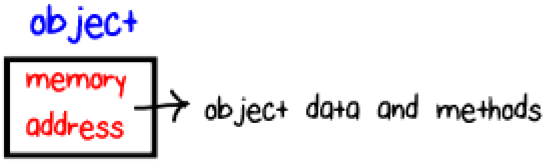
ICS3U Module 3: Note & Exercise 1c

Abstract Data Types

- A variable can be declared using a primitive data type (int, double, char) or an abstract data type
- One kind of *abstract data type* is the class
- Many classes are provided in Java, and can be created by programmers like you!
- Each class defines not just a single piece of data, but a set of data along with methods for performing actions on that data

Objects:

- A variable declared with a class is called an *object*. The variable itself actually stores a reference to the area in memory (where the object's data and methods are stored)



- Creating a new object is called *instantiation*.
    - Declare a variable to refer to the object, and then,
    - Create the object and initialize it in this form:

```
<class> <variable name> = new <class>(<arguments>);
```

- As shown in the code below which creates a new object using a class named Circle.

```
Circle spot = new Circle(4);   //spot with radius 4
```

the variable spot refers to a Circle object that has been initialized with a radius of 4

- To access a member of the class, such as a method, use the object name followed by a dot (.) and then the member name. For example:

Code	Output

`Circle spot = new Circle(4);`
 	
`System.out.println("Radius of spot is " + spot.getRadius());`
`System.out.println("Area of spot is " + spot.area());`
	Radius of spot is 4.0
	Area of spot is 50.42

The Cirlce class will be developed later in the course.

Java Packages

- The JDK includes numerous packages. End-users will have the packages as part of the Java Runtime Environmen (JRE). These packages contain general use classes, utility classes, or special purpose classes. The most fundamental package is java.lang with classes that define the language itself. Java.util have classes for reading input and storing data.

- **Package Naming conventions**
  - Java packages start with `java` followed by a dot (.) and then the package name
  - Companies often include their name as well
  - Ex) `java.util` or `java.StPaulHS.timetable`

- **Importing packages**
  - The import statement is used to make the members of a package accessible to an application – appear after a package statement and before any class definitions
  - Single class: `import java.util.Scanner;`
  - Several classes in a package: `import java.util.*;`
  - `Java.lang` is always imported entirely

<u>**Obtaining a Value from the User**</u>

- An *input stream* is the sequence of characters received from an input device (such as keyboard)
- To process data, Java includes the Scanner class with methods for reading integers, floating point numbers, and strings
- To obtain values from the user
  -
    - `import java.util.Scanner;`
  - Instantiate a Scanner object, that is initialized with an input stream (from keyboard)
    - `Scanner input = new Scanner(System.in);`
  - Before ending your application, close the input stream:
    - `input.close();`
- Scanner class methods include:

Class Scanner (java.util.Scanner)

Methods

`next()`	returns a string from the input stream
`nextLine()`	returns the string up to the end of line char from the input stream
`nextInt()`	returns the int read from the input stream
`nextDouble()`	returns the double read from the input stream
`nextBoolean()`	returns the Boolean read from the input stream
`close()`	closes the input stream

the next() method is used for reading a string that does not contain spaces.

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Here is an example:

Code:

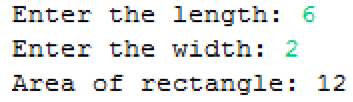
```
import java.util.Scanner;     *
/**
 * Calculates and displays the area of a rectangle
 * based on the width and length entered by the user.
 */

public class MulticulturalGreeting {


      public static void main(String[] args) {

            int length;       //longer side of rectangle
            int width;        //shorter side of rectangle
            int area;         //calculated area of rectangle
            Scanner input = new Scanner(System.in);    *

            System.out.print("Enter the length: ");
            length = input.nextInt();          *
            System.out.print("Enter the width: ");
            width = input.nextInt();           *
            input.close();

            area = length * width;
            System.out.println("Area of rectangle: " + area);
      }
}
```

Import statement appears above class

Scanner object is declared, instantiated and initialized

nextInt() used to obtain values from the user

Output:



```
Enter the length: 6
Enter the width: 2
Area of rectangle: 12
```

<u>Programming Exercise:</u>

Create a RaceDistance application that calculates and displays the total distance of a race with three segments. First prompt the user for the distance of each race segment, and then display the total distance to run. Use variables of the appropriate type.

Add your code to the Google Doc: “ICS4U – Activity Submission Form”.