several rings around it



Program schedule

Hour	Mon	Tue	Wed	Thu	Fri
8:00		Marketing	Programming		
10:00	Computer science 101	Programming		Computer science 101	History 1
12:00					Physics 2
14:00		Physics 2	History 1		Programming

Admission rate



• • •

80%

Neptune is the farthest planet from the Sun

• • •

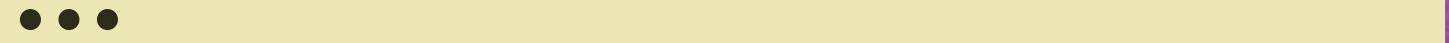
43%

Jupiter is the biggest planet of them all

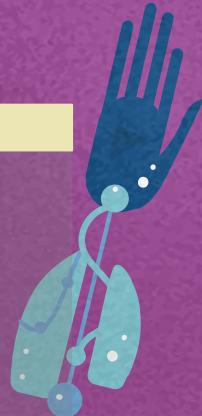
• • •

70%

Saturn is a gas giant and has several rings



AWESOME WORDS



Preparing for your degree

Step #01

Jupiter is the biggest planet of all

Step #02

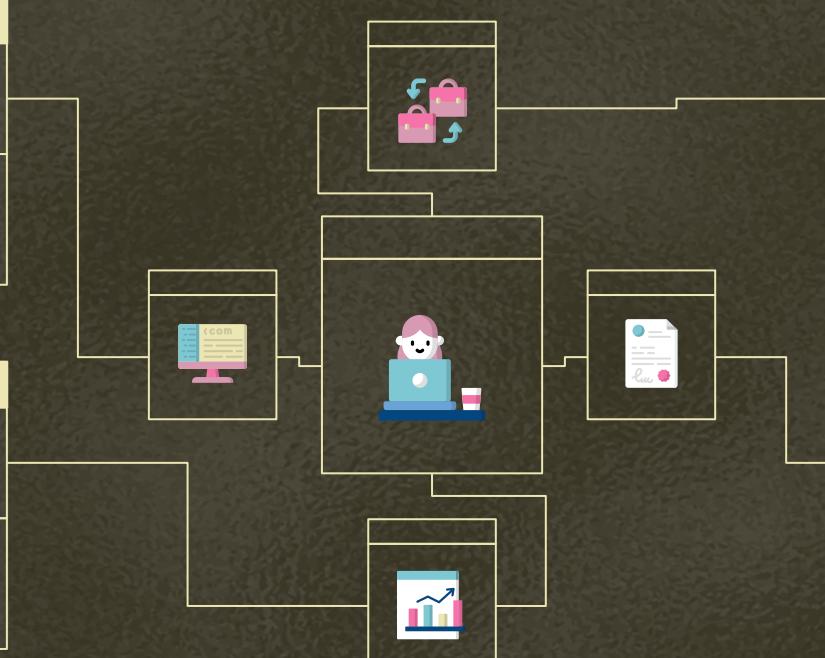
Neptune is the farthest planet

Step #03

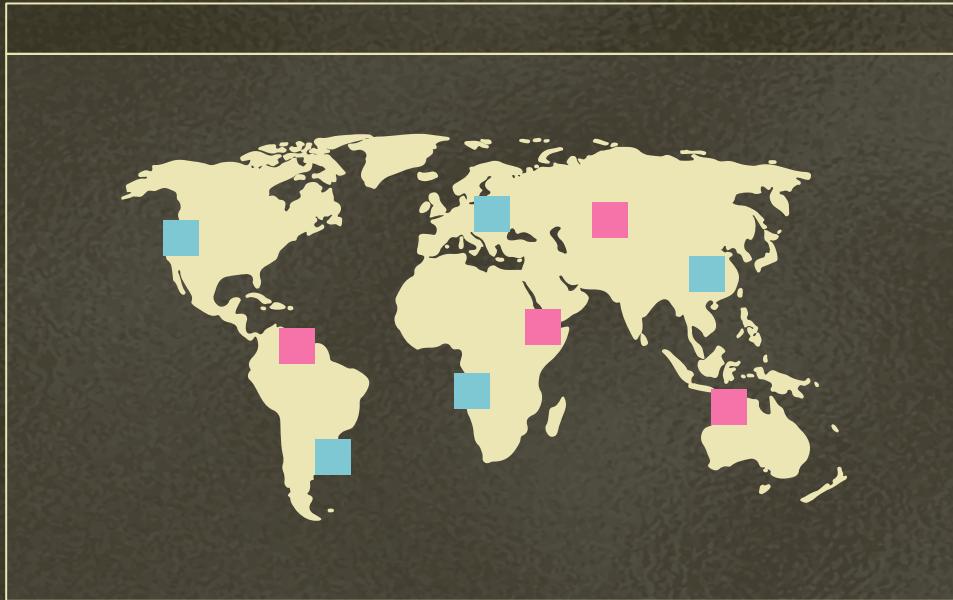
Earth is the beautiful planet we live on

