CISC 3115 TY2

Defining Java Class

Hui Chen

Department of Computer & Information Science

CUNY Brooklyn College

Notice

- The slides are always subject to change.
- The slides posted before the lecture are for preview only, and they are a draft and their content can change significantly.

Outline

- Review
- Defining classes for objects
- UML class diagram
- Accessing objects via reference variables
- Primitive and reference variables

Recall: Authoring a Java Program

- Let's consider the following 5 components
  - Requirement
  - Design
  - Implementation
  - Verification (commonly, testing)
  - Validation
- Call them 5 components instead of 5 steps, because it is not necessary to follow them in the above order

Recall: Requirements

- About answering question:
  - What does the “customer” want? Call the answer the requirement.
    - In the class:
      - What does the instructor want?
    - For your own exploration:
      - What do I want?
- Programmers provide a technical solutions in the means of software/programs to customers
- Is what we learned sufficient?

Review: What Have We Learned?

- Functions (In Java, we call them methods)
  - Data types and variables
  - Arrays
  - Statements
  - Comments
  - Flow control
    - Selections
    - Iterations/Loops

```
class PlayNumbers {
    public static void main(String[] args) {
    }
     public static int addTwo(int a, int b) {
          return a + b;
     }
     public static boolean isPositive(int a) {
          if (a > 0) return true;
          else return false;
     }
      // ……
}
```

Review: Arrays and *Something New*?

- Examine the code,
  - What data type is “String[] args” in the main method?
  - Can we print it out?
  - But who calls main and passes the argument to it?
- Something new?
  - Command line arguments

```
class PlayNumbers {
    public static void main(String[] args) {
    }
     public static int addTwo(int a, int b) {
          return a + b;
     }
     public static boolean isPositive(int a) {
          if (a > 0) return true;
          else return false;
     }
      // ……
}
```

Questions

- Have you been working on CodeLab assignments?
- Have you been reviewing topics in CISC 1115?
- How to use the command line arguments?

To Discuss: From Class to Objects

```
class PlayNumbers {
    public static void main(String[] args) {
    }
     public static int addTwo(int a, int b) {
          return a + b;
     }
     public static boolean isPositive(int a) {
          if (a > 0) return true;
          else return false;
     }
      // ……
}
```

```
class PlayNumbersToo {
    private int op1, op2;
    public static void main(String[] args) {
    }
     public int addTwo(int a, int b) {
          return a + b;
     }
     public boolean isPositive(int a) {
          if (a > 0) return true;
          else return false;
     }
      // ……
}
```

Object-Oriented Programming

- Programming using objects
- An *object* represents an entity in the real world that can be distinctly identified.
  - Student, instructor, class
  - Building, room, desk
  - Circle, rectangle
  - Button, menu
  - Loan, sales transaction

Object, State, and Behavior

- An object has a unique identity, state, and behaviors.
  - The *state* of an object consists of a set of *data fields* (also known as *properties*) with their current values.
  - The *behavior* of an object is defined by a set of methods representing what it does.

