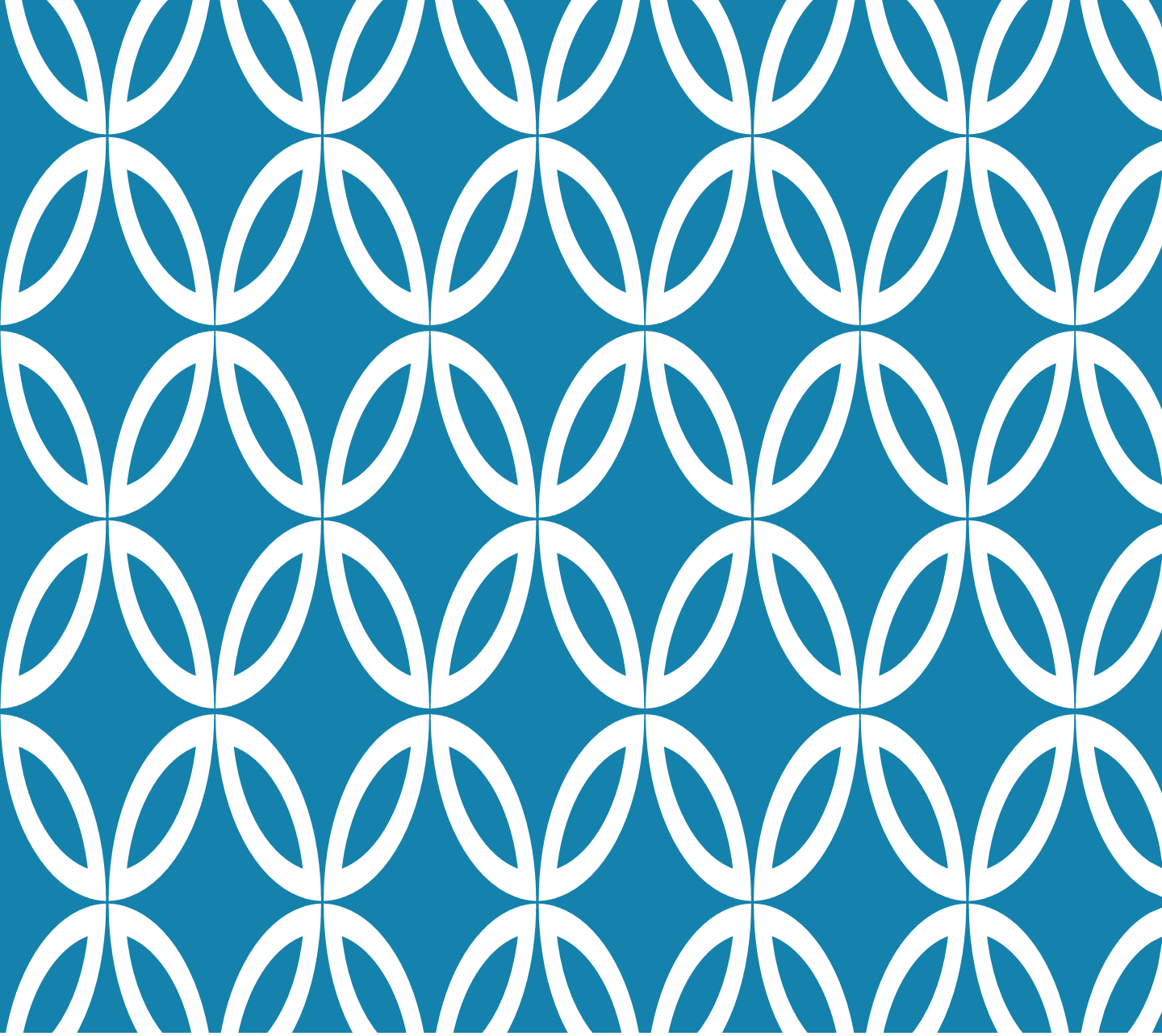


INTRO TO JAVASCRIPT

Basic Syntax

GOALS FOR TODAY

Today we want to learn about:

