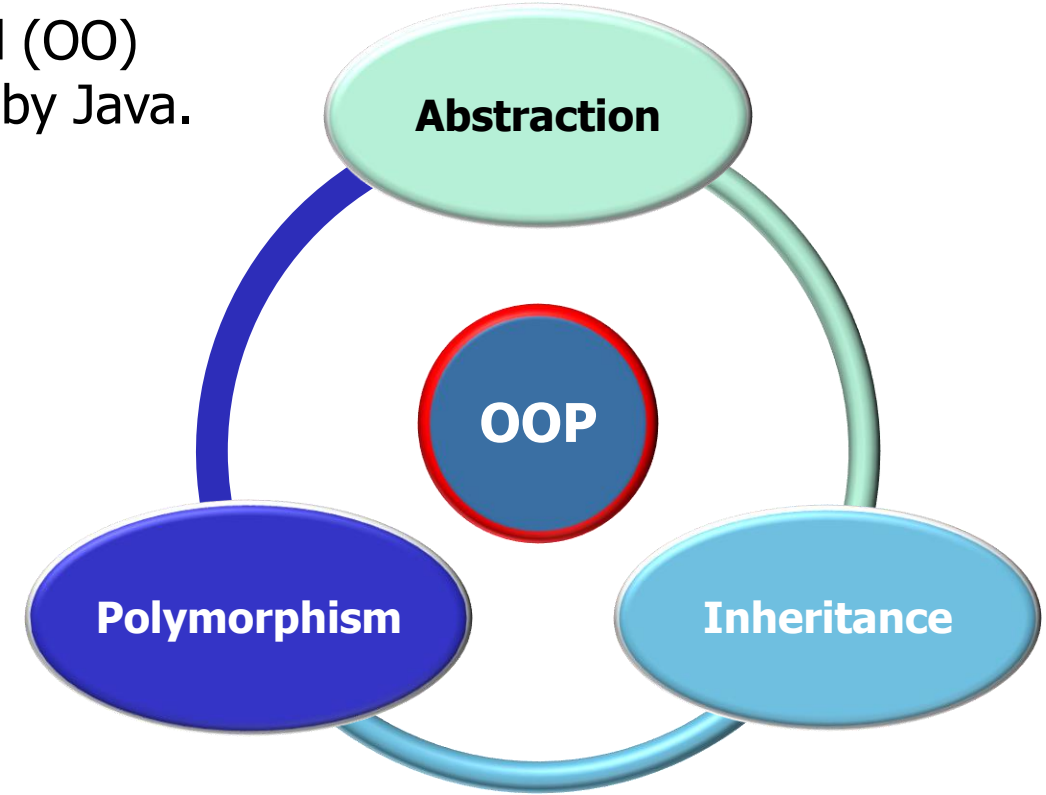
Overview of Java

Key Object-Oriented Concepts and Features

Douglas C. Schmidt

Learning Objectives for This Lesson

- Understand key object-oriented (OO) concepts & features supported by Java.



See www.stroustrup.com/whatis.pdf

Douglas C. Schmidt

Overview of Key Object-Oriented Concepts Supported by Java

Key Object-Oriented Concepts Supported by Java

- Java was originally just an object-oriented (OO) programming language.

See en.wikipedia.org/wiki/Object-oriented_programming

Key Object-Oriented Concepts Supported by Java

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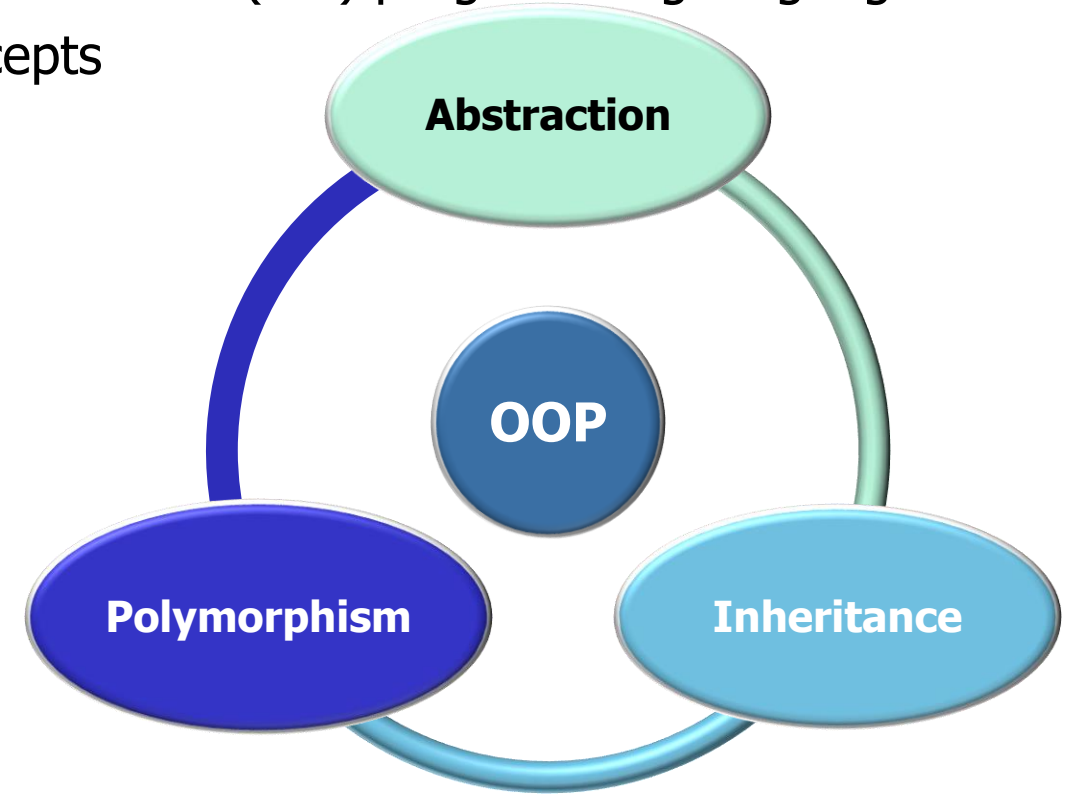
  - It, thus, supports key OO concepts and features



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Key Object-Oriented Concepts Supported by Java

