YEAH Hours: Assignment 3

CS 106A
Summer 2018

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Parameters

Previously: Methods are a way of organizing and efficiently repeating identical blocks of code

```
private static final int SIZE = 5;

private void drawTriangle() {
    for(int i = 1; i <= SIZE; i++) {
        for(int j = 1; j <= i; j++) {
            print("*");
        }
        println();
    }
}
```

Parameters

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private static final int SIZE = 5;

private void drawTriangle() {
    for(int i = 1; i <= SIZE; i++) {
        for(int j = 1; j <= i; j++) {
            print("*");
        }
        println();
    }
}
```

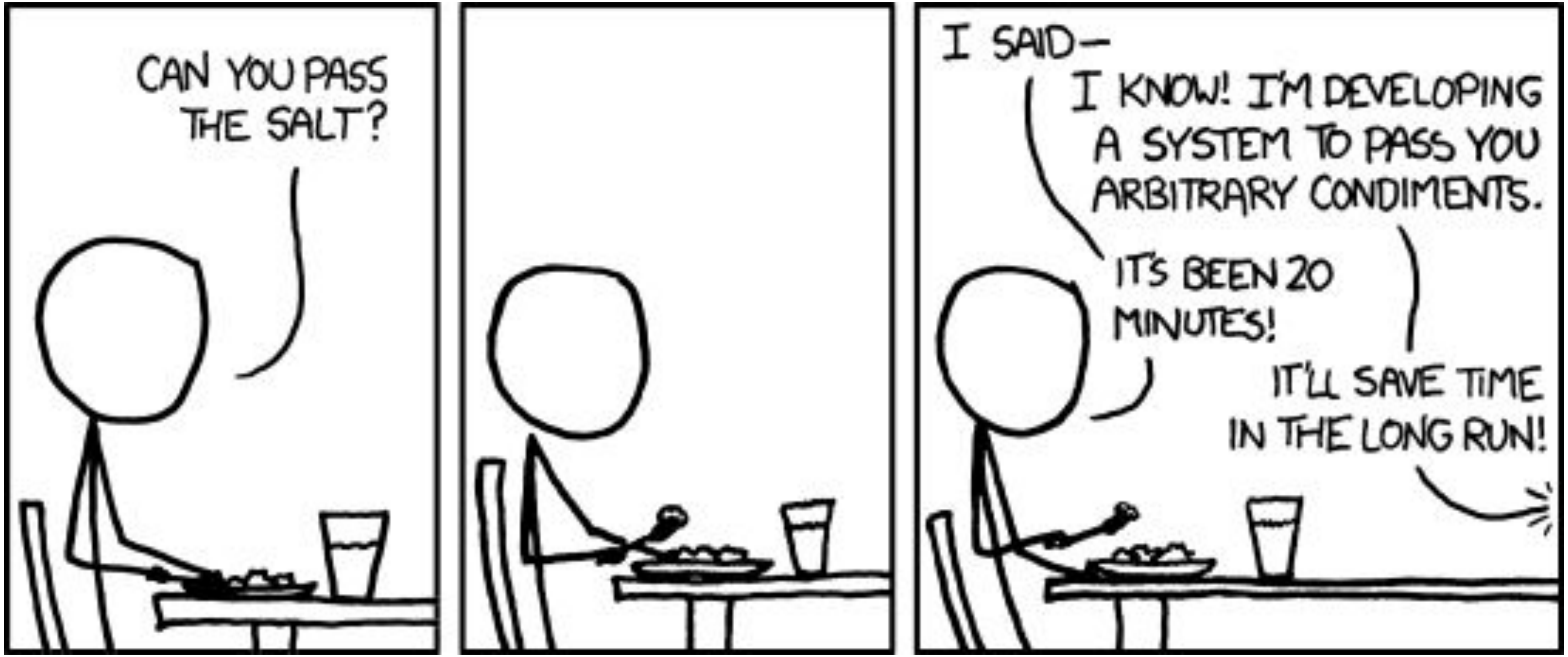
Now: Methods are a way of organizing and efficiently repeating similar blocks of code

```
private void drawTriangle(int size) {
    for(int i = 1; i <= size; i++) {
        for(int j = 1; j <= i; j++) {
            print("*");
        }
        println();
    }
}
```

Parameters

Key Question: When I do this task multiple times, what changes from one run to another?

Don’t Overthink It!


CAN YOU PASS THE SALT?
I SAID—
I KNOW! I'M DEVELOPING A SYSTEM TO PASS YOU ARBITRARY CONDIMENTS.
IT'S BEEN 20 MINUTES!
IT'LL SAVE TIME IN THE LONG RUN!

https://imgs.xkcd.com/comics/the_general_problem.png

Return Values

Previously: Calling a methods is like giving a command to the computer

