Northeastern University

# Lecture 6: Java Review - 6 (Self-Study)

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# What have we reviewed?

- Encapsulation & Abstraction
- Methods
- Interfaces
- System & Classes Design (UML)
- Classes, Methods, Objects, Inheritance (Labs)
- Classes and Methods

# Outline

- Objects and Methods
  - » Constructors
  - » Overloading

# Objects and Methods

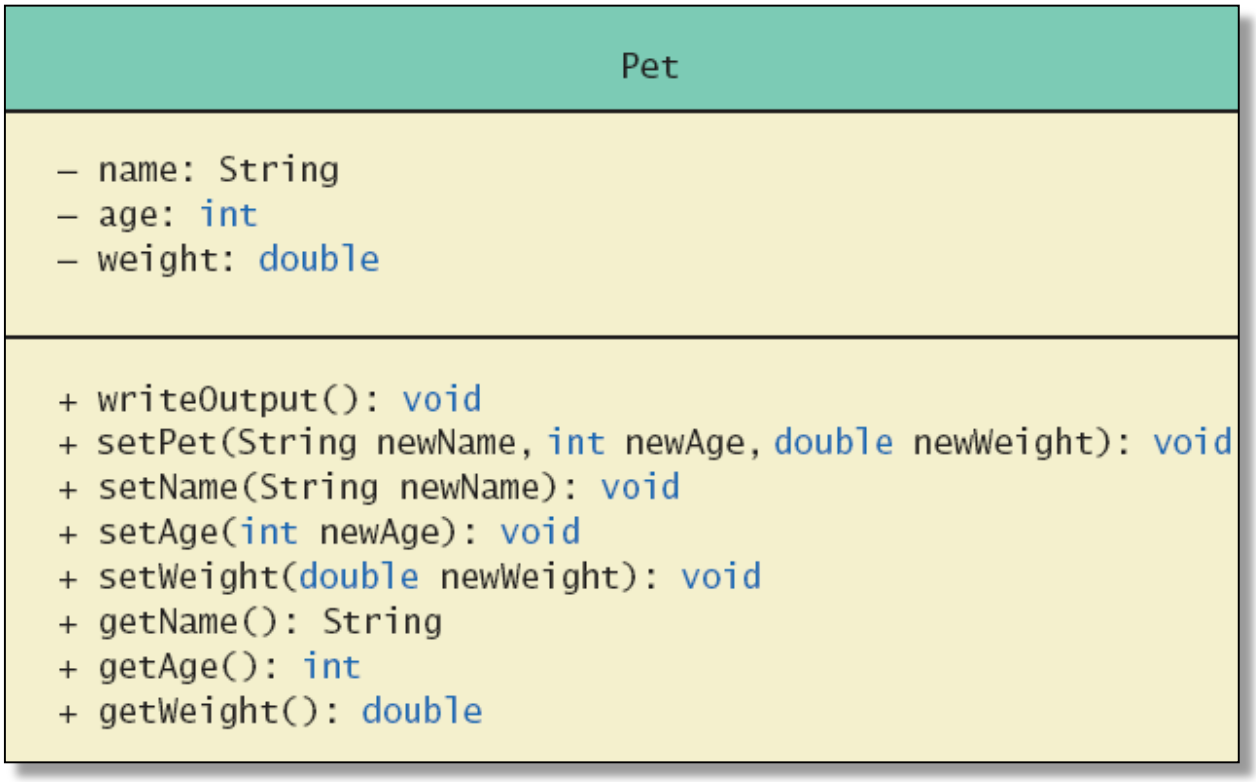
# Constructors

# Defining Constructors

- A special method called when instance of an object created with new
  - » Create objects
  - » Initialize values of instance variables
- Can have parameters
  - » To specify initial values if desired
- May have multiple definitions
  - » Each with different numbers or types of parameters

# Defining Constructors

- Example class to represent pet




Class Diagram for a Class **Pet**

# Defining Constructors

- Note sample code: `class Pet`
- Note different constructors
  - » Default
  - » With 3 parameters
  - » With 1 int parameter
  - » With 1 String parameter
  - » With 1 double parameter
- Note sample program: `class PetDemo`

# Defining Constructors

```
My records on your pet are inaccurate.
Here is what they currently say:
Name: Jane Doe
Age: 0
Weight: 0.0 pounds
Please enter the correct pet name:
Moon Child
Please enter the correct pet age:
5
Please enter the correct pet weight:
24.5
My updated records now say:
Name: Moon Child
Age: 5
Weight: 24.5 pounds
```

