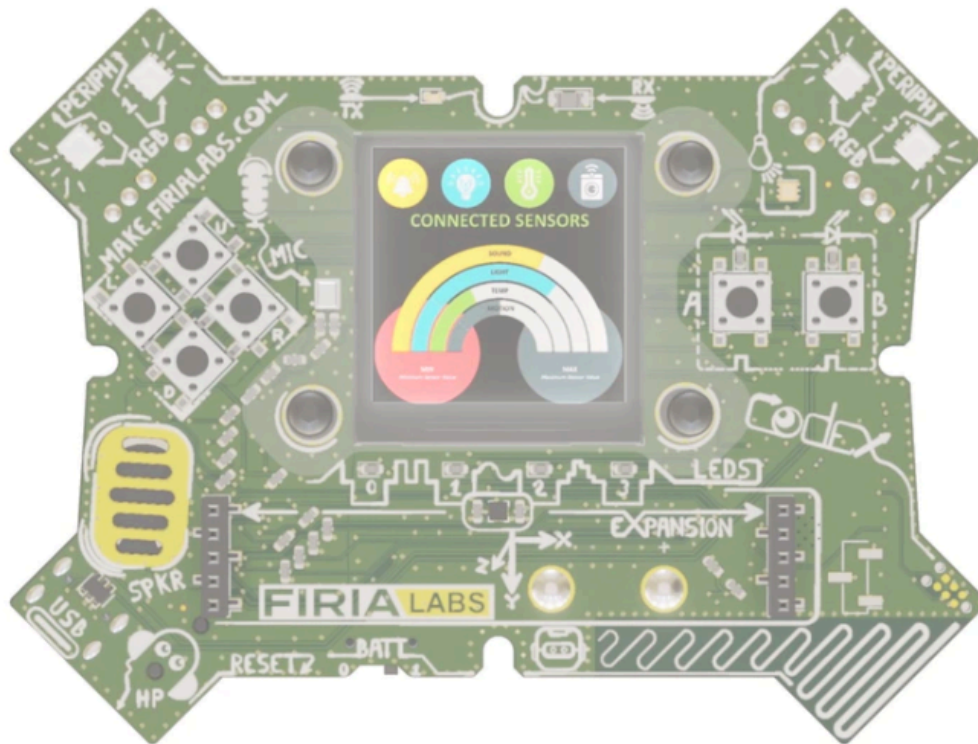


## Python with CodeX / TEKS Technology Applications Grade 7 Curriculum

The curriculum for Technology Applications Grade 7 consists of programming CodeX missions and completing lessons in computer science topics. The CodeX is a specialized micro:bit with integrated speaker, accelerometer, LEDs, display screen and several buttons for input. Using a physical device for coding dramatically increases engagement and interest over traditional computer science instructional methods that focus on math problems or manipulating on-screen elements.

Our educational program creates real-world learning experiences for students. This is achieved through the use of:

- Open-ended physical hardware, used to implement meaningful projects
- Open-ended software, integrating development tools with instructional content, with the possibility of students to directly apply the tools well beyond the scope of what is covered in the curriculum
- Python, the fastest growing major programming language used in Industry





All standards are met by completing the required missions and lessons. The amount of time needed to complete the curriculum is flexible; it can be used once or twice a week up to an entire semester (or more).

- The missions should be completed in order.
- The lessons can be completed in any order.
- Optional missions and lessons are available as time permits, but are not required.

Teachers have the option of completing the missions and then the lessons, or intermixing missions with lessons. Some possible timelines are suggested below. These are not the only options, but show the flexibility of the curriculum to meet the needs of the teacher and class.

**Option 1 -- missions followed by lessons**

0	Typing
1	Lesson: Technology & Global Trends
2	Mission 1 / Mission 2
3	Mission 3: Light Show
4	Mission 4: Display Games
5	Lesson: The Design Process
6	Remix #1
7	Mission 5: MicroMusician
8	Mission 6: Heartbeat
9	Remix #2
10	Mission 7: Personal Billboard
11	Mission 8: Answer Bot
12	Remix #3
13	Lesson: Google Searches
14	Lesson: Digital Information
15	Lesson: Digital Citizenship
16	Lesson: Cybersecurity (with CodeX project)
17	Lesson: Intellectual Property
18	Lesson: File Formats & Management
19	Lesson: Data & Trends
20	Final Project or Lesson: Computer Scientist