```
private void foo(int x){
    println(2 * x);
}

public void run(){
    foo(2); //prints 4
}
```

Return Values

Previously: Calling a methods is like giving a command to the computer

```
private void foo(int x){
    println(2 * x);
}

public void run(){
    foo(2); //prints 4
}
```

Now: Calling a method can also be like asking a question to the computer

```
private int bar(int x){
    return 2 * x;
}

public void run(){
    int result = bar(2);
    println(result); //prints 4
}
```

Return Values - Things to Remember

- Returning is different from printing!
  - Sometimes, we want to do things with the result of an operation rather than immediately print them out (e.g. store them in a variable for later use).

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    - Sometimes, we want to do things with the result of an operation rather than immediately print them out (e.g. store them in a variable for later use).
- Methods can be both commands and questions!
    - Just because a method returns something doesn’t mean that it doesn’t also perform an action.

Return Values – Things to Remember

- Returning is different from printing!
  - Sometimes, we want to do things with the result of an operation rather than immediately print them out (e.g. store them in a variable for later use).
- Methods can be both commands and questions!
  - Just because a method returns something doesn’t mean that it doesn’t also perform an action.
- You are allowed to have multiple return statements in the same function!
  - Let’s see an example!

Example: Hailstone Revisited

```
public int nextHailstoneStep(int n) {
    if(n % 2 == 0) {
        return n / 2;
    } else {
        return 3 * n + 1;
    }
}
```

Note: With code that branches like this, make sure that every possible path eventually reaches a return statement. Otherwise, your code won’t compile!

Strings

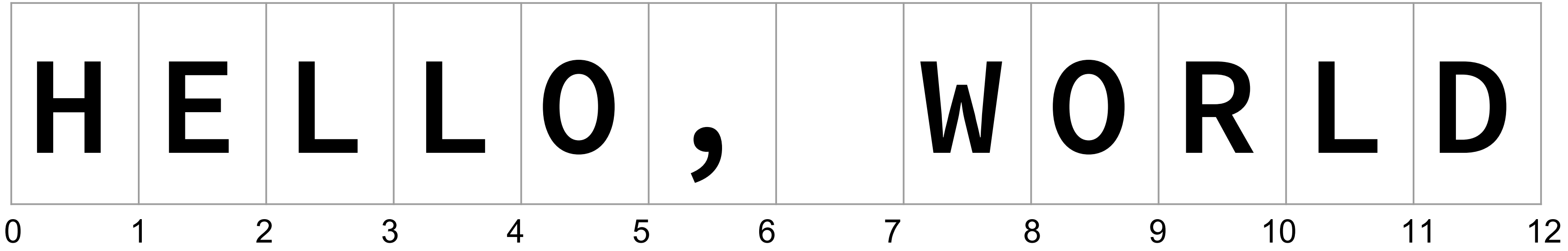
`int length()`	Returns the number of characters in the string
`char charAt(int index)`	Returns the character at **`index`**
`string substring(int begin)`	Returns the part of the string after index **`begin`**
`string substring(int begin, int end)`	Returns the part of the string between indices **`begin`** and **`end`**
`int indexOf(string str)`	Returns the *first* index where **`str`** appears in this string (or **`-1`** if not found)

`string toLowerCase()`
`string toUpperCase()`
	Returns an uppercase/lowercase version of the string

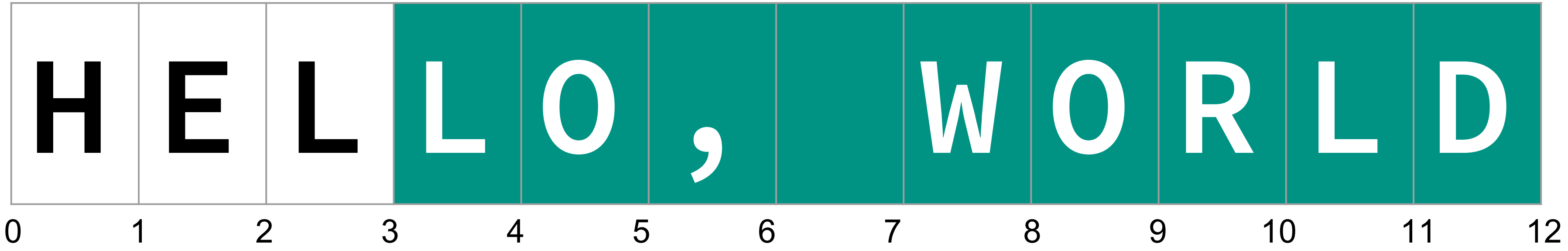
Note: All of these methods are called on a specific string!

