Unit One Lecture Three:

Topic 1: Designing a simple class (i.e. A Cylinder class)

Step 1: Determine the instance variables

Ask yourself what information an object needs to store to do its job. Make instance fields to store the information that is common to all methods.

An instance field belongs to an object. Each object has its own copy of each instance field. When an object is constructed, its instance fields are created. They exist until no method uses the object any longer. Instance fields should not be accessible by clients.

```
public class Cylinder
{
     private int height;   // These are the instance fields
     private int radius;   // of this class and immediately
                           // follow the class header.
```

Step 2: Determine the constructors

In unit one, we are going to keep this step simple. We are only going to use a default constructor.

```
     public Cylinder()     // This is a default constructor
     {
          height = 5;      // It gives the instance fields
          radius = 2;      // their initial values.
     }
```

This constructor would be called when a client of our class tried to execute the following line of code.

```
     Cylinder x = new Cylinder();
```

Step 3: Determine necessary methods

Ask yourself what aspects of my object do I want my class to simulate. Also ask if you will need access to the instance fields.

```
public double SurfaceArea()
{
     double ans, ans1, ans2;  // local variables, they belong
                              // to the method not the object

     ans1 = 2 * 3.14 * radius * radius;  // These 3 lines
     ans2 = 2 * 3.14 * radius * height;  // could have been
     ans = ans1 + ans2;                  // done in 1 line

     return ans;
}

public double Volume()
{
     double ans;

     ans = 3.14 * radius * radius * height;

     return ans;
}

public int getRadius()  // This is an accessor method, it gives
{                       // the client access to an instance field
     return radius;
}

public int getHeight()
{
     return height;
}
```

Step 4: Test your class

Write a short client (driver) program that will create an instance of your class and test its methods.

```
public class TestCyliner
{
     public static void main(String args[])
     {
          Cylinder x = new Cylinder();

          double sa, v;

          sa = x.SurfaceArea();
          v  = x.Volume();

          System.out.println(x.getRadius());
          System.out.println(x.getHeight());
          System.out.println();
          System.out.println("Surface Area = " + sa);
          System.out.println("Volume = " + v);
     }
}
```

In the example above, "Surface Area = " and "Volume = " are called Strings. A String object is a sequence of characters enclosed in quotation marks. A String object can be constructed like this:

```
String name = "Bob Jones";
```

In the example above, the + sign simply combines the String with the double to create one long String which is printed.

Assignment U1A3: The Roach problem