Step #04

Pluto is considered a dwarf planet



This degree around the world



Top degrees

Saturn is the ringed planet and also a gas giant

Standard degrees

Jupiter is the biggest planet in the entire Solar System



2021

Ceres is located in the main asteroid belt



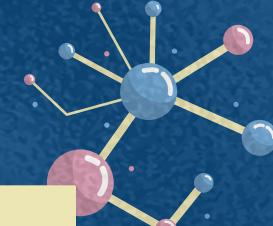
24.52 km

is the distance between Earth and the Moon



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

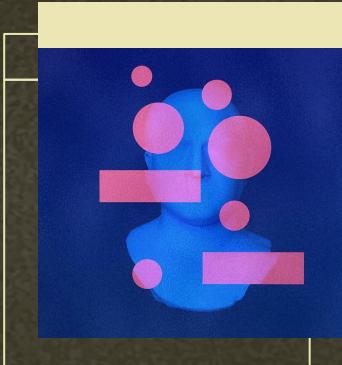
-SOMEONE FAMOUS



Our team



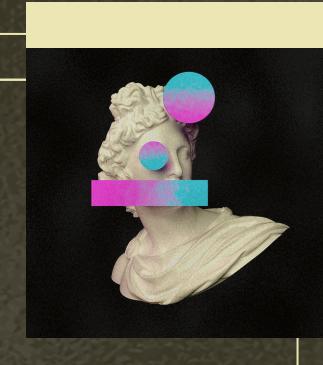
Tom Hannock



You can describe your team member here



Lisa Mendoza



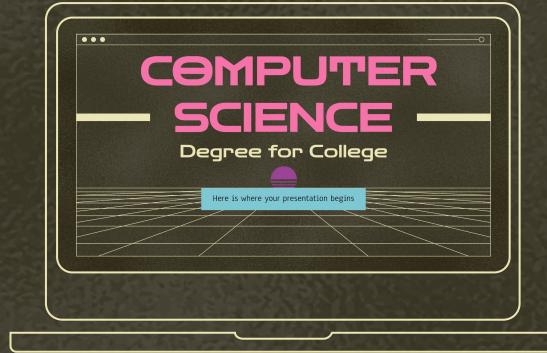
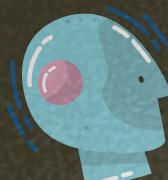
Jon Winter



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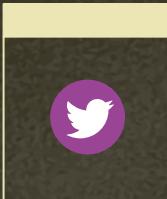


Mockup devices



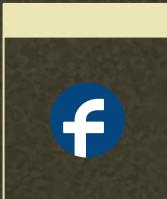
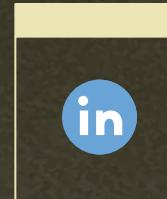
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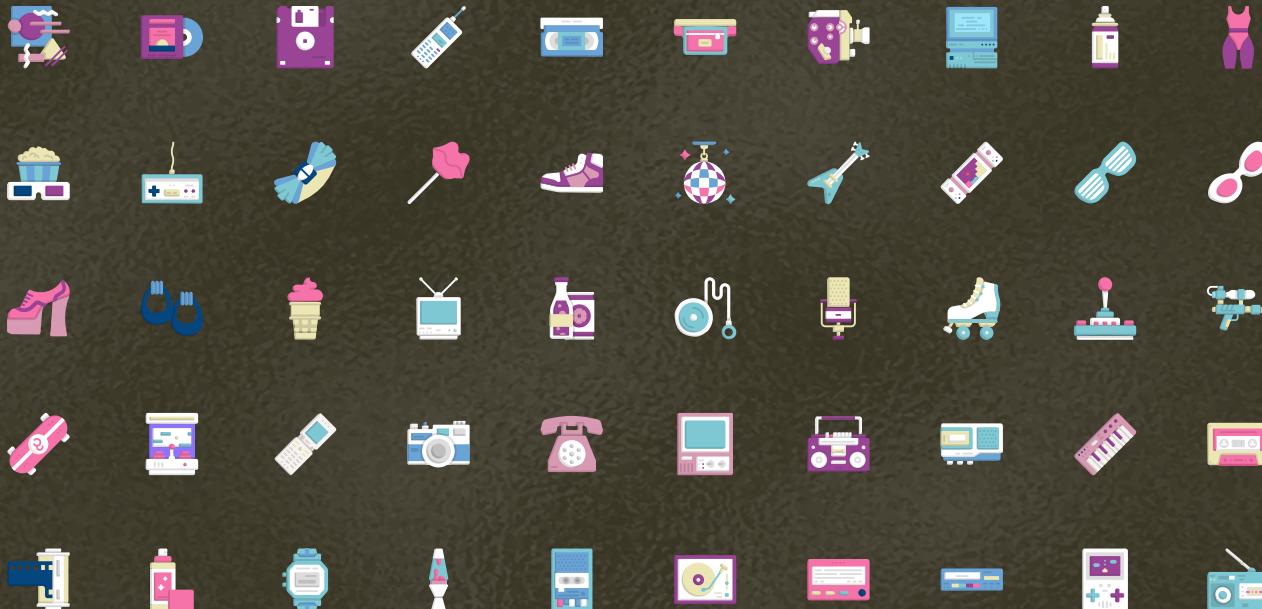
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Computer icon pack



