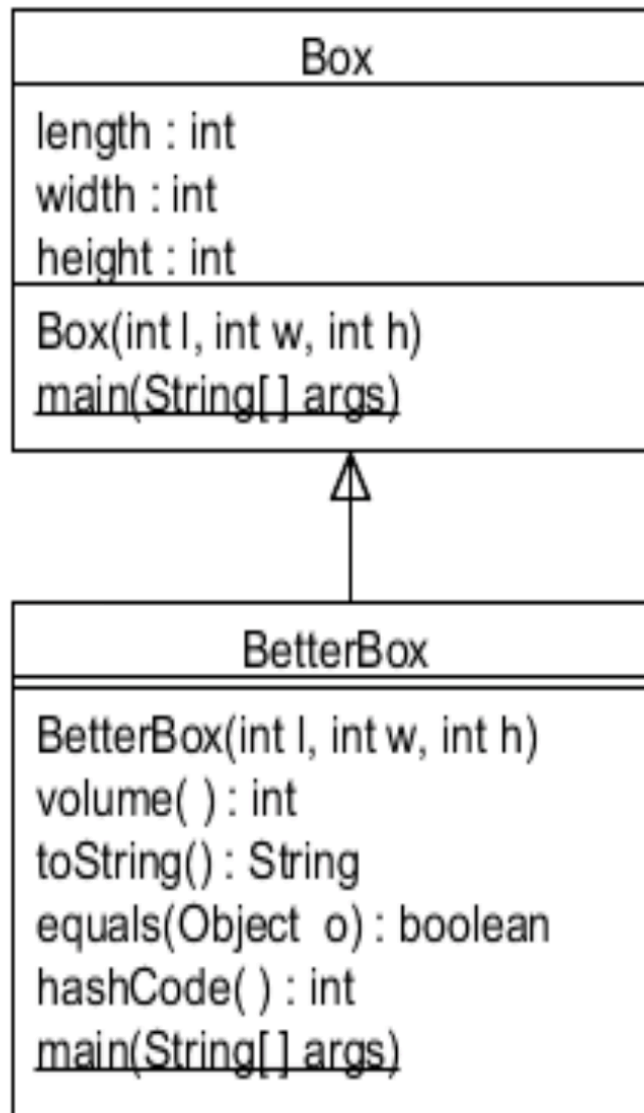LECTURE **7** SUPPLEMENT

UML
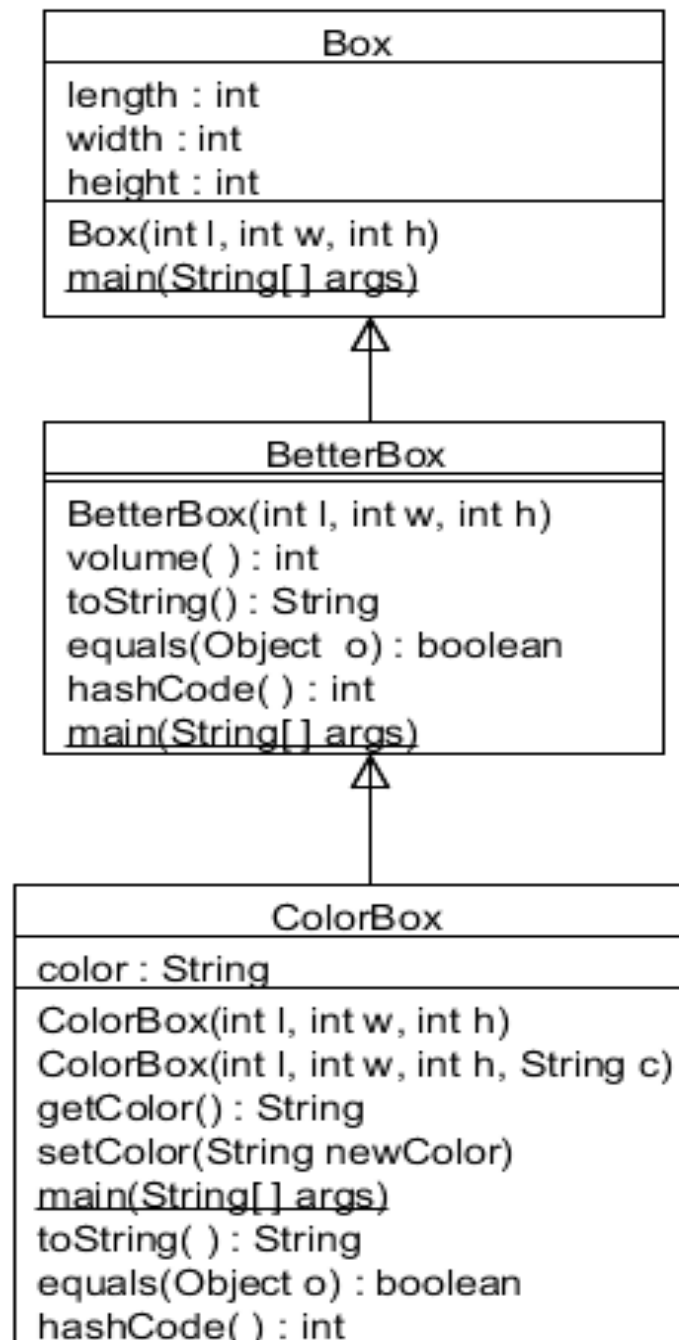
Unified Modeling Language (UML)

