

CONDITIONALS & LOOPS

The key topic for this week includes:

1. Conditional structures that select different paths through the program depending on particular conditions, such as the value of a variable.
2. Iteration structures that repeat segments of code to complete a task that has an iterative step or that inherently requires repetition.

TASKS:

1. Learn how to use control structures and loops
2. Carry out tracing with pencil and paper the steps that a computer goes through when executing a simple program
3. Trace and debug the program in IDE
4. Get familiar with methods in String class

TUTORIAL EXERCISES

1. A soft drink vending machine has control software that uses a `switch` statement to decide what drink to give to the buyer. Write a program with `switch` fragment to represent this (the drinks can be served by just printing their names).
 - a. If button 1 is pressed, cola is served.
 - b. If button 2 is pressed, lemonade is served.
 - c. If button 3 is pressed, orange is served.
 - d. Button 6 serves both cola and lemonade while all other buttons serve no drinks.
2. Trace the code below and figure out what will be printed for the case where: `a=1` and `b=-8`

```
int a = Integer.parseInt(args[0]);
int b = Integer.parseInt(args[1]);
int c;
if (a>0) {
    if (a<b)
        c=b-a;
    else
        c=a-b;
}
else
    c=0;
c=c*c;
System.out.print(c);
```

3. Write the following `for` loops:
 - a. prints on a separate line every number from 15 to 2 (both inclusive)
 - b. prints on a separate line every number from 15 to 2 (both exclusive)
 - c. prints on a separate line every even number between 2 to 20 (both inclusive)

4. Trace the following code for the situations:

a. `int x = 3;`

b. `int x = 7;`

```
for (int i = 0; i < 5; i++) {
    int j = x - i;
    if (j % 3 == 0) {
        System.out.println("i: " + i + ", j: " + j);
    }
    else{
        i++;
    }
}
```

LABORATORY EXERCISES

NOTE on Eclipse

When there are multiple classes in a project, you may follow the procedure to execute a specific Java class which required input argument(s):

1. Locate the “**Package Explor...**” tab on the left.
2. Highlight the class name to choose the class to be run.
3. Click **Run**→**Run...** and a dialog named “Run” will pop up.
4. In the “**Main**” tab, click button “**Search...**”. A dialog will pop up. Choose the class name to be run, and click “**OK**”.
5. In the “**Arguments**” tab; inside the “**Program arguments**” box, type the command line argument(s); finally, press the “**Run**” button on the bottom right corner of the dialog.

Exercise 1. Even or Odd?

Write code that reads in a single number from the command-line argument and prints whether the number is even or odd.

Exercise 2. Factorial ($n! = 1 * 2 * 3 * \dots * n$)

Write a program that takes a single command-line argument, and calculates the factorial of that number.

Exercise 3. Body Mass Index (BMI) by if-else

Body Mass Index (BMI) is used to estimate the risk of weight-related problems and it is calculated as:

BMI = *mass* / *height*²; where mass in kilograms, and height in meters. Health assessment can be estimated according to:

- | | |
|-------------------------------|---------------|
| ▪ BMI < 18.5 | Underweight |
| ▪ $18.5 \leq \text{BMI} < 25$ | Normal weight |
| ▪ $25 \leq \text{BMI} < 30$ | Overweight |
| ▪ $30 \leq \text{BMI}$ | Obese |

Write a program to read body weight and height, calculate BMI and then print health assessment.

HOMEWORK

Exercise 1. Converting student’s grade to mark range by *switch*

Input the student’s grade: H, D, C, P, or F (case insensitive), output the corresponding mark range for the grade.

(Use [*charAt\(int index\)*](#) method in String class, which returns the character at the specified index.)

Exercise 2: Triangle

Write a program that takes a single command-line argument, which is a number between 1 and 9, and prints a triangle such that the base of the triangle has all numbers from 1 to that number with spaces between numbers. An example of the system in operation is:

```
> java Triangle 4
1
1 2
1 2 3
1 2 3 4
```

Exercise 3: Pyramid

Write a program that takes in an odd positive integer n from the command line and draw a pyramid on the screen, with the highest level having 1 block, the 2nd 3 blocks, ..., and the last n blocks. An example in operation:

```
> java Pyramid 7
*
* * *
* * * *
* * * * *
* * * * * *
```

Exercise 4: Scissor-Rock-Paper Game (Advanced Question)

The rule for this popular game is: the scissor cuts the paper; the rock knocks the scissor; and the paper wraps the rock.

Write a program to simulate the game. Your program:

- (1) randomly generates a number (0, 1, or 2) to represent scissor, rock, or paper;
- (2) prompts the user to enter “scissor”, “rock”, or “paper”; and
- (3) displays the computer or the user wins, loses, or draws.