

4.1 While Loops

- loops are used to repeat one or more statements
- While loop executes the body of the loop as long as a boolean condition is true
- When a condition is false, the loop exits and continue with statements that are after the body of the while loop.

```
Ex: int x = 4;
    while (x > 1) {    ← checks if this condition is true
        System.out.print(x);
        x--;          ← subtracts 1 from x (x = x - 1)
    }
```

If $x = 4$, it will print 432.

If $x = 1$, it will print nothing.

If $x = 9$, it will print 98765432

Steps to write a loop:

- initialize loop variable
- test loop variable
- change loop variable

```
int x = 4
```

```
while (x > 1)
```

```
x --
```

Tracing Loops:

```
Ex: int x = 5;
    int count = 0;
    int sum = 0;
    while (x > 1) {
        count++;
        sum = sum + x;
        x--;
    }
    System.out.println(sum);
```

iteration	x	count	sum
0	5	0	0
1	4	1	5
2	3	2	9
3	2	3	12
4	1	4	14

(14)

Note: Make sure that the loop is not an infinite loop! Infinite loop never ends.

```
ex: int x = 5;
    while (x > 1) {
        System.out.println(x);
    }
```

← This loop will never end since x is always greater than 1.

4.2 For Loops

— It is a counter-controlled loop to execute the loop body a set number of times.

Example: ^{initialize} for (int x = 0; ^{condition} x < 5; ^{change} x++) {
 System.out.println(x);
}

output:

0
1
2
3
4

x is initialized to 0, it checks if $x < 5$, continues to the loop block, prints $x(0)$, sets x to $x+1$, continues to check for condition ($x < 5$).