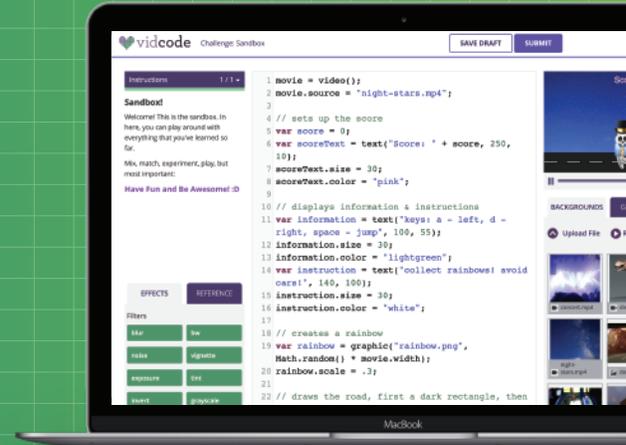




Computer Science Pathway

Computer Science 101-601



Course-level Scope and Sequence

Course	Theme	Concepts
CS 101	What does it mean to be a programmer?	Sequence, functions & arguments, objects & properties, variables, arrays
CS 201	Programmer culture: sharing, commenting, iteration	Loops, randomness, conditionals, operators
CS 301	Handling user interaction is an important part of programming!	Event listeners, logical operators, loops, functions
CS 401	With user input, the possibilities are endless!	String manipulation, parameters, simulations, combining control structures
CS 501	Object-oriented programming	Objects, object constructors, properties, methods
CS 601	Program computers to make their own decisions with algorithms and data structures	Nested loops and conditionals, data structures, decision trees, heuristics

Overview

In Vidcode's Computer Science Pathway, students learn the fundamental concepts of computer science and the basics of JavaScript programming. In the course students use code to enhance and personalize visual media while learning about programmer culture. Students are encouraged to identify as a programmer and explore creative uses of programming tools. Through completing various creative projects, students gain mastery of programming and problem-solving skills applicable across disciplines.

The Computer Science Pathway covers concepts and practices of computer science set by the K-12 Computer Science Framework and the Computer Science Teachers Association, as well as the Common Core Standards for Mathematical Practice and Next Generation Science Standards (NGSS) For Middle School Engineering Design. Special emphasis is given in this course to concepts in programming and the cultural and societal impact of computers and digital media. Students learn about different data structures for organizing data, combining control structures for completing complex tasks, breaking complex tasks into smaller ones, and using abstraction to avoid repetition in writing code. Students also engage in program development and learn about design processes. Since the course has students use these concepts to create works of digital media, an essential part of the course is its discussion of how digital media impacts culture and the relation between creating versus consuming media.

These concepts are taught through JavaScript, a web programming language used in a wide variety of applications. Students learn the syntax for creating and calling functions, as well as for creating instances of objects and accessing their properties and methods. Students also learn to create simple loops to repeat code and use conditionals to add complexity to their programs.

Each unit consists of **tutorials** that guide students in creating projects that require new skills, **challenges** which reinforce skills students have already learned and help students make connections between concepts covered in tutorials, and **final projects** which task students with building a creative project that combines the skills they have learned in the unit. Vidcode also provides **assessments** to test students' ability to recognize what a given piece of code does and accurately describe computer science concepts.

The Computer Science Pathway is an entry point for our sequence of courses for students grades 6–12. By the completion of Computer Science 601, students will be ready for an Advanced Placement Computer Science Principles course.

