CSE1 COURSE DESCRIPTION

CS Explorations 1 is an introductory computer science course based in the Scratch programming language, that empowers students to create authentic artifacts and engage with computer science as a medium for creativity, communication, problem solving, and fun. In this course, students will learn foundational concepts and skills of computer science (CS) and programming and students will explore using computers to solve problems and express themselves. Designed to be engaging and relevant to student life, students build, remix, and share their animations, games, stories, music, and art in an engaging and collaborative environment.

GRADE LEVEL	PREREQUISITES
Grade 6-8+	No prior computer science knowledge or coursework is required.

CS EXPLORATIONS PATHWAY

CSE 1: FUNDAMENTALS IN SCRATCH	CSE 2: ARTIFICIAL INTELLIGENCE	CSE 3: CS AND CREATIVE MEDIA
Grade 6+	Grade 7+	Grade 8

COURSE OBJECTIVES

By the end of this course, students will be able to:

- Create a variety of computer programs in Scratch that include animations and games.
- Apply fundamental computer science concepts to their programs.
- Evaluate their peers' programs using collaborative skills.

Students will also be prepared to continue on the CSE pathway with CSE2 in subsequent years.

STANDARDS AND FRAMEWORK

CS Explorations 1 was created using both the K–12 Framework for Computer Science and the CSTA standards as guidance. Specific standards are listed within the lessons that they address.

PACING GUIDANCE

CSE1 can be flexibly taught over the course of 9 weeks, 12 weeks, a single semester, a full school year, or broken up over multiple school years. Additional pacing options are available to support alternate elective blocks.

CORE COURSE STRUCTURE

The CSE1 curriculum consists of lessons, units, and blocks. Each CS block (A–D) contains 2 units that cover closely related computer science concepts. Each unit contains several lessons that each cover an aspect of the unit's major concept.

BLOCK A: GETTING STARTED AND MOTION IN SCRATCH

Block A of CSE1 provides students with an introduction to computer science, computing, and programming. This foundational knowledge allows students to immediately begin programming using the MIT-developed Scratch environment, through the introduction of key code blocks used to program events and responses in Scratch. Through projects focused on motion-based computing concepts, students become familiar with Scratch and start to understand computing fundamentals and the wide reach of computer science through its connections to other fields of study.

UNIT 0 GETTING STARTED WITH COMPUTER SCIENCE

Students start exploring what computer science is, what computers are (and are not), and the history of computing while becoming familiar with several key programming concepts. Initial activities introduce students to the basics of what computers are as well as introduce Scratch as a creative programming tool. The culminating project for this unit asks students to explore the Scratch interface by completing a simple exploratory Scratch project.

- **0.1** Why Does Computer Science Matter?
- **0.2** What is a Computer Program?
- **0.3** Growth Mindset
- **0.4** Pair Programming
- **0.5** Welcome to Scratch

UNIT 1 MOTION IN SCRATCH (EVENTS)

Students are introduced to the fundamental CS concepts of events, responses, sequences, parallelism, and initialization. Students design creative motion-based projects in Scratch that focus on using event blocks to trigger responses from their sprites. They learn how to move sprites around the Stage using the XY coordinate grid, and by broadcasting and receiving messages through code blocks. Students explore sequenced and parallel responses as well as the importance of initialization through their programming activities.

- **1.1** Events and Responses
- **1.2** Animate a Name
- **1.3** Exploring the XY Grid
- **1.4** Magic Room Cleaner
- **1.5** Mid-Unit Recap and Debugging
- **1.6** A-MAZE-ing Scratch!
- **1.7** Dance Party
- **1.8** Creating a Virtual Pet, Part 1
- **1.9** Creating a Virtual Pet, Part 2
- **1.10** Unit Recap and Debugging

BLOCK A FINAL PROJECT "MOVIE MAGIC!"

Using their new knowledge of events, responses, sequences, and initialization, students will recreate and animate a scene from a movie or TV show of their choosing in Scratch. Students will translate a script from their chosen scene into Scratch blocks and features, add backdrops and characters, and replicate dialogue from the movie or show to bring their scene to life. Students will partake in a brainstorming process to develop their Scratch program concept before they create it, and will share their finished work with peers and provide and receive feedback. This summative project will assess students' understanding of the foundational concepts from Unit 0 and 1 before they progress to the more advanced concepts covered in Block B (Units 2 and 3).