Sample screen output

## LISTING 6.1 The Class Pet: An Example of Constructors and Set Methods *(part 1 of 3)*

```
/**
 Class for basic pet data: name, age, and weight.
*/
public class Pet
{
    private String name;
    private int age;       //in years
    private double weight;//in pounds

    public Pet()  <-- Default constructor
    {
        name = "No name yet.";
        age = 0;
        weight = 0;
    }
```

```
public Pet(String initialName, int initialAge,
           double initialWeight)
{
    name = initialName;
    if ((initialAge < 0) || (initialWeight < 0))
    {
        System.out.println("Error: Negative age or weight.");
        System.exit(0);
    }
    else
    {
        age = initialAge;
        weight = initialWeight;
    }
}
public void setPet(String newName, int newAge,
                   double newWeight)
{
    name = newName;
    if ((newAge < 0) || (newWeight < 0))
    {
        System.out.println("Error: Negative age or weight.");
        System.exit(0);
    }
    else
    {
        age = newAge;
        weight = newWeight;
    }
}
```

```java
public Pet(String initialName)
{
    name = initialName;
    age = 0;
    weight = 0;
}

public void setName(String newName)
{
    name = newName; //age and weight are unchanged.
}
```

```java
public Pet(int initialAge)
{
    name = "No name yet.";
    weight = 0;
    if (initialAge < 0)
    {
        System.out.println("Error: Negative age.");
        System.exit(0);
    }
    else
        age = initialAge;
}

public void setAge(int newAge)
{
    if (newAge < 0)
    {
        System.out.println("Error: Negative age.");
        System.exit(0);
    }
    else
        age = newAge;
    //name and weight are unchanged.
}
```

```
public Pet(double initialWeight)
{
    name = "No name yet";
    age = 0;
    if (initialWeight < 0)
    {
        System.out.println("Error: Negative weight.");
        System.exit(0);
    }
    else
        weight = initialWeight;
}
public void setWeight(double newWeight)
{
    if (newWeight < 0)
    {
        System.out.println("Error: Negative weight.");
        System.exit(0);
    }
    else
        weight = newWeight; //name and age are unchanged.
}
```

```
    public String getName()
    {
        return name;
    }

    public int getAge()
    {
        return age;
    }

    public double getWeight()
    {
        return weight;
    }

    public void writeOutput()
    {
        System.out.println("Name: " + name);
        System.out.println("Age: " + age + " years");
        System.out.println("Weight: " + weight + " pounds");
    }
}
```

## LISTING 6.2 Using a Constructor and Set Methods

```
import java.util.Scanner;
public class PetDemo
{
    public static void main(String[] args)
    {
        Pet yourPet = new Pet("Jane Doe");
        System.out.println("My records on your pet are inaccurate.");
        System.out.println("Here is what they currently say:");
        yourPet.writeOutput();

        Scanner keyboard = new Scanner(System.in);
        System.out.println("Please enter the correct pet name:");
        String correctName = keyboard.nextLine();
        yourPet.setName(correctName);

        System.out.println("Please enter the correct pet age:");
        int correctAge = keyboard.nextInt();
        yourPet.setAge(correctAge);

        System.out.println("Please enter the correct pet weight:");
        double correctWeight = keyboard.nextDouble();
        yourPet.setWeight(correctWeight);

        System.out.println("My updated records now say:");
        yourPet.writeOutput();
    }
}
```

