CS206

Exceptions, Scope & Restaurants

Exceptions

- Try-catch or throws
  - Catch must tell user what / why
- If throws, somewhere **in the program** it must be caught
- Try-catch should be as “tight” as possible
- Programs should never die on an exception
  - It is not acceptable to simply surround main with try-catch

Exceptions
Bad = thrown but not caught

```
public class Crash1b {
    private static void faulty()
       throws ArrayIndexOutOfBoundsException {
   int[] a = { 10, 20, 30, 40, 50 };
   for (int i = 0; i <= 10; i++) {
       System.out.println(a[i]);
   }
    }
    public static void main(String[] args)
       throws ArrayIndexOutOfBoundsException {
   faulty();
   System.out.println("Done printing the array!");
    }
}
```

Exception
Bad = General + Loose + no message

```java
public class Crash1a
{
    static int[] a = { 10, 20, 30, 40, 50 };
    public static void main(String[] args) {
   try {
   for (int i = 0; i <= 10; i++) {
       System.out.println(a[i]);
   }
   System.out.println("Done printing the array!");
   }
   catch (Exception e) {
   }
    }
}
```

Exceptions:
Good = Tight + Specific

```
public class Crash1
{
    static int[] a = { 10, 20, 30, 40, 50 };
    public static void main(String[] args) {
   for (int i = 0; i <= 10; i++) {
       try {
      System.out.println(a[i]);
       }
       catch (ArrayIndexOutOfBoundsException aeoe)
       {
      System.err.println(aeoe.toString() + "Quitting");
      System.exit(0);
       }
   }
   System.out.println("Done printing the array!");
    }
}
```

Exceptions
OK — but not good or great

```
import java.util.Scanner;

public class Crash2
{
    public static void main(String[] args)
    {
     Scanner in = new Scanner(System.in);
     int prev=10;
     while (prev>=0) {
          System.out.print("Enter a number: ");
          String line = in.nextLine();
          try
          {
              int data = Integer.parseInt(line);
              System.out.println(data + " / " + prev + " = " + (data / prev));
              prev=data;
          }
          catch(NumberFormatException e) {
              System.out.println("That's not a number!");
          }
     }
     in.close();
    }
}
```

try could be “tighter” but it would be inconvenient

Multiple catch clauses

```java
import java.util.Scanner;
public class Crash2
{
    public static void main(String[] args)
    {
     Scanner in = new Scanner(System.in);
     int prev=10;
     while (prev>=0) {
          System.out.print("Enter a number: ");
          String line = in.nextLine();
          try
          {
              int data = Integer.parseInt(line);
              System.out.println(data + " / " + prev + " = " + (data / prev));
              prev=data;
          }
          catch(NumberFormatException e) {
              System.out.println("That's not a number!");
          }
          catch (ArithmeticException ae)
          {
              System.err.println("MATH Problem " + ae.toString());
          }
     }
     in.close();
    }
}
```

THIS IS NOT A GOOD WAY TO HANDLE DIVISION BY ZERO

Scope

- Scope is used to define the “lifetime” of a variable.
- “Global” means variable always available from anywhere
    - public static
- “Local” means variable only available in a specific place.
    - { } delimit scope
- Each scope is aware of its variables
- Variables defined within a scope die at the end of the scope.
- Java does not allow var name re-use in enclosing scopes

Scope example

```
public class Scoper {
    int var = 1;
  public void scopetest(int vv) {
   System.out.println(var);
   {
       int var = vv+2;
       System.out.println(var);
   }
   System.out.println(var);
    }
  public static void main(String args[]) {
   Scoper s = new Scoper();
   s.scopetest(2);
    }
}
```

Print?

GT Restaurant (simplified)

- GT offers 3 food types
  - drink :orangina, coffee, …
  - main course: burger, hot dog, …
    - NEW: Gluten Free: burger on lettuce
  - salad: spinach, cobb, …
- At the start of each day, GT decides what will be offered that day and how much is available, price & cost
- Special Deal: “The Trio”. One each of drink, main & salad for the price of the two highest priced items
- During day:
  - Order either trio or one item
    - How many
  - if run out, remove from list
  - if order would use more than available, reject
- End of day print out:
  - leftover food
  - Cost, Revenue, Profit.

Considerations to implement GT

- How to store available menu items
  - GT wants to use only 1 data structure
- How to represent available menu items
- How to represent “The Trio”
- How/what to update on each order

