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Introduction to Programming  
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# Loops!

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# Overview

- What is a loop? What are they used for?
- Types of loops
- Implementation in Java
- Examples
- Summary

# What is a loop?

In a nutshell...

Having a computer perform the same operation over and over again.

(So that we don't have to!)

# Can you imagine...

- Calculating the first 100 Fibo numbers by hand?
- Performing countless repetitions to achieve accuracy?
- Searching through heaps of data for one specific value?

Loops make life better!

# Types of Loops

- Counting Loops
  - *for* statements
- Conditional Loops
  - *while* statements
  - (*if* statements)

# Counting Loops: *for* statement

- Components
  - *for*, *( )*, *{ }*
- **Begin:** loop variables  
(Java: must be number)
- **Check:** test
- **Update:** increment

Basic *for* statement structure:

```
for (begin; check; update){  
    body of the loop;  
}
```

# *for* Loop Syntax

- Two possibilities:  
for (int i=1; i<=n; i++)

or

for (int i=0; i<n; i++)

Java uses zero as start...second form better

\*note: int is a good habit!

*for* Statement Example:

Exercise Problem 5  
ProduceIntegers

# Conditional Loops: *while* Statement

## How it works:

- check conditions
- logic is true then...
- logic is false then...
- after true execution...
- repeat until false

## Basic *while* statement structure:

```
while (conditions) {  
    statements  
    /*statements to execute the loop  
    and modify the conditions*/  
}
```

*while* Statement Example:

SumLoop

# *if* Statements: Also Conditional (but not a loop per se)

- `if x == 0 then y = y + 1;`  
What happens if `x ≠ 0`?
- `if x == 0 then y = y + 1 else z = z - 1;`  
Now what happens if `x ≠ 0`?
- Conditional statement usually Boolean expression

\*note: “=” is different than “==” (Boolean!)

# Structure and Example

Basic *if* statement structure:

```
if (condition)
    statement;
else statement;
```

Example:

```
if (number >= 0)
    System.out.println("positive");
else
    System.out.println("negative");
```

# The *do* Statement

- From procedural programming languages (we are OOP!!)
- Run thru body at least once, then check conditions
- Can use *while* statement instead

## Basic *do* Statement Structure:

```
Initialize conditions
do {
  Statements to execute loop
  and change conditions
}
while condition;
```

# Key Points

- Counting Loops: *for* Statements
- Conditional Loops: *while* Statements
- Conditional Statements: *if-then*
- Know the syntax
- Loops are our friends!

Tied... computer needs more loops!