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- Retro 3d shapes in vaporwave style

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Icons:

- Retro Wave

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Pana



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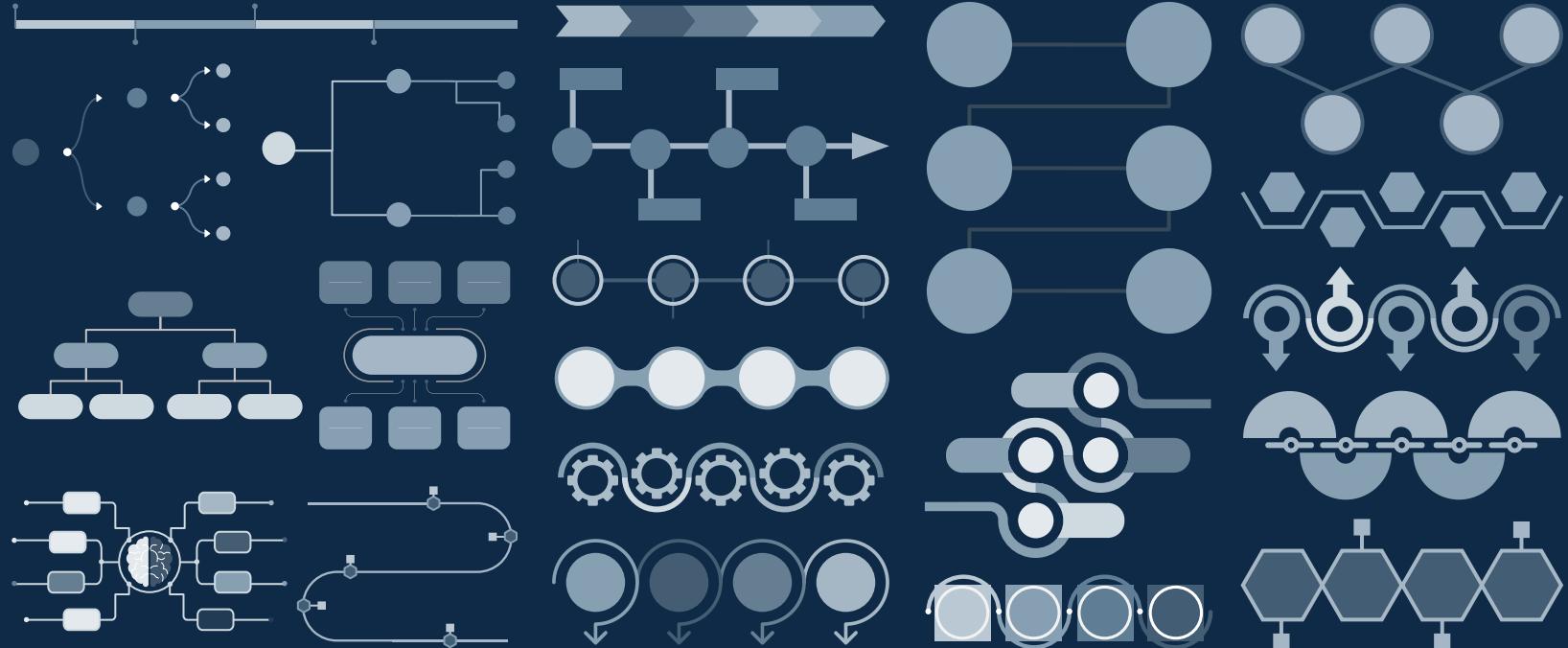
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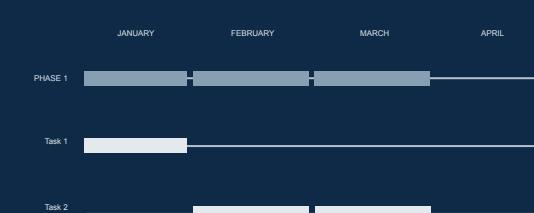
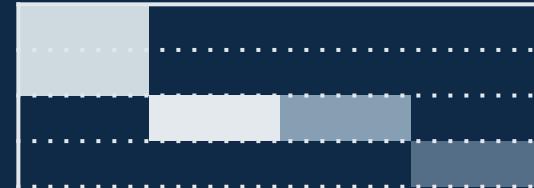
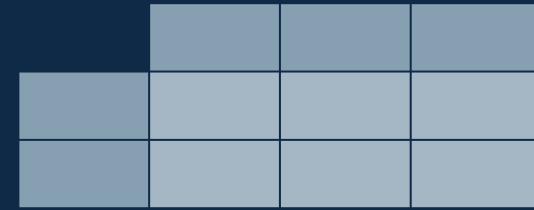
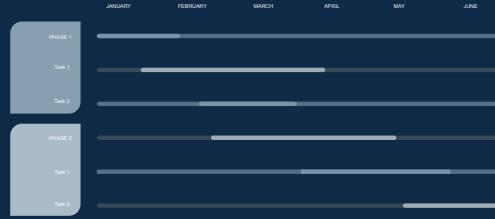
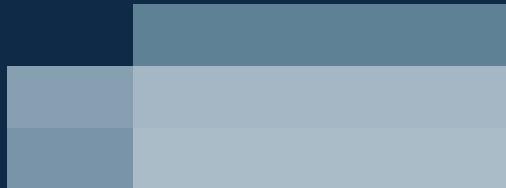
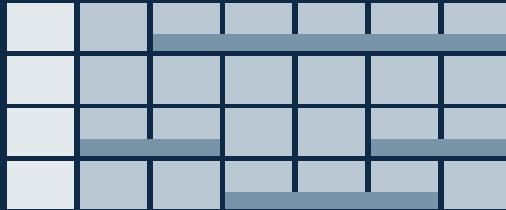
Use our editable graphic resources...

