Java Constructs
Announcements

- Reminder: Assignment 1 is due Tuesday January 31, 11:59 pm

- Reading for next class is LDC Chapter 5
  - Try exercises 5.2 and 5.3 before class and we will discuss possible solutions in lecture

- **SI sessions** and drop-in hours starting!
  - Sunday, 8-9pm in SCI E211 with Mary
  - Monday, 6-7pm in SCI E111 with Sam
  - Wednesday, 8-9pm in SCI E211 with Mary
  - Thursday, 6-7pm in SCI E111 with Sam
Relational Operators

- Java has a boolean type that can take the value true or false
- Booleans arise naturally when using relational operators to compare two values

3 < 5
3 < 2
3 > 2
5 <= 1
5 >= 1
5 == 5
5 == 6
5 != 6
Logical Operators

- Boolean values can be manipulated with the logical operators ! (not), && (and), and || (or)

<table>
<thead>
<tr>
<th>Expression</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>! (3 &lt; 5)</td>
<td>true</td>
</tr>
<tr>
<td>! (3 == 5)</td>
<td>true</td>
</tr>
<tr>
<td>(3 &gt; 5) &amp;&amp; (7 &lt; 8)</td>
<td>true</td>
</tr>
<tr>
<td>(3 &lt; 5) &amp;&amp; (7 &lt; 8)</td>
<td>true</td>
</tr>
<tr>
<td>(3 &gt; 5)</td>
<td></td>
</tr>
<tr>
<td>(3 &gt; 5)</td>
<td></td>
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</tbody>
</table>
Predicates

- A **predicate** is any method that returns a **boolean** value

//determine if n is even
public static boolean isEven(int n) {
    return (n % 2) == 0;
}

//determine if num is divisible by factor
public static boolean isDivisibleBy(int num, int factor) {
    return (num % factor) == 0;
}

//determine if n is between lo and hi
public static boolean isBetween(double n, double lo, double hi) {
    return (lo <= n) && (n <= hi);
}
Predicates

Write your own predicate to determine if n is odd. Then, can you write it another way?
Conditionals

- To choose between two courses of action, to control the program flow, we use **conditional statements** such as if, else if, and else

```java
//returns absolute value of n
public static double abs(double n) {
    if (n < 0) {
        return -n;
    } else {
        return n;
    }
}
```

```java
//returns absolute value of n
public static double abs(double n) {
    if (n < 0) {
        return -n;
    }
    return n;
}
```
public static void main(String[] args) {
    int x = 28; String s = "meow";
    if (x < 30 && s.length() < 10) {
        x = x + 5;
        int y = s.length();
        if (x + y > 36) {
            System.out.println("hello " + x);
        } else if (x + y < 33) {
            System.out.println("howdy " + y);
        } else {
            System.out.println("hi!");
        }
    } else {
        x = x - 10;
        int y = s.length() + 5;
        if (x == 15) System.out.println("Salut " + x);
        else System.out.println("Ciao " + y);
    }
}

Be the computer
Iteration – **while** loop

- **Iteration** refers to a sequence of steps that is repeated until some stopping condition is reached.

```java
int i = 1;
while (i < 4) {
    System.out.println("CS230");
    i = i + 1;
}
```

1. Evaluate the boolean expression.
2. If true, execute the body of the loop and go back to step (1).
3. If false, go to the statement after the while loop.

```java
while (boolean_expression) {
    statement 1;
    statement 2;
    ...
}
```
Write a for loop that prints the numbers from 1 to 10.

```java
for (int i=1; i<=10; i++) {
    System.out.println(i);
}
```
Math Class

System.out.println(Math.max(100, 50));
System.out.println(Math.sqrt(25));
System.out.println(Math.log(10));

// Given area of circle, returns the circle's radius.  
// Since area=pi*r*r, we have r = squareroot(area/pi).
public static double getCircleRadius(double area) {
    return Math.sqrt(area/Math.PI);
}

System.out.println(getCircleRadius(100));
Random Class

```java
import java.util.Random;

public class RandomExample {

    public static void main(String[] args) {

        Random rand = new Random();
        for (int i = 0; i < 15; i++) {
            System.out.println(rand.nextInt(10));
        }
    }
}
```
Count Vowels

// Returns true if character is lower-case vowel (a, e, i, o, u), false otherwise.
public static boolean isVowel(char ch);

// Returns the number of occurrences of vowels in the String s
public static int countVowels(String s);