### *Sample Screen Output*

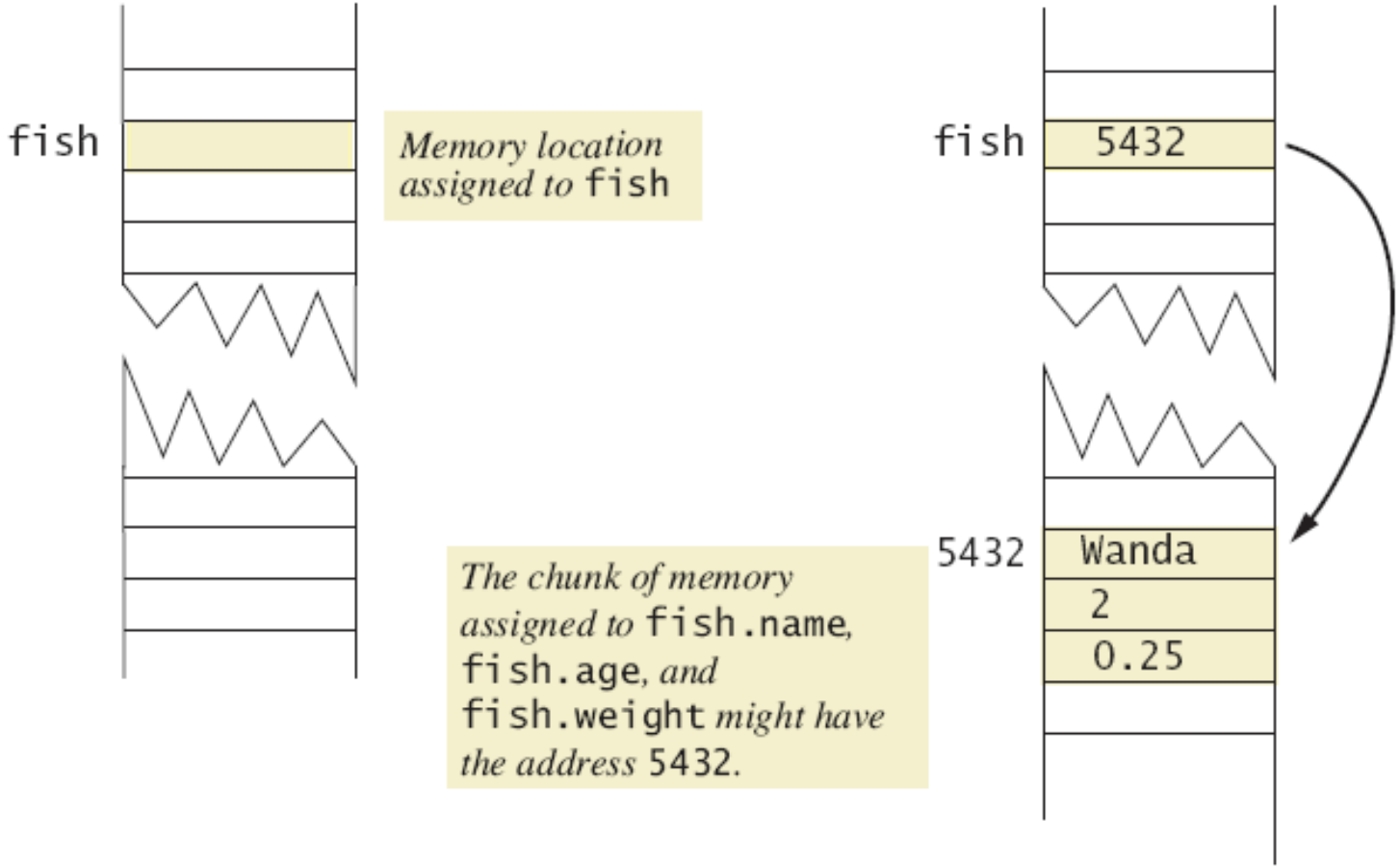
```
My records on your pet are inaccurate.
Here is what they currently say:
Name: Jane Doe
Age: 0
Weight: 0.0 pounds
Please enter the correct pet name:
Moon Child
Please enter the correct pet age:
5
Please enter the correct pet weight:
24.5
My updated records now say:
Name: Moon Child
Age: 5
Weight: 24.5 pounds
```

# Defining Constructors

- Constructor without parameters is the default constructor
  - » Java will define this automatically if the class designer does not define any constructors
  - » If you do define a constructor, Java will not automatically define a default constructor
- Usually default constructors are not included in class diagram

```
Pet fish;
```
*Assigns a memory location to* `fish`

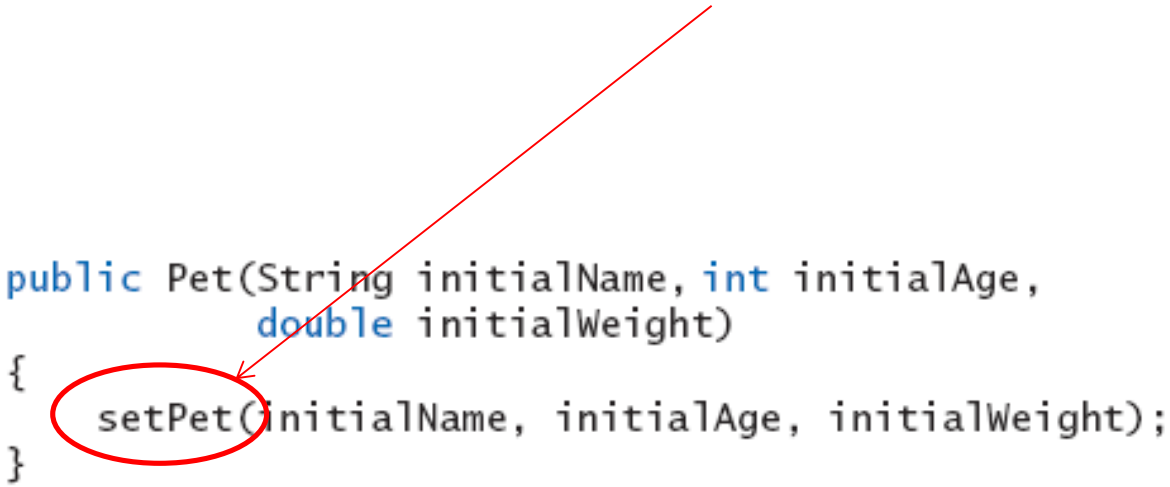
```
fish = new Pet();
```
*Assigns a chunk of memory for an object of the class* `Pet`*—that is, memory for a name, an age, and a weight—and places the address of this memory chunk in the memory location assigned to* `fish`




