Java Placement Cource (DSA) notes

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Contents

Lecture 1

22.12.2022 Thursday

1 Introduction to Java Language

1.1 Set of Instructions

- Flowchart
- Psudocode

1.2 Flowchart

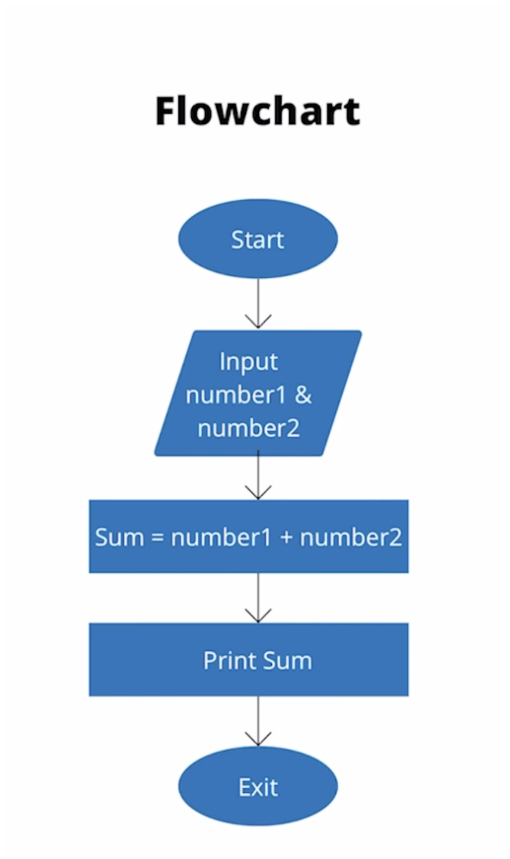


Figure 1: Flowchart

1.3 Psudocode

1. Start
2. Input 2 number
3. Calculate Sum = number1 + number2
4. Print Sum
5. Exit

1.4 Java Class 1

1.4.1 Installation

1. Java Development Kit (JDK)
2. Code Editor / IDE
   - VS Code
   - Intellij
   - Eclipse

1.4.2 First Code

- Extension -> .java

1.4.2.1 Hello World

```java
class FirstClass {
    public static void main(String args[]) {
        System.out.println("Hello World");
    }
}
```

1.4.3 How is code running?

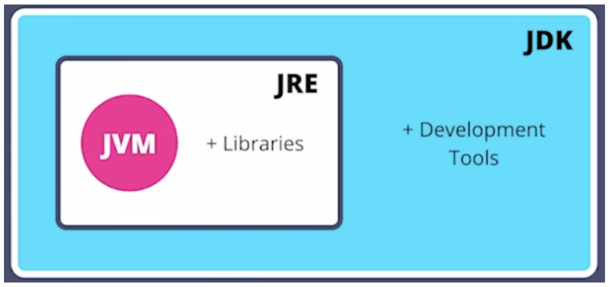


Figure 2: Java Development Kit (JDK)