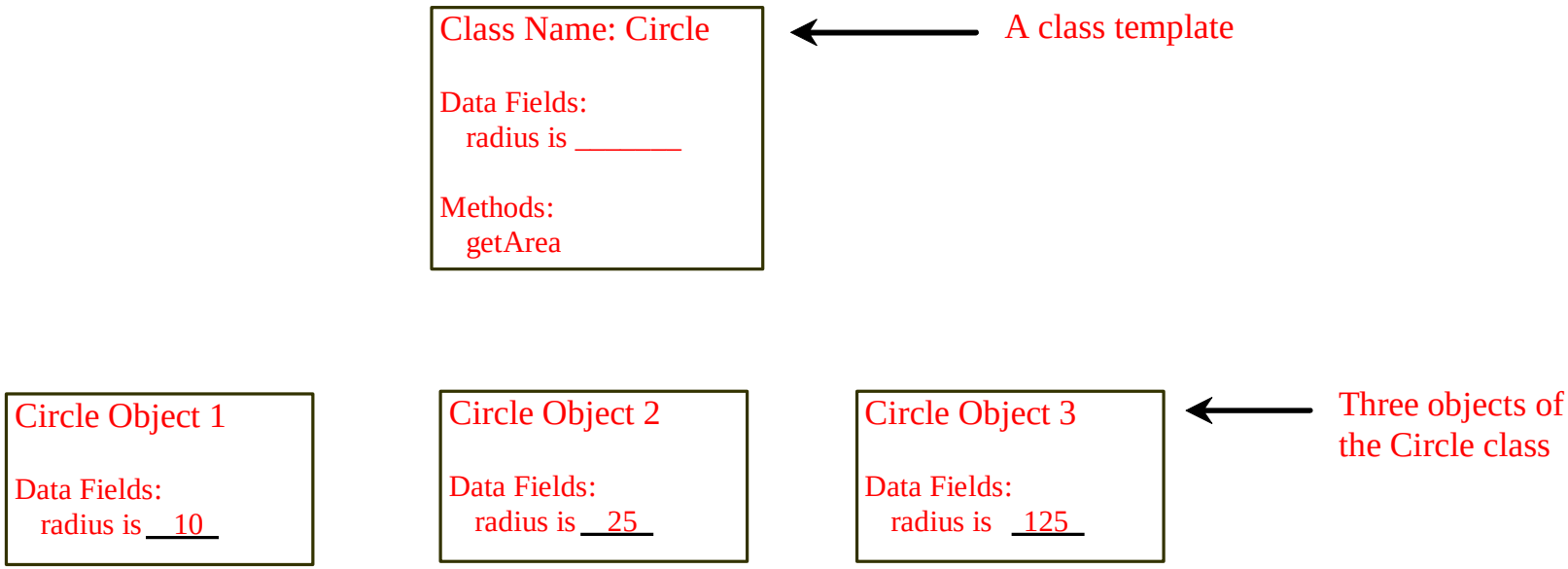
Classes

- Define objects of the same type, a template that an object can be created from.

- A Java class uses variables to define data fields and methods to define behaviors. Additionally, a