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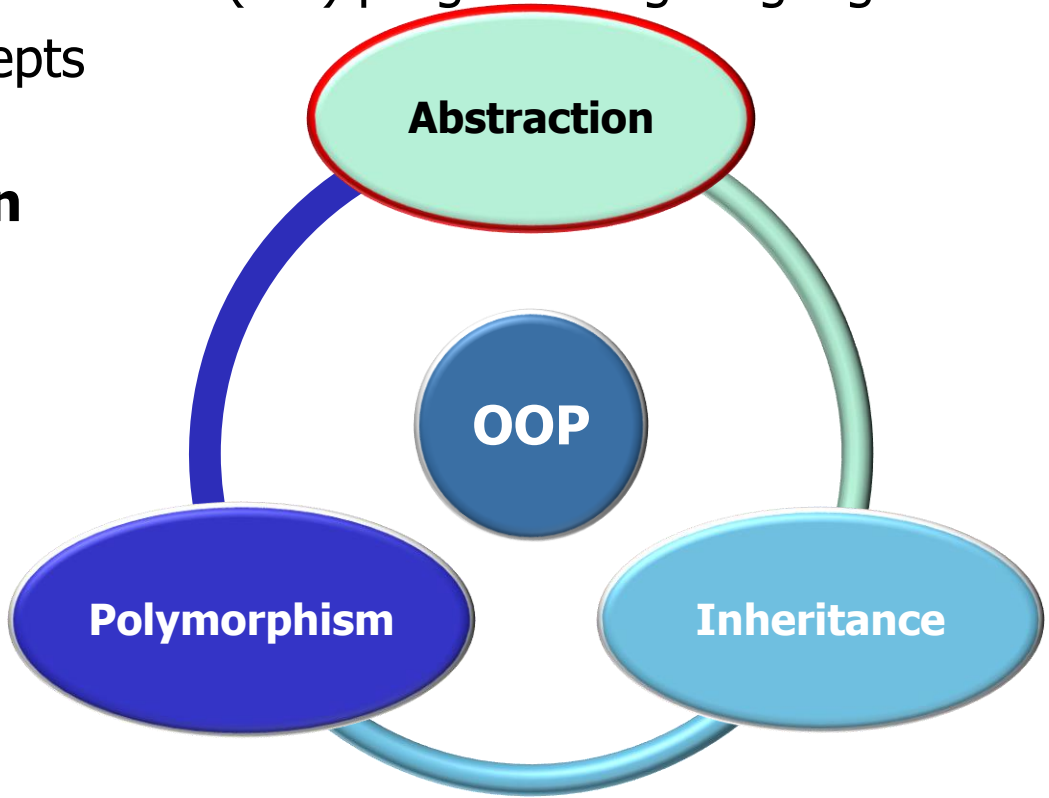
  - It, thus, supports key OO concepts and features, e.g.,
    - **Data & control abstraction**



See en.wikipedia.org/wiki/Abstraction_(computer_science)

Key Object-Oriented Concepts Supported by Java

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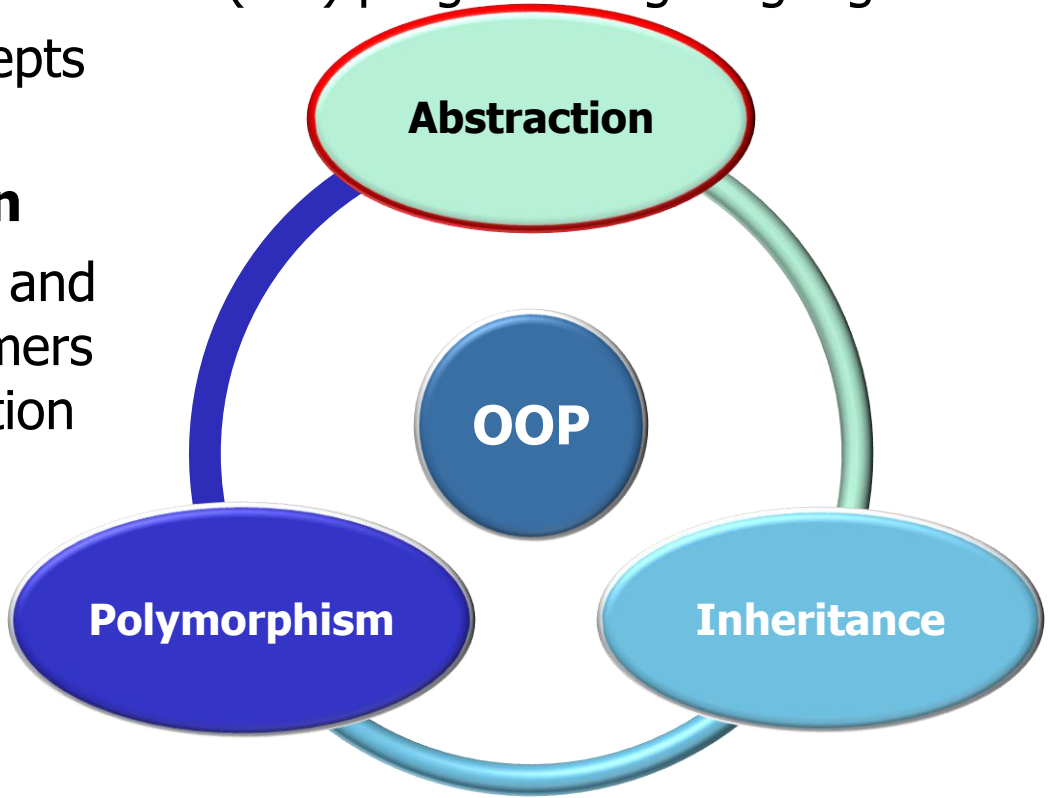
  - It, thus, supports key OO concepts and features, e.g.,
    - **Data & control abstraction**
      - Supports well-defined APIs and shields programs/programmers from low-level implementation details