1. Compilation

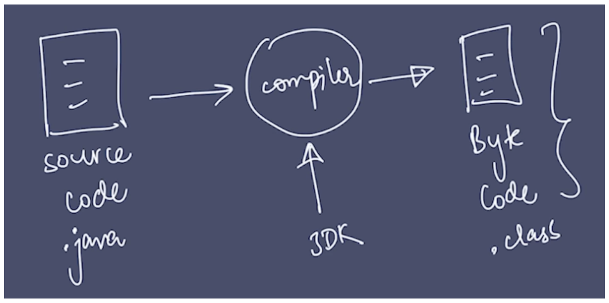


Figure 3: Java compilation

2. Execution

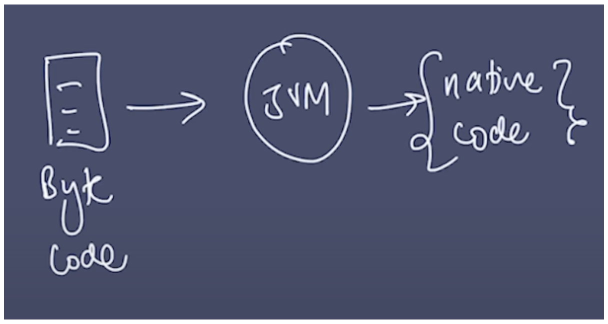


Figure 4: Java Execution

1.4.4 Code Components

1.4.4.1 Function

```
void main(){

}
```

1.4.4.2 Class

```
class Main{
    void main() {

    }
}
```

Lecture 2

22.12.2022 Thursday

2 Variables in Java | Input Output

2.1 Output

```
System.out.print("Hello World");
```

`Hello world` is the string which is printed.

- Use double quotes for strings

2.1.1 Boilerplate code

```
package com.apnacollege;

public class Main{
    public static void main(String[] args) {
        // Output
        System.out.print("Hello World");
    }
}
```

Here: - System -> class - print -> function

```
System.out.println("Hello world with java");
```

- print -> for output on the same line `System.out.print("Hello World");`
- println -> for output on the next line `System.out.println("Hello world with java");`
- "\n" -> `System.out.print("Hello World\n");`

2.1.2 Q. Print the pattern

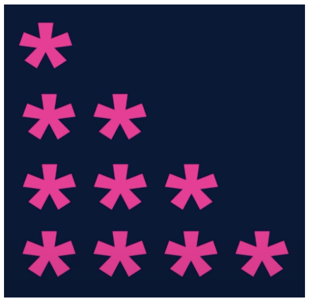


Figure 5: right triangle pattern

```
public class Main{
    public static void main(String[] args) {
        // Output
        System.out.println("*");
        System.out.println("**");
        System.out.println("***");
        System.out.println("****");
    }
}
```

2.2 Variables

`Perimeter = 2 * (a + b)`

here,

- 2 -> constant
- a&b -> variable

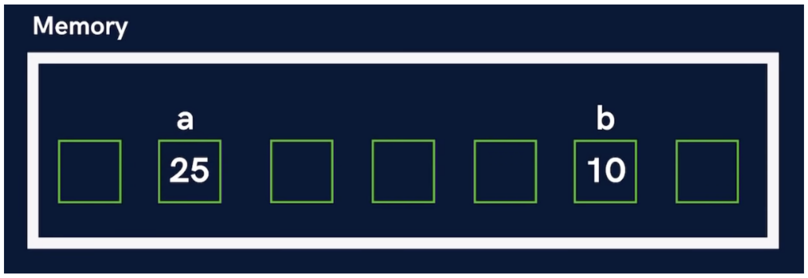


Figure 6: Variables in memory

```java
public class Main{
    public static void main(String[] args) {
        // Variables
        String name = "tony stark";
        int age = 48;
        double price = 23.25;
        int a = 25;
        int b = 1;

        b = 20;
        name = "ironman";
    }
}
```

2.3 Data Type

Java is a typed language. i.e; you need to tell the datatype.

2.3.1 Types of Datatypes

- Primitive
- Non-Primitive

Primitive	Non-Primitive
byte	String
short	Array
char	Class
boolean	Object
int	Interface
long	
float	
double	

2.3.2 Data Type sizes

Primitive	Size (in bytes)
byte	1
short	
char	2
boolean	1
int	4
long	8
float	4
double	8

Above sizes are for a 64-bit System

```
public class Main {
    public static void main(String[] argss) {
        // Variables
        int a = 10;
        int b = 25;

        int sum = a + b;
        System.out.println(sum);

        int diff = b - a;
        System.out.println(diff);

        int mul = a * b;
        System.out.println(mul);

    }
}
```