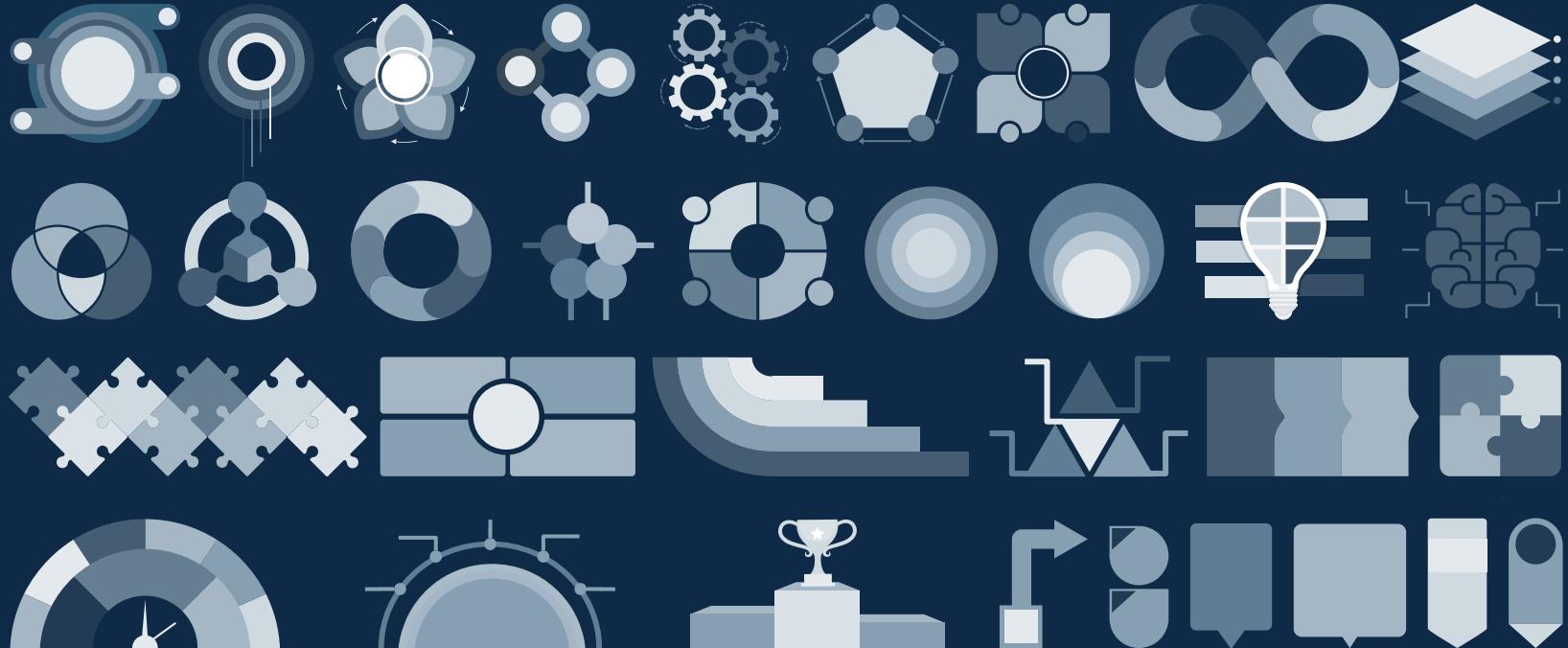
You can easily resize these resources without losing quality. To change the color, just ungroup the resource and click on the object you want to change. Then, click on the paint bucket and select the color you want. Group the resource again when you're done. You can also look for more infographics on Slidesgo.

