Computer Programming Fundamentals

CS 152
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TAs: Melody Horn, Noah Garcia, Andrew Geyko, Juan Ormaza
Time: MWF 10:00-10:50am
https://handandmachine.cs.unm.edu/classes/CS152_Fall2021/

OPEN INTELLIJ
CREATE A NEW PROJECT

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CREATE A NEW PROJECT

NAME IT Week4

CREATE A NEW JAVA CLASS
NAME IT Monday

CREATE A MAIN METHOD

```
public class Monday {

    public static void main(String[] args) {

    }

}
```

WHILE LOOPS

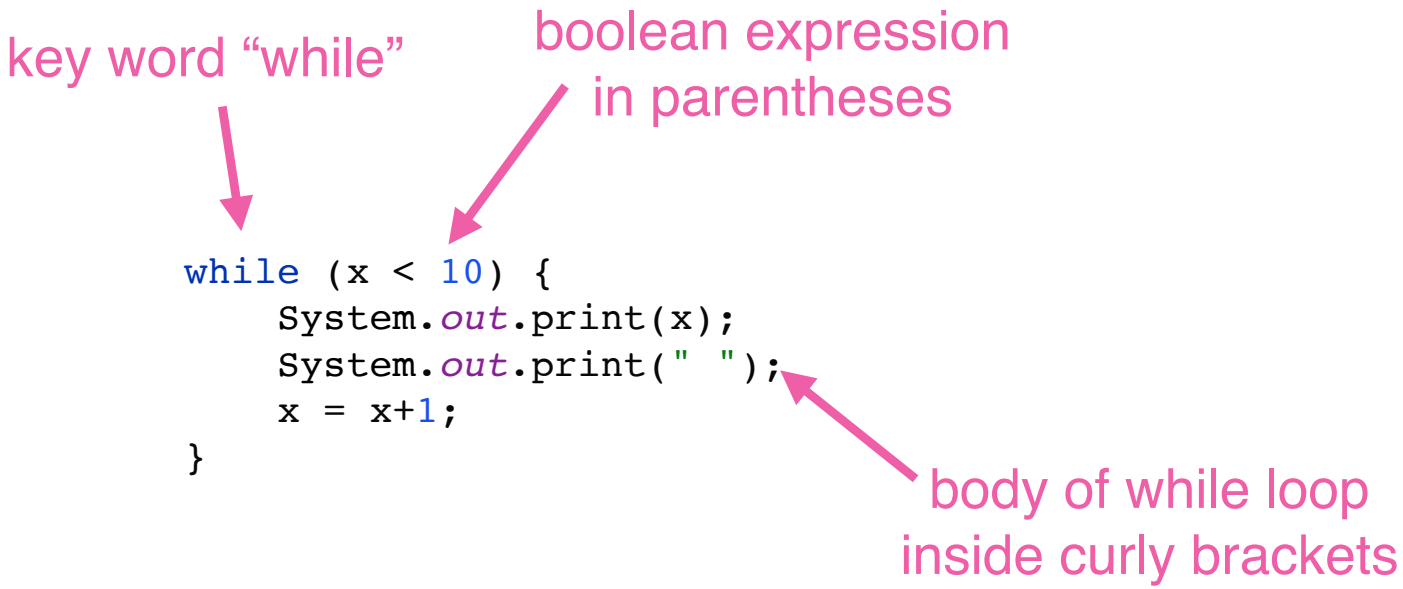
A SIMPLE PROGRAM

```
public static void main(String[] args) {
    int x = 0;
    while (x < 10) {
        System.out.print(x);
        System.out.print(" ");
        x = x+1;
    }
}
```

