## Java Review, Inheritance and Polymorphism

**▼11.2.3**

What is single inheritance? What is multiple inheritance? Does Java support multiple inheritance?

Single inheritance allows a subclass to extend only one superclass. Multiple inheritance allows a subclass to extend multiple classes. Java does not allow multiple inheritance.

Hide Answer

**▼11.5.2**

Explain the difference between method overloading and method overriding.

Method overloading defines methods of the same name in a class. Method overriding modifies the methods that are defined in the superclasses.

Hide Answer

**▼11.7.1**

What are the three pillars of object-oriented programming? What is polymorphism?

Encapsulation, inheritance, and polymorphism. In simple terms, polymorphism means that a variable of a supertype can refer to a subtype object.

Hide Answer

**▼11.8.6**

Show the output of following program:

```
1  public class Test {
2    public static void main(String[] args) {
3      A a = new A(3);
4    }
5  }
6
7  class A extends B {
8    public A(int t) {
9      System.out.println("A's constructor is invoked");
10   }
11 }
12
```

```
13  class B {
14    public B() {
15      System.out.println("B's constructor is invoked");
16    }
17  }
```

Is the no-arg constructor of Object invoked when new A(3) is invoked?

B's constructor is invoked
A's constructor is invoked

The default constructor of Object is invoked, when new A(3) is invoked. The Object's constructor is invoked before any statements in B's constructor are executed.

Hide Answer

**▼11.8.7**

Show the output of following program:

```
public class Test {
  public static void main(String[] args) {
    new A();
    new B();
  }
}

class A {
  int i = 7;

  public A() {
    setI(20);
    System.out.println("i from A is " + i);
  }

  public void setI(int i) {
    this.i = 2 * i;
  }
}

class B extends A {
  public B() {
    System.out.println("i from B is " + i);
```

```
  }

  public void setI(int i) {
    this.i = 3 * i;
  }
}
```

```
i from A is 40
i from A is 60
i from B is 60
```

Hide Answer

**▼11.8.8**

Show the output of following program:

```
public class Test {
  public static void main(String[] args) {
    Apple a = new Apple();
    System.out.println(a);
    System.out.println("---------------");

    GoldenDelicious g = new GoldenDelicious(7);
    System.out.println(g);
    System.out.println("---------------");

    Apple c = new GoldenDelicious(8);
    System.out.println(c);
  }
}

class Apple {
  double weight;

  public Apple() {
    this(1);
    System.out.println("Apple no-arg constructor");
  }

  public Apple(double weight) {
    this.weight = weight;
```

```
    System.out.println("Apple constructor with weight");
  }

  @Override
  public String toString() {
    return "Apple: " + weight;
  }
}

class GoldenDelicious extends Apple {
  public GoldenDelicious() {
    this(5);
    System.out.println("GoldenDelicious non-arg constructor");
  }

  public GoldenDelicious(double weight) {
    super(weight);
    this.weight = weight;
    System.out.println("GoldenDelicious constructor with weight");
  }

  @Override
  public String toString() {
    return "GoldenDelicious: " + weight;
  }
}
```

```
Apple constructor with weight
Apple no-arg constructor
Apple: 1.0
---------------
Apple constructor with weight
GoldenDelicious constructor with weight
GoldenDelicious: 7.0
---------------
Apple constructor with weight
GoldenDelicious constructor with weight
GoldenDelicious: 8.0
```

Hide Answer

## JavaFX

### Section 14.2

**▼14.2.1 ***

Explain the evolution of Java GUI technologies.

See the text for a brief discussion from AWT to Swing, and to JavaFX.

Hide Answer

**▼14.2.2 ***

Explain why this book teaches Java GUI using JavaFX.

This book teaches Java GUI programming using JavaFX for three reasons.

First, JavaFX is much simpler to learn and use for new Java programmers.

Second, JavaFX is a better pedagogical tool for demonstrating object-oriented programming than Swing.

Third, Swing is essentially dead, because it will not receive any further enhancement. JavaFX is the new GUI tool for developing cross-platform-rich Internet applications on desktop computers, on hand-held devices, and on the Web.