Computer Science 101

	Activity	Big Idea	Programming Concepts	Content	Time
1.	Tutorial: Create a Filter	You are a programmer!	Functions, Arguments	Filters/Effects, Calling a function, passing arguments	60 mins
2.	Challenge: Re-create a Filter	Sequence is the order your program does things and it is important!	Sequence, Data Types	Review functions and arguments	60 mins
3.	Challenge: Digital Quilt	With the precision of programming you can make something unique!	Functions, filters, and values	Review functions and arguments	60 mins
4.	Tutorial: Make a Meme	JavaScript is made up of objects that have properties and methods.	Objects, Properties, Methods	Graphics, text, creating a variable, setting properties, coordinate plane	60 mins
5.	Challenge: Doge Meme	Variables are a way of controlling objects by using their names.	Variables, Coordinates	Review of objects and properties	60 mins
6.	Tutorial: Snapchat Filter	Relative positioning and math makes your program flexible.	Objects, Properties, Methods, Global Values	Graphics, text, creating a variable, setting properties, coordinate plane	60 mins
7.	Tutorial: Doodle Augmented Reality	There's more than one way to do it.	Coordinates	Drawing, Program Development	60 mins
8.	Assessment 1		Functions, Arguments, Variables		30 mins
9.	Puzzle: Wandering Crab		Properties, Debugging	Debug a broken program using properties	30 mins
10.	Tutorial: Stop Motion	Arrays keep things in order.	Syntax, Arrays	Stop Motion, initializing an array	60 mins
11.	Tutorial: Famous Filters	Variables and arrays are two ways of keeping track of data.	Arrays, Iteration	Creating an array variable, indexing an array, passing variables as arguments	60 mins
12.	Challenge: Variable Emotions	Arrays are like lists!	Arrays, Indices, Variables as arguments	Review of arrays, indices, properties and coordinates	60 mins
13.	Tutorial: #Pride	Arguments to a function can set properties.	Functions, Arguments, Objects, Properties	Create shape objects and change their properties using arguments and dot notation.	60 mins
14.	Challenge: True Colors	Variables and arrays store data so we can change it.	Variables, Arrays, Abstraction	Using variables and arrays to make programming more efficient.	60 mins
15.	Tutorial: Surprise Emoji	Randomness is a mathematical surprise, and it's important.	Randomness, Math object	Math.random, array.length, Choosing a random number with a range	60 mins
16.	Challenge: Magic 8 Ball	Randomness can be applied to problems in the real world.	Randomness, Math object, Sequencing	Math.random, array.length, Choosing a random number with a range	60 mins
17.	Assessment 2		Arrays, Variables, Objects		30 mins
18.	Puzzle: Favorite Gif		Arrays, Debugging	Debug a project using what you know about JS syntax	30 mins
19.	Final Project: Digital Card		Review of CS 101 Concepts	Students use images, a clip of themselves, a song, and a graphic to code their own e-card for someone else.	120-240 mins

Computer Science 201

	Activity	Big Idea	Programming Concepts	Content	Time
1.	Tutorial: Doodle SFX Magic	Loops make your code repeat.	Loops	Filters/Effects, Calling a function, passing arguments	60 mins
2.	Tutorial: Film Transition	Operators make changes to variables.	Review variables, Operators	Review functions and arguments	60 mins
3.	Tutorial: Sad Song	Comments let you put notes in your code.	Commenting	Review functions and arguments	60 mins
4.	Challenge: Love on Top	Loops and operators work great together!	Variables, loops, operators	Graphics, text, creating a variable, setting properties, coordinate plane	60 mins
5.	Challenge: Get the Message	You can change properties gradually with loops and operators.	Variables, loops, operators	Review of objects and properties	60 mins
6.	Tutorial: Animoji	The modulo operator makes your counting wrap around, like a clock.	Review operators, iteration, Modulo	Graphics, text, creating a variable, setting properties, coordinate plane	60 mins
7.	Tutorial: Animate a Rainbow	Decimal is not the only way of counting: hexadecimal is base 16.	Hexadecimal values	Drawing, Program Development	60 mins
8.	Assessment 1		Loops, Operators, Properties		30 mins
9.	Puzzle: Clocks		Modulo, Debugging	Debug a broken program using properties	45 mins
10.	Midterm Project: Then and Now		Review Concepts	Stop Motion, initializing an array	120-240 mins
11.	Tutorial: The News	A conditional checks IF something is true.	Conditionals (if statements), Loops	Creating an array variable, indexing an array, passing variables as arguments	60 mins
12.	Tutorial: Started from the Bottom	You can do more with conditionals!	Conditionals (if statements), Loops, Operators	Review of arrays, indices, properties and coordinates	60 mins
13.	Tutorial: SFX Lasers	The opposite of IF is ELSE.	Conditionals (if, else statements)	Create shape objects and change their properties using arguments and dot notation.	60 mins
14.	Challenge: Conditional Surprise	Conditionals let you add surprises!	Review of Conditionals (if, else statements)	Using variables and arrays to make programming more efficient.	60 mins
15.	Tutorial: Heartbeat	Loops and conditionals together give you great power.	Review Conditionals	Math.random, array.length, Choosing a random number with a range	60 mins
16.	Challenge: Galactic Message	Loops can do multiple things at once.	Conditionals, properties, coordinates	Math.random, array.length, Choosing a random number with a range	60 mins
17.	Assessment 2		Conditionals		30 mins
18.	Puzzle: Ten Boxes		Loops, debugging	Debug a project using what you know about JS syntax	45 mins
19.	Final Project: Karaoke		Review of CS 201 Concepts	Students use images, a clip of themselves, a song, and a graphic to code their own e-card for someone else.	120-240 mins

