
GAME START
PLAY
MENU
EXIT

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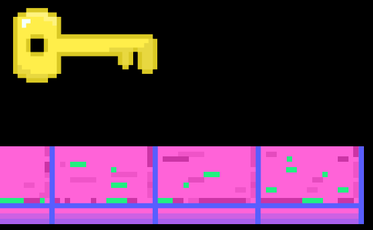
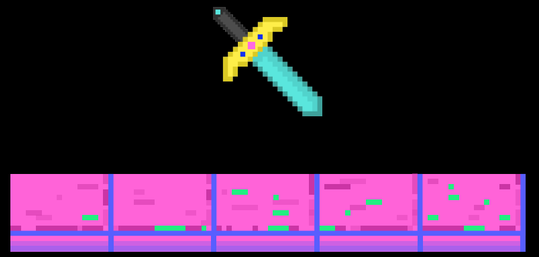
AGENDA

TOPICS COVERED



INTRO TO OBJECT-
ORIENTED PROGRAMMING



MAKE SPACE INVADERS
WITH GAMEMAKER STUDIO 2

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OBJECT ORIENTED PROGRAMMING

MENU

WHAT IS IT?

- Programming Paradigm, a way to code
- We have classes (things) with attributes (characteristics) attached to it
- A Person class has attributes Name and DOB

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MENU

FEATURES

- Classes and Objects
- Inheritance
- Polymorphism
- and some more...

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MENU

APPLICATIONS & COMMON LANGUAGES

- Software Dev
- Game Dev

- Python
- Java
- C++
- Ruby

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MENU

“ChatGPT, tell me in one sentence why programmers should use OOP.”

“Programmers should use Object-Oriented Programming (OOP) to better organize and structure code by encapsulating data and behavior into reusable and modular objects, leading to more maintainable and scalable software systems.”

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MENU

WHAT?

- Create structures
- Write reusable code
- Promote inheritance, polymorphism, abstraction

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SOUNDS TOO FANCY...

But how does it actually work?

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CLASSES AND OBJECTS

MENU

CLASS

A class is like a template for creating things.

For example, if you had a game:

- 1 player has a name and a superpower (2 attributes)
- Then 5 players have 10 attributes altogether!

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TAKE A LOOK AT THE DEFAULT STRATEGY

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```
# Define their names
player1_name = "Eden"
player2_name = "Rama"
player3_name = "Kasie"
player4_name = "Kevin"
player5_name = "Prat"

# And their powers...
player1_power = "Gravity Manipulation"
player2_power = "Force Fields"
player3_power = "Super Speed"
player4_power = "Elemental control"
player5_power = "Flight"

print(player1_name + " has superpower: " + player1_power)
print(player2_name + " has superpower: " + player2_power)
print(player3_name + " has superpower: " + player3_power)
print(player4_name + " has superpower: " + player4_power)
print(player5_name + " has superpower: " + player5_power)
```

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ADVANTAGES

- Easy to write
- Simple logic

DISADVANTAGES

- Lack of abstraction, hard for larger databases.
- Code duplication
- Limited reusability (can’t modify or extend)
- How do you know which player has which superpowers?

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SOLUTION? DEFINE A CLASS!

```
class Player:
  def __init__(self, name, power):
    self.name = name
    self.power = power
```

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CREAT AN OBJECT

An object is an instance of a class

```
player1 = Player("Eden", "Gravity Manipulation")
player2 = Player("Rama", "Force Fields")
player3 = Player("Kasie", "Super Speed")
```

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MENU

1 STEP BACK

Class name