BLOCK B: ANIMATION AND GAMES

Block B of CSE1 builds on students' foundational knowledge from Block A, to introduce them to additional creative ways of using computer science. Students are introduced to the concepts of programming loops and conditionals through block-based Scratch projects that investigate animation and game design.

UNIT 2 ANIMATION (LOOPS)

Students are introduced to the CS concept of loops. Students work through a series of animation projects in Scratch that focus on making the distinction between bitmap and vector graphics, and sprites and backgrounds, while also learning how sprite costumes work. Students demonstrate their understanding of these concepts with the completion of an animation project.

- **2.1** Introduction to Loops (Unplugged)
- **2.2** Exploring Animation
- **2.3** Effects in Animation
- **2.4** Vector Animation
- **2.5** Mid-Unit Recap and Debugging
- **2.6** Sound Board
- **2.7** Sound Party
- **2.8** Storytelling with Sound, Part 1
- **2.9** Storytelling with Sound, Part 2
- **2.10** Unit Recap and Debugging

UNIT 3 GAMES (CONDITIONALS)

Students are introduced to booleans and conditionals in this unit. Using these concepts, students create programs that perform different tasks based on various conditions, or parameters, through the use of if-then and if-then-else statements. These game-based Scratch projects challenge students to focus on how users will interact with their games through the use of the sensing category of code blocks.

- **3.1** Conditionals
- **3.2** Race to the Finish, Part 1
- **3.3** Race to the Finish, Part 2
- **3.4** Dance Battle
- **3.5** Mid-Unit Recap and Debugging
- **3.6** Bounce
- **3.7** If-Then-Else
- **3.8** Line Follower
- **3.9** Slideshow
- **3.10** Unit Recap and Debugging

BLOCK B FINAL PROJECT "CHOOSE YOUR OWN ADVENTURE!"

Using conditional statements, booleans, and loops, students design an animated "Choose Your Own Adventure"-style game that will be played by their classmates. Students create a narrative

that changes and adapts based on decisions made by the user to result in a fun and creative storytelling adventure that changes each time the program is run (or the game is played).

BLOCK C: INTERACTIVE GAMES AND STORYTELLING

Block C of CSE1 introduces operators and variables to allow students more complexity in their projects. Students build on their knowledge of conditional statements from the previous block and use variables to introduce user input and add variance to their creative projects.

UNIT 4 INTERACTIVE GAMES (BOOLEANS AND OPERATORS)

Students explore the if-then conditional statement in greater depth to learn how the status of a condition can change and why it needs to be continually tested. Students build game-based projects in Scratch with a focus on game design while starting to think about user motivation. One of the primary creative projects in this unit is a maze game.

- **4.1** Operators (Unplugged)
- **4.2** Rocket Launch
- **4.3** Let's Chat!
- **4.4** Translator
- **4.5** Mid-Unit Recap and Debugging
- **4.6** My Maze, Controls
- **4.7** My Maze, Conditionals
- **4.8** My Maze, Incentives
- **4.9** My Maze, Challenges
- **4.10** Unit Recap and Debugging

UNIT 5 STORYTELLING (VARIABLES)

Students are introduced to variables in this unit as a way to both generate labels and to store data by way of random values and lists. Students begin their journey with variables by learning the basics, which they use to create a program that collects user input through ask and answer prompts. Using the Scratch Spotify extension, students integrate storytelling and music into their projects. These concepts are then pulled together in a Mad Libs-style project.

- **5.1** Data and Variables (Unplugged)
- **5.2** Mad Libs
- **5.3** Improve the Games
- **5.4** Multiplication Game
- **5.5** Mid-Unit Recap and Debugging
- **5.6** Flappy Cat, Part 1
- **5.7** Flappy Cat, Part 2
- **5.8** Lists
- **5.9** Quiz
- **5.10** Unit Recap and Debugging

BLOCK C FINAL PROJECT "DON'T CHANGE THE CHANNEL!"

Students create a TV channel menu in Scratch that plays short TV show clips depending on the user's input. Want to watch a sports match between two sprites, a favorite cartoon, or the news? Using loops, ask and answer blocks, and user input, students write a program that allows a user to pick the channel they want to watch and then view the corresponding clip — by way of a series of sprite interactions — based on their choice.

