Ohio’s Standards and Model Curriculum

Computer Science Grade 1

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Ohio | Department of Education

Computer Science Model Curriculum for Grade 1

Strand	Computing Systems
Topic	**Devices**

CS.D.1.a Operate commonly used devices and their components to perform a variety of tasks.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students named and used common devices with guidance. In grade 1, students begin operating the devices independently. In grade 2, students will begin selecting devices with a purpose in mind.

IMPORTANT CONCEPTS

- Different devices operate in different ways

KEY SKILL/PROCEDURES

- Operate teacher-selected device for a specific task
- Navigate digital learning tools

Content Elaborations

CLARIFICATIONS

Students will recognize software/hardware and operate digital learning tools.

CONTENT FOCUS

The focus is on the student operating devices and software/hardware.

COMPUTER SCIENCE PRACTICES

Practice 7. Communicating About Computing

2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Computing Systems
Topic	**Hardware/Software**
CS.HS.1.a With guidance, describe and use hardware and software necessary for accomplishing a task.	**Expectations for Learning** **LEARNING PROGRESSION** In kindergarten, students named and used hardware and software with teacher support to perform functions. In grade 1, with guidance, students begin comparing hardware and software and their functions. In grade 2, students will use their knowledge of hardware and software to select what is needed to perform a task. **IMPORTANT CONCEPTS** • Hardware and software identification and the function they perform • Hardware and software interact to work together **KEY SKILL/PROCEDURES** • With guidance, identify the differences between hardware and software, their functions and purpose • With guidance, identify hardware and software interactions **Content Elaborations** **CLARIFICATIONS** Students will compare and contrast hardware and software and their interactions. **CONTENT FOCUS** The focus is on the characteristics, functions and interactions of hardware and software. **COMPUTER SCIENCE PRACTICES** *Practice 7.* Communicating About Computing 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Computing Systems
Topic	**Troubleshooting**

CS.T.1.a With guidance, use problem solving strategies to troubleshoot a problem.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students used a problem-solving process with teacher support to identify problems and begin troubleshooting. In grade 1, with guidance, and in grade 2, they will continue using a problem-solving process to troubleshoot.

IMPORTANT CONCEPTS

- There are a variety of problem solving processes. A problem-solving process typically includes identifying the problem, brainstorming solutions, making a plan, testing solutions, and revising

KEY SKILL/PROCEDURES

- With guidance, apply a problem-solving process, using appropriate terminology to solve a problem

Content Elaborations

CLARIFICATIONS

Students will identify problems (e.g., left click or right click, no audio, no power, navigating windows) and attempt to solve them using a problem-solving process.

CONTENT FOCUS

The focus is on solving a problem using a problem-solving process.

COMPUTER SCIENCE PRACTICES

Practice 6. Testing and Refining Computational Artifacts
2. Identify and fix errors using a systematic process.

Practice 7. Communicating About Computing
2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Networks and the Internet
Topic	**Networking**

NI.N.1.a Create a list of ways information can be shared electronically to gain a deeper understanding of how information is transmitted (e.g., email, social media).

NI.N.1.b Recognize that computing devices can be connected to retrieve information from the global community.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students were introduced to the idea of what a network is and how people use it. In grade 1, students begin to develop an understanding of concepts of networking and of unique identifiers within a global community. They also begin to develop an understanding of what devices people use to network and how each device people network with has a unique identifier. In addition, students recognize that the computing devices with unique identifiers can be connected together to access and retrieve information. In grade 2, students will describe what a network is, devices we use to network, how devices can be identified, and how they can be connected together. Additionally, students can network using devices to access and retrieve information within a global community.

IMPORTANT CONCEPTS

- Users of the internet communicate with a global community
- All devices that are connected to the network have a unique identifier
- A variety of information can be communicated electronically

KEY SKILL/PROCEDURES

- Interact with the global community
- Create communications that could be transmitted electronically
- Match devices with unique identifiers

Content Elaborations

CLARIFICATIONS

Students will communicate and retrieve information. They will identify the devices we use to communicate.

The internet is global. Each device has a unique identifier. This is not limited to IP addresses. A person's phone number can serve as a metaphor for a unique identifier. For example, two people can exchange information using their phones providing they call, or in other words connect to, the correct phone number.

Strand	Networks and the Internet	
Topic	**Networking**	
		CONTENT FOCUS The focus is on understanding networks, unique identifiers, and electronic communication. **COMPUTER SCIENCE PRACTICES** *Practice 1.* Fostering an Inclusive Culture 1. Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products. *Practice 7.* Communicating About Computing 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Networks and the Internet
Topic	**Cybersecurity**

NI.C.1.a Identify and use secure practices (e.g., passwords) to protect private information.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten through grade 2, students work on being able to explain why it is important to use technology in a responsible way in order to make decisions about its use. Students also work to demonstrate how to use technology appropriately and safely and how to protect login information.

IMPORTANT CONCEPTS

- Decision making when using technology

KEY SKILL/PROCEDURES

- Create and use passwords appropriately
- Log in and out of apps and devices

Content Elaborations

CLARIFICATIONS

In grade 1, some students may still require assistance with their passwords. Focus on the importance of passwords staying in the classroom. This provides peer assistance with passwords, but allows the teacher to focus on the importance of not sharing passwords.

