Catasauqua Area School District
Planned Course of Study

Course Title: Computer Science Foundations - Sphero

Grade Level(s): 9 - 12

Text: Computer Science Foundations by Sphero Courses 1 - 3

Course Description

Computer Science Foundations (CSF) by Sphero is a standards-aligned curriculum designed to be taught in the classroom alongside the Sphero BOLT robots. Students will explore STEAM principles through creative coding. By the end of the course, students will demonstrate a mastery of block programming by manipulating sensors, loops, conditionals, variables, and functions. Students will be able to develop complex programs with the Block Canvas and rewrite simple block programs in JavaScript. This course is designed to be independent of other Catasauqua High School Computer Science course offerings. No prerequisites required.

Essential Questions & Competencies

Course 1: "A" in STEAM, Shapes and Numbers, and Nature:

- Students create their own Draw programs, including movement (direction and speed) and lights.
- Manipulate and sequence movement, lights and sound Blocks.
- Create and animate their own designs on the BOLT matrix.
- Create Block programs with 1 to 2 simple controls, including loop forever and loop x times.
- Display a basic understanding of how 1 - 2 more complex controls, including loop until, if/then, and if/else affect programs.
- Explain how conditionals use sensors, comparators, and operators to make decisions.
- Read and interpret sensor data from all Draw and basic Block programs.

Course 2: Empathy, Storytelling, and Game Design:

- Use a series of nested controls—including loops & conditionals—to create more complex programs
- Be able to use basic comparators & operators in their conditionals
- Use functions as mini programs to perform a specific task within their larger program
- Use and manipulate all Sphero sensors to meet appropriate purposes in their programs
- Explain how variables are used in a program
- Explain how Blocks equate to JavaScript code and manipulate specific sections of JavaScript code

Course 3: Brain Breakers, Missions, and Navigation:

- Manipulate variables (numbers, sound) in the Block Canvas
- Apply conditionals without guidance that utilize sensors, comparators.
- Develop their own complex programs in Block programming.
- Read and interpret simple programs written in JavaScript involving movement, lights, sounds, and loops.
- Troubleshoot JavaScript to fix syntax errors.
- Rewrite simple Block programs in JavaScript.

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Grade Level: **9-12**

Course Syllabus

Course Content	Tentative Timeframe (Block Schedule)	State Standards
Course 1: "A" in STEAM	1-2 weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-15 3-AP-16 3A-AP-21 3A-IC-26
Course 1: Shapes and Numbers	1-2 weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-15 3A-AP-16
Course 1: Nature	1-2 weeks	**CSTA 9 - 12:** 3A-DA-11 3A-DA-12 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-18
Course 2: Empathy	2 weeks	**CSTA 9 - 12:** 3A-DA-11 3A-DA-12 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-18 3A-AP-19 3A-AP-22
Course 2: Storytelling	2 weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-16 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-22 3A-AP-23
Course 2: Game Design	2 weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-17 3A-AP-22
Course 3: Brain Breakers	2-3 Weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-22 3A-AP-23

Course 3: Missions	2-3 Weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-16
Course 3: Navigation	2-3 Weeks	**CSTA 9 - 12:** 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-17 3A-AP-19 3A-AP-22 3A-AP-23

Teaching Strategies Utilized
Direct Instruction
Indirect Instruction
Unplugged and Plugged Activities
Pair Programming
Classroom Discussion
Think-Pair-Share
Peer Feedback
Debugging
Journaling

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	PA Stand.
The student will be able to: **Course 1:** ● Create their own Draw programs, including movement (direction and speed) and lights. ● Manipulate and sequence movement, lights and sound Blocks. ● Create and animate their own designs on the BOLT matrix. ● Create Block programs with 1 to 2 simple controls, including loop forever and loop x times. ● Display a basic understanding of how 1 - 2 more complex controls, including loop until, if/then, and if/else affect programs. ● Explain how conditionals use sensors, comparators, and operators to make decisions. ● Read and interpret sensor data from all Draw and basic Block programs. **"A" in Steam** *1: Pictionary* *2: Art Bot* *3: Slam Poetry* *4: My Friend, Hue* *5: Lights! Camera! Action!* *6: Sphero Spirograph* *7: Dance Choreography* *8: Dance Dance Revolution* **Shapes and Numbers** *1: Sphero Gets Into Shape* *2: Spot the Shape* *3: My Favorite Number Is...* *4: Connect the Numbers* *5: Animated Dice* *6: Square Dance* *7: Figure Skating* *8: Guess My Number* **Nature** *1: The Tortoise and the Hare* *2: Pollination* *3: Journey to the Center of the Earth* *4: Mimicry* *5: School of Fish* *6: Sleep Cycles*	AW K AP M R	Direct Instruction Indirect Instruction Unplugged and Plugged Activities Pair Programming Classroom Discussion Think-Pair-Share Peer Feedback Debugging Journaling	Observation of Work Graded Assignments Homework Assessments	**CSTA 9 - 12:** 3A-DA-11 3A-DA-12 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-18 3A-AP-21 3A-IC-26

7: What a Seed Needs *8: Day or Night?*				

Resources/Materials
Sphero.com and edu.sphero.com Sphero BOLT robot Computer with internet and app iPad with internet and app Notebook/journal Printed Handouts from Sphero