**Option 2 -- missions intermixed with lessons**

0	Typing
1	Lesson: Technology & Global Trends
2	Mission 1 / Mission 2
3	Mission 3: Light Show
4	Lesson: Google Searches
5	Mission 4: Display Games
6	Lesson: The Design Process
7	Remix #1
8	Lesson: Cybersecurity (with CodeX project)
9	Mission 5: MicroMusician
10	Mission 6: Heartbeat
11	Remix #2
12	Lesson: Digital Citizenship
13	Mission 7: Personal Billboard
14	Lesson: Digital Information
15	Mission 8: Answer Bot
16	Remix #3
17	Lesson: Intellectual Property
18	Lesson: File Formats & Management
19	Lesson: Data & Trends
20	Final Project or Lesson: Computer Scientist



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### Beginning of Course

Lesson/Mission	Outline of lesson	Standards
<b>Typing</b> <i>(approx. 30 min)</i>	<p>This is the start of the Data &amp; Trends lesson. Students are introduced to a typing program and start typing practice for about 10 minutes 2-3 times a week. Students keep track of their words per minute on a table that they will use later on to create a chart and make inferences.</p> <p>Final Project: in the Data and Trends lesson</p>	(12) D

### Required Missions

Lesson/Mission	Outline of lesson	Standards
<b>Mission 1</b> <i>(approx. 30 min)</i>	<p><b>Welcome to CodeSpace</b></p> <p>The mission starts with an introduction to computer science. Then students log in to CodeSpace. They open the toolbox, which contains documentation, and it is used as a resource for debugging. Students will complete a worksheet or journal on the vocabulary, tools, etc. that they learn during the lesson.</p> <p>No final project (short lesson)</p>	(12) C, F, H
<b>Mission 2</b> <i>(approx. 30 min)</i>	<p><b>Introducing CodeX</b></p> <p>The mission starts with discussing how coding is used in many things, not just robots. Key vocabulary words are introduced, like input, output and CPU. Students learn more about CodeSpace and also are introduced to CodeX. The lesson gives students an opportunity to transfer current knowledge to the learning of newly encountered technology.</p> <p>No final project (short lesson -- combine with Mission 1)</p>	(4) C (12) A, B, F
<b>Mission 3</b> <i>(1-2 class periods)</i>	<p><b>Light Show</b></p> <p>The mission discusses how LEDs show colors with RGB. Abstraction is introduced through the use of parameters for turning on pixels. The debugger is introduced. Variables and editor shortcuts are used for the first time. The final mission involves lighting up the four pixel LEDs in various colors.</p> <p>Final Project: Completed program and programming journal</p>	(1) C, E (2) A (4) C (12) A
<b>Mission 4</b> <i>(1-3 class periods)</i>	<p><b>Display Games</b></p> <p>Some data types are introduced, and the need for converting from one data type to another is demonstrated. Branching with Boolean conditions is used for the first time. The final mission will show a variety of pre-made pictures on the display screen.</p> <p>Final Project: Completed program and programming journal</p>	(1) E (2) A, B (12) A, F

