Introduction to OOP with Java

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Lecture 03:

Control Flow Statements: Selection

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Course

• Java SE Basics
• Object Oriented Programming
• Course Page:
• Or, go to: [www.abukhleif.com](http://www.abukhleif.com) → Courses → Java 101 Course – Sep 2017
• Course Facebook Group:
  • [www.facebook.com/groups/AKF2017Java](http://www.facebook.com/groups/AKF2017Java)
Quick Review

• Relational (Comparison) Operators: > >= < <= == !=
• Logical Operators: && || !
• A boolean expression is an expression that evaluates to a boolean value: true or false
Motivations

If you assigned a negative value for radius in Lecture 02 - Task 2, ‘ComputeVolumeOfCylinder’, the program would print an invalid result. If the radius is negative, you don’t want the program to compute the volume. How can you deal with this situation?
One-way if Statements

- A one-way if statement executes an action if and only if the condition is true.
- If the condition is false, nothing is done.
- The syntax for a one-way if statement is:
  ```java
  if (boolean-expression) {
    statement(s);
  }
  ```
Notes

• The boolean expression is enclosed in parentheses.

```
if (i > 0) {
    System.out.println("i is positive");
}
```

(a) Wrong

```
if (i > 0) {
    System.out.println("i is positive");
}
```

(b) Correct

• The block braces can be omitted if they enclose a single statement.

```
if (i > 0) {
    System.out.println("i is positive");
}
```

(a) Equivalent

```
if (i > 0) {
    System.out.println("i is positive");
}
```

(b) Equivalent

Example

• Write a program that prompts the user to enter an integer. If the number is a multiple of \textit{5}, print \texttt{HiFive}. If the number is divisible by \textit{2}, print \texttt{HiEven}. 
Example Solution

```java
import java.util.Scanner;

public class SimpleIfDemo {
    public static void main(String[] args) {
        Scanner input = new Scanner(System.in);
        System.out.println("Enter an integer: ");
        int number = input.nextInt();

        if (number % 5 == 0)
            System.out.println("HiFive");

        if (number % 2 == 0)
            System.out.println("HiEven");
    }
}
```

Let’s Code

- Write a program that prompts the user to enter a string. If the string length is divisible by 2, print ‘EvenString’.
Two-way if Statements
(if – else)

- A two-way if-else statement executes an action if the condition is true and another action if the condition is false.
- The syntax for a two-way if-else statement is:

```java
if (boolean-expression) {
    statement(s);  // for the true case
} else {
    statement(s);  // for the false case
}
```
Two-way *if* Statements

Example

```java
if (radius >= 0) {
    area = radius * radius * 3.14159;
    System.out.println("The area for the " + "circle of radius " + radius + " is " + area);
} else {
    System.out.println("Negative input");
}
```
Let’s Code

- Write a program that prompts the user to enter his/her name and birth year. If the user is 18 years or older print ‘Welcome [username]’. Otherwise, print ‘Sorry, you are not eligible yet, please come back in (18-[user-age]) years’.

Multi-way if Statements (Nested if)
Multi-way if Statements

• An if statement can be inside another if statement to form a nested if statement.
• Example:
  
  ```java
  if (i > k) {
    if (j > k)
      System.out.println("i and j are greater than k");
  } else
    System.out.println("i is less than or equal to k");
  }
  ```

Multiple Alternative if Statements - Example

```
<table>
<thead>
<tr>
<th>Score</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;= 90</td>
<td>'A'</td>
</tr>
<tr>
<td>&gt;= 80</td>
<td>'B'</td>
</tr>
<tr>
<td>&gt;= 70</td>
<td>'C'</td>
</tr>
<tr>
<td>&gt;= 60</td>
<td>'D'</td>
</tr>
<tr>
<td>&lt;   60</td>
<td>'F'</td>
</tr>
</tbody>
</table>
```
Multiple Alternative if Statements – Example Solution

- Equivalent, but?!

```java
if (score >= 90.0)
    grade = 'A';
else
    if (score >= 80.0)
        grade = 'B';
    else
        if (score >= 70.0)
            grade = 'C';
        else
            if (score >= 60.0)
                grade = 'D';
            else
                grade = 'F';
```

Equivalent

```java
if (score >= 90.0)
    grade = 'A';
else if (score >= 80.0)
    grade = 'B';
else if (score >= 70.0)
    grade = 'C';
else if (score >= 60.0)
    grade = 'D';
else
    grade = 'F';
```

Let’s Code

- Write a full working program for the previous example, the mark should be entered by the user.
Note

- The **else** clause matches the most recent **if** clause in the same block.

```java
int i = 1;
int j = 2;
int k = 3;
if (i > j) {
  if (i > k)
    System.out.println("A");
  else
    System.out.println("B");
}
```

Note, cont.