- http://www.uml.org
- Specification
  - formal definition of the modeling language
- Visual model (diagram) of a software system
  - structure
  - behavior
  - architecture

UML Class diagram

```
┌─────────────────────────────────┐
│              Box                │
├─────────────────────────────────┤
│ length : int                    │
│ width : int                     │
│ height : int                    │
├─────────────────────────────────┤
│ Box(int l, int w, int h)        │
│ main(String[] args)             │
└─────────────────────────────────┘
                △
                │
┌─────────────────────────────────┐
│           BetterBox             │
├─────────────────────────────────┤
├─────────────────────────────────┤
│ BetterBox(int l, int w, int h)  │
│ volume( ) : int                 │
│ toString() : String             │
│ equals(Object  o) : boolean     │
│ hashCode( ) : int               │
│ main(String[] args)             │
└─────────────────────────────────┘
```

The main method is underlined as it is a static method.

The arrow must be drawn correctly:
- solid line
- triangle for the arrowhead
otherwise it is not inheritance.

Box

length : int
width : int
height : int

Box(int l, int w, int h)
main(String[] args)

△

BetterBox

BetterBox(int l, int w, int h)
volume( ) : int
toString() : String
equals(Object o) : boolean
hashCode( ) : int
main(String[] args)

△

ColorBox

color : String

ColorBox(int l, int w, int h)
ColorBox(int l, int w, int h, String c)
getColor() : String
setColor(String newColor)
main(String[] args)
toString( ) : String
equals(Object o) : boolean
hashCode( ) : int

19

More UML relationships:

inheritance
    Subclass extends Superclass
    Superclass is the parent
    Subclass is the child

```
  ┌─────────────┐
  │  Superclass │
  └─────────────┘
         △
         │
  ┌─────────────┐
  │  Subclass   │
  └─────────────┘
```
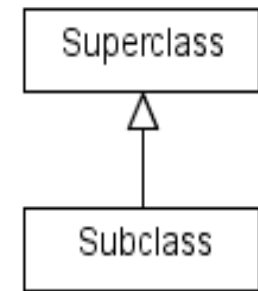
aggregation
    Aggregate has a field called Field

```
┌───────────┐        ┌──────────┐
│ Aggregate │◇────▷  │  Field   │
└───────────┘        └──────────┘
```
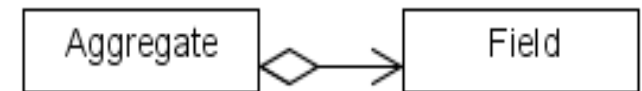
dependency (uses)
    Client uses Local
    e.g., Local is the type of a local variable
    e.g., Local is the type of a parameter

```
┌──────────┐        ┌──────────┐
│  Client  │- - -▷  │  Local   │
└──────────┘        └──────────┘
```
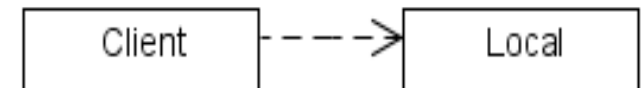
container aggregation
    Aggregate has a field that is
         is a container of Item

```
┌───────────┐        ┌──────────┐
│ Aggregate │◇────▷  │   Item   │
└───────────┘     *  └──────────┘
```

