Introduction
This assignment will ask that you write a very simple graphical user interface (GUI).

Assignment learning objectives
- Understand how a JFrame represents a window on the screen
- Understand how to add components to the JFrame's content pane
- Understand how an application must listen for a GUI event
- Understand how to add a listener to a component
- Understand in general how to implement an Interface
- Understand in particular how to implement the ActionListener Interface
- Understand how to use the ActionPerformed method

Reading for assignment
You should have read volume one of the subject guide including all recommended readings, with particular reference to chapter 12, of Head First Java pages 353-362, and chapter 11 of the subject guide.

Marks for assignment
The marks for each section of the assignment are clearly displayed against each question and add up to 25. There are another 25 marks each available from the second, third and fourth assignments.

Deliverables
- A print out of your two programs: SimpleGUI.java and MyGUI.java
- Electronic versions of your two programs: SimpleGUI.java and MyGUI.java
- A paragraph in answer to question (c)
Coursework one

Consider the program, *First*, below:

```java
import javax.swing.*;
import java.awt.*;
import java.awt.event.*;

public class First {
    public static void main (String[] args) {
        First thing = new First();
        thing.go();
    }

    public void go() {
        JFrame frame = new JFrame();
        frame.setSize(500,500);
        frame.setVisible(true);
        frame.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
    }
}
```

Compile and run this program. You should note that when run the program displays a 500 by 500 window on the screen to the user.

(a) Rewrite the program, calling your new program *SimpleGUI*. In your new program implement the following:

(i) Add a *JButton* to the frame that displays the text “coursework one”  
(ii) Implement *ActionListener*  
(iii) Register the *JButton* with the *ActionListener*  
(iv) Make the *JButton* display the text “You clicked me!” if the user clicks it.

You should now have a very simple GUI, that displays a button in a frame to the user. The button displays the text “coursework one” which changes to “You clicked me!” if the user clicks the button. However subsequent clicks by the user will have no further effect on the display.

(b) Rewrite your program, this time calling it *MyGUI*. This time the button should first of all say “Click me!” and once the user clicks the button it should say “I've been clicked 1 times”. With subsequent clicks of the button it should read “I've been clicked *n* times” where *n* is the number
of times the button has been clicked. For example, after the third click the button should read “I've been clicked 3 times”.

(c) Explain how the `actionPerformed()` method gets called, and why it is that you do not have to explicitly call it in your code. [4 marks]
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DIPLOMA AND BSc IN COMPUTING AND RELATED SUBJECTS
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COURSEWORK SUBMISSION FORM

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I declare that:

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Stewart House
University of London
32 Russell Square
London WC1B 5DN
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Introduction
This assignment asks you to write a basic graphical program, and a graphical program with a simple animation.

Assignment learning objectives
- Understand the form of the most basic graphical program
- Understand how to subclass JPanel and override paintComponent() in order to draw graphics
- Understand what the argument to paintComponent() is and that only the JVM can construct this object
- Cast the Graphics object to a Graphics2D object in order to invoke the methods from the Graphics2D library
- Understand how to use Thread.sleep in an animation to halt the program for a given time interval between frames

Reading for assignment
You should have read volume one of the subject guide including all recommended readings, with particular reference to chapter 12 of Head First Java, pages 363-368, and chapter 12 of the subject guide.

Marks for assignment
The marks for each section of the assignment are clearly displayed against each question and add up to 25. There are another 25 marks each available from the first, third and fourth assignments.

Deliverables
- Print outs of your four programs: MyDrawPanel.java; SimpleDrawing.java; RandomDrawPanel.java and RandomDrawing.java.
- Electronic versions of your four programs: MyDrawPanel.java; SimpleDrawing.java; RandomDrawPanel.java and RandomDrawing.java.
Coursework two

(a) Write a class `MyDrawPanel` that extends `JPanel` and overrides `paintComponent()`.

(b) Write a program called `SimpleDrawing.java`. Your program should display a 500 x 500 `JFrame`. Add a `MyDrawPanel` object to the frame such that when the program is run a blue oval is displayed.

(c) Write a class `RandomDrawPanel.java` that extends `JPanel` and overrides `paintComponent()`. The `paintComponent()` method should create a 200x200 oval with a random colour.

(d) Write a class `RandomDrawing.java` that uses `RandomDrawPanel.java` to display an oval that constantly changes colour. Use `Thread.sleep` to slow the colour changes so that the user sees each one for a second at a time.
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Introduction
This assignment asks that you write a simple GUI with two components, a button and a drawing, using a layout manager. The components should be linked by an `ActionListener` so that when the button is clicked the colour of the drawing changes. Additionally the button text should change with the colour of the drawing.