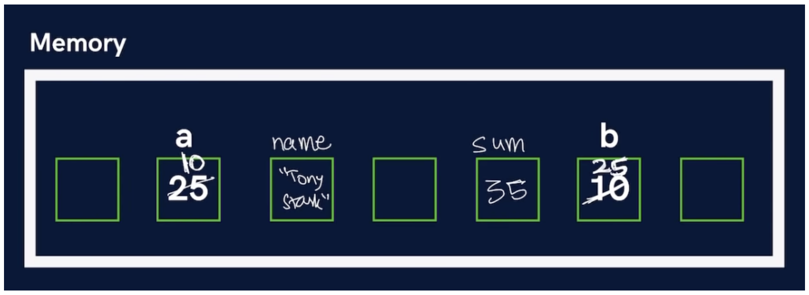


Figure 7: Memory allocation for the above program

2.4 Inputs in Java

```
import java.util.*;

public class Main {
    public static void main(String[] args) {
        // Input
```

```java
        Scanner sc = new Scanner(System.in);
        String name = sc.next(); // next() -> for next token ie; next word
        String name1 = sc.nextLine(); // nextLine() -> for taking a sentence as Input
        // Similarly
        // nextInt()
        // nextFloat()
        System.out.println(name);
    }
}
```

2.5 Q. Take 2 variables 'a' & 'b' and print their sum.

```java
import java.util.*;

public class Main {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);
        int a = sc.nextInt();
        int b = sc.nextInt();
        int sum = a + b;
        System.out.println(sum);
    }
}
```

Lecture 3

23.12.2022 Friday

3 Conditional Statements

Topics covered - if, else - else if - switch - break

3.1 if, else

3.1.1 Syntax

```
if (condition){

}
else {

}
```

Example

3.1.2 Q. Write a program to identify if a person is an adult.

```
import java.util.*;

public class Conditions {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        int age = sc.nextInt();

        if (age > 18) {
            System.out.println("Adult");
        } else {
            System.out.println("Not Adult");
        }
    }
}
```

3.1.3 Q. Write a program to check if a number is odd or even.

```
import java.util.*;

public class Conditions {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        int x = sc.nextInt();

        if (x % 2 == 0) {
            System.out.println("Even");
        } else {
            System.out.println("Odd");
        }
    }
}
```

3.2 else if

3.2.1 Q. Write a program to know if a is greater of lesser than b.

```
import java.util.*;

public class Conditions {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        int a = sc.nextInt();
        int b = sc.nextInt();

        if (a == b) {
            System.out.println("Equal");
        }
        else if (a > b) {
            System.out.println("a is greater than b");
        }
        else {
            System.out.println("a is lesser than b")
        }
    }
}
```

3.3 Switch

3.3.1 Syntax

```
switch (variable) {
case 1:
    break;
case 2:
    break;
default:

}
```

3.3.2 Q. Using switch write a program to greet in different languages

```
import java.util.*;

public class Conditions {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        int button = sc.nextInt();

        switch(button) {
            case 1: System.out.println("hello");
            break;
            case 2: System.out.println("namaste");
            break;
            case 3: System.out.println("bonjour");
            break;
            dafault: System.out.println("Invalid Button");
        }
    }
}
```

3.3.3 Q. Make a calculator

Make a Calculator. Take 2 numbers (a & b) from the user and an operation as follows :

- : + (Addition) a + b
- : - (Subtraction) a - b
- : * (Multiplication) a * b
- : / (Division) a / b
- : % (Modulo or remainder) a % b

Calculate the result according to the operation given and display it to the user.

3.3.4 Q. Ask the user to enter the number of the month & print the name of the month.

For eg - For '1' print 'January', '2' print 'February' & so on.

Lecture 4

23.12.2022 Friday

4 Loops

Topics covered - for Loop - while Loop - do while Loop

4.1 For Loop

4.1.1 Syntax

```
for (initialisation; condition; updation) {
    // do something
}
```

- initialisation -> int counter = 0
- condition -> counter < 100
- updation -> counter = counter + 2

Example

```
public class Loops {
    public static void main(String args[]) {
        for (int counter = 0; counter < 100; counter += 1){
            System.out.println("Hello world")
        }
    }
}
```

