

# Exercises with **for** and **while** instructions

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## Objectives

- Recap previous session
- Exercises
- Homework exercises
- Guidelines

## Recap previous session

- What is a **for** instruction? How does it help?
- What is the difference between a **for** and a **while**?
- Can you substitute a **for** loop with a **while** loop?

## Exercises

- Note: each exercises will be first solved using the **for** instruction and then using the **while** instruction such that you will get familiar with both of them

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1. Given **n** natural numbers, create a JAVA program which will compute the root mean square ( media patrativa) of them.

- Note: the formula for this is described in the image below:

$$\sqrt{\frac{x_1^2 + x_2^2 + \dots + x_n^2}{n}}$$

- Sample Input:
  - **n** = 5
  - 1 2 3 4 5
- Sample Output: The quadratic mean of the entered numbers is 3.3166247903554
- Solution:

a. **while**:

```
import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("How many numbers do you want to read? ");
```

```

        int n = in.nextInt();
        int i = 0;
        double sumOfSquares = 0.0;
        while (i < n) {
            System.out.println("Enter number #" + (i+1));
            sumOfSquares += Math.pow(in.nextDouble(), 2);
            i++;
        }

        double quadraticMean = Math.sqrt(sumOfSquares / n);
        System.out.println("The quadratic mean of the entered numbers
is: " + quadraticMean);
    }
}

```

b. **for**:

```

import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.println("How many numbers do you want to read? ");
        int n = in.nextInt();
        double sumOfSquares = 0.0;
        for(int i =0; i < n; i++) {
            System.out.println("Enter number #" + (i+1));
            sumOfSquares += Math.pow(in.nextDouble(), 2);
        }

        double quadraticMean = Math.sqrt(sumOfSquares / n);
        System.out.println("The quadratic mean of the entered numbers
is: " + quadraticMean);
    }

}

```

2. Given **n**, create a JAVA program wich will compute **10 to the power n**.

- Sample Input: n = 3
- Sample Output: 1000
- Solution: a. **while**

```

import java.util.Scanner;

public class Application {

```

```

        public static void main(String[] args) {
            Scanner in = new Scanner(System.in);
            System.out.print("N = ");
            int n = in.nextInt();
            int i = 0;
            double result = 1;
            while (i < n) {
                result = result * 10;
                i++;
            }

            System.out.println("10 to the power " + n + " is: " +
result );

        }

    }

```

b. **for**:

```

import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("N = ");
        int n = in.nextInt();
        double result = 1;

        for(int i = 0; i < n; i++) {
            result = result * 10;
        }
        System.out.println("10 to the power " + n + " is: " + result
);

    }

}

```

3. Given two numbers **a** and **b** read from the keyboard, create a JAVA program which will compute **a** to the power **b**

- Sample Input:
  - a = 4
  - b = 5
- Sample Output:
  - 1024

- Solution:

a. **while**:

```
import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("a = ");
        int a = in.nextInt();
        System.out.print("b = ");
        int b = in.nextInt();
        double result = 1;
        int i = 0;
        while (i < b) {
            result = result * a;
            i++;
        }
        System.out.println(a + " to the power " + b + " is: " + result
    );
    }
}
```

b. **for**:

```
import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("a = ");
        int a = in.nextInt();
        System.out.print("b = ");
        int b = in.nextInt();

        double result = 1;

        for(int i = 0; i < b; i++) {
            result = result * a;
        }
        System.out.println(a + " to the power " + b + " is: " + result
    );
    }
}
```

```
}
```

4. Given two numbers, not equal to 0,  $n$  and  $p$  create a JAVA program which will display in ascending order, powers of  $n$  which are smaller or equal to  $p$