See en.wikipedia.org/wiki/Application_programming_interface

Key Object-Oriented Concepts Supported by Java

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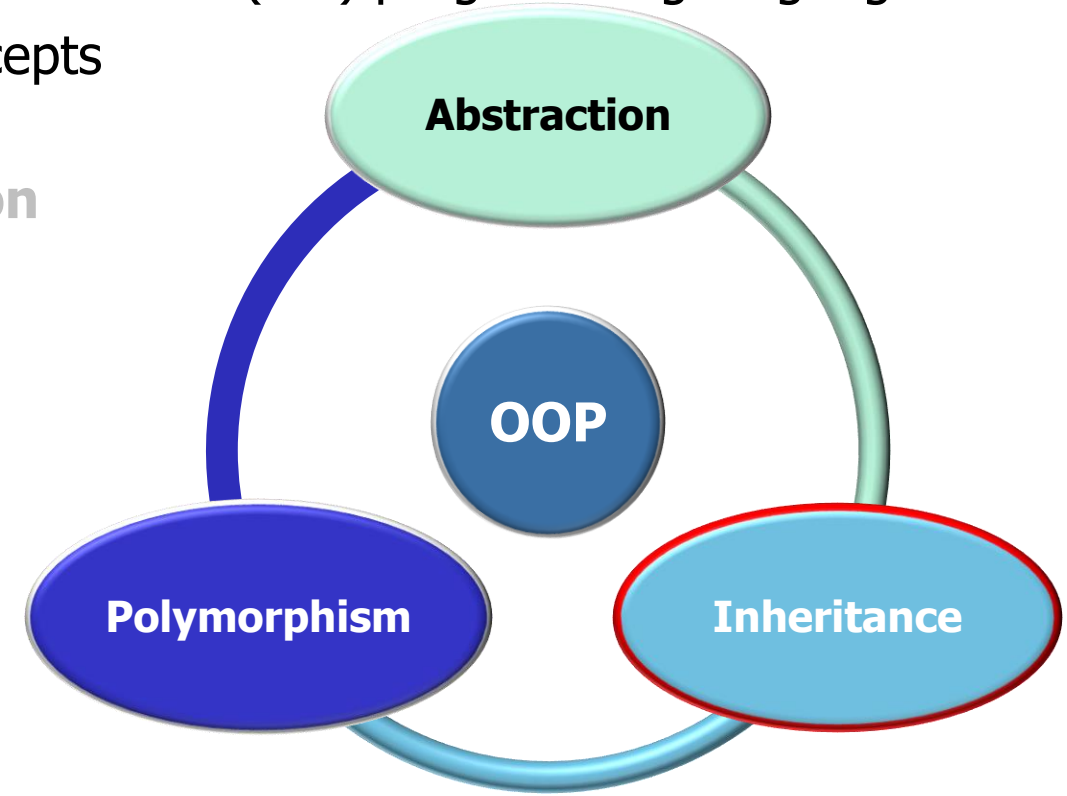
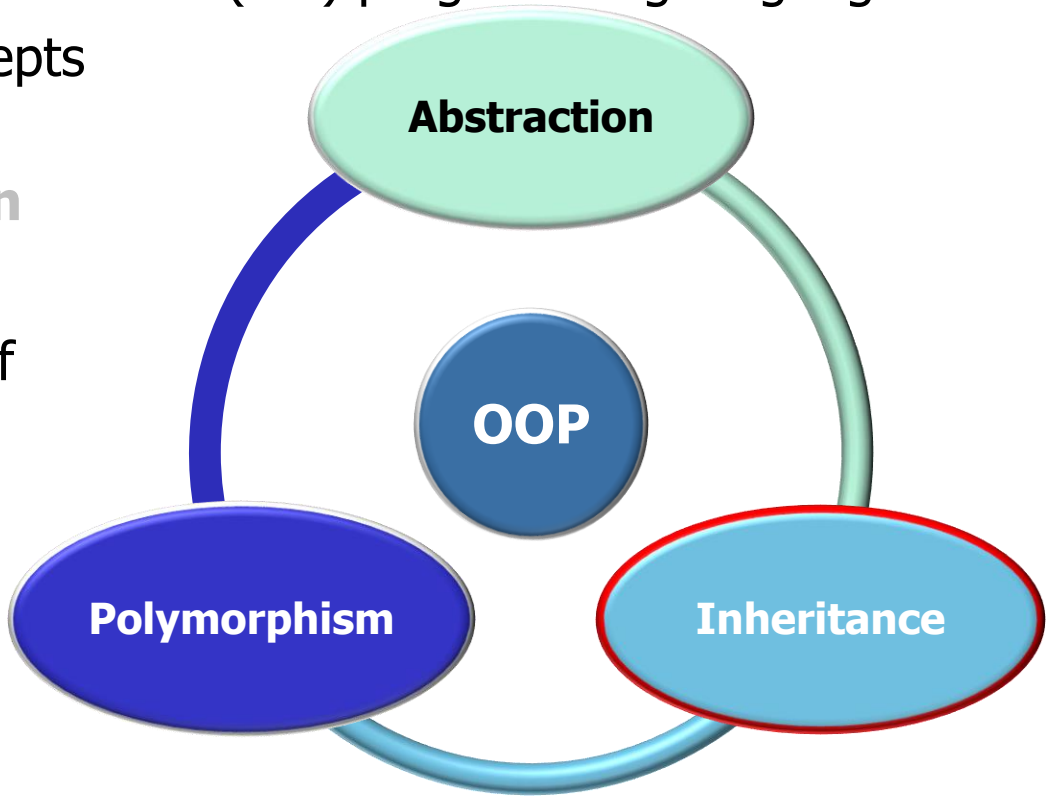
    - **Inheritance**



See en.wikipedia.org/wiki/Inheritance_(object-oriented_programming)

Key Object-Oriented Concepts Supported by Java

- Java was originally just an object-oriented (OO) programming language.
  - It, thus, supports key OO concepts and features, e.g.,
    - Data & control abstraction
    - **Inheritance**
      - Enables systematic reuse of existing methods & fields



See martin.griss.com/pubs/fusion1.htm

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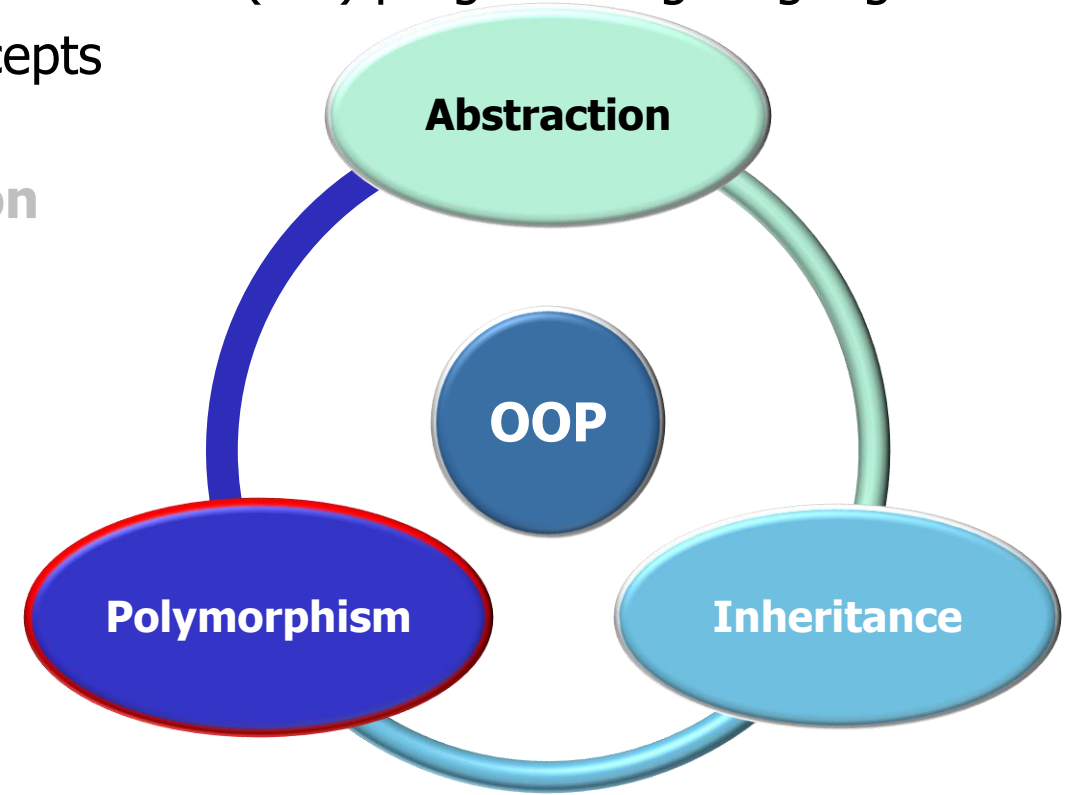
    - Inheritance
    - **Polymorphism**