Note: if any condition is not given an infinite loop will run

4.1.2 Q. Print the number from 0 to 10 using for loop

```
public class Loops {
    public static void main(String args[]) {
        // counter++ => counter = counter + 1
        for ( int i = 0; i < 11; i ++ ) [
            System.out.println(i);
        ]
    }
}
```

Dry Run => When analysing code without actually coding

4.2 While Loop

4.2.1 Syntax

```
int i = 0; // initialisation

while(condition){ // condition
    // do something
    i++; //updation
}
```

4.2.2 Q. Print the number from 0 to 10 using while loop

```
public class Loops {
    public static void main(String args[]) {
        int i = 0;
        while(i<11){
            System.out.println(i);
            i++;
        }
    }
}
```

4.3 Do While Loop

4.3.1 Syntax

```
int i = 0; // initialisation

do {
    // do something
    i++; // updation
}while(condition) // condition
```

In do while loop, the loop is run at least once.

4.3.2 Q. Print the number from 0 to 10 using do while loop

```
public class Loops {
    public static void main(String args[]) {
        int i = 0;
        do {
            System.out.println(i);
            i++;
        } while(i<11);
    }
}
```

4.4 Questions

4.4.1 Q. Print the sum of first `n` natural numbers.

```
import java.util.*;

public class Loops {
    public static void main(String args[]){
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        int sum = 0;
        for(int i=0; i<=n; i++) {
            sum = sum + i;
        }

        System.out.println(sum);
    }
}
```

4.4.2 Q. Print the table if a number input by the user.

```
import java.util.*;

public class Loops {
    public static void main(String args[]) {
        Scanner sc = new Scanner(System.in);
        int n = sc.nextInt();

        for(int i=1; i<11; i++) {
            System.out.println(i*n);
        }

    }
}
```

4.4.3 Q. Print all even numbers till n.

4.4.4 Q. Make a menu driven program. The user can enter 2 numbers, either 1 or 0.

If the user enters 1 then keep taking input from the user for a student's marks(out of 100). If they enter 0 then stop. If he/ she scores : Marks >=90 -> print "This is Good" 89 >= Marks >= 60 -> print "This is also Good" 59 >= Marks >= 0 -> print "This is Good as well" Because marks don't matter but our effort does. (Hint : use do-while loop but think & understand why)

Lecture 5 25.12.2022 Sunday

5 Basic Pattern Questions

5.1 Nested Loops

```
for(..){
  for(..){

  }
}
```

5.2 Q. Print the solid rectangle pattern

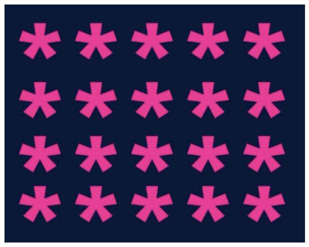


Figure 8: Solid rectangle pattern

```
import java.util.*;

class Patterns {
    public static void main(String args[]) {
        int n = 4;
        int m = 5;

        // inner loop
        for(int i=1; i<=n; i++) {
            // inner loop
            for (int j = 1; j <= m; j++) {
                System.out.print("*");
            }
            System.out.println();
        }
    }
}
```

5.3 Q. Print the hollow rectangle pattern

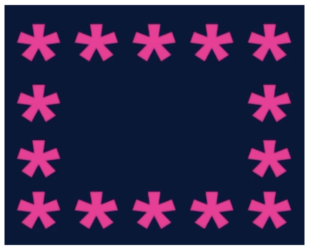


Figure 9: Hollow rectangle pattern

```java
import java.util.*;

public class patterns_hollow_rectangle {
    public static void main(String[] args) {
        int n = 4;
        int m = 5;

        // Outer loop
        for (int i = 1; i <= n; i++) {
            // Inner loop
            for (int j = 1; j <= m; j++) {
                // cell -> (i,j)
                if (i == 1 || j == 1 || i == n || j == m) {
                    System.out.print("*");
                } else {
                    System.out.print(" ");
                }

            }
            System.out.println();
        }
    }
}
```