22
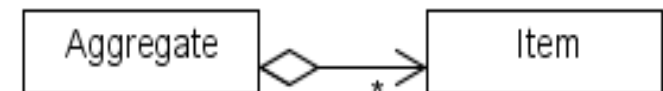
Standard UML does not have an arrowhead for aggregation, only the diamond.

```java
public class B extends A
{
        C c;

        public void run(D d)
        {
                E e = new E();
        }

        F[ ] f;

}
```
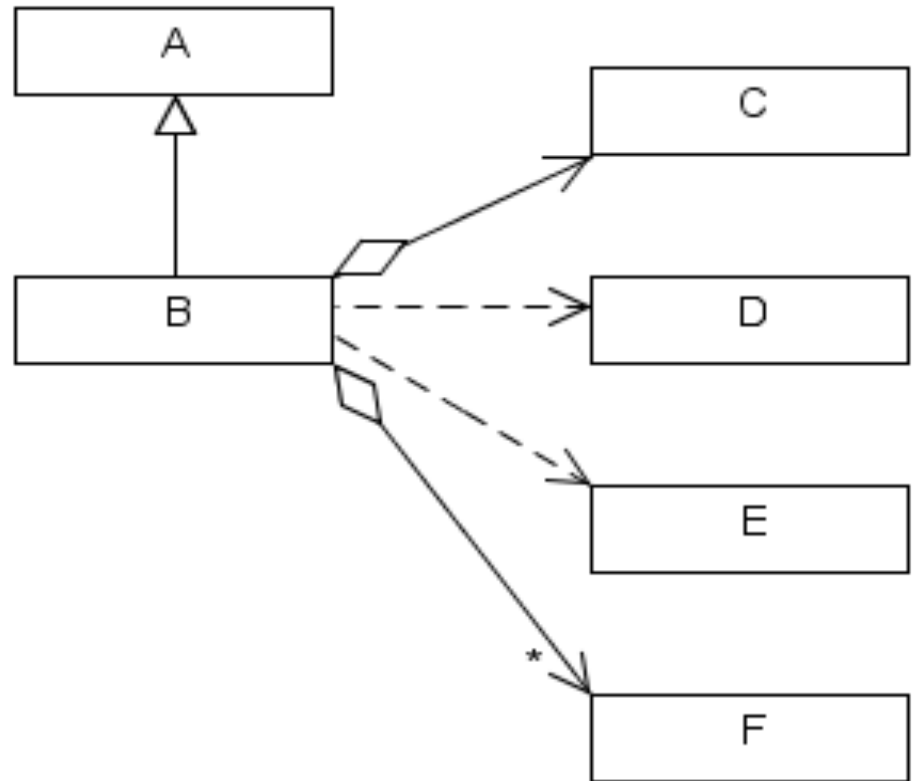
```
public class B extends A
{
        C c;

        public void run(D d)
        {
                E e = new E();
        }

        F[ ] f;

}
```

UML Drawing Tools

- www.umlet.com
- https://www.gliffy.com/uses/uml-software/.

- Or just vector drawing software:
- https://inkscape.org/

- Make sure that you use the correct arrows and arrowheads.