Computer Science 301

	Activity	Big Idea	Programming Concepts	Content	Time
1.	Tutorial: Interactive Filter	Using event listeners can make your videos interactive.	Click events, properties	Create a filter that changes when it is clicked on.	60 mins
2.	Challenge: Multicolor Filter	Programming tools are more powerful when used together.	Event listeners, review Variables and objects	Create a filter that cycles through different colors when clicked.	60 mins
3.	Tutorial: Secret Message	Using the and operator can make your if statements more powerful.	&& (AND) Operator, review conditionals	Reveal a message when the mouse is in a certain place.	60 mins
4.	Tutorial: Adventures of a Grumpy Cat	The or operator only needs one condition to be true.	(OR) Operator	Use conditionals, user interaction, and global values	60 mins
5.	Challenge: The Grumpy Cat Returns	Combine different programming tools to design interactive experiences.	&& (AND) Operator, click events	Iterate on the previous program, add interactive elements	60 mins
6.	Tutorial: Video DJ	Keyboard event listeners are another way to add interactivity.	Review event listeners, arrays	Keyboard event listeners and audio files	60 mins
7.	Assessment 1		Events		30 mins
8.	Puzzle: True and False		Conditionals, Operators, Booleans, Debugging	Make every condition true	45 mins
9.	Midterm Project: Create an App		Review concepts	Event listeners, interactivity	120-240 mins
10.	Tutorial: Growing Circles	You can control how loops repeat code.	While loops	Use a while loop to create growing concentric circles	60 mins
11.	Tutorial: Five-star Rating	For loops let you control exactly how many times your code repeats	For loops, review variables	Use a for loop to make copies of a graphic	60 mins
12.	Challenge: Pop Art	Loops do the same thing many times, but can also make changes to things.	For loops, review properties	Use a for loop to make slight changes graphic properties each time they are reproduced	60 mins
13.	Tutorial: Perfect Sunset	An algorithm is a series of instructions you design to solve a problem.	For-loops, RGB colors	Change RGB values over time with a for-loop	60 mins
14.	Tutorial: Emoji Battle	Functions make your code more readable and reusable	For loops, conditionals, functions, randomness	Combines for loops and conditionals to place emojis on the screen	60 mins
15.	Tutorial: Spinning Squares	Using an array to keep track of objects allows you to iterate over them and make changes.	Arrays, for loops, functions	use a for loop and the array.push method to create squares and add them to an array	60 mins
16.	Challenge: Control the Weather	When you create a programming solution you can use it again in similar situations.	For loops, for-in loops, functions, arrays	Combine a for loop and a for-in loop to control emojis	60 mins
17.	Assessment 2		While and for loops		30 mins
18.	Puzzle: Missing Sheep		Booleans, debugging	Debug a project using what you know about operators	45 mins
19.	Final Project: Algorithmic Augmented Reality		Review of CS 301 Concepts	Create a unique animated AR filter	120-240 mins

Computer Science 401

	Activity	Big Idea	Programming Concepts	Content	Time
1.	Tutorial: Hello, World	You can take a string as user input	Strings	Create a text field and personal greeting	60 mins
2.	Challenge: Silly Sentence	You can use the !(NOT) operator to check if a string is empty.	Strings, operators	A program takes two words as input, and combines them in a function	60 mins
3.	Tutorial: Emojify	Strings have their own special methods.	Strings, methods	Replace part of a string with emojis	60 mins
4.	Challenge: Super-Secret Coded Message	Creating your own functions with parameters can make your code easier to reuse.	Strings, event listeners, functions	Encode messages by replacing strings with numbers	60 mins
5.	Tutorial: Celebrity Couple	A return statement tells your function to end and share a result.	Strings, functions, methods, arguments	Use the slice method to combine strings	60 mins
6.	Tutorial: Elf Name	Algorithms can be combined to create new algorithms.	Arrays, conditionals, functions	Use character codes to create a new output	60 mins
7.	Assessment 1		Strings and Methods		30 mins
8.	Puzzle: Parameters and Arguments		Arguments, parameters, debugging	Fix a broken function call	45 mins
9.	Midterm Project: Magic Text		Review concepts	Hangman game	120-240 mins
10.	Tutorial: Click for Creatures	You can create your own objects with object constructors.	Objects, functions	Create repeating characters with object constructor functions	60 mins
11.	Challenge: Emoji Person	Computers make complex decisions in multiple steps.	Objects, conditionals, event listeners	Use an object constructor to arrange emojis and control them with events	60 mins
12.	Tutorial: 500-Pixel Dash	You can combine conditionals in different ways.	Conditionals, event listeners, logical operators	Create a two-player racing game	60 mins
13.	Challenge: Virtual Pet	You can create properties to keep track of the state of your object.	Variables, properties, conditionals	Create a virtual pet whose mood changes based on time and user input	60 mins
14.	Tutorial: Cross the Road	Objects can affect each other.	Objects, logical operators	Collision detection and user input	60 mins
15.	Challenge: Emoji-bot Loves Rainbows	So much of the code you write can be reused.	Object constructors	Create a game where the character can get points by "catching" a falling rainbow	60 mins
16.	Tutorial: Jump the Ghost	Computers use math to simulate things in the real world.	Variables, Mathematical operators	Create a simulation of gravity for a character to jump and fall back to the ground	60 mins
17.	Assessment 2		Object Constructors		30 mins
18.	Puzzle: Skyscrapers		Loops, variables, debugging	Debug a project using what you know about operators	45 mins
19.	Final Project: Create Your Own Game		Review of CS 401 Concepts	Create a unique video game	120-240 mins