class provides a special type of methods, known as constructors, which are invoked to construct objects from the class.

Objects and Classes

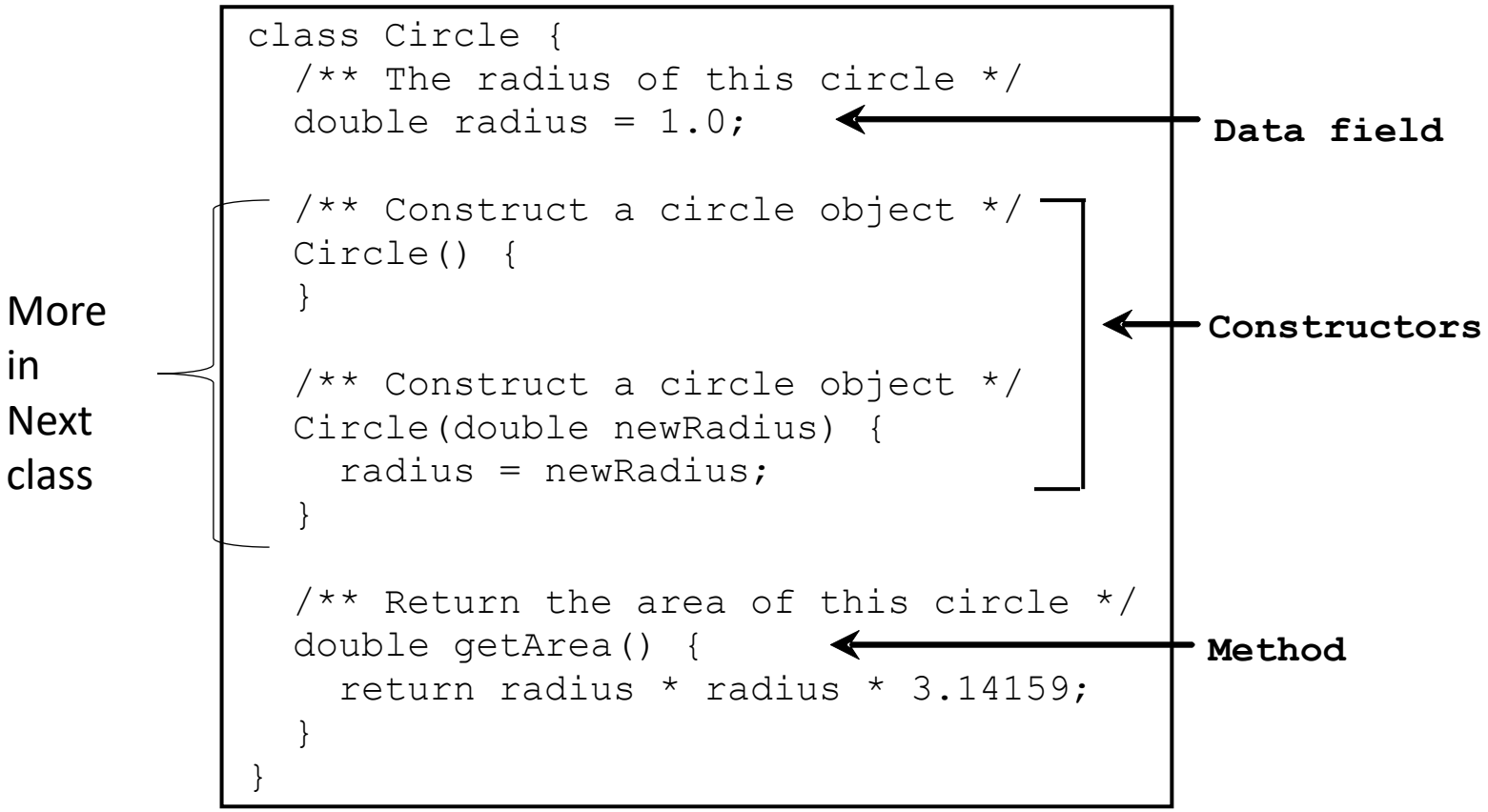
- From a class, we can create objects of the class