- Fundamental programming structures
- Basic JS Syntax
- Drawing functions (lines, rectangles, circles, etc.)
- Program design
- More pedagogy techiques

We will apply that knowledge to a simple game

GET READY

- Be sure you have the files (downloaded yesterday)
  - A solutions zip will be provided after you submit post-work
- Let's pick partners

CYNDI THE ROBOT

Commands:

- Take one step
- Turn right
  - 45 or 90 degrees
- Lift hand

Your task: Get me to touch the classroom door

FUNDAMENTAL PROGRAMMING OPERATIONS

Sequence

Actions performed one after the other

Repetition

Repeated actions

We call these **LOOPS.** We'll cover two types.

Selection

Decision (select action based on current situation)

Uses an IF STATEMENT

ALGORITHM – step by step process to solve a problem

EXERCISE

Fill out the Ratings Worksheet

As you do, think about sequence, selection and repetition.

LET'S PROGRAM IT - JAVASCRIPT

VARIABLE

Place in the computer's *memory* to hold data with a specific purpose

Variables have a name, such as:

- `average, list1, my_list, myList`
- `avg` is NOT the same as `Avg` (**CASE SENSITIVE**)

ASSIGNMENT

Variables contain values

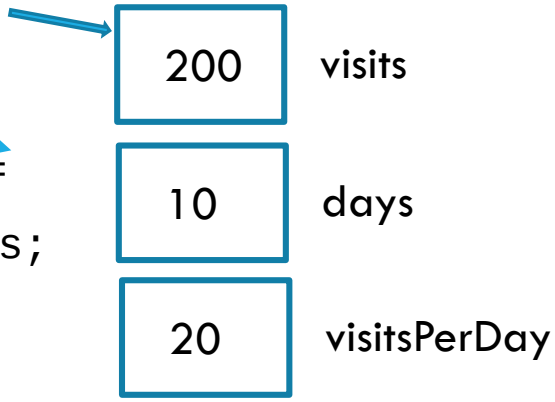
We **ASSIGN** a value with =

This is *NOT* the same as math equality

DECLARATION

KEYWORD (var)

```
var visits = 200;
var days = 10;

var visitsPerDay =
      visits / days;
```



https://www.w3schools.com/js/js_variables.asp

MATH IS EASY IN JAVASCRIPT

```
var cost = 20;
var tickets = 5;
var total = cost * tickets;

var day1 = 5;
var day2 = 30;
var totalVisits = day1 + day2;
var increase = day2 – day1;
total =  (day1 + day2) * cost;
```

We commonly need to *increment* a value (add 1 to it)

```
totalVisits++; // another visitor arrives
```

QUICK EXERCISE

On the back of your worksheet, write 3 lines of code to:

DECLARE a variable to represent the number of tickets sold so far, and **ASSIGN** it the value 40

DECLARE a variable to represent the maximum tickets available, and **ASSIGN** it the value 120

DECLARE a variable to represent the number of tickets remaining, and **ASSIGN** it the correct value using a MATH operation

DON'T LOOK AHEAD!

Don't write too big, we'll write/draw more throughout this lesson

ANSWER

Your variable names may differ!

```
var ticketsSold = 10;
var maxTickets = 120;
var ticketsRemaining =
     maxTickets – ticketsSold;
```

Pedagogy sidebar:

- camelCase is recommended for JS
- Some languages use snake_case
- Use abbreviations consistently
- Discourage 1-letter names unless really obvious (e.g., x, y)
- Common novice mistake: hard-code values (e.g., var tR = 120 – 40;)
- Guide students from concrete to abstract (i.e., maxTickets-ticketsSold NOT 120-1)

MULTIPLE VALUES - ARRAYS

Notice that each site has a list of reviews.

Could do:

```
var review1 = 2;
var review2 = 3;
var review3 = 2;
var review4 = 4;
```

DISCOURAGE THIS! What's an issue with this?