Constructor returns a reference

# Calling Methods from Other Constructors

- Constructor can call other class methods



# Exercise (10 minutes)

- Consider a class RatingScore that represents a numeric rating for something such as a movie.
  - » Attributes:
    - A description of what is being rated
    - The maximum possible rating
    - The rating
  - » Methods:
    - Get the rating from a user
    - Return the maximum rating possible
    - Return the rating
    - Return a string showing the rating in a format suitable for display
- Write a default constructor and a second constructor
- Implement and test the class

# Answer

```
import java.util.Scanner;
public class RatingScore {

    private String description;
    private int maximumRating;
    private int theRating;

    public RatingScore() {
        description = "this from 0 to 10";
        maximumRating = 10;
        theRating = -1;
    }

    public RatingScore(String desc, int max) {
        description = desc;
        maximumRating = max;
        theRating = -1;
    }

    public void inputRating(){
        System.out.println("What is your rating for " + description + "?");
        System.out.println("Please enter an integer from 0 to " + maximumRating);

        Scanner reader = new Scanner(System.in);
        int data = -1;
        boolean needTheRating = true;

        while(needTheRating){
            data = reader.nextInt();
            if(data>=0 && data<=maximumRating){
                needTheRating = false;
            } else {
                System.out.println("Sorry, that rating is out of range.");
                System.out.println("Please enter an integer from 0 to " + maximumRating);
            }
        }
        theRating = data;
    }
```

# Answer

```
    public int getMaxRating(){
        return maximumRating;
    }

    public int getRating(){
        return theRating;
    }

    public String getRatingString(){
        return "the rating is " + theRating + "/" + maximumRating;
    }

    public static void main(String[] args) {
        RatingScore movieRating = new RatingScore("Iron Man movie", 5);
        RatingScore restaurantRating = new RatingScore();

        movieRating.inputRating();
        System.out.println("Displaying the attributes for the movie rating.");
        System.out.println("The rating is " + movieRating.getRating() + " out of "
                + movieRating.getMaxRating());
        System.out.println();

        System.out.println("How was the quality of your food?");
        restaurantRating.inputRating();
        System.out.println("Displaying the rating for the restaurant.");
        System.out.println( restaurantRating.getRatingString());
    }
}
```

# Results

```
What is your rating for Iron Man movie?
Please enter an integer from 0 to 5
4
Displaying the attributes for the movie rating.
The rating is 4 out of 5

How was the quality of your food?
What is your rating for this from 0 to 10?
Please enter an integer from 0 to 10
3
Displaying the rating for the restaurant.
the rating is 3/10
```

# Overloading

# Overloading Basics

- When two or more methods have same name within the same class
- Java distinguishes the methods by number and types of parameters
  - » If it cannot match a call with a definition, it attempts to do type conversions
- A method's name and number and type of parameters is called the *signature*

## LISTING 6.15 Overloading

```
/**
 This class illustrates overloading.
*/
public class Overload
{
    public static void main(String[] args)
    {
        double average1 = Overload.getAverage(40.0, 50.0);
        double average2 = Overload.getAverage(1.0, 2.0, 3.0);
        char average3 = Overload.getAverage('a', 'c');
        System.out.println("average1 = " + average1);
        System.out.println("average2 = " + average2);
        System.out.println("average3 = " + average3);
    }

    public static double getAverage(double first, double second)
    {
        return (first + second) / 2.0;
    }

    public static double getAverage(double first, double second,
                                    double third)
    {
        return (first + second + third) / 3.0;
    }

    public static char getAverage(char first, char second)
    {
        return (char)(((int)first + (int)second) / 2);
    }
}
```

### *Sample Screen Output*

```
average1 = 45.0
average2 = 2.0
average3 = b
```