Hide Answer

### Section 14.3

**▼14.3.1 ***

How do you define a JavaFX main class? What is the signature of the start method? What is a stage? What is a primary stage? Is a primary stage automatically created? How do you display a stage? Can you prevent the user from resizing the stage? Can you replace Application.launch(args) by launch(args) in line 22 in Listing 14.1?

You define a JavaFX main class by extending the Application class. The signature of the start method is

```
public void start(Stage primaryStage)
```

A stage is a window to holding a scene. An application may have multiple stages. The primary stage is automatically created when a JavaFX program is launched. To display a stage, invoke its show() method.

You can prevent the user from resizing the stage by invoking stage.setResizable(false).

You can replace Application.launch(args) by launch(args), because the JavaFX main class is a subtype of Application.

Hide Answer

## Section 14.4

**▼14.4.1**

How do you create a Scene object? How do you set a scene in a stage? How do you place a circle into a scene?

To create a Scene, use new Scene(parent, width, height) or new Scene(parent). To set a scene in a stage, invoke Stage's setScene(scene) method. To place a circle to a scene, first place the circle into a pane, and then place the pane into the scene.

Hide Answer

**▼14.4.2 ***

What is a pane? What is a node? How do you place a node in a pane? Can you directly place a Shape or an ImageView into a Scene? Can you directly place a Control or a Pane into a Scene?

A pane is used to hold and organize nodes. A node is a visual component that can be displayed. You can place a node into a pane using the pane.getChildren().add(node). You cannot directly place a Shape or an ImageView into a scene. You can directly place a Control or a Pane into a scene when constructing a Scene using new Scene(Parent, width, height) or new Scene(Parent). Parent is the superclass for Control and Pane.

Hide Answer

**▼14.4.3 ***

How do you create a Circle? How do you set its center location and radius? How do you set its stroke color and fill color?

You can create a Circle using its no-arg constructor and use its setCenterX, setCenterY methods to set its center location and use its setRadius to set its radius. To set the stroke color, use setStroke(color) method. To set the color, use the setFill(color) method.

Hide Answer

## Section 14.5

**▼14.5.1 ***

What is a binding property? What interface defines a binding property? What interface defines a source object? What are the binding object types for int, long, float, double, and boolean? Are Integer and Double binding properties? Can Integer and Double be used as source objects in a binding?

A binding property is the one that binds with a source object. When the contents in the source changes, the binding property values change too. A binding property is an instance of Property and a source object is an instance of ObservableValue. The binding object types for int, long,

float, double, and boolean are IntegerProperty, LongProperty, DoubleProperty, and BooleanProperty. Integer and Double are not subtypes of ObservableValue. Hence, they cannot be used as a source object in a binding.

Hide Answer

**▼14.5.4 ***

What is a unidirectional binding and what is bidirectional binding? Write a statement to bind property d1 with property d2 bidirectionally.

A unidirectional binding binds a target with a source. A bidirectional binding binds two objects together. Changes in one object affects the other. The statement to bind d1 with d2 is d1.bindBidirectional(d2). 12.

Hide Answer

**▼14.6.2**

Can you rotate a pane, a text, or a button? Modify the code to rotate the button 15 degrees counterclockwise? How do you test if a point is inside a node? How do you scale up or down a node?

Yes.

```
button.setRotate(-15);
node.contains(x, y);
node.setScaleX(2.0); // Scale x-coordinates up
node.setScaleX(0.2); // Scale x-coordinates down
```

Hide Answer

## Section 14.7

**▼14.7.1 ***

How do you create a color? What is wrong about creating a Color using new Color(1.2, 2.3, 3.5, 4)? Which of two colors is darker, new Color(0, 0, 0, 1) or new Color(1, 1, 1, 1)? Does invoking c.darker() change the color value in c?

You can use the Color constructor or static methods in the Color class to create Color objects. new Color(1.2, 2.3, 3.5, 4) is wrong because the parameter values must be between 0 and 1. new Color(0, 0, 0, 1) is darker than new Color(1, 1, 1, 1). Invoking c.darker() returns a new Color. Color is immutable.

