Methods that are tests

- Some methods return logical values (true or false).
- A call to such a method is used as a <test> in a loop or if.

Scanner console = new Scanner(System.in);
System.out.print("Type your first name: ");
String name = console.next();

if (name.startsWith("Dr.")) {
    System.out.println("Will you marry me?");
} else if (name.endsWith("Esq.")) {
    System.out.println("And I am Ted 'Theodore' Logan!");
}
String test methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>equals(&lt;str&gt;)</td>
<td>whether two strings contain the same characters</td>
</tr>
<tr>
<td>equalsIgnoreCase(&lt;str&gt;)</td>
<td>whether two strings contain the same characters, ignoring upper vs. lower case</td>
</tr>
<tr>
<td>startsWith(&lt;str&gt;)</td>
<td>whether one contains other's characters at start</td>
</tr>
<tr>
<td>endsWith(&lt;str&gt;)</td>
<td>whether one contains other's characters at end</td>
</tr>
<tr>
<td>contains(&lt;str&gt;)</td>
<td>whether the given string is found within this one</td>
</tr>
</tbody>
</table>

String name = console.next();
if (name.contains("Prof")) {
    System.out.println("When are your office hours?");
} else if (name.equalsIgnoreCase("buTteRs")) {
    System.out.println("You're grounded, young man!");
}

Strings question

- Prompt the user for two words and report whether they:
  - "rhyme" (end with the same last two letters)
  - alliterate (begin with the same letter)

- Example output: (run #1)
  Type two words: car STAR
  They rhyme!

  (run #2)
  Type two words: bare bear
  They alliterate!

  (run #3)
  Type two words: sell shell
  They alliterate!
  They rhyme!

  (run #4)
  Type two words: extra strawberry
Strings answer

// Determines whether two words rhyme and/or alliterate.
import java.util.*;

public class Rhyme {
    public static void main(String[] args) {
        Scanner console = new Scanner(System.in);
        System.out.print("Type two words: ");
        String word1 = console.next().toLowerCase();
        String word2 = console.next().toLowerCase();

        // check whether they end with the same two letters
        if (word2.length() >= 2 &&
            word1.endsWith(word2.substring(word2.length() - 2))) {
            System.out.println("They rhyme!");
        }

        // check whether they alliterate
        if (word1.startsWith(word2.substring(0, 1))) {
            System.out.println("They alliterate!");
        }
    }
}

Random numbers

reading: 5.1
The Random class

- A Random object generates pseudo-random numbers.
- Class Random is found in the java.util package.

```java
import java.util.*;

Example:
Random rand = new Random();
int randomNumber = rand.nextInt(10);  // 0-9
```

### Method name | Description
--- | ---
nextInt() | returns a random integer
nextInt(<max>) | returns a random integer in the range [0, max) in other words, 0 to max-1 inclusive
nextDouble() | returns a random real number in the range [0.0, 1.0)

### Generating random numbers

- Common usage: to get a random number from 1 to N

```java
int n = rand.nextInt(20) + 1;  // 1-20 inclusive
```

- To get a number in arbitrary range [min, max] inclusive:

```
<name>.nextInt(<size of range>) + <min>
```

  - Where <size of range> is (<max> - <min> + 1)

- Example: A random integer between 4 and 10 inclusive:

```java
int n = rand.nextInt(7) + 4;
```
Random questions

- Given the following declaration, how would you get:
  Random rand = new Random();

- A random number between 1 and 47 inclusive?
  int random1 = rand.nextInt(47) + 1;

- A random number between 23 and 30 inclusive?
  int random2 = rand.nextInt(8) + 23;

- A random even number between 4 and 12 inclusive?
  int random3 = rand.nextInt(5) * 2 + 4;

Random and other types

- nextDouble method returns a double between 0.0 - 1.0
  Example: Get a random GPA value between 1.5 and 4.0:
  double randomGpa = rand.nextDouble() * 2.5 + 1.5;

- Any set of possible values can be mapped to integers
  code to randomly play Rock-Paper-Scissors:
  int r = rand.nextInt(3);
  if (r == 0) {
    System.out.println("Rock");
  } else if (r == 1) {
    System.out.println("Paper");
  } else {  // r == 2
    System.out.println("Scissors");
  }
Random **question**

- Write a program that simulates rolling of two 6-sided dice until their combined result comes up as 7.

  2 + 4 = 6  
  3 + 5 = 8  
  5 + 6 = 11  
  1 + 1 = 2  
  4 + 3 = 7  

  You won after 5 tries!

Random **answer**

```java
// Rolls two dice until a sum of 7 is reached.
import java.util.*;
public class Dice {
    public static void main(String[] args) {
        Random rand = new Random();
        int tries = 0;
        int sum = 0;
        while (sum != 7) {
            // roll the dice once
            int roll1 = rand.nextInt(6) + 1;
            int roll2 = rand.nextInt(6) + 1;
            sum = roll1 + roll2;
            System.out.println(roll1 + " + " + roll2 + " = " + sum);
            tries++;
        }
        System.out.println("You won after " + tries + " tries!");
    }
}
```
Random question

- Write a program that plays an adding game.
  - Ask user to solve random adding problems with 2-5 numbers.
  - The user gets 1 point for a correct answer, 0 for incorrect.
  - The program stops after 3 incorrect answers.

4 + 10 + 3 + 10 = 27
9 + 2 = 11
8 + 6 + 7 + 9 = 25
Wrong! The answer was 30
5 + 9 = 13
Wrong! The answer was 14
4 + 9 + 9 = 22
3 + 1 + 7 + 2 = 13
4 + 2 + 10 + 9 + 7 = 42
Wrong! The answer was 32
You earned 4 total points.

Random answer

```java
// Asks the user to do adding problems and scores them.
import java.util.*;

class AddingGame {
  public static void main(String[] args) {
    Scanner console = new Scanner(System.in);
    Random rand = new Random();
    // play until user gets 3 wrong
    int points = 0;
    int wrong = 0;
    while (wrong < 3) {
      int result = play(console, rand);  // play one game
      if (result == 0) {
        wrong++;
      } else {
        points++;
      }
    }
    System.out.println("You earned " + points + " total points.");
  }
}
```
public static int play(Scanner console, Random rand) {
    // Build one addition problem and presents it to the user.
    // Returns 1 point if you get it right, 0 if wrong.
    int operands = rand.nextInt(4) + 2;
    int sum = rand.nextInt(10) + 1;
    System.out.print(sum);
    for (int i = 2; i <= operands; i++) {
        int n = rand.nextInt(10) + 1;
        sum += n;
        System.out.print(" + "+n);
    }
    System.out.print(" = ");
    // Read user's guess and report whether it was correct
    int guess = console.nextInt();
    if (guess == sum) {
        return 1;
    } else {
        System.out.println("Wrong! The answer was "+total);
        return 0;
    }
}