<p><b>The Design Process</b> (required lesson)</p> <p><i>(1-3 class periods)</i></p>	<p>This lesson will explain the design process for software development. The use of flowcharts and pseudocode will be introduced and practiced. The lesson will also look at how the design process is used in various industries. Students will discuss goal setting and personal character traits needed to resolve design challenges. After this lesson, students are expected to create a flowchart or pseudocode for their programs.</p> <p>Final Project: Choose one of the following</p> <ul style="list-style-type: none"> <li>• Quiz on interpreting and creating flowcharts, design process</li> <li>• Poster or slide show presentation</li> </ul>	<p>(1) A, B, D, F (2) B (3) A, B, C</p>
<p><b>Remix 1</b></p> <p><i>(2-4 class periods)</i></p>	<p><b>Mission 4 Remix</b> Students will use what they have learned from the first four missions to create their own original program. They will follow the design process and keep a programming journal of their experience.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, D, E (2) A (3) A, B (4) C (12) A, F</p>
<p><b>Mission 5</b></p> <p><i>(1-2 class periods)</i></p>	<p><b>Micro Musician</b> The mission shows how the CodeX can play any of the several audio files that are pre-loaded on the CodeX. As a warm-up activity, discuss how today's musicians use technology. Code readability is also stressed, including using blank lines and adding comments.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) E (4) C (12) A, F</p>
<p><b>Mission 6</b></p> <p><i>(1-3 class periods)</i></p>	<p><b>Heartbeat</b> The mission introduces loops and the "kill switch" with a button press. The float data type is used, and shortcut keys and Boolean conditions are continued. Using the debugger is practiced. The final mission will show a heartbeat that can change speed faster or slower. It will end with a possible error! that they can go back and fix later.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, E, F (2) A, B (3) A (12) A, E, F</p>
<p><b>Remix 2</b></p> <p><i>(1-3 class periods)</i></p>	<p><b>Mission 5-6 Remix</b> Students will use what they have learned from the first six missions to create their own original program. They will follow the design process and keep a programming journal of their experience.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, D, E, F (2) A, B (3) A, B (4) C (12) A, E, F</p>
<p><b>Mission 7</b></p> <p><i>(1-3 class periods)</i></p>	<p><b>Personal Billboard</b> The mission introduces lists and tuples. They must navigate data conversion and use Boolean conditions to help them code the correct display commands. The use of CodeTrek and the debugger is emphasized. The final mission will display a variety of images, text and color on the screen.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, D, E, F (2) A, B (3) C (4) C (12) A, E, F</p>
<p><b>Mission 8</b></p> <p><i>(1-3 class periods)</i></p>	<p><b>Answer Bot</b> The mission is similar to the personal billboard, but it will show another way to display text. Random numbers are introduced and used. Students practice debugging by making intentional errors. The mission also uses lists. The final mission will display random answers on the screen and colors on the LEDs.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, C, D, E, F (2) A, B (3) A (12) A, E, F</p>

<b>Remix 3</b>  <i>(2-4 class periods)</i>	<b>Mission 7-8 Remix</b> Students will use what they have learned from the first eight missions to create their own original program. They will follow the design process and keep a programming journal of their experience.  Final Project: Completed program and programming journal	(1) A, B, C, D, E, F (2) A, B (3) A, B (4) C (12) A, E, F
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## Required Lessons

Lesson/Mission	Outline of lesson	Standards
<b>Technology &amp; Global Trends</b>  <i>(1-3 class periods)</i>	The lesson discusses changes in technology throughout history. Students will discuss global trends, and predict where the future of technology will go.  Final Project: Create a digital artifact on a global trend (Poster)	(4) A, B (7) A (11) A (12) A, C, F, H
<b>Data &amp; Trends</b>  <i>(1-3 class periods)</i>	This lesson culminates the typing practice with a graph and chart. At the beginning of the course, students started a typing program and practiced typing 2-3 times a week, recording their words per minute. Students will graph by hand their typing progress on a paper. Then recreate their graph using digital software, such as Google Sheets or Excel.  Possible warm-up or extension activities for this lesson: <ul style="list-style-type: none"> <li>● Poll the students on a topic (age, birth month, favorite dessert, etc.)</li> <li>● As a class, create a graph and make inferences/look for trends</li> <li>● Look at graphs and analyze patterns and sequences</li> <li>● Analyze patterns (compare with other students' charts) and sequences</li> </ul> Possible extension: Complete this lesson during the middle of the course and make inferences based on the graph. Then continue typing 2-3 times a week and recording data. Revisit the graph and see how close the predictions are.  Final project: graph of typing speed	(4) C (6) A (7) A (11) A (12) A, C, D, F, H
<b>File Formats &amp; Management</b>  <i>(1-2 class periods)</i>	The lesson will discuss various file formats of digital information, such as text, graphics, video and audio. Then file management strategies will be taught, such as file naming conventions, local and remote locations, backups, folder structure and file conversions. Emerging digital organizational strategies will be discussed. Students will learn about data storage choices, such as on a server, in the cloud, or using a flash drive.  Final project: choose one of the following: <ul style="list-style-type: none"> <li>● No final project -- students demonstrate file formats and management strategies throughout the course</li> <li>● Quiz on vocab, strategies and data storage options</li> <li>● Poster or slide show or presentation</li> </ul>	(11) A (12) A, B, G
<b>Google Searches</b>  <i>(1-2 class periods)</i>	The lesson will have students practice looking for information using a search engine. Students will start with looking at trends based on searches. Then students will use simple searches and get progressively more specific by using keywords, Boolean operators and limiters. Students are required to search for a variety of digital data, including text, images, and audio or video files.  Final project: Complete a search engine scavenger hunt (timed or untimed)	(5) A, B (6) A (7) A