Hide Answer

**▼14.7.2**

How do you create a Color object with a random color?

```
new Color(Math.random(), Math.random(), Math.random(), 1)
```

Hide Answer

**▼14.7.3**

How do you set a circle object c with blue fill color using the setFill method and using the setStyle method?

```
c.setFill(Color.BLUE)
c.setStyle("-fx-fill: blue")
```

Hide Answer

## Section 14.8

**▼14.8.1***

How do you create a Font object with font name Courier, size 20, and weight bold?

```
new Font("Courier", Weight.BOLD, 20)
```

Hide Answer

## Section 14.9

**▼14.9.1***

How do you create an Image from a URL or a filename?

Use new Image(filename) or new Image(url)

Hide Answer

## Section 14.10

**▼14.10.1***

How do you add a node to a Pane, StackPane, FlowPane, GridPane, BorderPane, HBox, and VBox? How do you remove a node from these panes?

To add a node to a Pane, StackPane, FlowPane, HBox, and VBox, use pane.getChildren().add(node). To add node to a BorderPane, use the setTop, setBottom, setLeft, setRight, and setCenter methods. To remove a node from these panes, use pane.getChildren().remove(node).

Hide Answer

**▼14.10.5***

What are the differences between a FlowPane and an HBox or a VBox?

FlowPane can have multiple rows and columns. The nodes in a FlowPane can be placed horizontally or vertically. An HBox can have only one row and an VBox can have only one column.

Hide Answer

## Section 14.11

**▼14.11.1***

How do you display a text, line, rectangle, circle, ellipse, arc, polygon, and polyline?

To display a text, line, rectangle, circle, ellipse, arc, polygon, and polyline, create an instance of the Text, Line, Rectangle, Circle, Ellipse, Arc, Polygon, and Polyline and add it to a pane and place the pane into a scene.

Hide Answer

**Note from Andy: Be able to read and understand the code snippets, for the next 10 questions. You will NOT need to write code on the exam. But you should be able to understand what it does.**

**▼14.11.2**

Write code fragments to display a string rotated 45 degrees in the center of the pane.

```
Text text = new Text("Welcome");
StackPane pane = new StackPane();
pane.getChildren().add(text);
text.setRotate(15);
```

Hide Answer

**▼14.11.3**

Write code fragments to display a thick line of 10 pixels from (10, 10) to (70, 30).

```
Line line = new Line(10, 10, 70, 30);
line.setStrokeWidth(10);
```

Hide Answer

**▼14.11.4**

Write code fragments to fill red color in a rectangle of width 100 and height 50 with the upper-left corner at (10, 10).

```
Rectangle rectangle = new Rectangle(10, 10, 100, 50);
rectangle.setFill(Color.RED);
```

Hide Answer

**▼14.11.5**

Write code fragments to display a round-cornered rectangle with width 100, height 200with the upper-left corner at (10, 10), corner horizontal diameter 40, and corner vertical diameter 20.

```
Rectangle rectangle = new Rectangle(10, 10, 100, 200);
rectangle.setArcWidth(40);
rectangle.setArcHeight(20);
```

Hide Answer

**▼14.11.6**

Write code fragments to display an ellipse with horizontal radius 50 and vertical radius 100.

```
Ellipse ellipse = new Ellipse();
ellipse.setRadiusX(50); ellipse.setRadiusY(100);
```

Hide Answer

**▼14.11.7**

Write code fragments to display the outline of the upper half of a circle with radius 50.

```
Arc arc = new Arc();
arc.setRadiusX(50); arc.setRadiusY(50);
arc.setFill(null);
arc.setStartAngle(0); arc.setLength(180);
arc.setType(ArcType.OPEN);
```

Hide Answer

**▼14.11.8**

Write code fragments to display the lower half of a circle with radius 50 filled with the red color.

```
Arc arc = new Arc();
arc.setRadiusX(50); arc.setRadiusY(50);
arc.setStartAngle(180); arc.setLength(180);
arc.setFill(Color.RED);
arc.setType(ArcType.ROUND);
```

Hide Answer

**▼14.11.9**

Write code fragments to display a polygon connecting the following points: (20, 40), (30, 50), (40, 90), (90, 10), (10, 30), and fill the polygon with green color.

```
Polygon p = new Polygon();
g.getPoints().addAll(20.0, 40.0, 30.0,
50.0, 40.0, 90.0, 90.0, 10.0, 10.0, 30.0);
p.setFill(Color.GREEN);
```