See en.wikipedia.org/wiki/Polymorphism_(computer_science)

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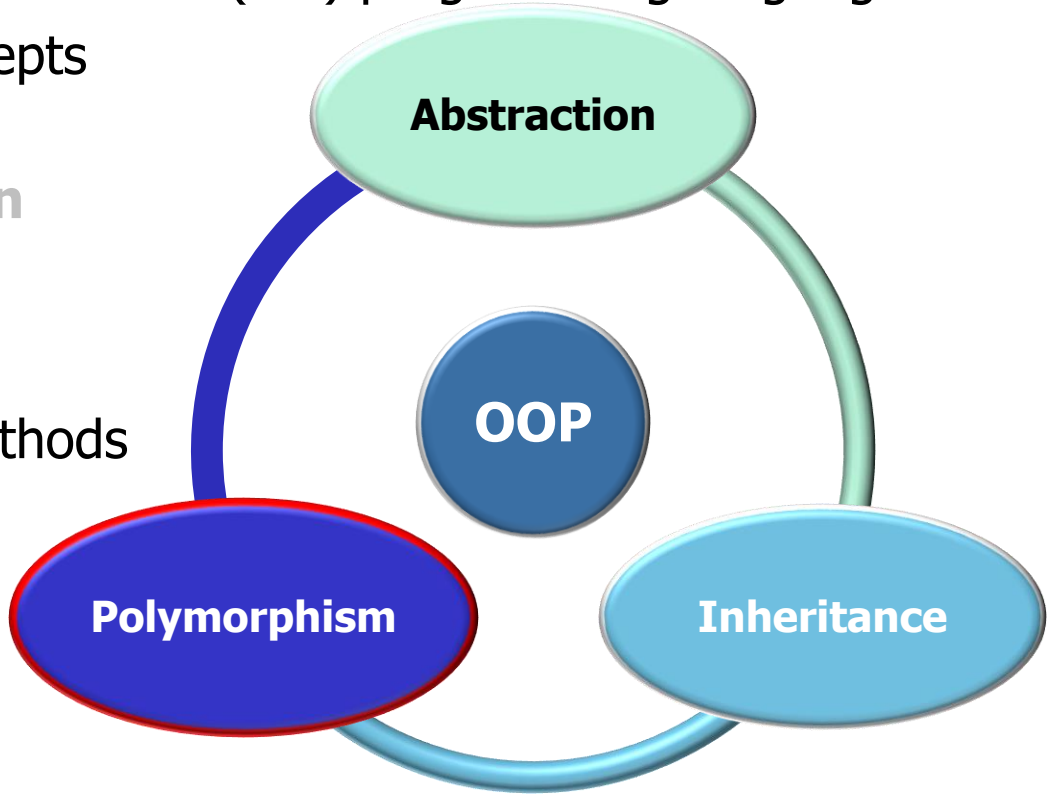
  - It, thus, supports key OO concepts and features, e.g.,
    - Data & control abstraction
    - Inheritance
    - **Polymorphism**
      - Dynamically dispatches methods based on runtime type information



See en.wikipedia.org/wiki/Dynamic_dispatch

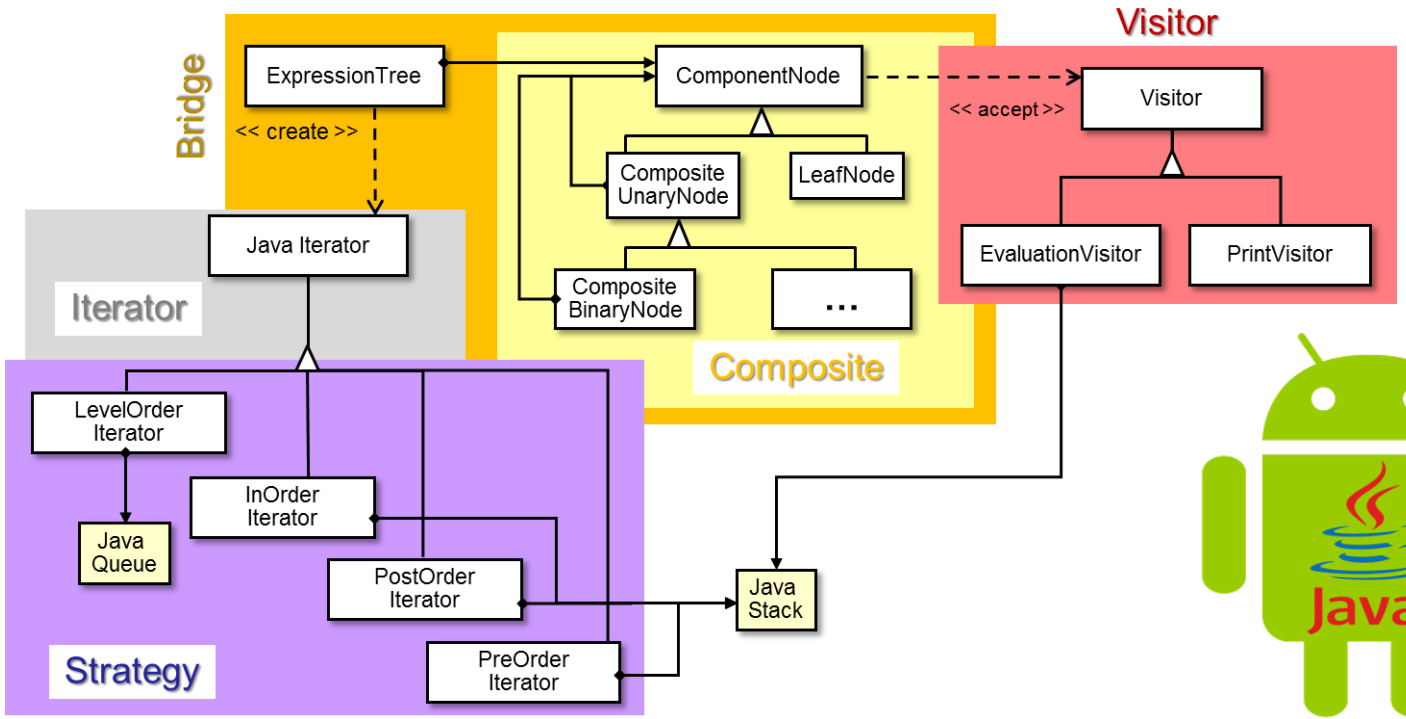
Key Object-Oriented Concepts Supported by Java

- OO apps written in Java are organized in terms of *structural* elements.