- Nothing is printed from the preceding statement. To force the **else** clause to match the first **if** clause, you must add a pair of braces:

```java
int i = 1;
int j = 2;
int k = 3;
if (i > j) {
  if (i > k)
    System.out.println("A");
} else
  System.out.println("B");
```

This statement prints **B**.
Common Error

• Adding a semicolon at the end of an if clause is a common mistake.

```java
if (radius >= 0);
{
    area = radius*radius*PI;
    System.out.println(
        "The area for the circle of radius " +
        radius + " is " + area);
}
```

• This mistake is hard to find, because it is not a compilation error or a runtime error, it is a logic error.

• This error often occurs when you use the next-line block style.

Tip

```java
if (number % 2 == 0)
    even = true;
else
    even = false;
```

Equivalent

```java
boolean even = (number % 2 == 0);
```

(a)  
Equivalent  

```java
if (number % 2 == 0) 
  even = true; 
else  
  even = false; 
```

(b)
if (even == true)
  System.out.println("It is even.");

Equivalent
if (even)
  System.out.println("It is even.");

Tip

switch Statements
switch Statements

• Nested if can be used to write code for multiple conditions.
  • However, it makes the program difficult to read.
• A switch statement simplifies coding for multiple conditions.
• A switch statement executes statements based on the value of a variable or an expression.

switch (switch-expression) {
  case value1: statement(s)1;
  break;
  case value2: statement(s)2;
  break;
  ...
  case valueN: statement(s)N;
  break;
  default: statement(s)-for-default;
}

The switch-expression must yield a value of char, byte, short, or int type and must always be enclosed in parentheses.

The value1, ..., and valueN must have the same data type as the value of the switch-expression. The resulting statements in the case statement are executed when the value in the case statement matches the value of the switch-expression. Note that value1, ..., and valueN are constant expressions, meaning that they cannot contain variables in the expression, such as 1 + x.
switch Statements Rules

The keyword \texttt{break} is optional, but it should be used at the end of each case in order to terminate the remainder of the \texttt{switch} statement. If the \texttt{break} statement is not present, the next case statement will be executed.

The default case, which is optional, can be used to perform actions when none of the specified cases matches the \texttt{switch-expression}.

```java
switch (switch-expression) {
    case value1: statement(s)1;
                break;
    case value2: statement(s)2;
                break;
    ...  
    case valueN: statement(s)N;
                break;
    default: statement(s)-for-default;
}
```

switch Statement Rules

- The case statements are executed in sequential order, but the order of the cases (including the default case) does not matter.
- However, it is good programming style to follow the logical sequence of the cases and place the default case at the end.
Let’s Code

Problem: Chinese Zodiac

• Write a program that prompts the user to enter a year and displays the animal for the year.

```
year % 12 =
```

0: monkey
1: rooster
2: dog
3: pig
4: rat
5: ox
6: tiger
7: rabbit
8: dragon
9: snake
10: horse
11: sheep

Ternary Operator (Conditional Operator)
Ternary Operator (Conditional Operator)

• A conditional operator evaluates an expression based on a condition.
• The syntax is:
  
  booleanExpression ? expressionIfTrue : expressionIfFalse;
• The result of the conditional operator is expressionIfTrue if booleanExpression is true, otherwise the result is expressionIfFalse.
• Example: max = (num1 > num2) ? num1 : num2;

Let’s Code

• Rewrite the following if-else statement using the ternary operator:

  if (num % 2 == 0)
    System.out.println(num + " is even");
  else
    System.out.println(num + " is odd");
Tasks

All tasks should be well-documented, well-designed, and well-styled.

Task 01

• (Sort three integers) Write a program that prompts the user to enter three integers and display the integers in non-decreasing order.
Task 02

• *(Find the number of days in a month)* Write a program that prompts the user to enter the month and displays the number of days in the month.

Task 03

• *(Financials: currency exchange)* Write a program that prompts the user to enter the exchange rate from currency in U.S. dollars to JOD.
  • Prompt the user to enter 0 to convert from U.S. dollars to JOD and 1 to convert from JOD to U.S. dollars.
  • Prompt the user to enter the amount in U.S. dollars or JOD to convert it to JOD or U.S. dollars, respectively.

• Sample runs in next slide.
Task 03 – Sample Runs

Enter the exchange rate from dollars to JOD: 0.71
Enter 0 to convert dollars to JOD and 1 vice versa: 0
Enter the dollar amount: 100
$100 is 71 JOD

Enter the exchange rate from dollars to JOD: 0.71
Enter 0 to convert dollars to JOD and 1 vice versa: 5
Enter the JOD amount: 10000
10000 JOD is $14100

Tasks Submission

• Submit a zipped file contains all the 3 .java files, 1 file for each task.
• Name your zipped file as follow [Lect3_YourName.zip].
• Upload your zipped file to the Facebook group.
• Submission due: Monday, Sep 18 - **10:00 PM**
• Late submission will not be reviewed by the instructor.
• Public solutions upload goal is to share knowledge, you can see other’s solutions, but, please, don’t cheat yourself!
• Don’t forget, all tasks should be well-documented, well-designed, and well-styled.
Test Yourself

• Answer all questions (exclude 3.1 & 3.2):
  

References:

- Liang, Introduction to Java Programming 10/e
- Eng. Asma Abdel Karim Computer Engineering Department, JU Slides.

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