BLOCK D: ART AND ARTIFICIAL INTELLIGENCE

Block D of CSE1 provides students with two additional pathways for exploring computer science — the visual arts and artificial intelligence. Students use the programming concept of procedures to create art in Scratch and explore the fundamentals and impact of artificial intelligence.

UNIT 6 ART (PROCEDURES)

Students are introduced to procedures. Students work through projects that integrate the visual arts through drawing using the pen tool. Their projects place an emphasis on the creation of procedures for efficiency and readability, as well as introduce the use of computer science in the creative world of art and design. Students build a "Fantastic Flower" project to demonstrate their understanding of these concepts.

- **6.1** Introduction to Procedures
- **6.2** Stamp
- **6.3** Animation Cycles, Part 1
- **6.4** Animation Cycles, Part 2
- **6.5** Mid-Unit Recap and Debugging
- **6.6** Pen Art
- **6.7** Shape Maker, Part 1
- **6.8** Shape Maker, Part 2
- **6.9** Generative Art
- **6.10** Unit Recap and Debugging

UNIT 7 ARTIFICIAL INTELLIGENCE

Students are introduced to artificial intelligence — what it is and is not — and the enormous impact it has on their daily lives as conscientious consumers and designers of AI. Students work through both offline and Scratch-based activities to explore the technical aspects of AI and the ethical implications those concepts have on both their own lives and on society.

The Unit 7: Introduction to Artificial Intelligence lessons will be available later this summer.

BLOCK D FINAL PROJECT "MUSEUM MAGIC"

Using the Scratch Stage as their canvas, students create a self-drawing work of art for a virtual art museum. Students use the pen tool and their understanding of procedures to create a program that, when run, self-draws a piece of artwork. Boolean statements are used to allow users to change the artwork that is on view.

EXTENSIONS STRUCTURE AND FLOW

INTERSESSIONS

Intersessions explore non-programming (non-coding) conceptual computer science ideas ranging from the history of computers and binary numbers to physical computing with Finch Robots and MaKey MaKey. Teachers can select intersessions based on available class time and student interest.

Physical computing lesson resources require schools to already have requisite hardware. These components are not provided by Project STEM at this time.

INTERSESSION A WHAT IS A COMPUTER?

Students explore what makes a computer a computer, the history of computing technology, and what components make up their computer.

- **A.1** What is a Computer?
- **A.2** What's Inside Your Computer?
- **A.3** The History of Computers

INTERSESSION B ENCODING & DECODING

Students explore using ciphers, storing data with binary numbers, and using binary to represent digital items.

- **B.1** Encoding and Decoding Messages
- **B.2** Binary Counting
- **B.3** Binary Coding

INTERSESSION C WHAT IS THE INTERNET?

Students explore how the Internet was created, how it works, and how to most effectively use it to perform searches.

- **C.1** What is the Internet?
- **C.2** How Do We Search the Internet?

INTERSESSION D MICRO:BITS*

Students use micro:bit computers — tiny programmable computers — to build pets, fidget cubes, and a Magic 8 Ball-style fortune teller. *Micro: bit computers are not included in the Project STEM curriculum.*

- **D.1** Micro: bit Exploration
- **D.2** Micro: bit Pet
- **D.3** Micro: bit Cube
- **D.4** Micro: bit Magic 8 Ball

ADDITIONAL COURSE INFO

COURSE MATERIALS

PROVIDED MATERIALS

The CSE1 curriculum provides all learning materials necessary for the successful completion of the course. These materials include videos, slides, workbooks, example projects, activities, projects, and assessments, all of which are able to be completed without the use of time outside of the classroom.

SUPPLIES NEEDED

In addition to standard school supplies, such as paper and pen or pencils, students will need access to a device (such as a chromebook, laptop, or desktop) with a reliable internet connection to complete the work required in this course.

TECHNICAL REQUIREMENTS

In order to complete the CSE1 coursework, students will need to be able to access a computer with reliable internet connection each time they work. While there are some offline aspects of the curriculum, the majority of the lesson materials and resources, including Scratch, are located online and can be accessed via browser.

A list of domains that will need to be whitelisted so that students and teachers can access course materials and ensure compatibility with firewalls, if any, will be provided.