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Java Foundations

5-3

switch Statement

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Objectives

- This lesson covers the following objectives:
  - Create a switch control structure
  - Compare if/else constructs with switch control structures
  - Understand the purpose of the break keyword

What About Using an if/else Statement?

- Consider the scenario where you need to write a Java program to implement the following:
  - User enters a school grade between 9 to 12 and the program prints the name of the grade
- First, let's start with a solution using an if/else statement

Solution: if/else Statement

```
Scanner in = new Scanner(System.in);
System.out.println("Enter your grade");
int grade = in.nextInt();
if (grade == 9){
   System.out.println("You are a freshman");
}
else if (grade == 10) {
   System.out.println("You are a sophomore");
}
else if (grade == 11) {
   System.out.println("You are a junior");
}
else if (grade == 12) {
   System.out.println("You are a senior");
}
else {
   System.out.println("Invalid grade");
}//endif
```

Complex conditions with a chained if construct tend to be confusing to read and hard to maintain

The code example shows a chained if to determine a student's class name.

The switch Statement

- The switch statement provides more efficient syntax for choosing among several alternatives

```
switch (<variable or expression>) {
    case <literal value>: //code_block1
                          [break;]
    case <literal value>: // code_block2
                          [break;]
    default: //default_code
 }//end switch
```


The syntax for the switch construct is shown in the slide.
The switch keyword indicates a switch statement.
variable is the variable whose value you want to test. Alternatively, you could use an expression. The variable (or the result of the expression) can only be of type char, byte, short, int, or String.
The case keyword indicates a value that you are testing. A combination of the case keyword and a literal value is referred to as a case label.
The break statement is an optional keyword that causes the code execution to exit the switch statement immediately.

Solution: switch Statement

```
Scanner in = new Scanner(System.in);
System.out.println("What grade are you in?");
int grade = in.nextInt();
switch (grade) {
   case 9:
       System.out.println("You are a freshman");
       break;
   case 10:
       System.out.println("You are a sophomore");
       break;
   case 11:
       System.out.println("You are a junior");
       break;
   case 12:
       System.out.println("You are a senior");
       break;
   default:
       System.out.println("Invalid grade");
}//end switch
```


Compared with the solution provided by an if statement, this solution is more compact and readable.

The switch statement

- Compared with the if/else statement the switch statement:
  - Is more streamlined than chained if statements
  - Is easier to read and maintain
  - Simplifies the organization of the various branches of code that can be executed
  - Offers better performance
  - Can be used for complex conditions

When to Use switch Constructs

- Use when you are testing:
  - Equality (not a range)
  - A single value
  - For fixed known values at compile time
  - int, short, byte, char, or String

```
int month = 8;
month = in.nextInt();

switch (month) {
   case 1: case 3: case 5: case 7:
   case 8: case 10: case 12: System.out.print("31 days");
                             break;
   case 2: if(isLeapYear)){
           ..
```

Only a single value can be tested

Known values

If you can't find values for individual test cases, use an if/else construct.

String in a switch Statement: Example

```
String typeOfDay;
String dayOfWeekArg = "Thursday";

switch (dayOfWeekArg) {
   case "Monday": typeOfDay = "Start of work week";
                  break;
   case "Tuesday":
   case "Wednesday":
   case "Thursday": typeOfDay = "Midweek";
                    break;
   case "Friday": typeOfDay = "End of work week";
                  break;
   case "Saturday":
   case "Sunday": typeOfDay = "Weekend";
                  break;
   default: System.out.print("Invalid");
}//end switch
```


This example shows using a string in a switch statement expression and in case label expressions.