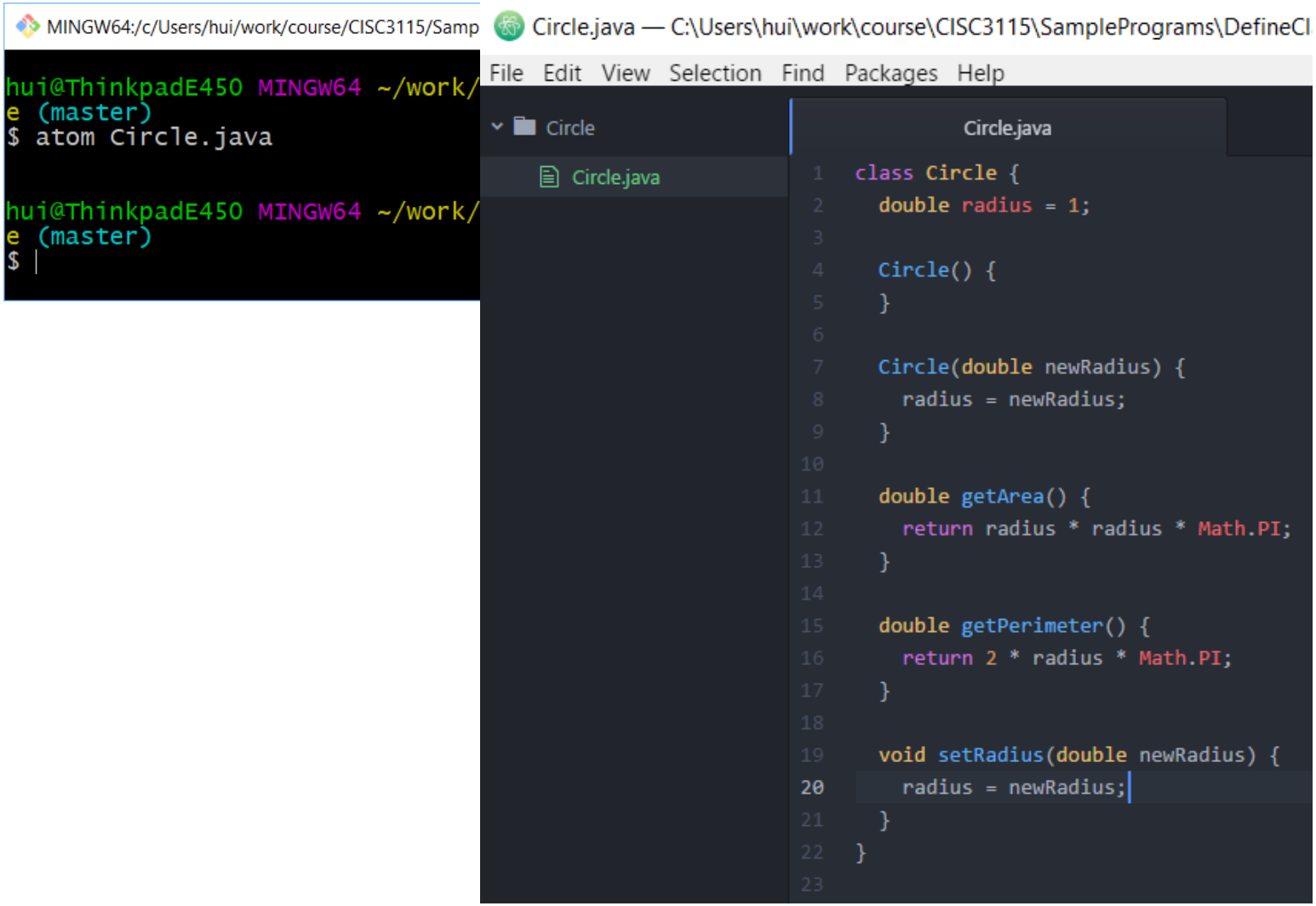
Objects and Classes: State and Behavior

- A Java class uses variables to define data fields and methods to define behaviors.
  - The state of an object of the class corresponds to the data fields and their values.
  - The behavior of the object corresponds to the methods.
- Constructors
  - A special type of methods that are invoked to initialize the data fields when the object is being constructed.

A Circle Class



Writing the Circle Class

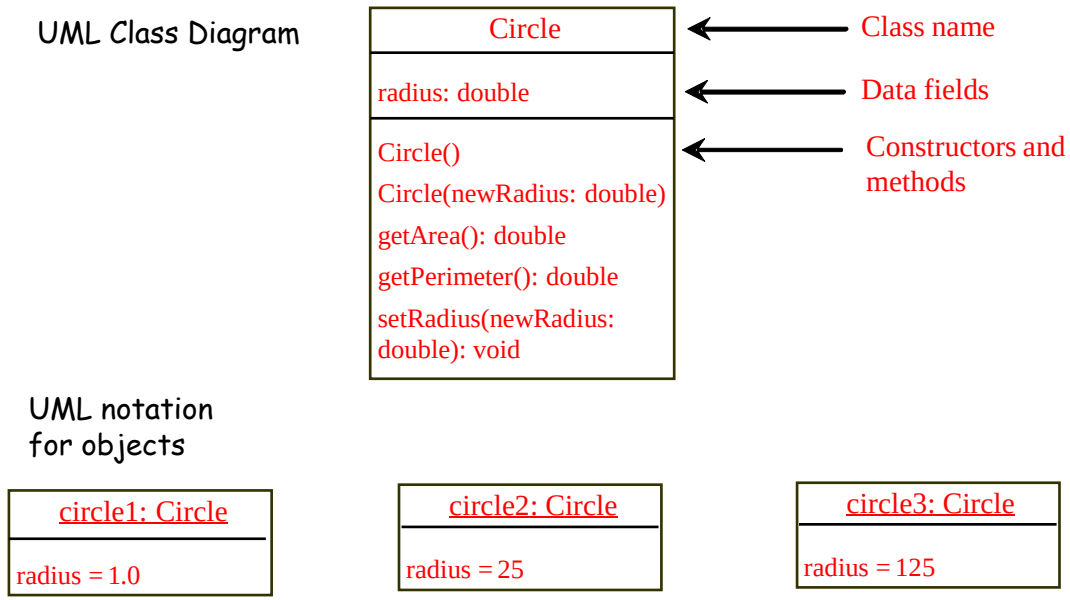


Reading the Circle Class

- Compared to the programs you written, is there any notable difference?
  - Does it have a main method?
  - Can you run it?
  - Can you compile it?
  - Is there any constructors? Where are they? How are constructors named? Does a constructor have a return type?
  - Where are the methods that define the behavior an object created from the class? Must a method have a return type? What are the return types?
  - Can method take a parameter? Must a parameter have a type and name?

Representing Class and Objects in UML Diagram

- UML = Unified Modeling Language



Reading the UML Diagram

- How does a class diagram depict a class?
  - How is a data field presented?
  - How is a constructor represented?
  - How is a method represented?
- How is an object represented in UML?

