**Lesson 5 - Calculator:**

| **Title of Unit** | Foundations | **Grade Level** | 11-12 |
| --- | --- | --- | --- |
| **Subject** | Mobile App Development | **Time Frame** |  |
| | **Description** | Objects are a *very* important part of the JavaScript language, and while for the most part you can accomplish simple and even intermediate tasks without worrying about them, any real project that you’re going to attempt is going to feature Objects. The uses of Objects in JavaScript can get deep relatively quickly, so for the moment we’re only going to cover the basics. There’ll be an in-depth dive later. | | --- | --- | | | | |
| **Stage 1 - Identify Desired Results** | | | |
| **Learning Outcomes**  What relevant goals will this unit address? | | | |
| Computer and Information Sciences, General.  **CIP#**: 11.0101  Pathway Competencies   * **Algorithms & Programming**: | | | |
| **Enduring Understandings** | | **Essential Questions** | |
| *Students will understand that…*   * *To understand the basic theory behind object-oriented programming how this relates to JavaScript ("everything is an object"), and how to create constructors and object instances.* * *Arrays are mutable, or changeable* | | *Content specific….* | |
| **Knowledge:** | | **Skills:** | |
| *Students will know how to...* | | *Students will be able to…*   * *Create objects to store various related properties in one variable.* * *Access or change properties of an object using both “bracket notation” and “dot notation”.* * *Create arrays where each element is an object.* * *Iterate through an array of objects using a for loop.* * *Create arrays to store a sequence of values in one variable.* * *Access or change elements of an array using “bracket notation”.* * *Add elements to an array using the push() method.* * *Iterate through an array using a for loop.* | |

| **Stage 2 – Assessment Evidence** | | |
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| **Performance Task** | | |
| **PROJECT: CALCULATOR****Introduction** You made it! By now you should have a *really* firm grasp on the fundamentals of JavaScript. Of course there’s plenty more to learn, but you should be able to create quite a bit at this point. Our final project is going to combine everything you’ve learned so far: you’re going to make an on-screen calculator using JavaScript, HTML, and CSS.  As usual with these things, there are elements of this project that are not going to be trivially easy for you, but if you’ve been following the course so far, you definitely have everything you need to finish it. We’re going to walk you through the various steps you can take, but again, how you actually implement them is up to you!  Important Note: Before you get started with this calculator project, we need to cover a word of warning. As you look into how to evaluate complex mathematical statements in JavaScript, you will likely come across the tantalizing [eval()](https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/eval) function. However, this function can be very dangerous and [should not ever be used](https://developer.mozilla.org/en-US/docs/Web/JavaScript/Reference/Global_Objects/eval#Never_use_eval!)! You’ll need to build your own functions to evaluate expressions as part of this calculator project. On the same note, when researching how to calculate expressions for this project, you may encounter solutions that suggest that you return a new Function() that evaluates a string. Similarly to eval(), this should not be used [due to potential pitfalls of evaluating insecure data](https://stackoverflow.com/questions/4599857/are-eval-and-new-function-the-same-thing). Besides, where’s the fun in solutions that do all the work for you? Let’s get to it! | | |
| **Other Evidence** | | **Student Self-Assessment** |
| * Assignment | | * Reflection |

| **Stage 3 – Learning Plan** | | | | |
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| * Activity 1 - Javascript Fundamentals Part 5 * Project 5: Calculator | | | | |
| **How will you engage students at the beginning of the unit? (motivational set)** | | | | |
| **JAVASCRIPT FUNDAMENTALS PART 5****Objects** Objects are a *very* important part of the JavaScript language, and while for the most part you can accomplish simple and even intermediate tasks without worrying about them, any real project that you’re going to attempt is going to feature Objects. The uses of Objects in JavaScript can get deep relatively quickly, so for the moment we’re only going to cover the basics. There’ll be an in-depth dive later.   1. [This JavaScript.info](http://javascript.info/object) article is the best place to get started with Objects. 2. [The MDN tutorial](https://developer.mozilla.org/en-US/docs/Learn/JavaScript/Objects/Basics) isn’t bad either, so check it out if you need another take on the subject. | | | | |
| **#** | **Lesson Title** | **Lesson Activities** | **CCCs** | **Resources** |
| 1 | Activity 1 - Javascript Fundamentals Part 5 | **Practice** You have been through a *ton* of content, and it would not be surprising if you were feeling rather overwhelmed at this point. Let’s take a little time to slow down and practice this stuff with more coding exercises. I’ll warn you now: some of these get pretty difficult, but if you’ve done the lessons you should have covered everything you need to know to solve them. Don’t be afraid to go back and review if you find that you can’t remember something, that’s part of the process. If you get stuck, come join us in the chatroom! **Assignment** At this point you just need a little more practice! Go back to the [JavaScript exercises](https://github.com/TheOdinProject/javascript-exercises) that we introduced in the Fundamentals 4 project and complete the following:   * calculator * palindromes * fibonacci * getTheTitles * findTheOldest * (Solutions for these exercises can be found in the ‘solutions’ branch of that repo) |  |  |
| P5 | Project 5: Calculator | **Assignment** Here are some use cases (abilities your project needs to have):   1. Your calculator is going to contain functions for all of the basic math operators you typically find on simple calculators, so start by creating functions for the following items and testing them in your browser’s console.    1. add    2. subtract    3. multiply    4. divide 2. Create a new function operate that takes an operator and 2 numbers and then calls one of the above functions on the numbers. 3. Create a basic HTML calculator with buttons for each digit, each of the above functions and an “Equals” key.    1. Do not worry about wiring up the JS just yet.    2. There should also be a display for the calculator, go ahead and fill it with some dummy numbers so you can get it looking right.    3. Add a “clear” button. 4. Create the functions that populate the display when you click the number buttons… you should be storing the ‘display value’ in a variable somewhere for use in the next step. 5. Make the calculator work! You’ll need to store the first number that is input into the calculator when a user presses an operator, and also save which operation |  |  |

| **Stage 4 - Assess and Reflect** | |
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| **Considerations** | **Comments** |
| **Is there alignment between outcomes, performance assessment and learning experiences?** |  |
| **Have I made purposeful adjustments to the curriculum content (not outcomes), instructional practices, and/or the learning environment to meet the learning needs and diversities of all my students?** | For struggling students:                    For students who need a challenge: |
| **Do I use a variety of teacher directed and student centered instructional approaches?** |  |
| **Do the students have access to various resources on an ongoing basis?** |  |
| **Have I nurtured and promoted diversity while honoring each child’s identity?** |  |