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Java Foundations

6-3
Using break and continue Statements

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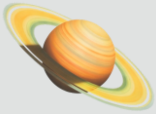
Objectives

- This lesson covers the following objectives:
  - Use a break statement to exit a loop
  - Use a continue statement to skip part of a loop
  - Explain the need for loop comments



Mission to Saturn's Rings

- Let's consider another scenario for this mission
  - As the spaceship is rotating around Saturn and taking snapshots, the robotic arm or camera breaks
- How would you solve this problem?
  - If you were to write a Java program, which construct would you use?
  - Let's see whether Java has a statement that enables you to end a loop immediately

How Do You Exit a Loop Early?

- Usually, the only way to exit a loop is for the loop condition to evaluate to false
- However, it's often convenient to terminate a loop early when certain conditions are met
- In such cases, continuing to loop would be a waste of processor time

How Do You Exit a Loop Early?

- You can use two Java statements to terminate a loop early:
  - **`break`**
  - **`continue`**

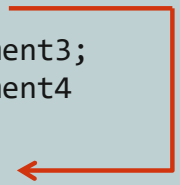
Using break in a Loop

- When a break statement is executed inside a loop, the loop statement is terminated immediately
- The program continues to execute with the statement following the loop statement
- Syntax:

```
break;
```

Using break in a while Loop

```
while(condition){
    statement1;
    statement2;
    break;
    statement3;
    statement4
}
statement;
```



Control passes to the statement outside the loop

[statement outside the while loop]

Using break in a while Loop: Example

- Output: `0 1 2 3`
  - Execution of the loop is terminated when the loop counter is equal to 4

```
public static void main(String[] args) {
    int i = 0;
    while (i < 10) {
        System.out.println(i + "\t");
        i++;
        if (i == 4) {
            break;
        }//endif
    }//end while
}//end method main
```


In the code example, although the loop is declared to run 10 times, the break statement exits the loop after only 4 iterations. The last value of i is output to the console after the loop is terminated.

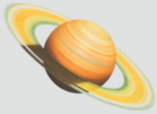
Using break in a for Loop

- Let's write a program to demonstrate a break statement in a for loop
- The program must …
  - Read 10 numbers from the console
  - Compute the sum of the numbers that the user enters
  - If the user enters 999, terminate the loop regardless of the value of the loop counter and without adding to the sum

Using break in a for Loop: Example

```
public static void main(String[] args) {
   Scanner in = new Scanner(System.in);
   int numInputs = 10, input = 0, sum = 0, stopLoop = 999;
   System.out.println("Enter 10 numbers");
   for (int i = 0; i < numInputs; i++) {
      input = in.nextInt();
      if (input == stopLoop){
         break;
      }
      else {
         sum += input;
      }//endif
   }//end for
   System.out.println("The sum of the numbers:" + sum);
}//end method main
```

Mission to Saturn's Rings: Implementing the Conditions



- Let's use a while loop and a break statement to implement the conditions specified at the beginning of the lesson

```
public static void main(String[] args) {
   long distTravelled = 0;
   long minDistance = 50000000;
   while (distTravelled >= minDistance) {
      snap++; //click snap
      if (camera == broken) {
         break;
      }
      else {
         rotate();
      }//endif
   }//end while
} //end method main
```

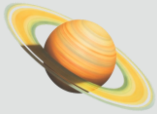

In this example, the camera is broken, the statements within the while loop are terminated, and the control goes to the statement outside the while loop. That is, the spaceship continues to rotate around Saturn.

Exercise 1

- Import and open the `BreakContinueEx` project
- Examine `ComputeSum.java`
- Implement the following:
  - Accept 10 numbers from the user
  - Compute the sum of the numbers entered
  - When 0 is entered, the program must exit and display the sum of the numbers

Expected output:
Please enter 10 numbers.
Enter 0 to exit.
1
2
3
0
The sum of the numbers entered is 6.

Mission to Saturn's Rings: Another Scenario



- Let's consider another scenario for this mission
  - As the spaceship is rotating around Saturn and taking snapshots of Saturn's rings …
    - If the visibility is zero, do not take snapshots
    - Otherwise, continue to take the snapshots
- How would you solve this problem?
  - If you were to write a Java program, which construct would you use?
  - Let's see whether Java has a statement that enables you to skip the current iteration of the loop

Using continue in a Loop

- Sometimes, you may want to skip the current iteration in a loop and not terminate the loop itself
- You can use a continue statement to skip the current iteration in a loop:
  - That is, the rest of the loop body is skipped to the end of the loop
  - However, it doesn't end the loop
  - When the program reaches the end of the loop, the program jumps back to test the loop continuation condition
- Syntax:

```
continue;
```

