Decision, Iteration, Instance methods and Static methods
Introduction
This module revises decisions and iterations in Java. It also covers some issues in class design. It related to text book Chapter 5, 6 and 8.

Objectives
- Review topics in Chapter 5 (decision) and Chapter 6 (Iteration)
- To understand the difference between instance methods and static methods
- To introduce the concept of static fields
- To understand the scope rules for local variables and instance fields

Reading
Chapter 5 Whole chapter
Chapter 6 Whole chapter
Chapter 8.6 Static methods
Chapter 8.7 Static fields
Chapter 8.8 Scope

Review questions

Review exercises:
Page 217, 219: Exercise R5.1, R5.12
Page 277: Exercise R6.1, R6.8

Programming exercises:
Page 222: Exercise P5.4
Page 278: Exercise P6.1
Page 381: Exercise P8.5 (pay attention on how to call static method)
Exercise P8.6 (part code is provided)
Lab session

1) Exercise P5.4, complete the main method below to ask the user to decide whether to continue. A YesNoChecker class is provided in the next page.

```java
import java.util.Scanner;
//This program asks the user to decide whether to continue.

class Continue
{
public static void main(String[] args)
{
Scanner in = new Scanner(System.in);
System.out.println("Do you want to continue?");

String input = in.nextLine();
YesNoChecker c = new YesNoChecker(input);
// fill you code here
}
}
```
public class YesNoChecker
{

    public YesNoChecker(String input)
    {
        if (input.equalsIgnoreCase("Y") ||
            input.equalsIgnoreCase("Yes") ||
            input.equalsIgnoreCase("Sure") ||
            input.equalsIgnoreCase("Why not?") ||
            input.equalsIgnoreCase("OK"))
        {
            type = YES;
        }
        else if (input.equalsIgnoreCase("N") ||
                input.equalsIgnoreCase("No"))
        {
            type = NO;
        }
        else
        {
            type = UNKNOWN;
        }

        // Test if the user wants to continue.
        public boolean isYes()
        {
            return type == YES;
        }

        // Test if the user does not want to continue.
        public boolean isNo()
        {
            return type == NO;
        }

        private int type;
        private static final int YES = 1;
        private static final int NO = 0;
        private static final int UNKNOWN = -1;
    }
}
2) Exercise P6.1

```java
import java.util.Scanner;
// This program converts dollar to euros.
public class CurrencyConverter {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("How many euros is one dollar: ");
        double rate = in.nextDouble();

        boolean done = false;
        while (!done) {
            System.out.print("Dollar value (Q to quit): ");
            String input = in.next();
            if (input.equalsIgnoreCase("Q"))
                done = true;
            else {
                double amount = Double.parseDouble(input);
                double exchange = amount * rate;
                System.out.printf("%.2f dollar = %.2f euro\n", amount, exchange);
            }
        }
    }
}
```
Exercise P8.5, refer to the class Geometry.java class in the next page, and complete the GeometryCalculator.java class.

```java
//GeometryCalculator.java

import java.util.Scanner;

/**
   * This program calculate the volume
   * and surface area of a sphere, a cylinder, and a cone.
   */
public class GeometryCalculator
{
    public static void main(String[] args)
    {
        Scanner in = new Scanner(System.in);

        System.out.println("Please enter the radius: ");
        double r = in.nextDouble();

        System.out.println("Please enter the height: ");
        double h = in.nextDouble();

        System.out.println("The volume of the sphere is: 
                          + Geometry.sphereVolume(r));

        System.out.println("The surface area of the sphere is: 
                          +
                          + Geometry.sphere());

        System.out.println("The volume of the cylinder is: 
                          +
                          + Geometry.cylinderVolume(r, h));

        System.out.println("The surface area of the cylinder is: 
                          +
                          + Geometry.cylinderSurface(r, h));

        System.out.println("The volume of the cone is: 
                          +
                          + Geometry.coneVolume(r, h));

        System.out.println("The surface area of the cone is: 
                          +
                          + Geometry.coneSurface(r, h));
    }
}
```
//Geometry.java
/**
 * This class has methods to calculate the volume and surface area of geometric shapes.
 */
public class Geometry {

    // Computes the volume of a sphere.
    public static double sphereVolume(double r) {
        return 4.0 * Math.PI * r * r * r / 3.0;
    }

    // Computes the surface area of a sphere.
    public static double sphereSurface(double r) {
        return 4.0 * Math.PI * r * r;
    }

    // Computes the volume of a cylinder.
    public static double cylinderVolume(double r, double h) {
        return Math.PI * r * r * h;
    }

    // Computes the surface area of a cylinder.
    public static double cylinderSurface(double r, double h) {
        return 2.0 * r * Math.PI * (r + h);
    }

    // Computes the volume of a cone.
    public static double coneVolume(double r, double h) {
        return Math.PI * r * r * h / 3.0;
    }

    // Computes the surface area of a cone.
    public static double coneSurface(double r, double h) {
        return Math.PI * r * (r + h);
    }
}
Exercise P8.6, based on the GeometryCalculator class given below, implement class Sphere, Cylinder and Cone to solve the Exercise P8.5 problem.

```java
import java.util.Scanner;

/**
 * This is a test driver for the Sphere, Cylinder, and Cone class 
 * This approach is more object-oriented than the previous one because it clearly separates the duties of each class.
 */

public class GeometryCalculator {
    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("Please enter the radius: ");
        double r = in.nextDouble();
        System.out.println("Please enter the height: ");
        double h = in.nextDouble();

        Sphere sp = new Sphere(r);
        double v = sp.getVolume();
        double s = sp.getSurfaceArea();
        System.out.println("The volume of the sphere is: "+v);
        System.out.println("The surface area of the sphere is: "+s);

        Cylinder cy = new Cylinder(r, h);
        v = cy.getVolume();
        s = cy.getSurfaceArea();
        System.out.println("The volume of the cylinder is: "+v);
        System.out.println("The surface area of the cylinder is: "+s);

        Cone co = new Cone(r, h);
        v = co.getVolume();
        s = co.getSurfaceArea();
        System.out.println("The volume of the cone is: "+v);
        System.out.println("The surface area of the cone is: "+s);
    }
}

Complete the rest three classes.