Instead, use an **ARRAY**.

```
var site1Reviews = [2,3,2,4];
```

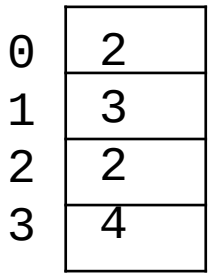
One list with all the values. To access, need the list AND a selector, which we call an **INDEX**.

Pedagogy sidebar: Some students prefer this type of lecture on a white/chalk board. Slows it down, easier to follow.
Advantage of ppt: available for later review

DOES SITE 1 OR SITE 2 HAVE THE MOST REVIEWS?

```
var site1Reviews = [2,3,2,4];
```

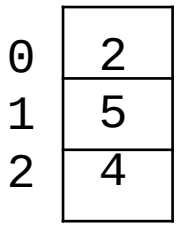
Declares the array, sets the values



site1Reviews

```
var count = site1Reviews.length;
```

length is the number of elements



SELECTION. Which site has most reviews?

site2Reviews

```
var site2Reviews = [2,5,4];
```

```
if (site1Reviews.length > site2Reviews.length) {
    alert("site 1 has most reviews");
} else {
    alert("site 2 has most reviews");
}
```

What would be displayed if both sites had 4 reviews?

IF-STATEMENT SYNTAX DETAILS

```
if (condition) {
    what to do if it's true;
} else {
    what to do if it's false;
}
```

condition needs to evaluate to a **Boolean** value (true or false)

else statement(s) are optional (can have just if)

{ } only required if multiple actions… BUT it's good practice to always use.

```
if (condition) {
    what to do if it's true;
} else if (condition2) {
    what to do if 2nd condition true;
} else {
    what to do if neither is true;
}
```

https://www.w3schools.com/js/js_if_else.asp

QUICK EXERCISE

- Continue on the back of your paper
- Write an if/else that will display “Sell more!” if the # of tickets remaining is > 100 and “Order more!” if the # of tickets remaining is < 20
- Just use an alert to display the message

- What will happen with your code if tickets remaining is 60? Is that OK?

SOLUTION

```
if (ticketsRemaining > 100) {
  alert("Sell more!");
} else if (ticketsRemaining < 20) {
  alert("Order more!");
}
```

CALCULATE THE AVERAGE REVIEW RATINGS FOR SITE 1

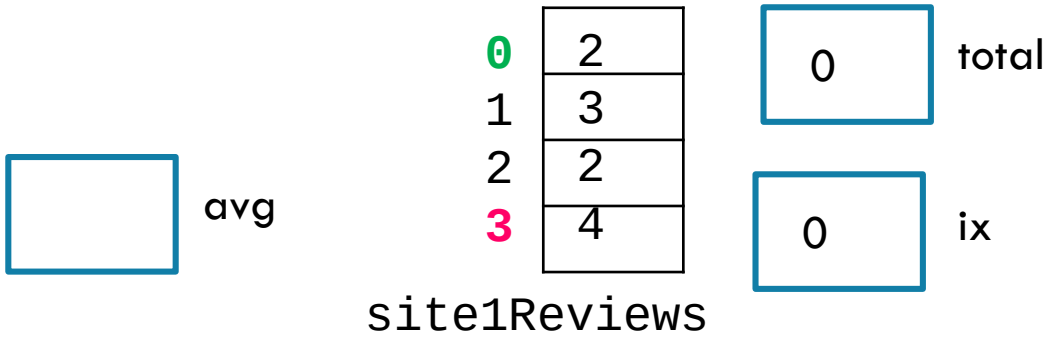
```
var site1 = [2,3,2,4];
// Access first "slot" in array
var firstValue = site1[0];

// Access last "slot" in array
var lastValue = site1[site1.length - 1];

// Calculate average, access each slot in order
var total = 0;
for (var ix = 0; ix < site1Reviews.length; ix++)
{
    total = total + site1Reviews[ix];
}
var avg = total / site1Reviews.length;
```

Let's **TRACE** this!