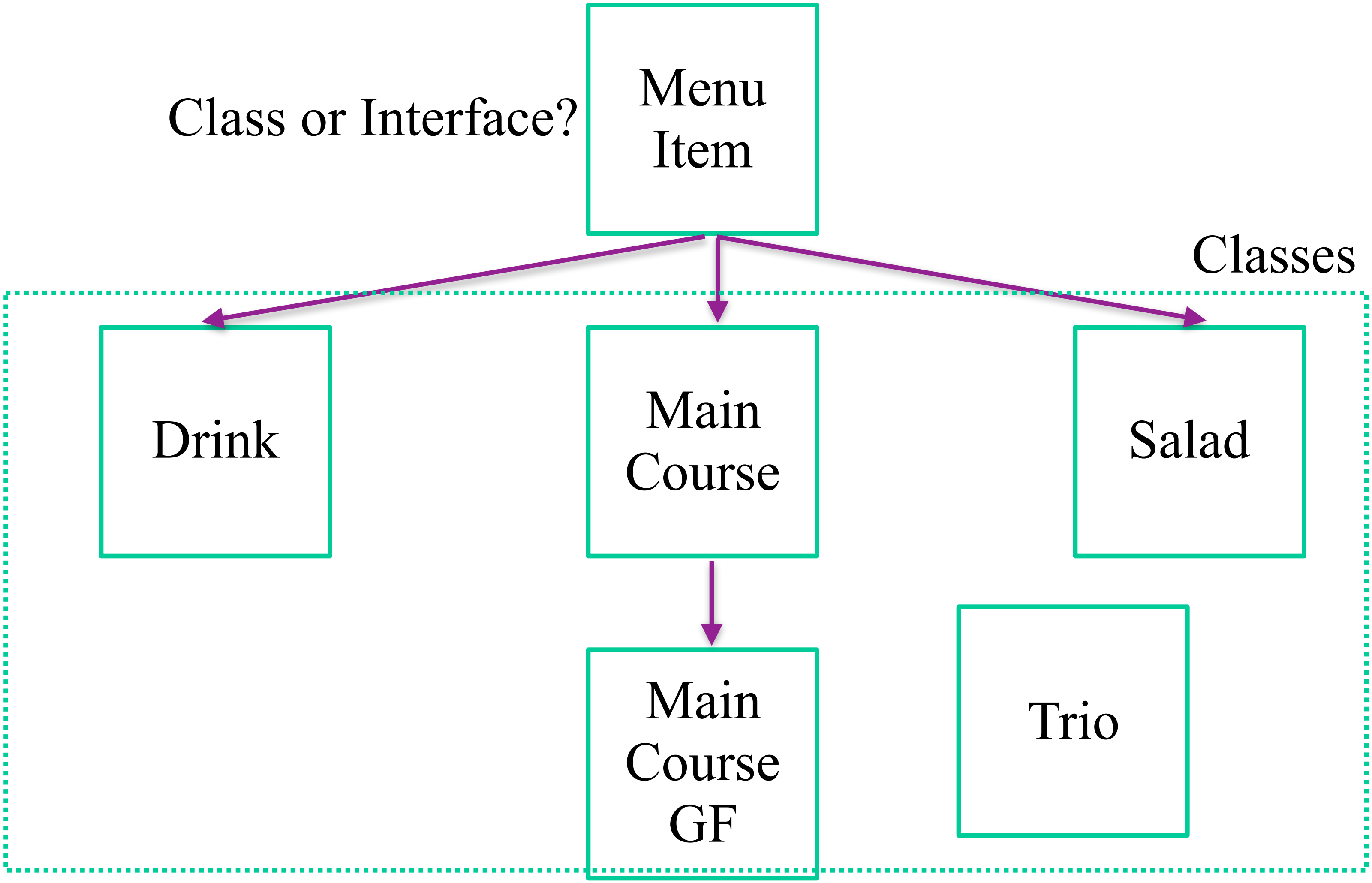
GTRestaurant start

```
public class GTRestaurant
{
    public void addItem(Object o) {
    }
    public boolean doOrder(int id, int count) {
       return true;
    }
    public boolean doOrder(Trio aTrio) {
       return true;
    }
    public void endOfDay(){
        System.out.println("No cost, no revenue, no food");
    }
}
```

GT Restaurant Usage

```
import java.util.Scanner;
public class Main {
    public static void main(String[] args)
    {
    GTRestaurant gtr = new GTRestaurant();
    // Add items at start of day
    gtr.addItem(new Drink(1, “sip orangina", 1.50, 0.45, 20, 20));
    gtr.addItem(new Drink(2, “small coffee", 2.99, 0.20, 4, 250));
    gtr.addItem(new MainC(101, "hamburger", 3.50, 2.20, 30));
    gtr.addItem(new MainC(102, "hot dog", 2.45, 1.05, 40));
    gtr.addItem(new MainCGF(103, "burger on lett", 5.99, 0.40, 2000))
    gtr.addItem(new Salad(201, "spinach", 2.50, 1.99, “Vinegar”, 20))
    gtr.addItem(new Salad(202, "cobb", 4.99, 1.99, “lemon juice”,
200));
    gtr.doOrder(1, 2);
    gtr.doOrder(101, 5);
    gtr.doOrder(new Trio(1, 101, 201, 5));
    gtr.endOfDay();
    }}
```

MenuItems
Class Hierarchy



Interfaces

- A class is what an object is
- An interface is what an object does

Interface

- A collection of method signatures with no bodies
- No modifier - implicitly `public`
- No instance variables except for constants (`static final`)
- No constructors
- Can not be instantiated

More on Interfaces

- An interface is not a class!
  - can not be instantiated
  - incomplete specification
- An interface is a type
  - a class that implements an interface is a subtype of the interface
- Classes may implement several interfaces
- Classes can only extend one class

Shape Interface

```
public interface Shape {
  double area();
}
public class Circle implements Shape {
  private Point center; private double radius;
  //constructors and getters not shown
  public double area(){return Math.PI*radius*radius;}
}
public class Square implements Shape {
  private double sideLength;
  //constructors and getters not shown
  public double area(){return sideLength*sideLength;}
}
```

Transportable Example

```
public interface Transportable {
  int volume();
  boolean isHazardous();
}
public class Box implements Transportable {
  private int height, width, depth;
  // constructors and getters not shown
  public int volume(){
    return height*width*depth;
  }
  public boolean isHazardous(){return false;}
}
```