```
String s = "Hello World!";
println(s.substring(1, 3));
```

String Indexing



String Indexing



```
s.substring(3, 12);
```

How I Remember It: Think of the indices as being at the bottom left of each character. The result of `substring(begin, end)` is the letters that are physically between `begin` and `end`.

Strings – Things to Remember

- Strings are immutable - they can’t be modified directly
  - If we want to modify a string, we need to build up a new version from scratch
- Make sure not to use indices beyond the end of the string - your program will crash if you do
- Useful paradigm: looping over the characters of a string:

```
for(int i = 0; i < s.length(); i++) {
    char c = s.charAt(i);
    //Do something with c
}
```

File IO

```
try {
    Scanner input = new Scanner(new File(“myfile.txt”));
    while(input.hasNext()) {
        String s = input.nextLine();
        println(s.toUpperCase());
    }
} catch (Exception e) {
    println(e.getMessage());
}
```

File IO

```
try {
    Scanner input = new Scanner(new File(“myfile.txt”));
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    }
} catch (Exception e) {
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}
```

File-reading code goes in a `try-catch` block in case something goes wrong while we’re accessing the file.

File IO

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    while(input.hasNext()) {
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} catch (Exception e) {
    println(e.getMessage());
}
```

We use a Scanner to read through a file line-by-line or token-by-token.

File IO

```
try {
    Scanner input = new Scanner(new File(“myfile.txt”));
    while(input.hasNext()) {
        String s = input.nextLine();
        println(s.toUpperCase());
    }
} catch (Exception e) {
    println(e.getMessage());
}
```

We can loop through a file by continually checking `input.hasNext()`, which returns a boolean indicating whether we’ve hit the end or not.

File IO

```
try {
    Scanner input = new Scanner(new File("myfile.txt"));
    while(input.hasNext()) {
        String s = input.nextLine();
        println(s.toUpperCase());
    }
} catch (Exception e) {
    println(e.getMessage());
}
```

We can get stuff out of the file by using methods like `next`, `nextLine`, and `nextInt`, then do whatever we want with it.

The Assignment: Snowman!

Assignment Logistics

- Due 11AM on Thursday, July 19th
- Partners are allowed, but you must work with someone from your section!
- Uses lecture material up through Wednesday, July 11th
- We give you the decomposition (though you're encouraged to decompose further if you see fit)

Task #0 – Introduction Message

- Requires writing the `intro` method
- Just prints an intro message to the console. You're all experts at this by now :)

```
CS 106A Snowman!
I will think of a random word.
You'll try to guess its letters.
Every time you guess a letter
that isn't in my word, a new
piece of the snowman appears.
Guess correctly to avoid
bringing him to life in the sun!
```

Task #1 – Single Game

1. Program presents user with a hint and tells them what they've guessed so far and how many guesses they have left

```
Secret word : ----------
Your guesses:
Guesses left: 8
```

Task #1 – Single Game

1. Program presents user with a hint and tells them what they've guessed so far and how many guesses they have left
2. User guesses a letter

```
Secret word : ----------
Your guesses:
Guesses left: 8
Your guess? r
```

Task #1 – Single Game

1. Program presents user with a hint and tells them what they've guessed so far and how many guesses they have left
2. User guesses a letter
3. Program tells user whether or not they were correct

```
Secret word : ----------
Your guesses:
Guesses left: 8
Your guess? r
Correct!
```

Task #1 – Single Game

1. Program presents user with a hint and tells them what they’ve guessed so far and how many guesses they have left
2. User guesses a letter
3. Program tells user whether or not they were correct
4. Repeat the process with a (possibly) new hint string

```
Secret word : ----------
Your guesses:
Guesses left: 8
Your guess? r
Correct!
Secret word : -R--R----R
Your guesses: R
Guesses left: 8
Your guess? s
Incorrect.
```