Using continue in a while Loop

```
while(condition){

    statement1;
    statement2;
    continue;
    statement3;
    statement4
}
statement;    [statement outside the while loop ]
```

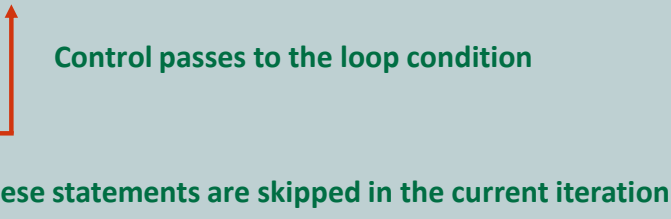
Control passes to the loop condition

These statements are skipped in the current iteration

Using continue in a for Loop

```
for (i = 0; i < 10; i++) {

    statement1;
    statement2;
    continue;
    statement3;
    statement4;
}//end for
```



Using continue in a for Loop

- Output: `0 1 2 3 5 6 7 8 9`
  - The output doesn't include 4
  - Because of the continue statement, the loop execution is skipped when the loop counter is 4

```
public static void main(String[] args) {
   for (int i = 0; i < 10; i++) {
      if (i == 4) {
         continue; //control jumps to update i++
      }//endif
      System.out.print(i + "\t");
   }//end for
}//end method main
```

Putting It All Together

- Let's write a program using the while loop and the continue statement
- The program must …
  - Compute the sum of numbers between 1 and 99 using the while loop
  - If the number is a multiple of 10, the current iteration must be skipped and the number must not be added to the sum
  - Display the sum to the console

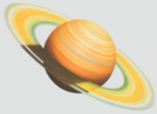
Computing the Sum of Numbers

```
public static void main(String[] args) {
   int counter = 0;
   int sum = 0;
   while (counter < 100) {
      counter++;
      if (counter % 10 == 0) {
         continue;
      }
      else {
         sum += counter;
      }//endif
   }//end while
   System.out.println("Sum of 1 - 99: " + sum);
}//end method main
```

Is this a multiple of 10? If yes, then skip the current iteration

The output for this example is:
Sum of 1 - 99: 4500

Mission to Saturn's Rings: Implementing the Conditions



- Let's use a `while` loop and a `continue` statement to implement the conditions specified at the beginning of this topic

```
public static void main(String[] args) {
   long distTravelled = 0;
   long minDistance=50000000;
   while (distTravelled >= minDistance) {
      if (visibility == 0) {
         continue;
      }
      else {
         snap++;
      }//endif
   }//end while
}//end method main
```


In this example, the visibility is zero, snapshots of Saturn's rings aren't taken, control is transferred to the condition, and the program continues to execute with the next iteration. These actions happen because you used the continue statement.

Exercise 2

- Import and open the `BreakContinueEx` project
- Examine `CountChar.java`
  - The program is used to count the number of occurrences of the char ‘w’ in the string
  - Modify the program to …
    - Resolve the syntax error
    - Print the count of char ‘w’
  - Expected Output:
    - Number of w : 3

Exercise 3

- Import and open the `BreakContinueEx` project
- Examine `BreakContinue.java`
- Modify the program by using break and continue statements …
  - If the number is even, the number should not be printed
  - Execution of the loop should stop when the value of the loop counter is 7

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Expected Output:

```
The number is 1
The number is 3
The number is 5
The number is 7
```

Writing Loop Comments

- It's a good practice to add appropriate comments to loops
- Otherwise …
  - Code tends to be confusing to look at
  - You won't be able to understand the logic very easily
- It helps to understand …
  - Loop variables used and their purpose
  - Logic of the loop
  - Number of iterations
  - Execution of the statements in the loop depending on the condition or criteria or both

Writing Loop Comments: Example

```
public static void main(String[] args) {

   Scanner in = new Scanner(System.in);
   int numInputs = 10, input = 0;

   //This loop is executed 10 times
   for (int i = 0; i < numInputs; i++) {
      input = in.nextInt(); //user inputs a number

      if (input % 2 == 0) { //if the number is even skip the
        continue;           //remaining code and restart the loop
      }//endif

      System.out.println("That number was odd");
   }//end for
}//end method main
```

Exercise 4

- Import and open the `BreakContinueEx` project
- Examine `Divisors.java`
- The program finds all divisors of a number

Exercise 4

- Modify the program to include comments for the loop about …
  - Loop variables used
  - Logic of the loop
  - Number of iterations
  - Condition used
  - Control flow in the loop

Summary

- In this lesson, you should have learned how to:
  - Use a break statement to exit a loop
  - Use a continue statement to skip part of a loop
  - Explain the need for loop comments

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