Hide Answer

**▼14.11.10**

Write code fragments to display a polyline connecting the following points: (20, 40), (30, 50), (40, 90), (90, 10), (10, 30).

```
Polyline p = new Polyline();
p.getPoints().addAll(20.0, 40.0, 30.0,
50.0, 40.0, 90.0, 90.0, 10.0, 10.0, 30.0);
```

Hide Answer

**▼14.11.11**

What is wrong in the following code?

```
public void start(Stage primaryStage) {
  // Create a polygon and place it in the scene
  Scene scene = new Scene(new Polygon(), 400, 400);
  primaryStage.setScene(scene); // Place the scene in the stage
  primaryStage.show(); // Display the stage
}
```

Polygon is a Shape, which cannot be directly added to a scene. You have to place a shape into a pane and add the pane into the scene.

Hide Answer

## Section 15.2

**▼15.2.1***

What is an event source object? What is an event object? Describe the relationship between an event source object and an event object.

The event source object, also called source object, is the source where an event is fired. An event object contains the information about the event. The relationship between a source object and an event is that the event is an object created by the source.

Hide Answer

## Section 15.3

**▼15.3.2***

Explain how to register a handler object and how to implement a handler interface.

To register a handler object, you invoke the source object's registration method; for example, button.setOnAction (handler) for registering a handler for a button action event. To implement a handler interface, you implement the method defined in the handler interface.

Hide Answer

**▼15.3.3***

What is the handler method for the EventHandler<ActionEvent> interface?

The handler method for the EvnetHandler<T extends Event> interface is

```
public void handle(T)
```

Hide Answer

**▼15.3.4***

What is the registration method for a button to register an ActionEvent handler?

The method for a button to register an ActionEvent is

```
button.setOnAction(handler)
```

Hide Answer

## Section 15.5

**▼15.5.1**

If class A is an inner class in class B, what is the .class file for A? If class B contains two anonymous inner classes, what are the .class file names for these two classes?

If class A is an inner class in class B, the .class file for A is B$A.class. If class B contains two anonymous inner classes, the .class file names for these two classes are B$+1 and B$+2.

Hide Answer

## Section 15.6

**▼15.6.1***

What is a lambda expression? What is the benefit of using lambda expressions for event handling? What is the syntax of a lambda expression?

Lambda expressions can be viewed as an anonymous class with a concise syntax. Using lambda expressions can make code concise and easy to read. The syntax for lambda expressions is:

```
(type1 para1, …, typen paramn) -> expression;
(type1 para1, …, typen paramn) -> {statements};
() -> expression;  or
() -> {statements};
```

Hide Answer

**▼15.6.2**

What is a functional interface? Why is a functional interface required for a lambda expression?

A functional interface is the interface with exactly one method. A lambda expression works only with a functional interface. For the compiler to understand lambda expressions, the interface must contain exactly one abstract method.

Hide Answer

**▼15.8.2**

What methods do you use to register a handler for a mouse pressed, released, clicked, entered, exited, moved and dragged event?

```
setOnMouseClicked(handler)
setOnMousePressed(handler)
setOnMouseReleased(handler)
setOnMouseEntered(handler)
setOnMouseExited(handler)
setOnMouseDragged(handler)
setOnMouseMoved(handler)
```

Hide Answer

## Section 15.9

**▼15.9.1**

What methods do you use to register handlers for key pressed, key released, and key typed events? In which classes are these methods defined? (See Table 15.1)

```
setOnKeyPressed(handler)
setOnKeyReleased(handler)
setOnKeyTyped(handler)
```

These methods are defined in the Node and Scene classes.

Hide Answer

## Section 15.11

**▼15.11.1**

How do you set the cycle count of an animation to infinite? How do you auto reverse an animation? How do you start, pause, and stop an animation?

```
animation.setCycleCount(Timeline.INFINITY);
animation.setAutoReverse(true);
animation.start();
animation.pause();
animation.stop();
```

Hide Answer

**▼15.11.2***

Are PathTransition, FadeTransition, and Timeline a subtype of Animation?

