What is a Program

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Participants View

A program is a colletion of instruction

(to whom?) the computer system

(why?) To perform a task

Is this an Object Oriented Definition?

Popular Perception

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Abstraction

What?

hiding data.

hiding details.

hiding implementation.

showing only necessary information.

driver dont need to know the internal technical aspects of a car-abstraction?

only useful information to be shown to end user.

Why?

End user may not require to know all minute details

How?

specifying in scope like private, public protected

Encapsulation

What?

- * grouping data and functions into a single object
- * enclosing related information together
- $\ensuremath{^{*}}$ wrapping data and function in a class
- * prevent changes datA outside

Why?

- * to protect information from other object
- * data hiding

How?

- * using class
- * class with get and set property
- * access specifier (private/protected)

Inheritance

What?

- * reuse from parent
- * derive properties from another class <-- what is another class?
- * derived class inheriting the properties and behaviours from parent class
- * hierarchy
- * access properties of parent class by child class

Why?

* Avoid redundant code (code reuse)

How?

* language semantic class X : Y{}

Polymorphism

What?

* behaving in different ways depending on the input received

who

is there a

conflict

here?

functions

Why?

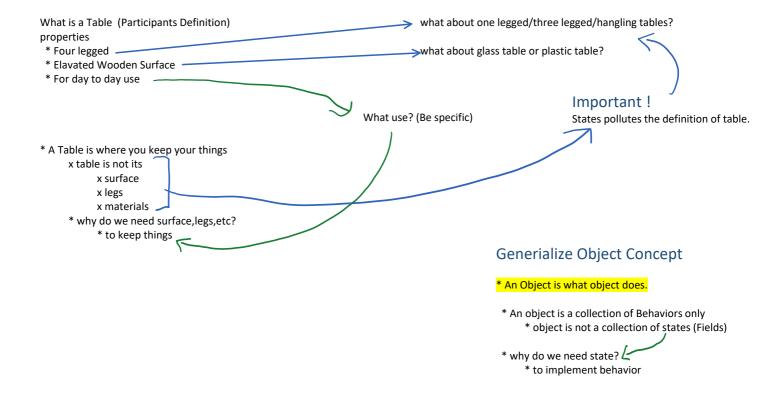
- * Hide type/properties/methods
- * features can be similar so we can specify them in base class?
- * helps in abstraction---> you hide inner details

How?

- * function and operator overloading
- * method and overriding
- * access modifier

What is an Object?

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What type of Programmer Are you?

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You are driving a bike on a busy day when your friend stops you asks a SFAQ (Silly Frequently Asked Question) -- Hey what are you doing? What would be your response?

A. I am burning the fuel

• engineering of driving, energy conversion, bike parts

Assembly language thought process. Thinking in terms of memory, stack, heap and program as set of data and methods

B. I am Driving

• following direction, following traffic rules etc etc

C. I am going to office

D. I am going to work

• Work from Home!



Furhter Refinement of thinking. A more abstract generalized approach

Proceedural Thinking. In terms of instruction to achieve the task. Often in the details the real task loses the focus

Object Oriente Thinking

Focus on the business and defocus the implementation details. There are more than one proceedural approach to do whatever you want to do

Code Economics

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Everyline of code you write is either an expense or investment.

Code ---> Expense, Investment?

Expense Code --> main()/even-handler

Investment Code --> Reusable! Long Lasting Use! printf()/Console.WriteLine

Animal Class

```
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```

```
class Animal
     public void Move()
           switch(animalType)
           {
                 case AnimalType.Tiger:
                       //move on land
                 case AnimalType.Snake:
                       //crawl
           }
     }
     public void Breed()
           switch(animalType)
                 case AnimalType.Tiger:
                       //child birth
                 case AnimalType.Snake:
                       //egg lay
           }
     }
}
```

Is A vs Has A

Gaurang is an Employee

• He is a born Employee

• Will remain an Employee as long as he lives

• Forget

• Retriement

• Own Business

Employee gaurang=new Employee();

Console.WriteLine(gaurang.GetType()); //Employee

gaurang.SetType(); //unchangable

- Gaurang may have employed someone such as
 - o Driver
 - HouseHelp

To change "is a" to "has a" you need to change your design

Gaurang Has an Employeement

- If you have an employement you can decide
 - Not to have an employement
 - o Change the employement
 - o Have multiple employement

Inhuman

Person is unqualified biological species with

- · some behavior
- some skills
- some relationship

```
class Person{
    Behavior behavior
    List<Relation> relations;
    List<Skills> skills;
    ...
}
```

//C# code

var gaurang= new Human(); Person();

gaurang.Behavior=new HumanBehavior();

gaurang.Employement= new LTTSEmployement();

//unemployed gaurang.Employement=null;

//change employement gaurang.Employement=new SelfEmployement()

//C# code for multiple employements
var gaurang=new ???();

gaurang.Employements.Add(new SoftwareDeveloper()); gaurang.Employements.Add(new YoutubeBlogger());

var vivek=new ???()

vivek.Role=new TrainerRole(); vivek.Work(); //works as trainer

vivek.Role=new Driver(); vivek.Work(); //works as Driver

Grammar of OO Design

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Traditional/Academeic/Outdated Approach

Convert Noun to ----> class or object

Covert Verb to -----> class method

How to convert Adjective, Adverb, Preposition, Conjunction?

Modern Understanding of Object Oriented Design

Convert Everything to Object

- You are an object
- Your states (age, height) is an object
- Your behaviors are object
- Your nature is object
- Your skills are object
- You relation to other object is also object

What is the difference

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Humans can't fly vs Ostritch can't fly?

- Ostritch being a Bird has a fly method
 - o But implmentation wise it doesn't work
 - o It has a non-working fly() behavior
- Humans don't have fly behavior

What is True?

- A. Square Don't have any orientation
- B. Square have oreintation equal to None

7 Introduct

Rectangle-Square Problems

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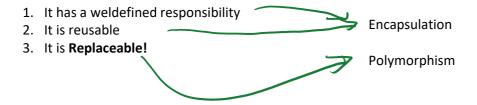
- 1. Rectangle require 2 int to define, Square needs only 1
- 2. Rectangle has set method for Width/Height, Square's width, height can't be different
- 3. Rectangle has Orientation, Squares don't have Orientation

While Inheritance is easy, there is way to uninherit or partially inherit!

What is a software component

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It has 3 qualities



```
class LinkedList
{
    void Add(Object item){ //adds item at the end of list
    }
    Object Remove(int pos){
    }
    int Size(){
    }
    Object this [](int index){} //get/set
}

class Stack{
    LinkedList items;
    public void Push(Object value){ items.Add(value); }
}

what if I need an LinkedList to add item in sorted order (not at the end)
//we can go and modify the add logic
```

Meaningful word

```
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```

```
class Triangle{
    int Solve(){}
    int Calculate(){}
}
```

Together Triangle, Solve and Calculate doesn't make any sense

 $\label{lem:means} \mbox{Meaningful means we can understand the responsibility of a method}$