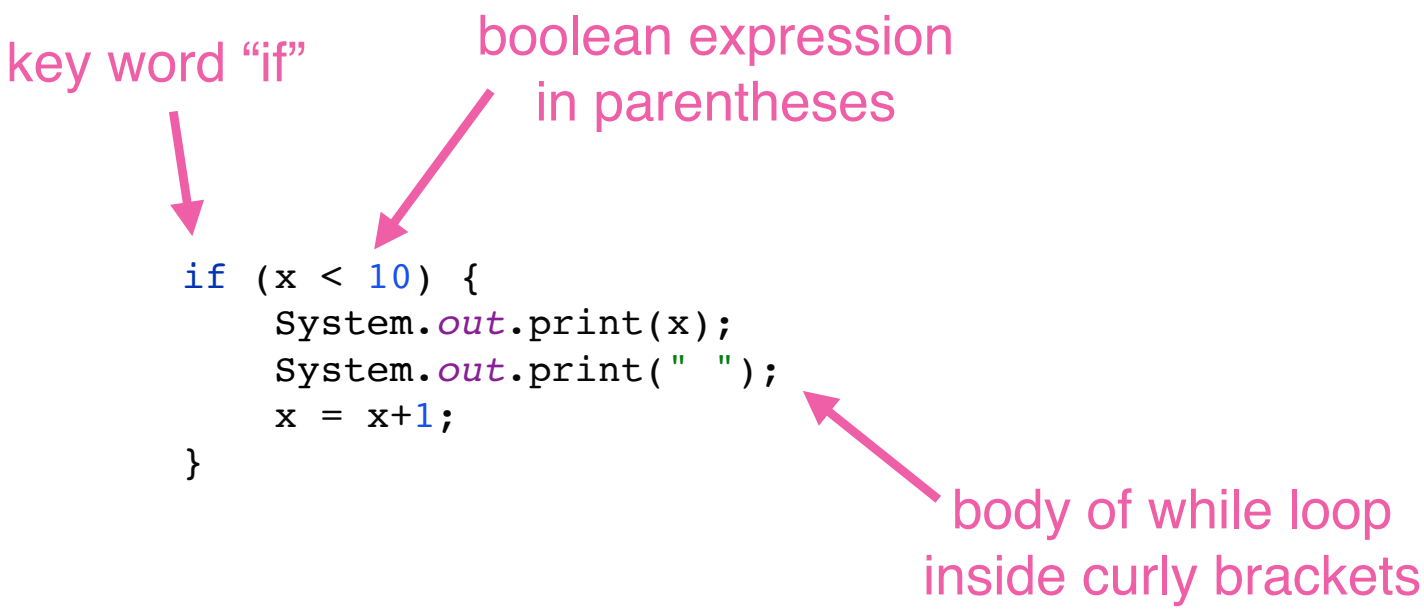
```
0 1 2 3 4 5 6 7 8 9
```

WHILE LOOPS

STRUCTURE of WHILE LOOP in JAVA



SIMILAR TO IF



HOW A WHILE LOOP WORKS

while the boolean expression is true

```
while (x < 10) {
    System.out.print(x);
    System.out.print(" ");
    x = x+1;
}
```

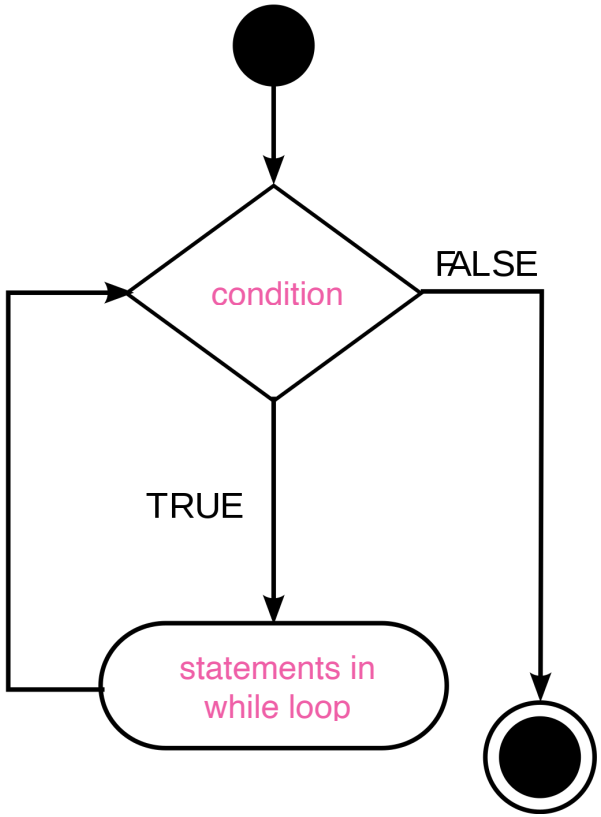
these statements will be executed

HOW A WHILE LOOP WORKS

while the boolean expression is true

```
while (x < 10) {
     System.out.print(x);
     System.out.print(" ");
     x = x+1;
}
```