PRETEND YOU'RE THE COMPUTER

"Execute" each line of code in order

On the board, create boxes for each variable



FOR-LOOP SYNTAX DETAILS

```
for (statement 1; statement 2; statement 3) {
  // code block to be executed
}
```

Statement 1 is executed (one time) before the execution of the code block.
Statement 2 defines the condition for executing the code block.
Statement 3 is executed (every time) after the code block has been executed.

https://www.w3schools.com/js/js_loop_for.asp

QUICK EXERCISE – SIMPLE ARRAY

- Edit the file JavaScriptArrayExercise.html
- Find the smallest value in the given array
- Hint: what actions will be the same as the average calculation? What actions will be different?

- `console.log` displays the result in the Browser console (often more convenient/less irritating that alert)
- `"title/prompt " + variableName`
- `"Smallest value: " + smallest`
- Remember Web Developer Tools from yesterday

Pedagogy sidebar: Programmers make extensive use of examples (entire sites devoted to examples of how to achieve various tasks).

Research shows that effective use of examples is a trait of high performing students – but it's a skill that's often not taught! What code is similar to this exercise?

QUICK EXERCISE - SOLUTION

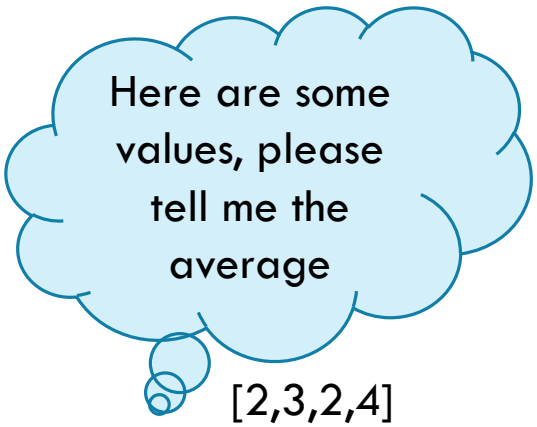
```
var a = [2,3,-5,4];
// common error: initialize to 0
var smallest = a[0];


/*
Since we've "used" slot 0, start loop with ix=1
*/
for (var ix = 1; ix < a.length; ix++) {
    if (smallest > a[ix]) {
        smallest = a[ix];
    }
}
console.log("The smallest value is: "  + smallest );
```

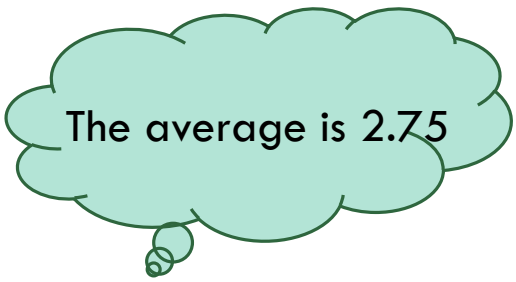
CALCULATE THE AVERAGE REVIEW RATINGS FOR BOTH SITES

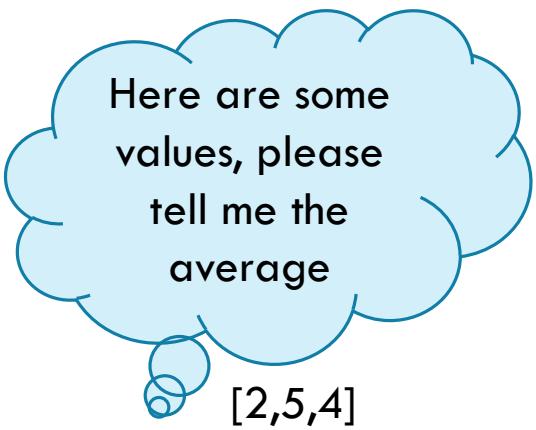
```
var site1Reviews = [2,3,2,4];
var site2Reviews = [2,5,4];

// Calculate the average for site 1
var total = 0;
for (var ix = 0; ix < site1Reviews.length; ix++)
{
    total = total + site1Reviews[ix];
}
var site1Avg = total/site1Reviews.length;
console.log("Average for site 1 is " + site1Avg);

// Calculate the average for site 2
total = 0;
for (var ix = 0; ix < site2Reviews.length; ix++)
{
    total = total + site2Reviews[ix];
}
var site2Avg = total/site2Reviews.length;
console.log("Average for site 2 is " + site2Avg);
```