Questions

- Concepts of objects and classes
- Relationship between objects and classes
- Defining class in Java
- Depicting class in UML

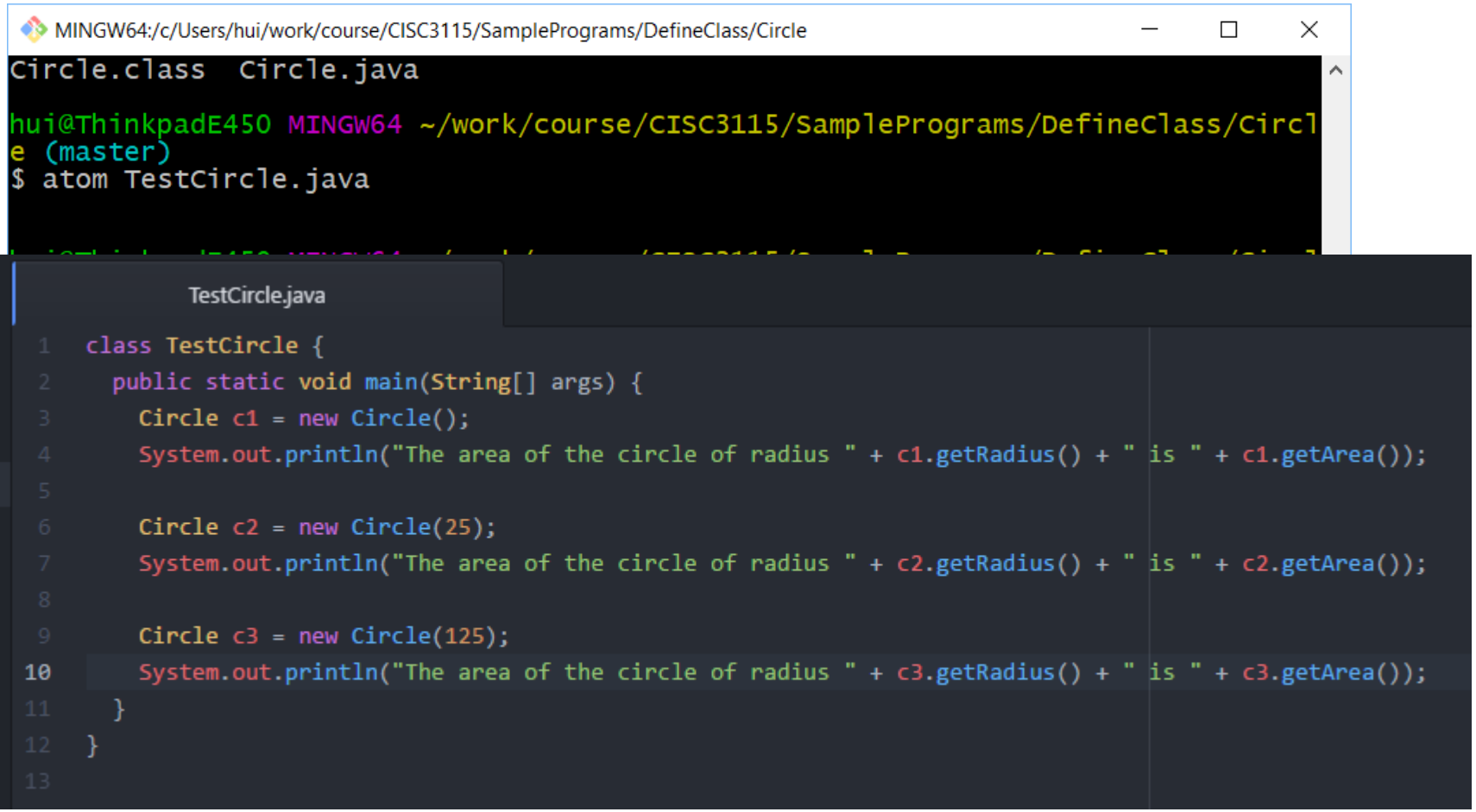
Observations

- We can compile the Circle class, but we cannot run it. Why can we not run it?
- The Circle class acts as a template from which objects of the Circle class can be created, but have we created any objects from the Circle class?