See en.wikipedia.org/wiki/Object-oriented_programming

Key Object-Oriented Concepts Supported by Java

- OO apps written in Java are organized in terms of *structural* elements.
  - e.g., classes, interfaces, & packages



See en.wikipedia.org/wiki/Software_design_pattern

Key Object-Oriented Concepts Supported by Java

- An object is an instance of a class that performs certain operations & interacts with other objects.

See docs.oracle.com/javase/tutorial/java/javaOO/objects.html

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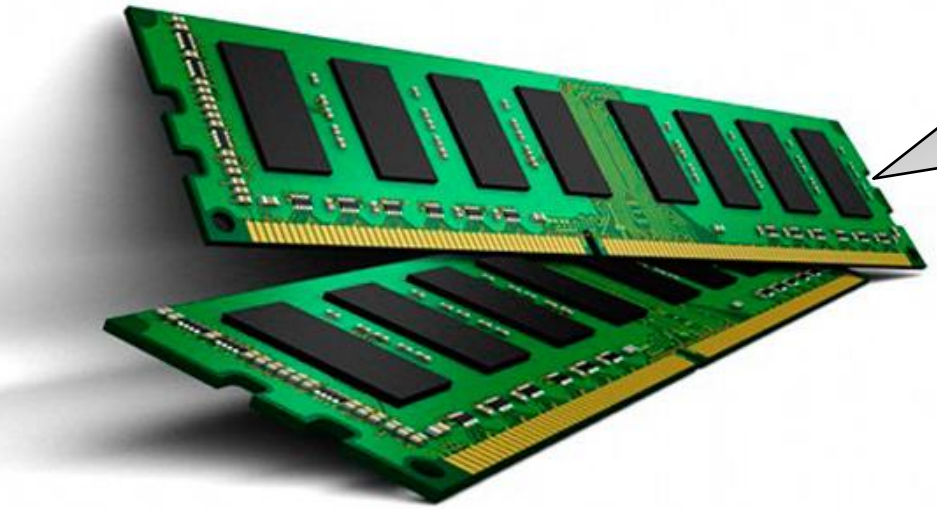

SimpleSet<T>

```
Object[] mElementData
int mSize
int mEnd
...
```

```
boolean add(E element)
boolean contains(Object o)
int size()
...
```

See ImageCounter/src/main/java/utils/SimpleSet.java

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```
class SimpleSet<E>
  extends AbstractSet<E> {
  private Object[]
    mElementData;

  private int mSize;

  private int mEnd;
  ...
  public int size()
  { return mSize; }

  public boolean isEmpty()
  { return mSize == 0; }
  ...
```

See ImageCounter/src/main/java/utils/SimpleSet.java

Key Object-Oriented Concepts Supported by Java

- An object is an instance of a class that performs certain operations & interacts with other objects.
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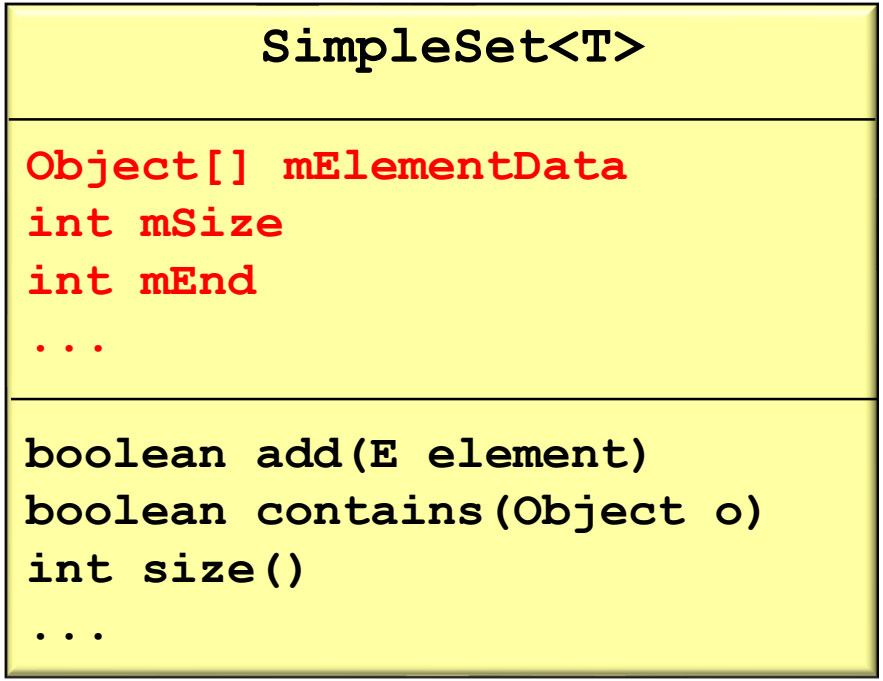
  - It consists of:
    - *State*—represented via data fields



See docs.oracle.com/javase/tutorial/java/javaOO/variables.html

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Data fields are typically defined using "private" access control specifiers.

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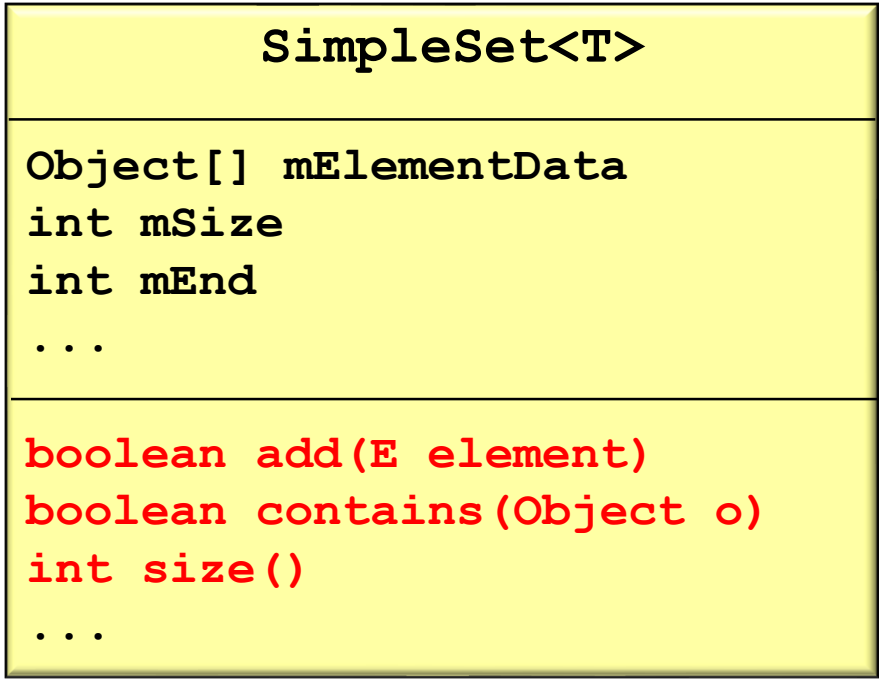

See docs.oracle.com/javase/tutorial/java/javaOO/methods.html

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```
class SimpleSet<E>
  extends AbstractSet<E> {

...
public int size()
{ return mSize; }

public boolean isEmpty()
{ return mSize == 0; }

private void
  ensureCapacityInternal
    (int minCapacity) { ... }
...
```

Methods can be specified as "private," "protected," or "public."

