## How would you….

- Print out the numbers 1 to 10 on a form using only variables, assignment and the document.write() method?



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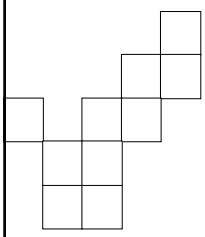
```
var x;
x = 1;
document.write(x);
x = x +1;
document.write(x);
x = x +1 ;
document.write(x);
x = x + 1;
document.write(x);
x = x + 1;
document.write(x) ;
x = x + 1 ;   . . .
```

Are you tired of typing yet?





## Iteration: Once Is Not Enough

People don't usually like to repeat themselves, but in computers repetition is one of the most valuable things a program can do. Computers can repeat steps systematically without tiring. If program instructions are to be performed more than once, the computer can be programmed to repeat instructions without the programmer explicitly writing them out each time



## The Idea of Iteration

- Concept: Iteration is the repeated execution of a series of statements in programming
- There are two key components to iteration:
  - The repetition of a bunch of steps…
  - A way to stop the repetition at some point and continue with the rest of the program
- To perform iteration, programming languages include special statements often called *iteration statements*

## Key Components of Iteration

- Iteration Component # 1
  - The statements that will be repeated are called the loop body
- Iteration Component # 2
  - A test specifying when the repetition stops is called the stop condition
- In addition to the components above, loops typically have at least one variable that is explicitly changed "inside" the loop – this is called the iteration variable
- When the iteration variable contains a certain value (defined by the program), then the loop stops
- Some value must change at some point between consecutive iterations, or else the loop will never terminate… it is an infinite loop

## Syntax of a JavaScript Iteration

- Programming languages usually have more than one form of iteration as part of their notation. While is one iteration construct:

```
while (<stop condition>) {
        <code statements>;
       }
…continue code…
```

  - The stop condition is tested. If it is false, all the statements are skipped. Execution of the code continues at the point just after the closing curly bracket
  - If the stop condition is true, the code statements are performed once
  - The stop condition is tested again. If it is false the loop is over and the code statements are skipped; code execution continues after the closing curly bracket
  - If the stop condition is true, the code statements are performed a second time
  - …..



## Iteration using the while statement

- The easiest way to see iteration in action is to print out the iteration variable after each loop:

```
var num=1;              //Declaration and initialization of
                        //iteration variable
while (num <=10) {      // stop condition
alert( num );                   // start loop body
document.write("<H1>" + num + "</H1>");
num= num + 1;           // change iteration
                        // variable
   }
```



## What Just Happened?

- What is the value of num after the first Loop?
- What does the alert method display after the second Loop?
- Why does the Loop end?
- How many times does the loop execute?

## Other Iteration Constructs…

- Another iteration construct is the for loop
- for is commonly used when the iteration
  - Starts at a specific value,
  - increases by a set amount on each loop,
  - terminates at a specific value

```
for ( <initialization; test; increment>)
  {
      <code statements>;
  }
```



## Iteration using the for statement

```
for (x=0; x<=10;x=x+1)   // Declaration and initialization
                         // of iteration variable, stop
                         // condition and change of
                         // variable value
 {
alert( x );              // start loop body
document.write("<H1>" + x + "</H1>");
        }
```



## Exercise #1

- What does this code print?

```
var i;
  i = 2;
  while (i <= 4)
        {
        alert(i);
        i=i + 1;
        }
```

2
3
4



## Exercise #2

- What does this code print?

```
for (i = 2; i<5; i=i+1)
        {
        alert(i)
        }
```

2
3
4

## Exercise #3

- What does this code print?

```
var i;
i = 2;
while (i <= 4)
        {
        i=i + 1;
        alert(i);
        }
```

3
4
5



## Exercise #4

- What does this code print?

```
for (i = 3; i<5; i++)
        {
        alert(i);
        }
```

3
4



## Exercise #5

- What does this code print?

```
var i;
i = 5;
while (i < 5)
        {
        alert(i);
        i=i + 1;
        }
```

It doesn't print anything!



## Exercise #4

- What does this code print?

```
var i;
i = 1;
while (i >= 1)
        {
        alert(i);
        i=i + 1;
        }
```

This is an infinite loop!

1
2
3
4
5
6
…

## A Little More About Infinite Loops

- If you don't properly change your iteration variable – so that the stop condition eventually evaluates to false- then you will never exit the loop
- This is called an infinite loop
- The only way out of the infinite loop is by stopping the program from outside of the program itself
- Press the CTRL + ALT + Delete keys to get to the Task Manager and end the browser application



## Summary

- Iteration is very useful when you want the program to repeat a sequence of instructions a certain number of times
- Iteration requires 2 components
  - Loop body – the steps to be repeated
  - Stop Condition – a way to exit the loop
- When the loop ends, the execution of code continues at the point where the loop ended
- You have been introduced to two iteration statements, while and for, but there are many
- With Conditionals and Iteration, you can accomplish almost any programming needed



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x = x +1;
document.write(x);
x = x +1 ;
document.write(x);
x = x + 1;
document.write(x);
x = x + 1;
document.write(x) ;
x = x + 1 ;   . . .
```

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