<p><b>Digital information</b></p> <p><i>(1-2 class periods)</i></p>	<p>The lesson will show students, at a basic level, how data can be represented in binary. Different data types will be discussed, such as integers, strings, Boolean, real numbers and lists, so that students can select the best data type to represent information.</p> <p>Final Project: Demonstration of learning. Could be any of the following</p> <ul style="list-style-type: none"> <li>• <a href="#">Binary game</a> for practice</li> <li>• Kahoot or quiz on binary and data types</li> <li>• Completion of a worksheet</li> <li>• Poster or slide show presentation</li> </ul>	<p>(2) A (5) A</p>
<p><b>Digital Citizenship</b></p> <p><i>(1-4 class periods)</i></p>	<p>The lesson will show students different styles of digital communication. They will learn that their online actions can have a long term effect. Students will practice digital etiquette and learn how to use digital communication responsibly.</p> <p>Final project: create an artifact to present on this topic</p> <ul style="list-style-type: none"> <li>• Suggestion: slide show or poster</li> <li>• Include peer feedback</li> </ul>	<p>(7) A (8) A, B, C (9) A (11) A (12) A, C, H</p>
<p><b>Cybersecurity</b></p> <p><i>(1-4 class periods)</i></p>	<p>During this lesson students will learn about real-world cybersecurity problems, such as phishing, malware, and hacking. They practice safe, legal and ethical digital behaviors so they are responsible digital citizens. The impact of cyberbullying will also be discussed.</p> <p>Final project: create an artifact to present on this topic</p> <ul style="list-style-type: none"> <li>• Suggestion: slide show or poster</li> <li>• Include peer feedback</li> </ul> <p>Final project: Program the CodeX to be password protected</p> <ul style="list-style-type: none"> <li>• Press the buttons in a specific order to “unlock” the CodeX)</li> <li>• Can be done anytime after Mission 4</li> </ul>	<p>(4) B (7) A (9) A (10) A, B (11) A (12) A, C, H</p>
<p><b>Intellectual Property</b></p> <p><i>(1-2 class periods)</i></p>	<p>The lesson defines intellectual property and covers intellectual property laws. Students learn about copyright law, fair use, creative commons, open source and public domain. Students learn how to cite their sources for a variety of digital forms of intellectual property.</p> <p>Final project: create an artifact to present on this topic</p> <ul style="list-style-type: none"> <li>• Suggestion: report</li> </ul>	<p>(7) A (9) B, C, D (11) A (12) A, C, H</p>

## Optional Missions

Lesson/Mission	Outline of lesson	Standards
<p><b>Mission 9</b></p> <p><i>(2-4 class periods)</i></p>	<p><b>Game Spinner</b></p> <p>The mission uses a built-in list for arrow images. Logical operators are introduced and used. Abstraction is emphasized, and students create their own functions with parameters. The program uses a loop with a counter condition, modifies the counter, and identifies local variables. Students also learn how to use the debug console. The final mission has the CodeX act as an authentic spinner for a game by pressing a button.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, C, E, F (2) A, B (3) A (4) C (5) A (12) A, E, F</p>

<p><b>Remix 4</b> <i>(2-4 class periods)</i></p>	<p><b>Mission 9 Remix</b> Students will use what they have learned from the first four missions to create their own original program. They will follow the design process and keep a programming journal of their experience.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, C, D, E, F (2) A, B (3) A, B (4) C (5) A (12) A, E, F</p>
<p><b>Mission 10</b> <i>(1-3 class periods)</i></p>	<p><b>Reaction Tester</b> The mission introduces students to the internal clock. Using a loop and accessing the CodeX clock, students learn how to record a reaction time. Students create their own functions and use them during this mission. The final mission is a reaction game by recording the reaction time to pressing a button after a LED is lit.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) C, E, F (2) A, B (3) A (7) A (12) A, E, F</p>
<p><b>Mission 11</b> <i>(1-3 class periods)</i></p>	<p><b>Spirit Level</b> The mission introduces the CodeX's accelerometer, which tracks the CodeX position in three dimensions. Students will read data from the accelerometer and store the information in a tuple. Students will also learn how to draw simple graphics, like a line and a circle. The final mission will use the display screen as a level, with a circle as the bubble.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) C, E, F (2) A, B (3) A (7) A (12) A, E, F</p>
<p><b>Mission 12</b> <i>(1-3 class periods)</i></p>	<p><b>Night Light</b> The mission introduces the light sensor embedded on the CodeX. Students use math to manipulate the data from the sensor into useful information. The final mission will light up the display screen like a night light when the light sensor reads dim light.</p> <p>Final Project: Completed program and programming journal</p>	<p>(1) A, C, E, F (2) A, B (3) A (7) A (12) A, E, F</p>
<p><b>Remix 5</b> <i>(3-5 class periods)</i></p>	<p><b>Final Project</b> The final remix allows students to use their creativity to design and code their own project. Students can work with a partner, or in teams, to use their coding knowledge and interests to create a new use for the CodeX. Students will use the design process, create a flowchart, and resolve design challenges during the creation of their program. Students can use previous missions as a starting point for their project.</p> <p>Final Project: Completed program and programming journal</p> <ul style="list-style-type: none"> <li>• Create a presentation and show to class or other identified audience</li> <li>• Show program run in a video to include in presentation</li> <li>• Optional -- create a web page for the final remix</li> </ul>	<p>(1) A, C, D, E, F (2) A, B (3) A, B (4) C (12) A, C, E, F</p>
<p><b>Mission 13</b> <i>3-5 class periods</i></p>	<p><b>Sounds Fun</b> In this mission students will create a user-friendly graphical interface and explore the "soundlib" library for CodeX sound effects. Students will learn how to play sounds and music in the background while other code is running, make sound effects for games and user feedback, and control the pitch and loop sounds.</p>	<p>(1) A, C, D, E, F (2) A, B (3) A, B (4) C (11) A (12) A, C, E, F</p>