See docs.oracle.com/javase/tutorial/java/javaOO/accesscontrol.html

Key Object-Oriented Concepts Supported by Java

- Objects often correspond to real-world entities.

anAccount : Account
Money mCurrentBalance boolean mOverdraftProtection ...
void deposit(Money amount) void withdrawl(Money amount) Money checkCurrentBalance() ...

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Key Object-Oriented Concepts Supported by Java

- Non-object-oriented programming languages organize apps in terms of *functional* elements.

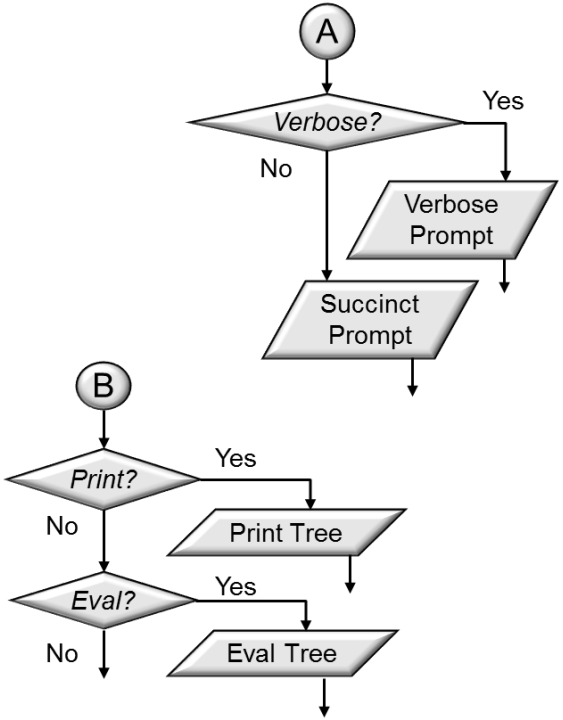
See en.wikipedia.org/wiki/Procedural_programming

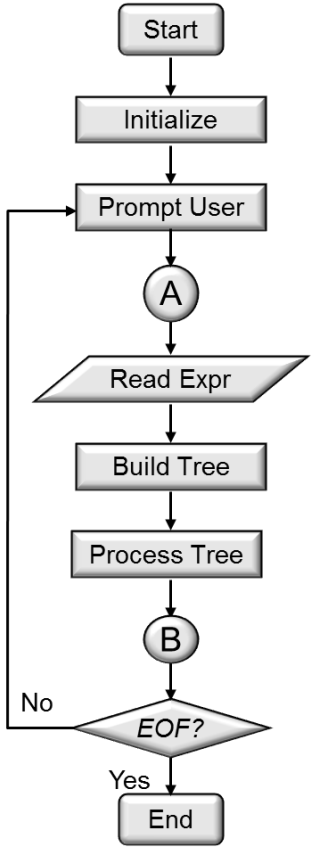
Key Object-Oriented Concepts Supported by Java

- Non-object-oriented programming languages organize apps in terms of *functional* elements.
  - e.g., actions & logic

FORTRAN

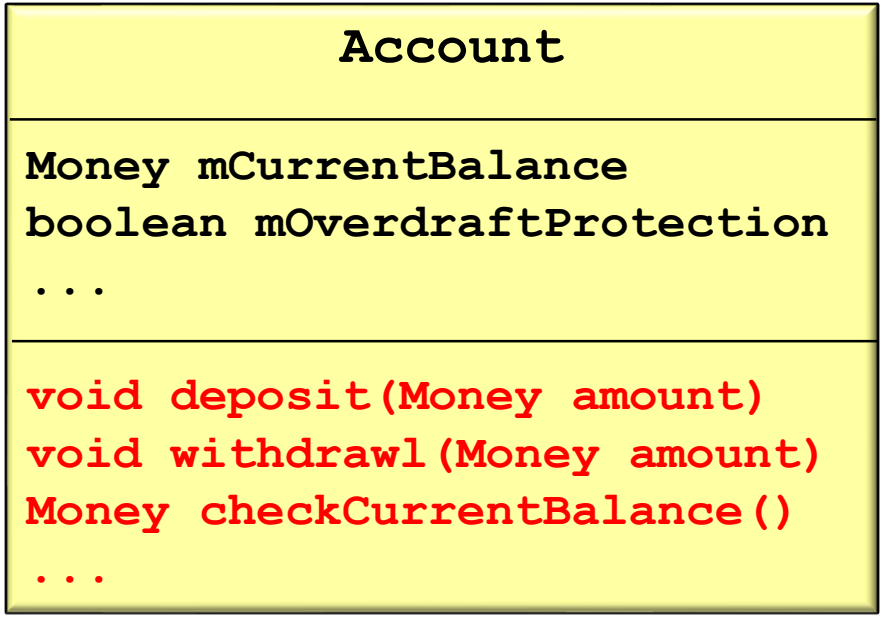
THE C PROGRAMMING LANGUAGE





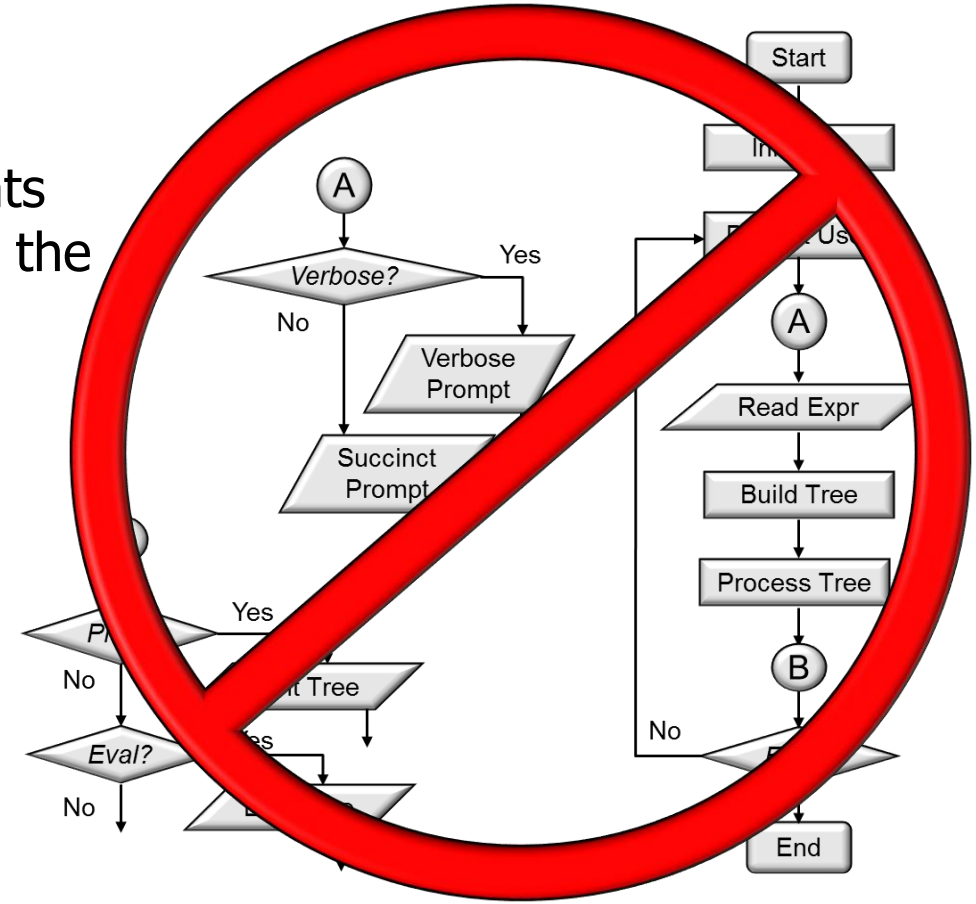
Key Object-Oriented Concepts Supported by Java