these statements will be executed

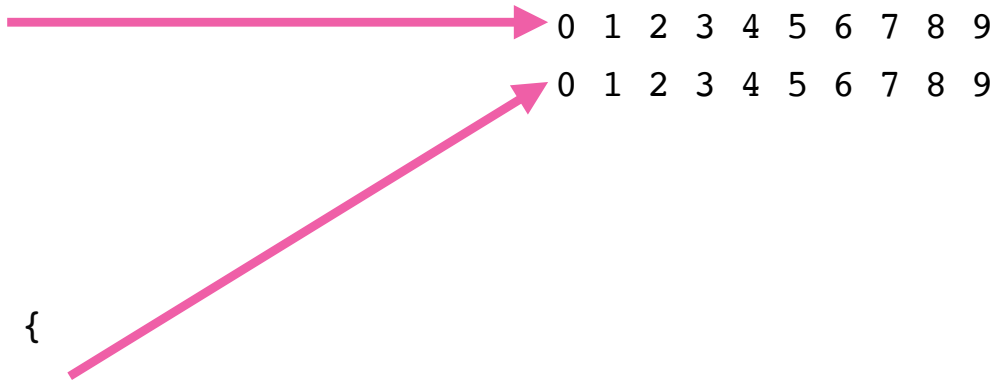


questions?

FOR LOOPS

A SIMPLE PROGRAM

```
public static void main(String[] args) {
    int x = 0;
    while (x < 10) {
        System.out.print(x);
        System.out.print(" ");
        x = x+1;
    }

    System.out.println();

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```



```
0 1 2 3 4 5 6 7 8 9
0 1 2 3 4 5 6 7 8 9
```

STRUCTURE of FOR LOOP in JAVA

key word “for”

(declare variable; test variable; change variable)

```
for (int i = 0; i<10; i=i+1) {
    System.out.print(i);
    System.out.print(" ");
}
```

body of for loop
inside curly brackets

WHILE vs FOR

```
int x = 0;
while (x < 10) {
    System.out.print(x);
    System.out.print(" ");
    x = x+1;
}
```

```
for (int i = 0; i<10; i=i+1) {
    System.out.print(i);
    System.out.print(" ");
}
```

WHILE vs FOR

```
int x = 0;
while (x < 10) {
    System.out.print(x);
    System.out.print(" ");
    x = x+1;
}
```

```
for (int i = 0; i<10; i=i+1) {
    System.out.print(i);
    System.out.print(" ");
}
```

WHILE vs FOR

```
int x = 0;
while (x < 10) {
    System.out.print(x);
    System.out.print(" ");
    x = x+1;
}
```

```
for (int i = 0; i<10; i=i+1) {
    System.out.print(i);
    System.out.print(" ");
}
```

WHILE vs FOR

```
int x = 0;
while (x < 10) {
    System.out.print(x);
    System.out.print(" ");
    x = x+1;
}
```

```
for (int i = 0; i<10; i=i+1) {
    System.out.print(i);
    System.out.print(" ");
}
```

FOR IS SAFER. WHY?

```
int x = 0;
while (x < 10) {
    System.out.print(x);
    System.out.print(" ");
    x = x+1;
}
```

```
for (int i = 0; i<10; i=i+1) {
    System.out.print(i);
    System.out.print(" ");
}
```

protection from accidental infinite loops

NOTE ABOUT ADDITION

```
i++;
```

is the same as

```
i = i+1;
```

```
for (int i = 0; i<10; i++) {
    System.out.print(i);
    System.out.print(" ");
}
```

VARIABLES AND SCOPE

VARIABLES AND SCOPE

```
for (int i = 0; i<10; i++) {
    System.out.print(i);
    System.out.print(" ");
}
```

note how we use the variable i inside of the for loop

VARIABLES AND SCOPE

```
for (int i = 0; i<10; i++) {
    System.out.print(i);
    System.out.print(" ");
}
System.out.println(i);
```

but, we can't use it outside of the for loop

```
java: cannot find symbol
  symbol:   variable i
```

ALL VARIABLES HAVE A “SCOPE”

The part of the program in which they can be accessed

Determined by { }

They can only be used/accessed in the { } where they were declared.

VARIABLE SCOPE

```
public static void main(String[] args) {
    int x = 0;
    while (x < 10) {
        int y = 7;
        System.out.print(x + y);
        System.out.print(" ");
        x = x+1;
    }
}
```

scope of x determined by these { }

x can be accessed anywhere inside them

including inside the while { }

VARIABLE SCOPE

```
int x = 0;
while (x < 10) {
    int y = 7;
    System.out.print(x+y);
    System.out.print(" ");
    x = x+1;
}
```

scope of y determined by these { }

y can be accessed anywhere inside them

can't access y outside of them

VARIABLE SCOPE

```
for (int i = 0; i<10; i++) {
    int x = 0;
    System.out.print(i);
    System.out.print(" ");
}
```

scope of i determined by these { }

can't access i outside of them

VARIABLE SCOPE