Exercise 1

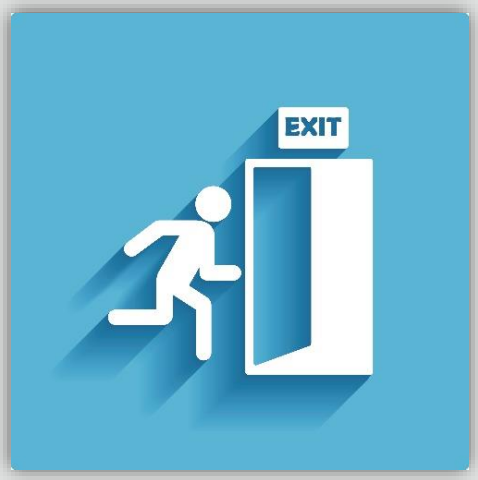
- Create a new project and add the `SwitchEx1.java` file to the project
- Modify `SwitchEx1.java` to implement the following with the switch statement
  - The user enters the month as a number
  - The corresponding month name must be displayed
  - For any invalid month, the output must be displayed as "Invalid month"

switch Statement: Keywords

- The following keywords are used in a switch statement:
  - switch: Specifies the variable to test for value
  - case: Compares the value of the switch variable
  - default: When the input doesn't match the cases, then the default statement is executed, however, the default statement is optional
  - break: Is used as the last statement in each case statement list, a break statement causes control to transfer to the end of the switch statement

What Is a break Keyword?

- Is used as the last statement in each case statement list and it causes control to transfer outside the switch



What Is a break Keyword?

```
char option = 'A';
int aCount = 0, bCount = 0, cCount = 0;

switch (option) {
   case 'A': aCount++;
             System.out.println("Count of A  " + aCount);
             break;
   case 'B': bCount++;
             System.out.println("Count of B  " + bCount);
             break;
   case 'C': cCount++;
             System.out.println("Count of C  " + cCount);
             break;
}//end switch

//additional code . . .
```

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When the value of the option is A:

The control jumps to the first case statement.

The value of aCount++ is incremented by 1.

Because of the break statement used in this case statement, control is transferred outside the switch statement, and the other two case statements aren't executed.

Output: Count of A 1

Exercise 2

- Add the file `SwitchEx2.java` to the project you created for exercise 1
- Observe `SwitchEx2.java` and execute the program
- Observe the output

Exercise 2

- Modify the switch statement as follows:
- Remove the break statements for case ‘A’
  - Execute the program
  - Observe the output
- Remove the break statements for case ‘A’ and case ‘B’
  - Execute the program
  - Observe the output

What Is switch Fall Through?

- switch fall through is a condition that occurs if there are no break statements at the end of each case statement
- All statements after the matching case label are executed in sequence, regardless of the expression of subsequent case labels, until a break statement is encountered.

Understanding switch Fall Through

- Expected Output:
  - The values of the count variables are incremented by 1

```
char option = 'A';
int aCount = 0, bCount = 0, cCount = 0;

switch (option) {
   case 'A': aCount++;
             System.out.println("Count of A  " + aCount);

   case 'B': bCount++;
             System.out.println("Count of B  " + bCount);
             break;
   case 'C': cCount++;
             System.out.println("Count of C  " + cCount);
             break;
}//end switch
```

No break statement, so it continues execution with the next case statement

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In this example, if the option value is A, it matches the first case statement. Because there is no break statement, execution continues with the next case statement until a break statement is encountered. The value of bCount is also incremented by 1.

Output:
Count of A 1
Count of B 1

switch Fall Through: Example

```
int month = 12;
switch (month) {
   case 2: System.out.println("28 days (29 in leap years)");
           break;
   case 4:
   case 6:
   case 9:
   case 11: System.out.println("30 days");
            break;
   case 1:
   case 3:
   case 5:
   case 7:
   case 8:
   case 12: System.out.println("31 days");
            break;
   default: System.out.println("Illegal month number");
            break;
}//end switch
```


This example shows how fall through is useful in some scenarios. It's sometimes preferable to have multiple cases without break statements between them.

Summary

- In this lesson, you should have learned how to:
  - Create a switch control structure
  - Compare if/else constructs with switch control structures
  - Understand the purpose of the break keyword


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