- Object-oriented Java programs also perform actions & contain logic.



Key Object-Oriented Concepts Supported by Java

- Object-oriented Java programs also perform actions & contain logic.
  - However, these functional elements don't constitute the main focus in the object-oriented portions of Java.



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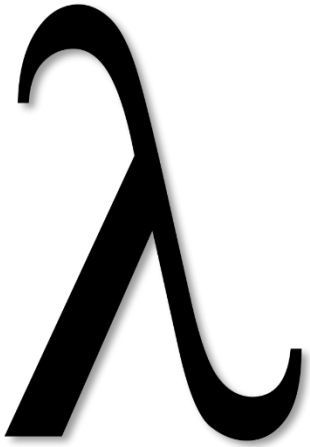
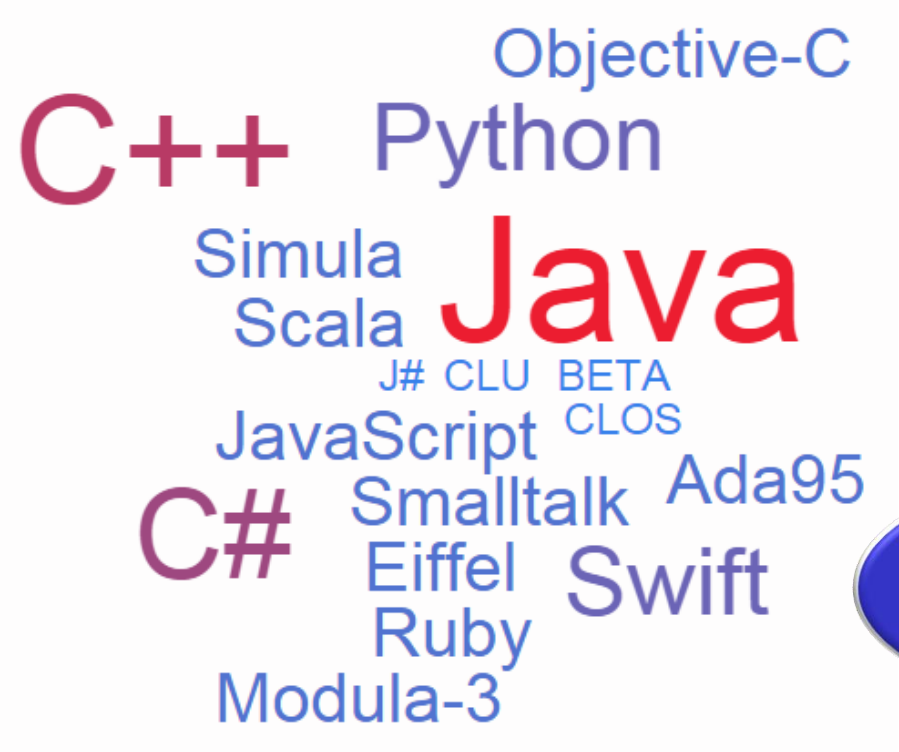
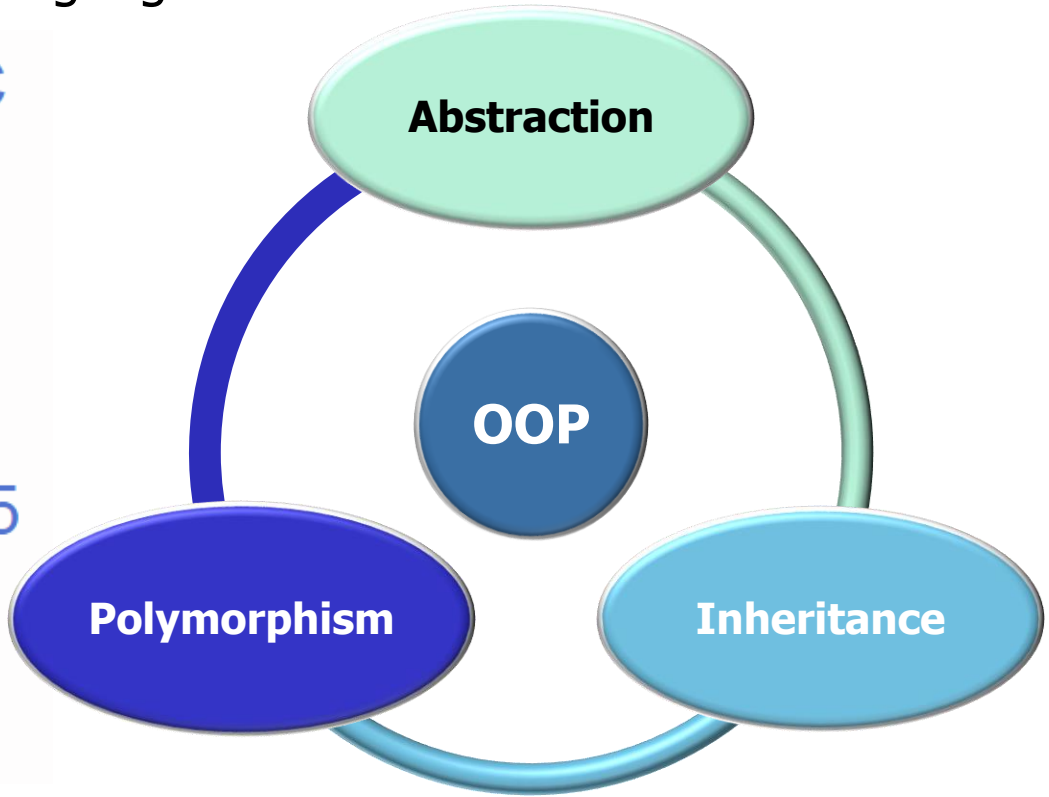


Java 8 *does* focus heavily on functional programming.