```
for (int i = 0; i<10; i++) {
    System.out.print(i);
    System.out.print(" ");
}
```

scope of i determined by these { }

can't access i outside of them

questions?

RANDOM NUMBERS

IMPORT THE MATH PACKAGE

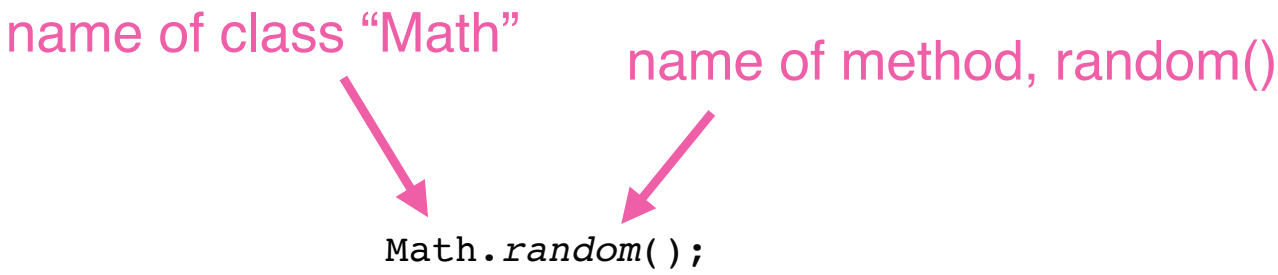
```
import java.math.*;

public class Monday {

    public static void main(String[] args) {
        int x = 0;
        while (x < 10) {
            System.out.print(x);
            System.out.print(" ");
            x = x+1;
        }

        System.out.println();

        for (int i = 0; i<10; i=i+1) {
            System.out.print(i);
            System.out.print(" ");
        }
    }
}
```

GENERATE SOME RANDOM NUMBERS

```
public static void main(String[] args) {
    double r;

    int x = 0;
    while (x < 10) {
        r = Math.random();
        System.out.println(r);
        x = x+1;
    }

    System.out.println();

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

```
0.456664087914635
0.5522273118627072
0.9560459464748382
0.9884410199488026
0.180125784213781
0.44572214756175343
0.667412887988518
0.2881990840791976
0.9968151549045745
0.26332520409160365
```

Math.random()



returns a number (a double) that is greater than or equal to 0 and less than 1.
https://docs.oracle.com/javase/8/docs/api/java/lang/Math.html

WHAT IS THE LARGEST r CAN BE?

```
public static void main(String[] args) {
    double r;

    int x = 0;
    while (x < 10) {
        r = Math.random();                          0.9999999999999999
        System.out.println(r);
        x = x+1;
    }

    System.out.println();

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

WHAT IS THE LARGEST r CAN BE?

```
public static void main(String[] args) {
    double r;

    int x = 0;
    while (x < 10) {
        r = Math.random() * 10;
        System.out.println(r);
        x = x+1;
    }

    System.out.println();

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

9.999999999999999

questions?

LET’S COUNT HOW MANY TIMES WE GET A NUMBER THAT IS GREATER THAN 5

COUNTING r > 5

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        System.out.println(r);
        x = x+1;
    }

    System.out.println();

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

COUNTING r > 5

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count);

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

RUN THE PROGRAM A FEW TIMES

USING + IN PRINT STATEMENTS

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

questions?

STRUCTURE OF OUR PROGRAM

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

STRUCTURE OF OUR PROGRAM

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

STRUCTURE OF OUR PROGRAM

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

PROBLEM??

```
public static void main(String[] args) {
    double r;

    int x = 0;
    while (x < 10) {
        int count = 0;
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

PROBLEM??

```
public static void main(String[] args) {
    double r;

    int x = 0;
    while (x < 10) {
        int count = 0;
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

Variable scope.
Variable count declared in while loop.
Can't be used outside of it.

STRUCTURE OF OUR PROGRAM

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
        r = Math.random() * 10;
        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1) {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

STRUCTURE OF OUR PROGRAM

```
public static void main(String[] args) {
    double r;

    int x = 0;
    int count = 0;
    while (x < 10) {
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        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

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PROBLEM??

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PROBLEM??

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    int x = 0;
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        if (r > 5) {
            count = count+1;
        }
        System.out.println(r);
        x = x+1;
    }

    System.out.println(count + " numbers were greater than 5");

    for (int i = 0; i<10; i=i+1); {
        System.out.print(i);
        System.out.print(" ");
    }
}
```

Misplaced semicolon
Creates logic problem +
Creates scope problem
Variable i no longer in scope in for loop

questions?