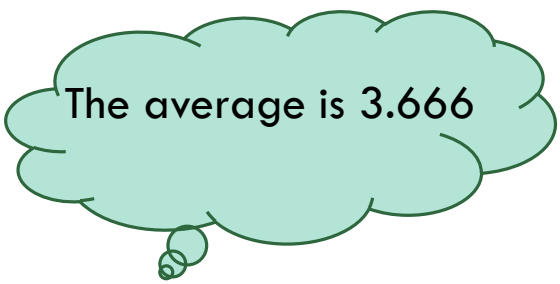
What do you notice about these two blocks of code?
What problems might occur in writing this code?
DRY – Don't Repeat Yourself

BETTER TO USE A FUNCTION









AVERAGE CALCULATION WITH FUNCTION

```
var site1Reviews = [2,3,2,4];
var site2Reviews = [2,5,4];

// Calculate the average for site 1
var avg = calcAvg(site1Reviews);
console.log("Average for site 1 is " + avg);

// Calculate the average for site 2
avg = calcAvg(site2Reviews);
console.log("Average for site 2 is " + avg);

function calcAvg(values) {
      var total = 0;
      for (var ix = 0; ix < values.length; ix++) {
            total = total + values[ix];
      }
      return total/values.length;
}
```

PARAMETER/ ARGUMENT

FUNCTION NAME

Let's TRACE this!

SYNTAX FOR FUNCTIONS

FUNCTION DEFINITION

```
function functionName(parm1, parm2) {
        JAVASCRIPT CODE– DOES THE WORK
        return calculatedValue;
}
```

- return does not need to return a value. Sometimes the function just does an action. Quick Exercise next.

FUNCTION CALL

```
var myVar = functionName(p1, p2);
```

- Order of the parameters must match (p1 becomes the value for parm1, etc. Can be very confusing at first, use descriptive names to make it clear)
- Parameter can be a literal value (e.g., 10)

https://www.w3schools.com/js/js_functions.asp

QUICK EXERCISE – SIMPLE FUNCTION

Update your array program

- Create a second array
- Move the “smallest” calculation into a function
- Call the function with each array
- Have the function display the value using console.log (i.e., no “return” statement)

QUICK EXERCISE - SOLUTION

```
var theArray = [2,3,-5,4];
smallestValue(theArray);
smallestValue([8,1,9,3]); // notice literal

function smallestValue(a) {
     var smallest = a[0];
     for (var ix = 1; ix < a.length; ix++) {
          if (smallest > a[ix]) {
               smallest = a[ix];
          }
     }
     console.log("The smallest value is: "
          + smallest );
     return; // optional - no value returned
}
```

WHAT ABOUT SITE 3?

Need to handle the case where there are no values.

```
function smallestValue(a) {
      if (a.length == 0) {
            console.log("No values in list");
            return;
      }
      var smallest = a[0];
      for (var ix = 1; ix < a.length; ix++) {
            if (smallest > a[ix]) {
                  smallest = a[ix];
            }
      }
      console.log("The smallest value is: "
           + smallest );
      return; // optional
}
```

Pedagogy sidebar: These cases are *very* important for professionals. Are HS students ready to think about this?

WAYS TO EXTEND THIS EXERCISE – TOPICS NOT COVERED

- How to create a new array
- How to add values to an array
- How to "sort" the array (put it in order)
- Other decisions (e.g., assign a smiley face if average rating > 3, a frowny face otherwise)
- How to create "bins" for the ratings (i.e., # of 5-star, # of 4-star, etc.).