Key Object-Oriented Concepts Supported by Java

- There are many object-oriented languages.

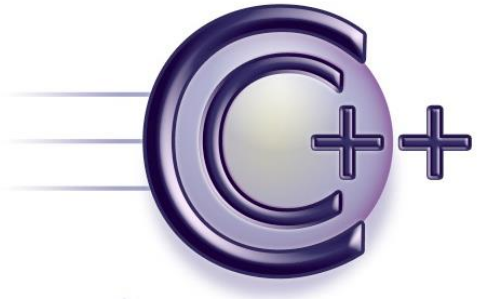


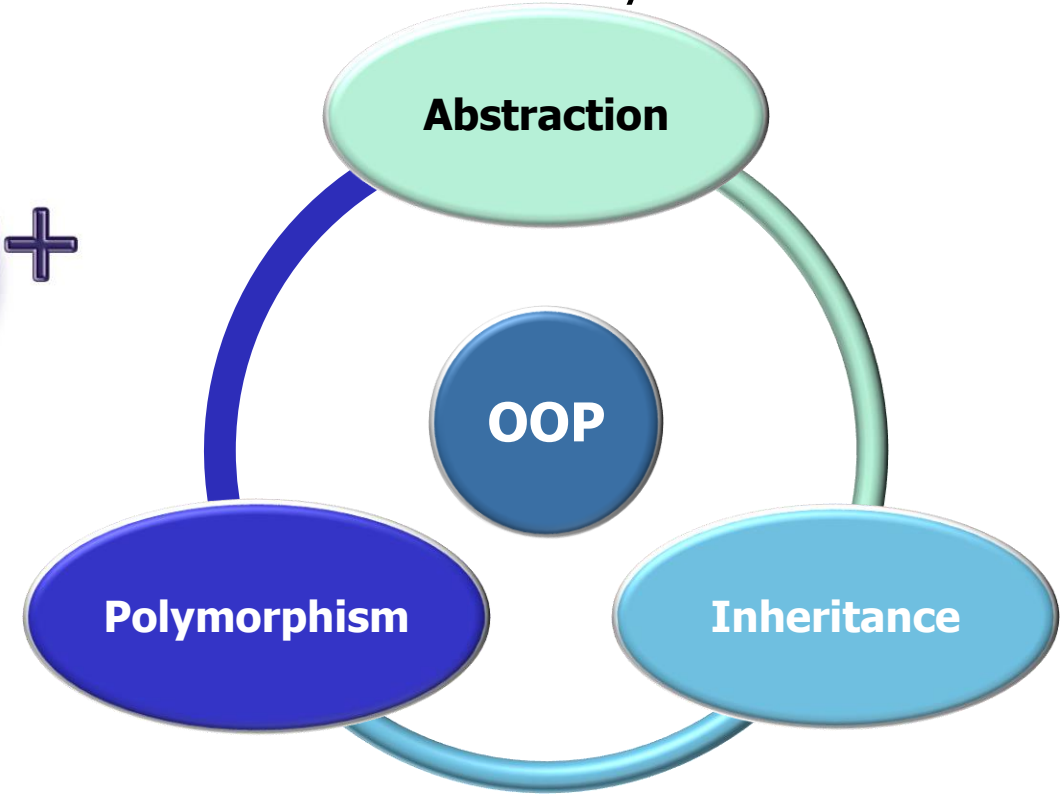


See en.wikipedia.org/wiki/List_of_object-oriented_programming_languages

Key Object-Oriented Concepts Supported by Java

- These are (arguably) some of the most common ones today.

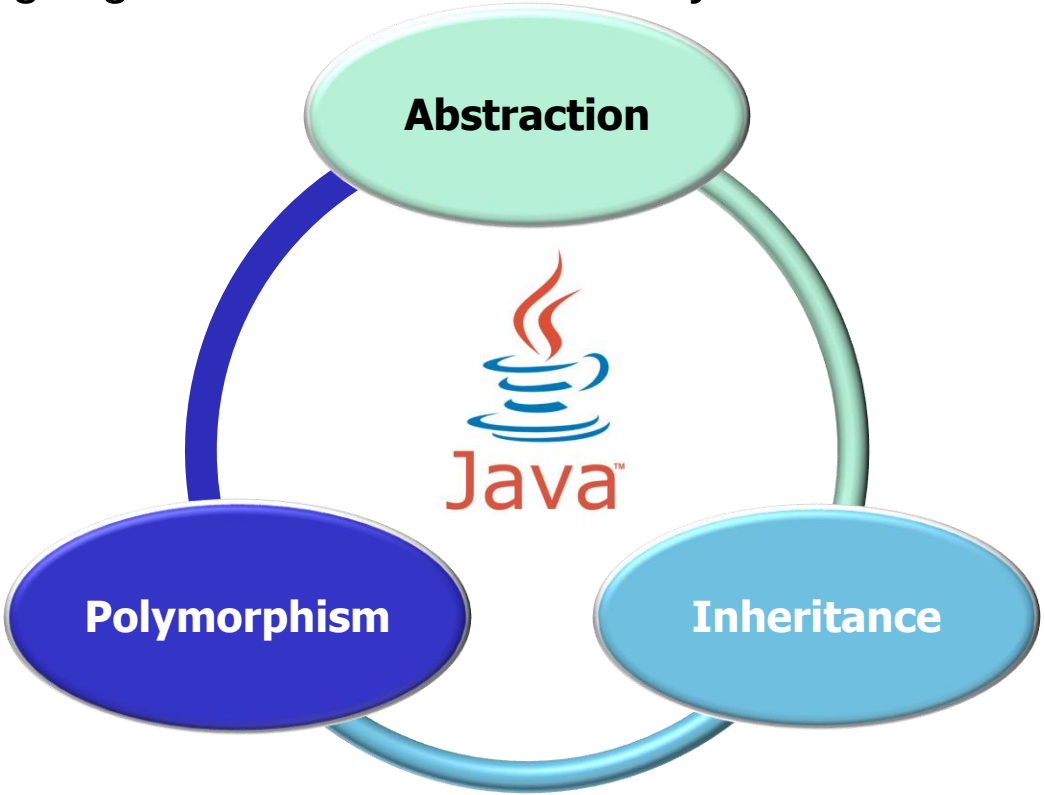




See www.tiobe.com/tiobe-index

Key Object-Oriented Concepts Supported by Java

- Learning other object-oriented languages is much easier once you know Java.



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- If you already know Java you may be bored by some parts of these lessons!

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Please ask questions you have on this material since other lessons depend on it.

Key Object-Oriented Concepts Supported by Java

- If you don't know Java at all you may need some more hands-on experience.

Course launched on Apr 5, 2016

Java for Android

Instructors: Dr. Jerry Roth, Dr. Julie L. …

Launched

Total Enrollments	Active Learners
74391	1081

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