- Sample Input:
  - $n = 2$
  - $p = 31$
- Sample Output: 0 1 2 3 4
- Solution:

a. **while**

```
import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        double n = in.nextDouble();
        System.out.print("p = ");
        double p = in.nextDouble();
        int i = 0;
        double power = Math.pow(n, i);
        while (power <= p) {
            System.out.print(i + " ");
            i++;
            power = Math.pow(n, i);
        }

    }

}
```

b. **for**

```
import java.util.Scanner;
public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        double n = in.nextDouble();
        System.out.print("p = ");
        double p = in.nextDouble();
        for(int i = 0; Math.pow(n, i) < p; i++) {
```

```

        System.out.print(i + " ");
    }
}

```

5. Create a JAVA program which will compute the first  $n$  pyramidal numbers,  $n$  read from the keyboard. A pyramidal number  $n$  is the sum of the first  $n$  perfect squares

- Sample Input:
  - $n = 5$
- Sample Output:
  - 55
- Solution:

a. **while**:

```

import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        int n = in.nextInt();
        double sum = 0;

        int i = 1;
        while (i <= n) {
            sum += (i * i);
            i++;
        }
        System.out.println(sum);
    }
}

```

b. **for**:

```

import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        int n = in.nextInt();
        double sum = 0;

```

```

        for(int i = 1; i <=n; i++) {
            sum += (i * i);
        }

        System.out.println(sum);
    }
}

```

6. Given a character `c` and a number `n`. Create a JAVA program which will display the following pyramid:

```

c
c c
c c c
.....
c c c ... c

```

◦ Solution:

a. `while`:

```

import java.util.Scanner;
public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        int n = in.nextInt();
        System.out.print("c = ");
        String character = in.next();

        int line = 1;
        while ( line <= n) {

            int i = 0;
            while (i < line) {
                i++;
                System.out.print(character);
            }
            System.out.println();

            line++;
        }
    }
}

```

```
}
```

b. **for**:

```
import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        int n = in.nextInt();
        System.out.print("c = ");
        String character = in.next();

        for(int line = 1; line <= n; line++) {

            for(int i = 0; i < line; i++) {
                System.out.print(character);
            }
            System.out.println();
        }
    }
}
```

7. Create a JAVA program which will display a square of **n** rows and **n** columns, where each element is equal to the character **c** read from the keyboard.

◦ Sample Input:

- n = 4
- c = r

◦ Sample Output:

```
r r r r
r r r r
r r r r
r r r r
```

◦ Solution: a. **while**:

```
import java.util.Scanner;
```



```

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        int n = in.nextInt();
        System.out.print("c = ");
        String character = in.next();
        int line = 0;
        while(line < n) {
            int column = 0;
            while(column < n) {
                System.out.print(character + " ");
                column++;
            }
            System.out.println();
            line++;
        }
    }
}

```

b. **for**:

```

import java.util.Scanner;

public class Application {

    public static void main(String[] args) {
        Scanner in = new Scanner(System.in);
        System.out.print("n = ");
        int n = in.nextInt();
        System.out.print("c = ");
        String character = in.next();

        for(int line = 0; line < n; line++) {

            for(int column = 0; column < n; column++) {
                System.out.print(character + " ");
            }
            System.out.println();
        }
    }
}

```

## Homework exercises

1. Create a JAVA program which will read n numbers from the keyboard and it will determine their sum

- Sample Input:
    - $n = 3$
    - 1 2 3
  - Sample Output: 6
2. Create a JAVA program which will read numbers from the keyboard until the user presses 0. In the end, the program should return their sum
- Sample Input:
    - 1 2 3 0
  - Sample Output: 6
3. Create a JAVA program which will read numbers from the keyboard until the user presses two consecutive identical numbers. The program should compute their sum
- Sample Input:
    - 1 2 3 4
  - Sample Output: 14

Note: try to resolve the homework with both `for` and `while` instructions.

## Guidelines

- Try to redo each of the class exercises, both with `while` and `for` instructions. Then, compare your solution with the one provided in our session
- Do not forget that there are multiple solution to a problem, thus, if your solution differ than the one described, it is NOT wrong.
- At the end of each lecture, try to note everything that was new such that, if it not clear, we can talk about it in the next lesson.