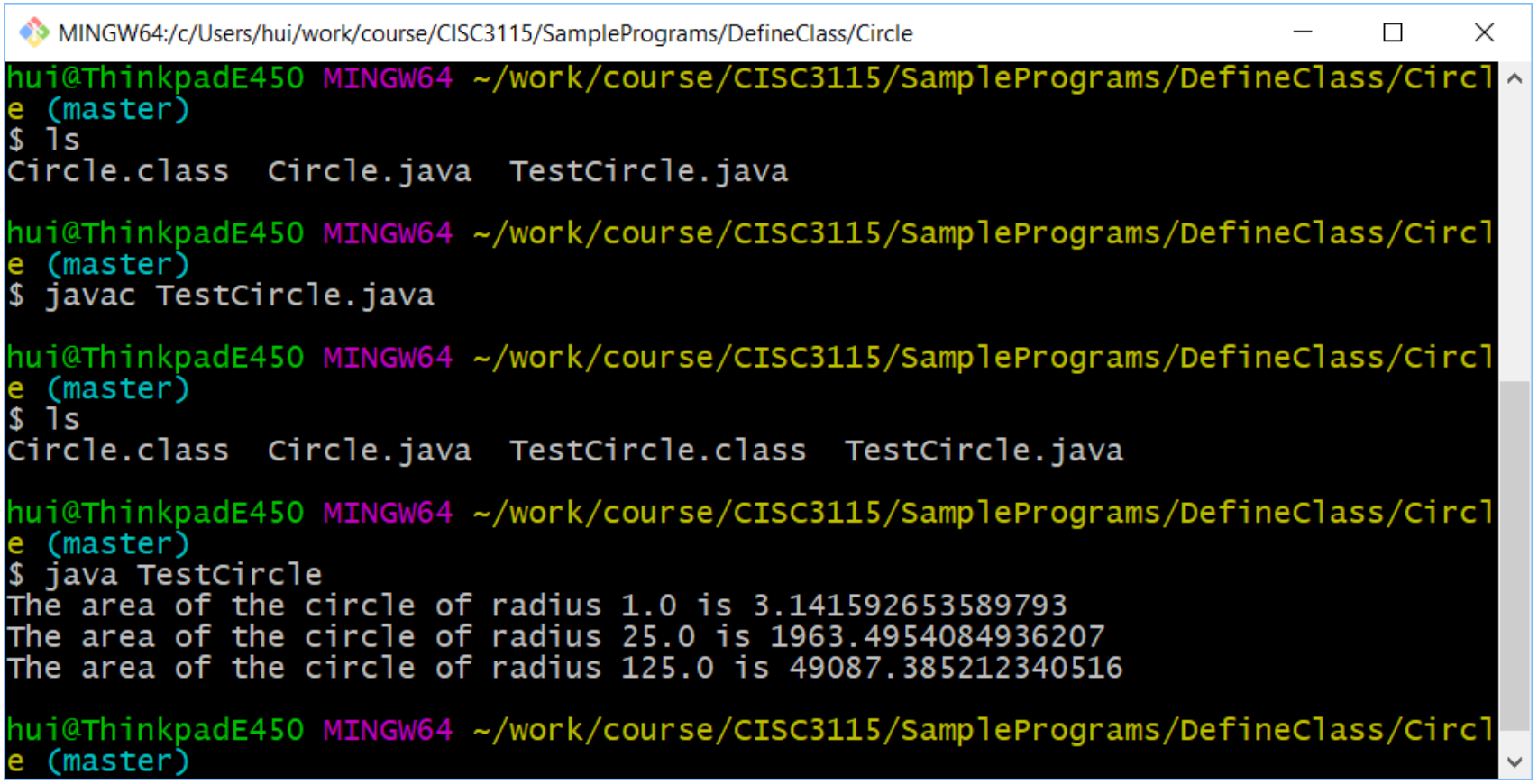
The TestCircle Class

- It has a main method
  - A number of Circle objects are created.
  - The areas of the Circle objects are computed and printed out

Writing the TestCircle Class



Compiling and Running the Program



Static (Class) vs. Instance

- Instance variables and instance methods defined in a class, but are part of an object (not the class).
- static variables and methods defined in a class, and also part of the class.

Given

```
class A {
    public static void m1() {
     }

     public void m2() {
     }
}
```

What about this? (correct or wrong)

```
class B {
    public void m1() {
         A.m1();
         A.m2();
    }
}
```

Setters and Getters

- Getters are methods to return the value of a data field of an object
- Setters are methods to change the value of a data field of an object

```
class Circle {
// …
    public void setRadius(double r) {
        this.r = r;
    }
    public void getRadius() {
        return r;
    }
//…
}
```

Exercise (in Groups)

- Write the Circle and TestCircle classes
- Compile and run the program
- Submit your work as a journal entry
- Have free time? Go to next slide

Exercise (in Groups)

- Write two classes, TV and TestTV as illustrated in Listings 9.3 and 9.4 in the textbook
- Compile and run the program
- Submit your work as a journal entry