Interdisciplinary Relationships
Arts - Drawing process, poetry, color integration, dance choreography Career Readiness - Problem solving process, basics of computers Mathematics - Problem solving techniques, input and output, storage quantities, Geometric use of shapes and space, locations of cursor using coordinates, velocity, conditionals, and functions English - Written coding, punctuation, poetry Science - Biological connections to plant life as well as some Earth science as well. **21st Century Student Outcomes:** Creativity and Innovation Critical Thinking and Problem Solving Communication and Collaboration ICT Literacy Flexibility and Adaptability Initiative and Self-Direction Social and Cross-Cultural Skills Productivity and Accountability Decomposition Pattern Recognition Pattern Generalization and Abstraction Algorithm Design

Catasauqua Area School District
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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	PA Stand.
The student will be able to: **Course 2** ● Use a series of nested controls—including loops & conditionals—to create more complex programs ● Be able to use basic comparators & operators in their conditionals ● Use functions as mini programs to perform a specific task within their larger program ● Use and manipulate all Sphero sensors to meet appropriate purposes in their programs ● Explain how variables are used in a program ● Explain how Blocks equate to JavaScript code and manipulate specific sections of JavaScript code **Empathy** *1: Sphero Is Feeling* *2: I've Got Your Back* *3: Compliment Giver* *4: Emotional Bumper Cars* *5: Sphero Pet* *6: Have You Ever…?* *7: Good Vibes* *8: Shoes for Sphero* **Storytelling** *1: A Long, Long Time Ago* *2: Never-Ending Stories* *3: Hot Potato Story* *4: Scary Stories* *5: Titanic Functions* *6: Writing Prompt Generator* *7: A Conversation in Spanish* *8: Shakespeare Smackdown* **Game Design** *1: Sphero Challenge Bingo* *2: Loopy Games* *3: Treasure Hunt* *4: Better Dice* *5: Flashlight Freeze Tag*	AW K AP M R	Direct Instruction Indirect Instruction Unplugged Activities Plugged Activities Pair Programming Think-Pair-Share Peer Feedback Debugging Journaling	Observation of Work Graded Assignments Homework Assessments	**CSTA 9 - 12:** 3A-DA-11 3A-DA-12 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-17 3A-AP-18 3A-AP-19 3A-AP-21 3A-AP-22 3A-AP-23

6: Play Ball *7: Choose Your Own Adventure* *8: Keep the Cups Connected*				

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iPad with internet and app
Notebook/journal
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Interdisciplinary Relationships

Social and Emotional Learning - Students engage in ways to show empathetic learning and experiences
Digital Footprint Education - Intellectual property, knowledge of the internet
Career Readiness - Problem solving process, basics of computers
Mathematics - Problem solving techniques, input and output, storage quantities, Geometric use of shapes and space, locations of cursor using coordinates, velocity, conditionals, and functions
English - Written coding, punctuation, poetry
21st Century Student Outcomes:
Creativity and Innovation
Critical Thinking and Problem Solving
Communication and Collaboration
Information Literacy
Media Literacy
ICT Literacy
Flexibility and Adaptability
Initiative and Self-Direction
Social and Cross-Cultural Skills
Productivity and Accountability
Leadership and Responsibility
Global Awareness
Decomposition
Pattern Recognition
Pattern Generalization and Abstraction
Algorithm Design

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Objectives	Level of Ach.	Suggested Learning Activities	Forms of Assessment	PA Stand.
The student will be able to: **Course 3:** ● Manipulate variables (numbers, sound) in the Block Canvas ● Apply conditionals without guidance that utilize sensors, comparators. ● Develop their own complex programs in Block programming. ● Read and interpret simple programs written in JavaScript involving movement, lights, sounds, and loops. ● Troubleshoot JavaScript to fix syntax errors. ● Rewrite simple Block programs in JavaScript. **Brain Breakers** *1: Crossword Clue-Giver* *2: Take and Brain Break* *3: Jigsaw Puzzle Pranks* *4: Who Am I?* *5: Word Scrambler* *6: Logic Puzzlers* *7: Bank Robbers* *8: Google the Gates* **Missions** *1: Sp(hero) Mobile* *2: Escape Room* *3: Sphero Lockbox* *4: Get Dorothy Home* *5: To the Rescue* *6: Cheesy Code Crackers* *7: Shark Water Bay* *8: The Crystal Orb of Destiny* **Navigation** *1: Spherobird to the North* *2: Boomerang* *3: Pirate Name Generator* *4: Find Your Route* *5: Sphero Compass* *6: Precision Collision* *7: Black Box Data* *8: National Parks Road Trip*	AW K AP M R	Direct Instruction Indirect Instruction Unplugged Activities Plugged Activities Pair Programming Think-Pair-Share Peer Feedback Debugging Journaling	Observation of Work Graded Assignments Homework Assessments	**CSTA 9 - 12:** 3A-AP-13 3A-AP-15 3A-AP-16 3A-AP-17 3A-AP-19 3A-AP-22 3A-AP-23

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Interdisciplinary Relationships
Mathematics - Geometric use of shapes and space, locations of cursor using coordinates, velocity, conditionals, and functions Science - Speed vs velocity, scientific method and process English - Literacy skills, grammar skills, spelling, punctuation, proper use of camel case and Javascript **21st Century Student Outcomes:** Creativity and Innovation Critical Thinking and Problem Solving Communication and Collaboration ICT Literacy Flexibility and Adaptability Initiative and Self-Direction Social and Cross-Cultural Skills Productivity and Accountability Decomposition Pattern Recognition Pattern Generalization and Abstraction Algorithm Design