5.4 Q. Print the half pyramid pattern

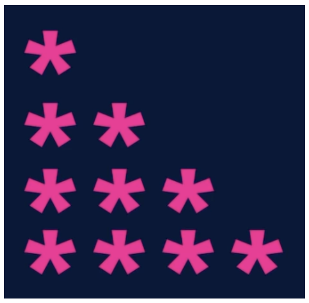


Figure 10: Half pyramid pattern

```java
import java.util.*;
```

```java
public class patterns_half_pyramid {
    public static void main(String[] args) {
        int n = 4;

        // Outer loop
        for ( int i = 1; i <= n; i++) {
            // Inner Loop
            for (int j = 1; j <= i; j++ ) {
                System.out.print("*");
            }
            System.out.println();
        }
    }
}
```

5.5 Q. Print the inverted half pyramid pattern

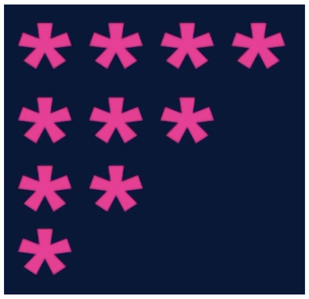


Figure 11: Inverted half pyramid pattern

```java
import java.util.*;

public class patterns_half_pyramid {
    public static void main(String[] args) {
        int n = 4;

        // Outer loop
        for ( int i = n; i >= 1; i--) {
            // Inner Loop
            for (int j = 1; j <= i; j++ ) {
                System.out.print("*");
            }
            System.out.println();
        }
    }
}
```

5.6 Q. Print the inverted half pyramid pattern (rotated by 180 deg)

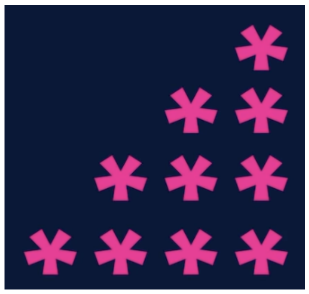


Figure 12: Inverted half pyramid rotated 180 deg

```java
import java.util.*;

public class patterns_inverted_half_pyramid_180 {
    public static void main(String[] args) {
        int n = 4;

        // Outer loop
        for (int i = 1; i <= n; i++) {
            // Inner loop
            for (int j = 1; j <= n; j++) {
                if ( j > n - i )
                    System.out.print("*");
                else
                    System.out.print(" ");
            }
            System.out.println();
        }
    }
}
```

5.7 Q. Print the half pyramid with numbers pattern

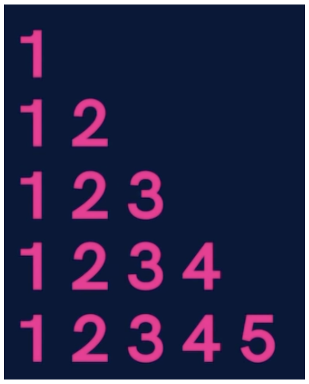


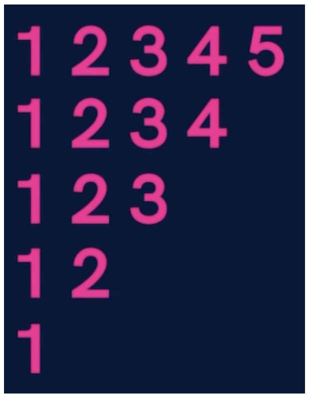
Figure 13: Half pyramid with numbers

```java
import java.util.*;
```

```java
public class patterns_half_pyramid_numbers {
    public static void main(String[] args) {
        int n = 5;

        // Outer loop
        for (int i = 1; i <= n; i++) {
            // Inner loop
            for (int j = 1; j <= i; j++) {
                System.out.print(j);
            }
            System.out.println();
        }
    }
}
```