Assignment learning objectives
- Understand how to add more than one component to a frame
- Understand how to link two components so that the actions of one affects another
- Understand how layout managers determine the location of components
- Understand how to use the `BorderLayout` manager to add components to its five regions
- Understand `BorderLayout` manager's policies with respect to height and width of components
- Understand how to use inner classes

Reading for assignment
You should read volume two of the subject guide with particular reference to chapter 4, and Chapters 12 and 13 of *Head First Java*, particularly pages 369-384 and pages 399-407.

Marks for assignment
The marks for each section of the assignment are clearly displayed against each question and add up to 25. There are another 25 marks each available from the first, second and fourth assignments.

Deliverables
- Print out of your program, `ColourCircle.java`
- Electronic version of your program, `ColourCircle.java`
Coursework three

Write a program to do the following:

(a) Write a program called ColourCircle.java that will display a 400 x 400 JFrame labelled “coursework three” [2 marks]

(b) Write an inner class of ColourCircle called NewDrawPanel that extends JPanel and overrides the paintComponent() method to draw a blue oval with the coordinates 125,125,150,150 [2 marks]

(c) Implement ActionListener in your class and register the button with the ActionListener [2 marks]

(d) Using the BorderLayout manager add a JButton to the SOUTH region that displays the text “click me” [2 marks]

(e) Using the BorderLayout manager add a NewDrawPanel object to the CENTER region [2 marks]

(f) Add the functionality to the button that when the button is clicked the colour of the oval changes to red [5 marks]

(g) Extend your program so that the colour of the oval change from red to blue, or from blue to red every time the user clicks the button. [5 marks]

(h) Extend your program again so that when the button is clicked it displays either “The circle is now red” or “The circle is now blue” as appropriate [5 marks]
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Introduction
This assignment will ask that you use the BorderLayout manager to add two drawing components to a JFrame. You should then animate both components. You are then asked to write a second program where the animation is continuous, stopping only when a button is pressed.

Assignment learning objectives
• Deepen your understanding of how layout managers determine the location of components
• Understand how a layout manager uses the preferred size of the added components in its calculations
• Understand how to give a component a preferred height and width
• Understand that whether or not the preferred height and width is respected depends on the layout manager's policies
• Deepen your understanding of how to use the BorderLayout manager to add components to one of five regions
• Deepen your understanding of BorderLayout manager's policies with respect to height and width of components
• Deepen your understanding of inner classes

Reading for assignment
You should read volume two of the subject guide with particular reference to chapter 4, and Chapters 12 and 13 of Head First Java, particularly pages 369-385 and pages 399-407.

Marks for assignment
The marks for each section of the assignment are clearly displayed against each question and add up to 25. There are another 25 marks each available from the first, second and third assignments.

Deliverables
• Print out of your programs, MovingShapes.java and MovingShapesButton.java.
• Electronic version of your programs, MovingShapes.java and MovingShapesButton.java.
• A paragraph in answer to question (j)
Coursework four

(a) Write a program called `MovingShapes.java` with a 500 x 500 `JFrame` labelled “Coursework four” [1 mark]

(b) Write two inner classes that extend `JPanel`. The first should be called `FirstDrawPanel` and should draw a blue oval with the coordinates 0,0,50,50, the second should be called `SecondDrawPanel` and should draw an orange rectangle with the coordinates 0,0,50,50 [2 marks]

(c) Using `BorderLayout` manager add a `FirstDrawPanel` object to the CENTER region [1 mark]

(d) Using the `BorderLayout` manager add a `SecondDrawPanel` object to the NORTH region [1 mark]

(e) Make sure that the component in the NORTH region gets its preferred height of 50 [3 marks]

(f) Make the rectangle move in a straight line across the frame while at the same time the oval moves down the frame diagonally. Both shapes should appear to move at the same time, and should continue moving until they exit the frame. You should make sure that they move slowly enough to be seen by the user. [6 marks]

(g) Resave your program as `MovingShapesButton.java` and extend the animation so that it is continuous – ie so that the shapes keep moving while the program is running. You may choose to make the animation continuous in any way you choose. You could, for example, start the animation again from the beginning once the shapes have exited the frame, or you may have the shapes retrace their movements or even have them start moving randomly. [4 marks]

(h) Add a `JButton` to the frame, label the button “Click me to stop the animation”. [1 mark]

(i) When the button is clicked the animation should stop. [4 marks]

(j) Explain why it is that despite the oval and the rectangle having the same coordinates, the circle is displayed below the rectangle. [2 marks]
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