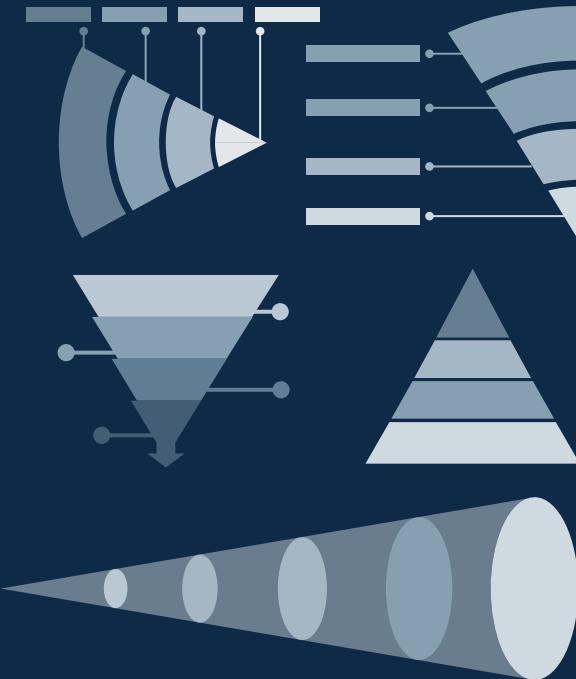
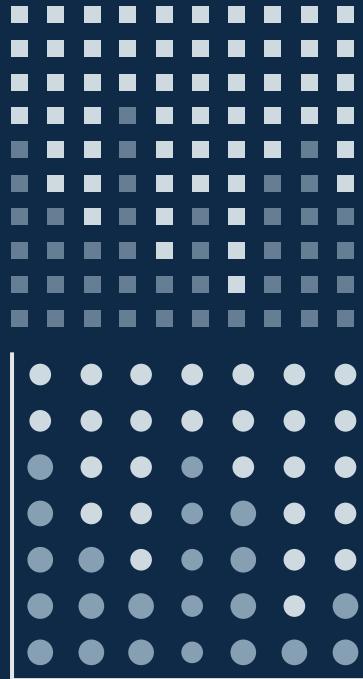












...and our sets of editable icons

You can resize these icons without losing quality.

You can change the stroke and fill color; just select the icon and click on the paint bucket/pen.

In Google Slides, you can also use Flaticon's extension, allowing you to customize and add even more icons.



Educational Icons



Medical Icons



Business Icons



Teamwork Icons



Help & Support Icons



Avatar Icons



Creative Process Icons



Performing Arts Icons



Nature Icons



SEO & Marketing Icons