## Optional Lessons

Lesson/Mission	Outline of lesson	Standards
<b>What is Computer Science?</b>	<p>The lesson is ideal for either the beginning of the unit or the end of the unit. Students will watch videos of careers that use computer science. They learn to envision themselves as being computer scientists.</p> <p>Final Project: Create a digital artifact on computer science</p> <ul style="list-style-type: none"> <li>• Could be on computer science in general or a specific topic</li> <li>• Could be on a career in computer science</li> <li>• Digital artifact ideas: Web page, poster, slide show, booklet, in-person presentation</li> </ul>	(4) A, B (7) A (12) H
<b>Creating pixel images</b>	<p>The CodeSpace editor includes images, similar to ASCII art, but with color. These are the pictures students use starting in Mission 6. Instead of using characters to create an image, students can make a grid of colors for the display pixels to create their own picture. This mission shows students how to take either ASCII art or pixel art and recreate it for the CodeX. This lesson should be given after Mission 7 and/or Mission 8.</p> <p>Final Project: Program the CodeX to display an ASCII (or pixel) image</p> <ul style="list-style-type: none"> <li>• Can use and re-color an included image</li> <li>• Can use an image found on the Internet and adapt for CodeX</li> <li>• Can create original artwork</li> </ul>	(1) A, D, E (2) A, B (3) A (5) A (11) A (12) B, C, E, F
<b>Transforming images</b>	<p>Students may want to display their own images or photos on the CodeX display screen. This mission teaches students the steps to resizing and compressing an image to fit CodeX display requirements. Editing software is needed for this part of the mission. Then students must upload their images to the CodeX. Finally, they use code to display the image. This lesson should be given after Mission 7 and/or Mission 8.</p> <p>Final Project: Program the CodeX to display resized JPG images</p>	(1) A, D, E (2) A, B (3) A (5) A (11) A (12) B, C, E, F
<b>Creating audio files</b>	<p>Students may want to play their own audio files in a program like the personal billboard, or to enhance a game. This mission teaches students to record their own audio file and save it in the correct file format. Additional software is needed for this part of the lesson. Then students must upload their audio files to the CodeX. Finally, they use code to play their original files. This lesson should be given after Mission 5.</p> <p>Final Project: Program the CodeX to play an original audio file</p> <ul style="list-style-type: none"> <li>• Use in a program like Heartbeat, Personal Billboard, or AnswerBot, or in a game like GameSpinner</li> </ul>	(1) A, D, E (2) A, B (3) A (5) A (11) A (12) B, C, E, F
<b>Creating line art</b>	<p>Students may want to create their own simple artwork using lines, rectangles and circles. This lesson teaches students how to draw these shapes, either as an outline or filled in. Graph paper can be used to design a simple graphic. The lesson can be extended by using variables with the simple graphic in a series of loops to create a row of images, a grid of images, an image in a random location, etc.</p> <p>Final Project: Program the CodeX to draw a simple graphic</p>	(1) A, D, E (2) A, B (3) A (11) A (12) B, C, E, F