Yes

Hide Answer

## Section 15.12

**▼15.12.1***

How does the program make the ball moving? (The green ball, example in class)

The program makes the ball moving by redisplaying it in a new location every 50 milliseconds.

Hide Answer

**▼15.12.2***

How does the code in Listing 15.17 BallPane.java change the direction of the ball movement?

The direction is changed by changing the sign for dx and dy.

Hide Answer

## Section 16.2

**▼16.2.1***

How do you create a label with a node without a text?

First create a Label using its no-arg constructor and then set its graphic property to a node.

Hide Answer

**▼16.2.3**

Can you display multiple lines of text in a label?

Use '\n' character in the text. For example, label.setText("Welcome\nto\nJava").

Hide Answer

**▼16.2.4**

Can the text in a label be underlined?

Yes. Use label.setUnderline(true).

Hide Answer

**▼16.3.3**

How do you set a handler for processing a button-clicked action?

Use button.setOnAction(handler).

Hide Answer

## Section 16.4

**▼16.4.1**

What is the output of the following code?

```
public class Test {
  public static void main(String[] args) {
    Test test = new Test();
    test.new B().start();
  }

  class A {
    public void start() {
      System.out.println(getP());
    }

    public int getP() {
      return 1;
    }
```

```
  }

  class B extends A {
    public int getP() {
      return 2 + super.getP();
    }
  }
}
```

3

Reason: When the start method is invoked from new B(), the getP() method in the B class is invoked. When super.getP() is invoked, the getP() method in the A class is invoked.

Hide Answer

## Section 16.5

**▼16.5.1**

How do you test if a radio button is selected?

Use rb.isSelected().

Hide Answer

## Section 16.6

**▼16.6.1**

Can you disable editing of a text field?

Yes. Use tf.setEditable(false).

Hide Answer

## Section 16.8

**▼16.8.1**

How do you create a combo box and add three items to it?

Use new ComboBox<>(). Use cbo.getItems().addAll(item1, item2, item3).

Hide Answer

**▼16.8.2***

How do you retrieve an item from a combo box? How do you retrieve a selected item from a combo box?

Use cbo.getItems() to return a list of values in the combo box. Use cbo.getValue() to get selected value.

Hide Answer

**▼16.8.3**

How do you get the number of items in a combo box? How do you retrieve an item at a specified index in a combo box?

Use cbo.getItems().size() to return the number of items in a combo box and use cbo.getItems().get(i) to get the item at the specified index in a combo box.

Hide Answer

**▼16.8.4**

What events would a ComboBox fire upon selecting a new item?

Upon selecting a new item, a combo box fires an ActionEvent.

Hide Answer

**▼16.9.4**

How do you obtain the selected items and selected indices?

Use lv.getSelectionModel().getSelectedItems() and lv.getSelectionModel().getSelectedIndices().

Hide Answer

## Section 16.10

**▼16.10.1**

How do you create a horizontal scroll bar? How do you create a vertical scroll bar?

To create a horizontal scroll bar, create a ScrollBar using new ScrollBar() and then invoke its setOrientation(Orientation.HORIZONTAL) or setOrientation(Orientation.VERTICAL).

Hide Answer

## Section 16.11

**▼16.11.1**

How do you create a horizontal slider? How do you create a vertical slider?

To create a horizontal slider, create a Slider using new Slider() and then invoke its setOrientation(Orientation.HORIZONTAL) or setOrientation(Orientation.VERTICAL).

Hide Answer

**▼16.11.2**

How do you add a listener to handle the property value change of a slider?

Use sl.valueProperty().addListener(ov -> statements) to respond to a change in the slider value.

Hide Answer

**▼16.11.3**

How do you get the value from a slider? How do you get the maximum value from a slider?

To get the value from a slider, use sl.getValue(). To get the scroll bar's maximum value, use sl.getMax().

Hide Answer

## Section 16.13

**▼16.13.1**

How do you create a Media from a URL? How do you create a MediaPlayer? How do you create a MediaView?

To create a Media from a URL, use new Media(url). To create a MediaPlayer, use new MediaPlayer(media). To create a MediaView, use new MediaView(mediaPlayer).

Hide Answer