Task #1 – Single Game

1. Program presents user with a hint and tells them what they've guessed so far and how many guesses they have left
2. User guesses a letter
3. Program tells user whether or not they were correct
4. Repeat the process with a (possibly) new hint string
5. Keep going until the user runs out of guesses or loses

```
Secret word : ----------
Your guesses:
Guesses left: 8
Your guess? r
Correct!
Secret word : -R--R----R
Your guesses: R
Guesses left: 8
Your guess? s
Incorrect.
...
Secret word : PROGR-MMER
Your guesses: RSTPXONGYMDE
Guesses left: 2
Your guess? a
Correct!
You win! My word was "PROGRAMMER".
```

Task #1 – Single Game

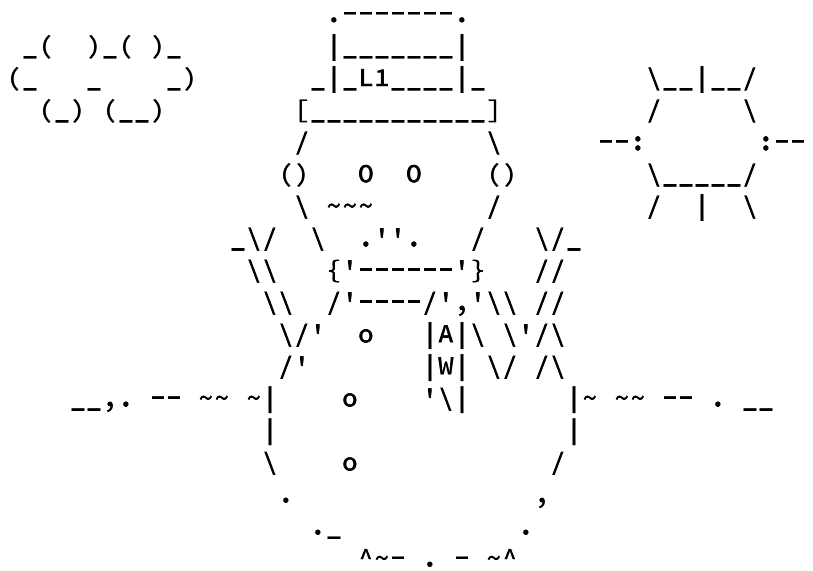
- Requires writing the `playOneGame` method
    - What other methods will you need to write in order to get `playOneGame` to work?
    - Once you've decided, consider writing (and testing) the smallest parts first, then building up to a complete solution
- How will you keep track of the guessed letters?
- For testing, you can print out the secret word before the game begins, so you know what it is you're trying to guess
- User input should be checked for errors (e.g. not a single character, already guessed) - reprompt if it's bad
- Creating the hint requires manipulating strings - good examples in Lecture 9

Task #2 – Display Snowman (ASCII Art)

- Requires writing the `displaySnowman` method
- ASCII art is located in files named `display0.txt` through `display8.txt`
- Use a `Scanner` to read the files:

```
Scanner input = new Scanner(
    new File("display0.txt"));
```

- Consult Lecture 10 for good examples of reading and displaying text files



Task #3 – Choosing Random Words

```
73
ABSTRACT
AMBASSADOR
... (70 lines omitted)
ZIRCON
```

Task #3 – Choosing Random Words

- Requires writing the `getRandomWord` method
- Algorithm to find a random word:
  - Find the number of words from the first line of the file
  - Pick a random line in the file
  - Advance the scanner to that line
  - Return whatever word you find
- Requires more file reading (see previous slide) and `RandomGenerators` (see Lecture 8)

```
RandomGenerator.getInstance().nextInt(min, max);
```

- `Scanner.nextLine()` behaves strangely when used with `nextInt()`. For this assignment, just use `next()` instead.
- You can use the `promptUserForFile()` to ask the user for a filename.

Task #4 - Multiple Games and Statistics

- When the game is over, ask the user if they want to play again
    - We already have a `playOneGame` method - how can we take advantage of that for this task?
    - Can use the `while-readBoolean` idiom:

      ```
      while (readBoolean("prompt text", "Y", "N")) { …
      ```
- Track statistics such as win rate and best game and display them at the end
    - Requires writing the `stats` method
    - Where should the variables to track these quantities go? What scope should they live in?
    - How do we know the results of a single game and communicate them across methods?

Common Pitfalls

- String comparison - remember to use `str1.equals(str2)`
- Remember not to change the parameters or return types of the given methods
- Off-by-one errors:
  - `RandomGenerator.nextInt(low, high)` is inclusive
  - `String.substring(begin, end)` is inclusive at the beginning and exclusive at the end
- No instance variables are allowed - it is 100% possible to do all the required tasks without them