5.8 Q. Print the Inverted half pyramid with numbers pattern



```
1 2 3 4 5
1 2 3 4
1 2 3
1 2
1
```

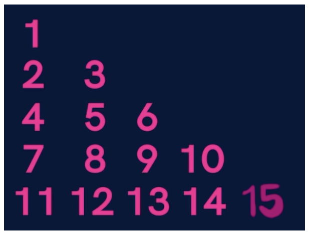
Figure 14: Inverted half pyramid with numbers

```java
import java.util.*;

public class patterns_inverted_half_pyramid_numbers {
    public static void main(String[] args) {
        int n = 5;

        // Outer loop
        for (int i = 1; i <= n; i++) {
            // Inner loop
            for(int j = 1; j <= n-i+1; j++) {
                System.out.print(j);
            }
            System.out.println();
        }
    }
}
```

5.9 Q. Print the Floyd's triangle pattern



```
1
2  3
4  5  6
7  8  9  10
11 12 13 14 15
```

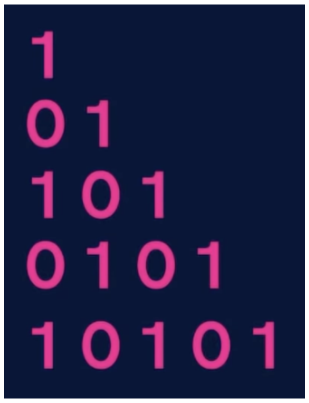
Figure 15: Floyd's triangle pattern

```java
import java.util.*;

public class patterns_floyds_triangle {
    public static void main(String[] args) {
        int n = 5;
        int a = 1;

        // Outer loop
        for (int i = 1; i <= n; i++) {
            // Inner loop
            for (int j = 1; j <= i; j++) {
                System.out.print(a);
                a++;
            }
            System.out.println();
        }
    }
}
```

5.10 Q. Print the 0-1 triangle pattern



```
1
0 1
1 0 1
0 1 0 1
1 0 1 0 1
```

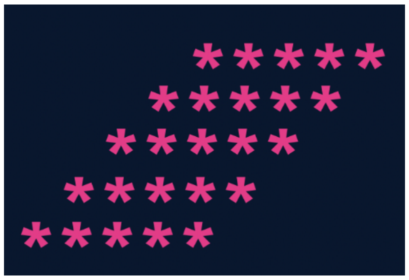
Figure 16: 0-1 triangle pattern

```java
import java.util.*;

class Patterns {
    public static void main(String[] args) {
        int n = 5;
        int a = 1;

        // Outer loop
        for (int i = 1; i <= n; i++) {
            // Inner loop
            for (int j = 1; j <= i; j++) {
                int sum = i+j;
                if (sum % 2 == 0) { //even
                    System.out.print("1 ");
                } else { // odd
                    System.out.print("0 ");
                }
            }
            System.out.println();
        }
    }
}
```

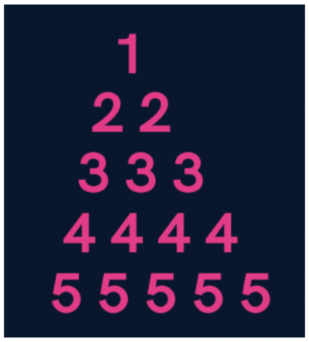
5.11 Q. Print a solid rhombus pattern



```
    *****
   *****
  *****
 *****
*****
```

Figure 17: Solid rhomubs pattern

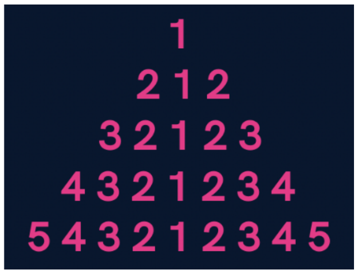
5.12 Q. Print a number pyramid pattern



```
    1
   2 2
  3 3 3
 4 4 4 4
5 5 5 5 5
```

Figure 18: Number pyramid pattern

5.13 Q. Print a palindrome number pyramid pattern



```
        1
      2 1 2
    3 2 1 2 3
  4 3 2 1 2 3 4
5 4 3 2 1 2 3 4 5
```

Figure 19: Palindrome number pyramid pattern