Computer Science 501

	Activity	Big Idea	Programming Concepts	Content	Time
1.	Tutorial: Emoji Packs	Object Constructors are like factories that allow your code to create objects.	Object constructors, arguments	Create an object constructor and use it to create emojis that move randomly	60 mins
2.	Tutorial: Filter Button	Object Constructors are great for reusable code.	Object constructors, click events	Create a Button object constructor that changes something when clicked	60 mins
3.	Challenge: Use Your Button	Object Constructors are great for reusable code.	Object constructors, event listeners	Reuse your button object code	60 mins
4.	Tutorial: Eclipse Simulation	To solve a problem, break it down into smaller parts.	Objects, interaction	Use objects to create a simulation	90 mins
5.	Assessment 1		Objects, properties, and methods		30 mins
6.	Midterm Project: Create a Fancy Button		Objects	Reuse your code to create more ambitious creative projects	120-240 mins
7.	Tutorial: Slider	Object-oriented programming is great for creating a user interfaces.	Object constructors, values	Create an object constructor for a dimmer switch.	60 mins
8.	Tutorial: Dance to the Rhythm	Object constructors allow you to create multiple objects with the same methods.	Object constructors, booleans	Create multiple buttons using object constructors	60 mins
9.	Challenge: Fetch	You can use the values of one object to affect another.	Object constructors, properties	Create a slider to move an object around until it is overlapping with another object.	90 mins
10.	Tutorial: A Wild Race	You can use coding to model things that would be difficult to do in real life.	Objects, functions	Create a race between animals	90 mins
11.	Assessment 2		Objects		30 mins
12.	Puzzle: Bee Game		Debugging	Solve 6 debugging challenges	60 mins
13.	Final Project: Creative Sliders		Review of CS 501 concepts	Create a creative project using sliders	120-240 mins

Computer Science 601

	Activity	Big Idea	Programming Concepts	Content	Time
1.	Tutorial: Fill the Screen	You can use different algorithms to solve the same problem.	Loops, functions, algorithms	Write an algorithm that completely fills up the page with rectangles.	60 mins
2.	Challenge: Crazy Fill	Different algorithms can solve problems more or less efficiently.	Decomposition, refactoring	Write an algorithm that completely fills up a given area with randomly sized rectangles.	90 mins
3.	Tutorial: Cutest Animal	You can use code to model data.	Objects, properties, data structures	Visually represent data based on research	60 mins
4.	Tutorial: Animal Cloud Histogram	How you structure your data is important.	Objects, user input, data structures	Create a data visualization that responds to user input	90 mins
5.	Assessment 1		Data structures		30 mins
6.	Puzzle: Wave Art		Debugging	Solve two debugging challenges and one creative problem	60 mins
7.	Midterm Project: Visual Data		Data structures	Create a unique data visualization	120-240 mins
8.	Challenge: What Coder Are You?	You can use algorithms to make decisions.	Binary trees	Create a program that asks yes/no, true/false, or questions	90 mins
9.	Challenge: Math Question Generator	You can write algorithms that work in lots of different situations.	Data Structures, Program Control	Design an algorithm to help users make a decision.	90 mins
10.	Tutorial: A Fuzzy Decision	Heuristic programming can be used to make decisions based on fuzzy data.	Heuristics, Fuzzy Data, Data Structures	Create a program that heuristically solves a question based on other inputs from the user.	90 mins
11.	Tutorial: Decision Bot	You can create algorithms for handling fuzzy data.	Heuristics, Fuzzy Data, Data Structures	Create a bot that does its best to answer a question based on user input and the data it's given.	90 mins
12.	Assessment 2		Conditionals & Heuristics		30 mins
13.	Final Project: Build a Bot		Review of CS 601 concepts	Create a decision-making bot	120-240 mins