Beginner/intermediate Java programming

Loops, Arrays, And Random Numbers

By STEMPowering Girls
stempoweringgirls.org

For-Loops

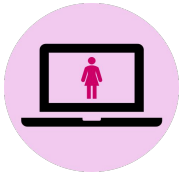
Repeats code FOR a certain number of times and is used when the number of iterations is known.

SAMPLE CODE 1

```
for(int x = 0; x<=4; x++)
{
   System.out.println(x);
}
```

Output:

```
0
1
2
3
4
```



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For-Loops

Repeats code FOR a certain number of times.

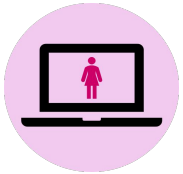
SAMPLE CODE 2

```
int number = 0;
System.out.println(“Before: ” + number);
for(int x = 0; x<=4; x++)
{
    number = number + x;
}
System.out.println(“After: ” + number);
```

Tracing:

x	number
0	0
1	1
2	3
3	6
4	10

Output:
Before: 0
After: 10



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Write a for loop that prints out the odd numbers from 1-20

While loops

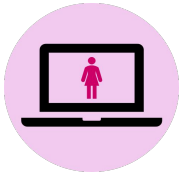
Repeats code WHILE a condition is true and when the number of iterations is unknown.

SAMPLE CODE 1

```
int x = 5;
while(x>0)
{
   x--;
}
System.out.println(x);
```

Tracing:
Initial: x=5
Rep 1: x=4
Rep 2: x=3
Rep 3: x=2
Rep 4: x=1

Output:
1

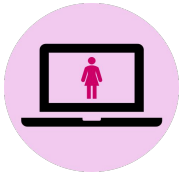


While loops

Repeats code WHILE a condition is true.

SAMPLE CODE 2

```
int x = 2;
System.out.println(“Before: ” + x);
while(x>0)
{
    x = x - 1;
}
System.out.println(“After: ” + x);
```



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Write a while loop that prints out numbers from 10 to 5 in descending order

Arrays

An array is a data structure that holds a fixed-size collection of data of the same type.

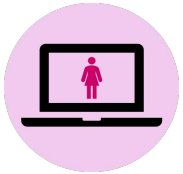
Syntax to initialize an array:

```
data type[](name of array) = new (data type)[array length]
```

Ex:

```
int[]numbers = new  int[30];

boolean[]values = new boolean[16];
```



ARRAYS

The following statement creates an array of integers with a length of 10, without the programmer manually inputting any values into the array:

```
int[]nums = new int[10];
```

Before this array is modified, every index of this array is filled with zeros as such:

Index	0	1	2	3	4	5	6	7	8	9
Data	0	0	0	0	0	0	0	0	0	0

*notice that the last index of the array is one less than the array's length

Similarly, all elements of:
double arrays are initially filled with 0.0
String arrays are initially filled with nulls
boolean arrays are initially filled with false

ARRAYS

Array of strings:

Index	0	1	2	3	4	5
Data	“Hello”	“World”	“Data”	“Array”	“STEM”	“Bye”

To initialize:

```
String[] arrayOfStrings = {“Hello”, “World”, “Data”, “Array”, “STEM”, “Bye”};
```

*this is a way to declare and initialize an array in a single statement

Array of integers:

Index	0	1	2	3	4	5
Data	14	23	38	55	76	101

To declare and initialize:

```
Int[]nums = {14,23,38,55,76,101};
```

Array methods

The following methods can be used with two arrays: **a1** and **b1**

Arrays.sort(a1**):**

- Can be used after importing the array class (import java.util.Arrays)
- Sorts the elements of an int or double array in ascending order
- Sorts the elements of a String array in alphabetical order

a1**.length:**

- Provides the length of the array (one more than the last index)

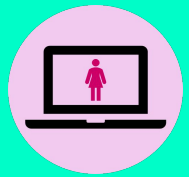
Arrays.toString(a1**):**

- Prints out the elements of the array as if they were stored in a String

Arrays.equals(a1**,**b1**):**

- Returns a boolean value
- Returns true all of the elements of one array are equal to all of the elements of another array with the same indices
- Else, it returns false

Make an array of words and print each word on a separate line using Loops



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Make an array of integers and print its elements in reverse order

The Math Class

Contains methods that perform basic numeric operations
To import the Math class: Import java.lang.Math;

Math.pow(4,3**)** returns 64
Math.sqrt(16**)** returns 4
Math.abs(-25**)** returns 25
Math.ceil(23.7**)** returns 24
Math.floor(23.7**)** returns 23
Math.log(e^2**)** returns e
Math.log10(100**)** returns 3
Math.sin($\frac{\pi}{3}$ **)** returns 0.8660254 (√3/2)

Math.cos($\frac{\pi}{3}$ **)** returns 0.5 (1/2)

Math.tan($\frac{\pi}{3}$ **)** returns 1.7320508 (√3)

Math.max(30,15**)** returns 30
Math.min(30,15**)** returns 15

Random Number Generator

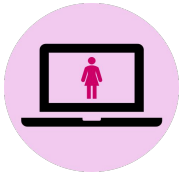
The method **Math.random()** generates a random double value in between 0.0 and 1.0, not including 1.0 In order to generate random integers, you must **cast** the produced value to an integer.

To generate a random number between 1 and 10 using the Math class:

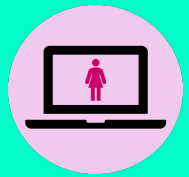
```
int random = (int)(Math.random()*10)+1;
```

To generate a random number between 50 and 100 using the Math class.

```
int random = (int)(Math.random()*50)+100;
```



Make a Guess the Number Game using loops, random numbers, and scanners.



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