Last Time

❖ We created our first Java application

❖ What are the components of a basic Java application?

❖ What GUI component did we use in the examples?

❖ How do we write to the standard output?

Java Applets

❖ An applet is a small Java program that can be embedded into an HTML document
  ➤ Question: What does an html document look like?

❖ The Java program is stored on the web server along with the html files, images, etc.

❖ How is the Java program executed on the client's machine?

Java Applets

❖ When the web browser loads the web page, it downloads the applet to the client machine and begins executing it

❖ Web browsers are able to run Java applets either by
  ➤ Directly supporting Java (such as Netscape 7)
  ➤ Using the Java Plug-in (such as Microsoft Internet Explorer and Safari)

Java Applets

❖ Another way to run Java applets is to use the `appletviewer` that is included with the Java SDK

❖ The steps for creating and running applets are:
  ➤ Create the Java applet in the text editor and compile it using `javac`

  ➤ Create an html file that includes the Java applet

  ➤ Run the applet by using the `appletviewer`
    ✓ `appletviewer myhtml.html`

Java Applets

❖ What are the useful things about Java applets?

❖ Can you think of examples of situations where Java applets would be appropriate?

First Java Applet

```java
import java.awt.Graphics;      // import class Graphics
import javax.swing.JApplet;    // import class JApplet

public class WelcomeApplet extends JApplet {

   public void paint( Graphics g )
   {
      super.paint( g );

      g.drawString( "Welcome to Java Programming!",
               25, 25 );
   } // end method paint

} // end class WelcomeApplet
```

Executing the Applet

❖ To execute the applet, we must perform the following steps:
  ➢ Compile the applet in the same way that we did for Java applications
    ✓ How is that?
  ➢ Create and html document to load and run the applet
  ➢ Load the html file into a brower or using appletviewer

HTML

❖ The html should contain the command to load the Java applet
  ➢ `<applet code="WelcomeApplet.class" width="300" height="45"></applet>`

Properties of Applets

❖ They do not need a main method.

❖ They do however require a paint method

❖ To simplify the process of writing Java applets, the applet inherits from the JApplet class.

❖ This class contains all the methods needed to create basic applets (over 200 of them!)

❖ The inheritance is achieved by using the `extends` keyword

How Applets Work

❖ When the browser or appletviewer begins executing the Java applet, three methods are called in this order:
  ➢ init
  ➢ start
  ➢ paint

❖ These three methods are defined in the JApplet superclass and are inherited by the subclass

Method `paint`

❖ In our example, the method `paint` overrides the method defined in the superclass

❖ This new method is called instead of the original method

❖ Since we want the original `paint` method to be called we need to specify that in the body of our paint method
  ➢ `super.paint(g);`

Method paint

❖ The next line in method `paint` draws a string to the screen
  ➢ `g.drawString( "Welcome to Java Programming!", 25, 25 );`

Graphics Class

❖ A package in Java is just a collection of classes

❖ java.awt is an example of a package

❖ It's classes include Dailog, Event, Graphics and Image

Modifying the Applet

❖ Let us practice using some of the other methods in the Graphics class

❖ Which method would you like to use?

❖ Let us try changing the colour of the text or shapes.
  ➢ How can we find out how to do this?

Including Swing Components in Applets

❖ What do I mean by Swing components?

❖ The graphics class is not powerful enough to create meaningful Java applets

❖ It is sometimes necessary to read in data from the users, display data on multiple lines and display several windows

❖ How can we combine Swing and applets?

Swing and Applets

❖ We can use the JOptionPane class in an applet in the same way that we used it in the application

❖ Write a Java applet that will ask the user for two numbers and display the sum of these numbers

Basic Programming Concepts

❖ Selection structures
  ➢ If statement. Same as in C++

```
if(x>0)
   System.out.println("X is positive");
else
   System.out.println("X is negative");
```

Conditional Operator (?:)

❖ Java's only ternary operator
  ➢ What does ternary mean?

❖ Shortcut of the if-else statement

```
System.out.println( studentGrade >= 60? "Passed" : "Failed" );
```

More Selection Structures

❖ Selection Structures:
  ➢ Switch statements. Same as C++

```
int choice = 3;
switch(choice)
{
  case 1: System.out.println("One");
          break;
  case 2: System.out.println("Two");
          break;
  case 3: System.out.println("Three");
          break;
  default: System.out.println("None");
}
```

Repetition Structures

❖ Java supports three loop structures

❖ While loop

```
number = 0;
while( number <= 16 )
  total += number;
```

❖ For loop

```
for( number=0; number<=16; number++ )
  total += number;
```

Repetition Structures

❖ Do-while loop

```
number = 0;
do
{
  total += number;
}
while( number <= 16 )
```

Primitive Data Types

❖ In other words, simple data types

boolean		true or false
char	16 bits	65536 chars
byte	8 bits	-128 to 127
short	16 bits	-32,768 to 32,767
int	32 bits	-2,147,483,648 to 2,147,483,647
long	64 bits	-2^{63} to $2^{63}-1$
float	32 bits	IEEE 754 floating point
double	64 bits	IEEE 754 floating point

Break

❖ The `break` statement can be used with while, do-while, for and switch statements

❖ `break` causes the immediate exit from any of the above statements

```
for( int i=0; i<10; i++)
{
 if(i == 5)
  break;
 number += i;
}
```

Continue

❖ The continue statement is used with while, for or do-while loops

❖ It causes the current iteration of the loop to stop and moves on to the next iteration

```
for( int i=0; i<10; i++)
{
 if(i == 5)
  continue;
 number += i;
}
```

Arrays

❖ Arrays are declared by:

```
int myArray[] = new int[10];

int myArray[];
myArray = new int[10];
```

Program

❖ Write a program that creates an array of 10 elements. Assign values to the array (just hard code these in for now). Display a histogram of the contents of the array in the following format

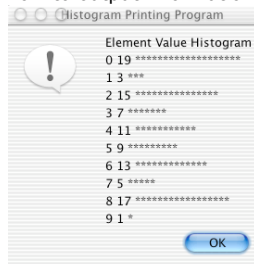| Element	Value	Histogram
0	3	***
1	5	*****
2	7	*******
3	1	*
4	3	***
5	8	********
6	6	******

GUI

❖ So far we have learnt how to output information using JOptionPane

❖ As you notice, JOptionPane ignores \t

GUI

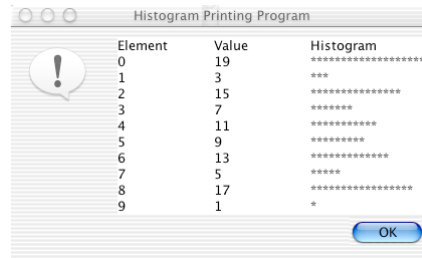❖ A text area is better able to handle text formatting

Assignment

❖ Knights Tour Assignment

❖ Start Early

❖ Due on Tuesday, February 17, 2004

Summary

❖ We have covered:
  ➢ Java Applets
  ➢ JTextArea
  ➢ Selection Structures
  ➢ Repetition Structures
  ➢ Arrays
  ➢ Batch Files