```
class Player:
    def __init__(self, name, power):
        self.name = name
        self.power = power
```

Define a method, a function that the object can use

Referencing attributes, the variables inside the class

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WHAT IS A METHOD?

A method is a function that can be called by an object to perform a task.

Example:

- The __init__ function (automatic upon creation)
- findDistance, output

How is it different to a normal function?

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HOW IS THAT DIFFERENT FROM A FUNCTION???

A method is linked with a class, and the class is `implicitly` passed to the method

A method can operate on data within the class

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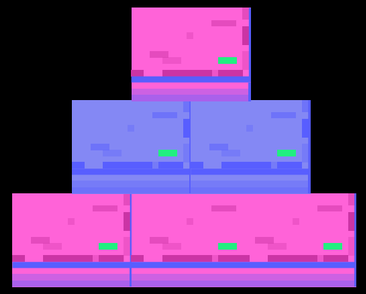
NOW...

Say I want to print a sentence describing a class



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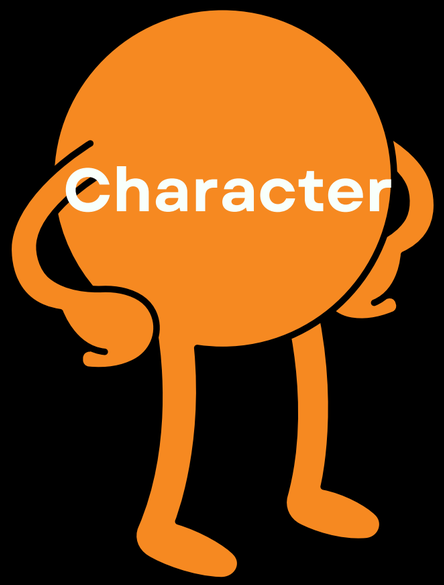
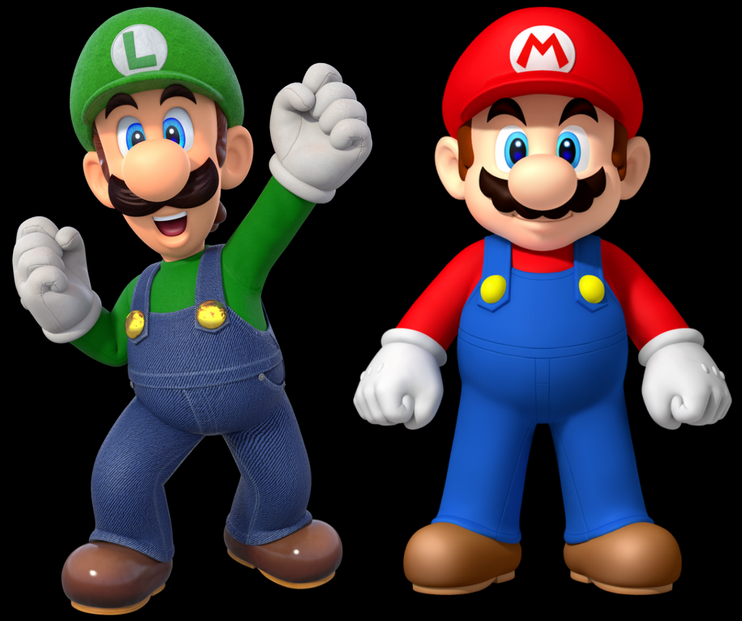
```
class Player:
  def __init__(self, name, power):
    self.name = name
    self.power = power

  def describe(self):
    print(self.name + " has superpower: " + self.power)


# Create your objects, instances of your class
player1 = Player("Eden", "Gravity Manipulation")
player2 = Player("Rama", "Force Fields")
player3 = Player("Kasie", "Super Speed")


player1.describe()
player2.describe()
player3.describe()
```

MENU

CLASS



OBJECT



ATTRIBUTE

Name

Speed

Special ability

Vehicle preference

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What should be a class?

YES

- Person
- Furniture
- ChessPiece
- Device

NO

- Name
- Height
- Knight
- Laptop

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INHERITANCE

WHAT IS INHERITANCE?

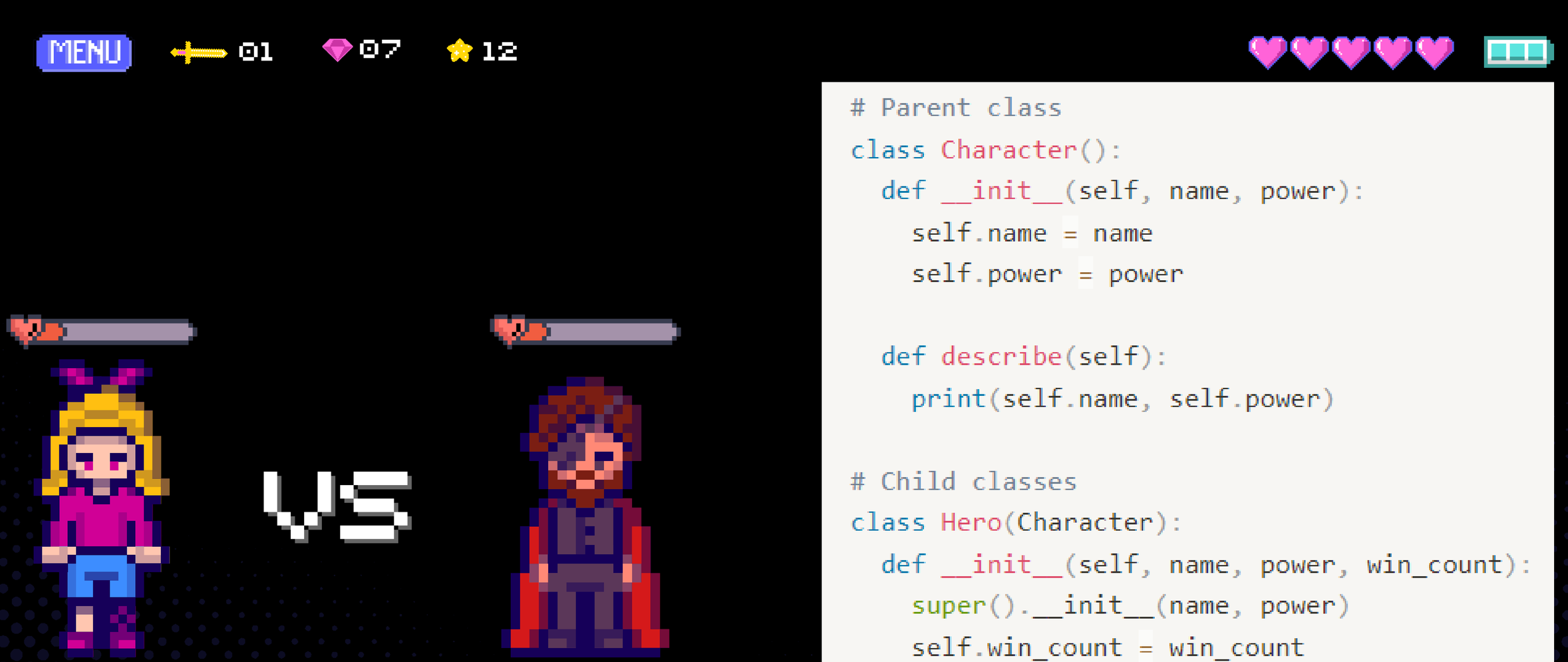
- Inheritance is when you have one class that inherits some or all of its properties from another class. We say the child class inherits from the parent class.

- For example, there are multiple characters in a game, some are heroes, and others are villains. So we define a parent class as follows:


```python
class Character():
  def __init__(self, name, power):
    self.name = name
    self.power = power

  def describe(self):
    print(self.name, self.power)
```

And then....

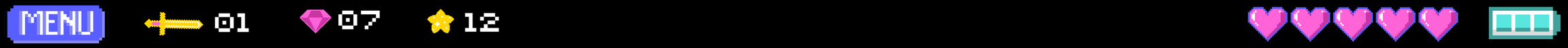



```python
# Parent class
class Character():
  def __init__(self, name, power):
    self.name = name
    self.power = power

  def describe(self):
    print(self.name, self.power)

# Child classes
class Hero(Character):
  def __init__(self, name, power, win_count):
    super().__init__(name, power)
    self.win_count = win_count

class Villain(Character):
  def __init__(self, name, power, story):
    super().__init__(name, power)
    self.story = story
```



Now we can create objects just like we did earlier:

```
spiderman = Hero("Spiderman", "Spider Powers", 10)
DocOctopus = Villain("Doctor Octopus", "Electronic Arms", "Originally a brilliant sc
ientist, his greatest invention, a set of metallic limbs, became fused to his body b
y an accident which caused his insanity. He has telepathic control of these arms, wh
ich are strong enough to physically hurt Spider-Man.[12] While Doctor Octopus is reg
arded as one of Spider-Man's archenemies, he also been portrayed as an antihero, and
even starred in his own comic book storyline that saw him becoming a superhero calle
d the Superior Spider-Man after the original Spider-Man's death.")
```

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POLYMORPHISM

An overview

MENU

"MANY FORMS"

It is like using the same function for different purposes

```
# len() function
print(len("Hello World!"))
print(len([1, 2, 3, 4, 5]))
print(len("Apples", "Bananas"))
print(len({"num1": 1, "num2": 2, "num3": 3}))
```

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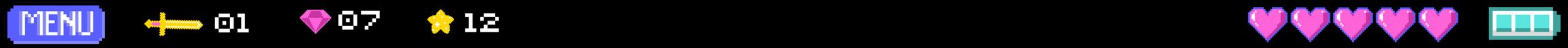
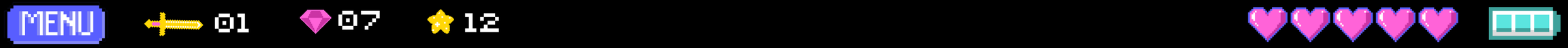
LAST SECTION I PROMISE



EVENTS AND LISTENERS

- events in game occur when something happens and changes the state (usually connections in behaviour between game objects)

- Examples include:
  - clicking
  - key presses
  - in game events like health damage



MULTIPLE EVENTS?

A class can have multiple events, just like a character can kick, move, jump, defend, lose/gain health and talk.

We use what's called an "event listener", these are:

- Methods in classes
- Exist for the sole purpose of waiting for events to happen,
  - When an event occurs, they are triggered.
  - Example, pressing the UP key (event) moves the player (action by listener)

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WHO DOESN'T LIKE A DIAGRAM