

Nested loops

→ A loop inside the body of another loop, is known as nested loop

eg:-

```

for( initialization; condition; update expression)
{
    for(initialization; condition; update expr.)
    {
        // inner loop block
    }
}
  
```

outer loop {

inner loop {

Nested while loop:-

```

while (condition1) {
    while (condition 2) {
        // inner loop block
    }
    // outer loop statements
}
  
```

Nested do-while loop:-

```

do {
    do {
        // inner loop statements
    } while (condition);
    // outer loop statements
} while (condition);
  
```

## Hybrid Nested loop:-

for( initialization; condition; update expression )  
{  
    while( condition )  
    {  
        // while loop statements  
    }  
    // for loop statements  
}

- Nesting can be possible up to many levels.

## Need of nested loops:-

- ① Pattern printing
- ② used to handle 2D arrays & Matrices
- ③ for data structures with more than two dimensions such as 3D arrays, additional level of nested loops are needed to access all elements.
- ④ use in traversal of complex data structures such as trees, graphs, lists of lists etc.
- ⑤ Game development, especially in grid based games like chess, checkers or puzzles.
- ⑥ Sorting algorithms like bubble sort, insertion sort use nested loops to compare & arrange elements.

1

```
for (int i = 1; i <= 5; i++)
```

```
{
```

```
    for (int j = 1; j <= 5; j++)
```

```
    {
```

```
        System.out.print("x");
```

```
    }
```

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

```
}
```

```
int i = 1;
```

```
while (i <= 5)
```

```
{
```

```
    int j = 1;
```

```
    while (j <= 5)
```

```
    {
```

```
        System.out.print("x");
```

```
        j++;
```

```
    }
```

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

```
    i++;
```

```
}
```

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

using nested  
for loop

2

using nested  
while loop

3

Using nested  
do-while loop.

```
int i = 1;
```

```
do {
```

```
    int j = 1;
```

```
    do {
```

```
        System.out.print("x");
```

```
        j++;
```

```
    } while (j <= 5);
```

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

```
    i++;
```

```
} while (i <= 5);
```