1. Open Visual Studio Code
2. At the top click on View->Integrated Terminal (if not already open)
3. In the terminal, first run: `npm run pull`
4. After this finishes run: `npm start`

For Loops
Lecture 14

“…Baby One More Time”
Announcements

• PS3 due Thursday

• Quiz on Friday

• Office hours close at 12pm on Friday
4. Given the code below, suppose the user inputs 4 and then “hey” (without quotes).

```javascript
let s: string[] = [“2”, “a”, “b”, “c”];
s[0] = “a”;
let x: number = await promptNumber(“A”);
let y: string = await promptString(“B”);
s[1] = s[0] + x;
s[2] = y + y;
s[x] = “hi”;
print (s.length);
```

(a) What will be the screen output?
Today: A second style of loop statement...

• The **while** loop statement is the most flexible and powerful kind of loop at our disposal.

• However, it's easy to accidentally write infinite loops.

• Today we'll learn the **for** loop statement.
#TBT: Writing a while loop that repeats a specific number of times.

• Repeating a task a specific number of times is a very common task in computing.

• You will see this all semester.

• Three keys:
  1) Declare a counter variable and initialize it to 0.
  2) The loops test will check that the counter variable is less than the # of times you want to repeat
  3) Don't forget! The last step of the repeat block is incrementing your counter variable.

```javascript
let i: number = 0;
while (i < ___) {
    // Do Something Useful
    i = i + 1;
}
```
The **for** Loop Statement

• General form:

```
for ( <variable initialization> ; <boolean test> ; <variable modification> ) {
    <repeat block>
}
```

1. Counter variable is initialized
2. Boolean test is evaluated
   True? – 3. Repeat block is entered and runs.
   Finally, loop back to step #2.

False? – 5. Skip repeat block and loop is complete.
The **for** Loop Statement

• General form:

```typescript
for ( let i: number = 0 ; i < 10 ; i = i + 1 ) {
  <repeat block>
}
```

1. Counter variable is initialized
2. Boolean test is evaluated
   - True? – 3. Repeat block is entered and runs.
     - Finally, loop back to step #2.
   - False? – 5. Skip repeat block and loop is complete.
Follow-along: **for** Loop Example

• Open lec14 / 00-for-loops-app.ts

```typescript
print("For Loop Examples");
for (let i: number = 0; i < 10; i = i + 1) {
    print(i);
}
```
What's so great about a for loop?

• Special syntax for the common while loop pattern using a counter variable
  • *But to the computer, each is exactly the same!*

• For us as human programmers, the `for` loop syntax has two benefits:

  1. You are *much* less likely to accidentally write an infinite loop

  2. The counter variable is only defined within the for-loops repeat block
     • This means you can have a sequence of for loops that each use, say *i*, as the counter variable.

• Generally, once the syntax is familiar, for-loops are less human-error prone
Practice: Part A: What is printed to the screen

```javascript
for (let i: number = 3; i > 0; i = i - 1) {
  print((i + 1) + "!");
}
```

Part B: What is the value of `i` when the loop terminates?
Syntax Shortcuts

• Adding one to a variable (incrementing) is super common
  • Programmers are lazy

• Increment
  
  \[ i = i + 1; \rightarrow i++; \]

• Decrement
  
  \[ i = i - 1; \rightarrow i--; \]

• Very commonly used in loops
Hands On: Weather Stats

• We will all become amateur weather[wo]men today!

• And get some hands on experience working with real world data

• Step 1: Code Walk - lec14 / 01-weather-app.ts and lec14 / 01-weather-helper.ts
Hands On: Weather Stats Part 1

1. Using a `for` loop compute the total precipitation for Spring 2017
   1. Loop over each element in the precipitation array
   2. Add the rainfall for that day to the `sum` variable

2. Print the total rainfall (stored in `sum`)

3. Check in on pollev.com/compunc when finished!

```java
for ( <variable initialization> ; <boolean test> ; <variable modification> ) {
    <repeat block>
}
```
Hands On: Weather Stats Part 1

```javascript
// Part 1: Compute the total rainfall for Spring 2017

let sum = 0;
// TODO: Compute sum
for (let i = 0; i < precipitation.length; i++) {
    sum += precipitation[i];
}
print("Total rainfall for Spring 2017 was: " + sum);
// ---------------------------- //
```
Hands On: Weather Stats Part 2

• The array `dailyHighs` contains the daily high temperature for every day in Spring 2017

1. Find the record high temperature for Spring 2017
   1. Loop over each element in the `dailyHighs` array
      2. `if` the daily high temperature at the current index is greater than `maxTemp`, assign `maxTemp` to be the temperature at that index

2. Print the `maxTemp`

3. Check in on pollev.com/compunc when finished!
Hands On: Weather Stats Part 2

```javascript
// Part 2: Compute the highest temperature recorded for Spring 2017

let maxTemp = 0;
// TODO: Find max
for (let i: number = 0; i < dailyHighs.length; i++) {
    if (dailyHighs[i] > maxTemp) {
        maxTemp = dailyHighs[i];
    }
}

print("The highest temperature in Spring 2017 was: " + maxTemp);
```
Hands On: Weather Stats Part 3

• The array `dailyLows` contains the daily low temperature for every day in Spring 2017

1. Find the **average** low temperature for Spring 2017
   • Formula for average: \( \frac{x_1 + x_2 + x_3 + \cdots + x_n}{n} \)

2. Print the `averageLowTemp`

3. Check in on pollev.com/compunc when finished!
// Part 3: Compute the average low temperature

let averageLowTemp = 0;
// TODO: Find average low
for (let i: number = 0; i < dailyLows.length; i++) {
    averageLowTemp = averageLowTemp + dailyLows[i];
}

averageLowTemp = averageLowTemp / dailyLows.length;
print("The average daily low temperature in Spring 2017 was: "+ averageLowTemp);
Practice: What is printed to the screen

```javascript
for (let i: number = 0; i < 2; i++) {
  for (let h: number = 0; h < 2; h++) {
    print("go");
  }
  print("heels");
}
```