CONTENT FOCUS

The focus is on using passwords and devices appropriately.

COMPUTER SCIENCE PRACTICES

Practice 7. Communicating About Computing

3. Articulate ideas responsibly by observing intellectual property rights and giving appropriate attribution.

Strand	Data and Analysis
Topic	**Data Collection and Storage**

DA.DCS.1.a With guidance, collect and organize data to retrieve for later use.

DA.DCS.1.b With guidance, demonstrate how data can be collected and stored in a variety of ways.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students are collecting and sorting data in a variety of ways with teacher support. In grade 1, students begin storing and retrieving data with guidance. In grade 2, students will begin to retrieve data to modify.

IMPORTANT CONCEPTS

- Data is information. When using technology, data is often quantities, characters, or symbols that are the inputs and outputs of computer programs (see Code.org)
- Data can be organized, collected, stored, and retrieved in a variety of ways

KEY SKILL/PROCEDURES

- Use appropriate tools to organize data
- Use appropriate tools to collect data with guidance
- With guidance, store, retrieve and save data

Content Elaborations

CLARIFICATIONS

Students can address this content with or without a computing device.

Students can create and, with guidance, retrieve files. Students can organize files (i.e., file structure).

CONTENT FOCUS

The focus is on storing and retrieving data.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions
2. Evaluate existing technological functionalities and incorporate them into new designs.

Strand	Data and Analysis
Topic	**Visualization and Communication**

DA.VC.1.a Organize and present data in various formats to make observations.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students are presenting data in various formats. In grade 1, students will make observations of representations of data. In grade 2, they will continue to analyze data in various formats.

IMPORTANT CONCEPTS

- Data can be sorted by attributes
- Data can be presented in a variety of formats

KEY SKILL/PROCEDURES

- Collect with guidance and organize data for peer understanding
- Describe and sort data by different attributes to create multiple representation of the same data sets
- Transfer data between grids to lists

Content Elaborations

CLARIFICATIONS

Students can address this content with or without a computing device.

Various formats can include:

- graphic organizers
- categorical sort
- modeling
- drawings
- sorting by different attributes

CONTENT FOCUS

The focus to make observations on representations of data.

Strand	Data and Analysis
Topic	**Visualization and Communication**
	COMPUTER SCIENCE PRACTICES *Practice 5.* Creating Computational Artifacts 1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, taking into account key features, time and resource constraints, and user experience. 2. Create a computational artifact for practical intent, personal expression, or to address a societal issue. 3. Modify an existing artifact to improve or customize it. *Practice 7.* Communicating About Computing 1. Select, organize, and interpret large data sets from multiple sources to support a claim. 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Data and Analysis
Topic	**Inference and Modeling**

DA.IM.1.a Create and explain a model of an object or process that includes patterns and key elements.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students modeled data and identified patterns with guidance. In grade 1, students continue to model data and identify patterns and begin explaining their model. In grade 2, students will begin interpreting models.

IMPORTANT CONCEPTS

- Data can be represented through modeling
- Patterns within the data can be discovered and explained

KEY SKILL/PROCEDURES

- Model data to discover and identify patterns
- Explain the model and patterns discovered

Content Elaborations

CLARIFICATIONS

Students can address this content with or without a computing device.

Students model data through representation data visually, although not necessarily using paper and pencil as in graphs. Data can be modeled using manipulatives and physical models.

CONTENT FOCUS

The focus is on modeling data, pattern detection, and explanation of the model.

COMPUTER SCIENCE PRACTICES

Practice 5. Creating Computational Artifacts

1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, taking into account key features, time and resource constraints, and user experience.
2. Create a computational artifact for practical intent, personal expression, or to address a societal issue.
3. Modify an existing artifact to improve or customize it.

Strand	Data and Analysis
Topic	**Inference and Modeling**
	Practice 6. Testing and Refining Computational Artifacts 1. Systematically test computational artifacts by considering all scenarios and using test cases. *Practice 7.* Communicating About Computing 1. Select, organize, and interpret large data sets from multiple sources to support a claim. 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Algorithmic Thinking and Programming
Topic	**Algorithms**

ATP.A.1.a With guidance, model a real-world process by constructing and following step-by-step directions (i.e., algorithms) to complete tasks.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students constructed and followed instructions verbally and/or pictorially with teacher support. In grade 1, students construct and follow directions with guidance to complete a task in a real-world context through pictures and written words. In Grade 2, students will construct and follow instructions to complete a task through pictorial symbols and written words.

IMPORTANT CONCEPTS

- Step by step directions can be constructed to complete a real-world task
- Directions can be given verbally or visually

KEY SKILL/PROCEDURES

- With guidance, complete a verbal and/or visual task with multiple steps

Content Elaborations

CLARIFICATIONS

Students will follow multiple-step directions with precision to complete a task. Students should be able to use a task from their daily lives (e.g., brush teeth, washing hands, getting ready for school) and create the multiple steps necessary to complete that task. Students should articulate the steps to a task using visual representations, such as simple flow charts or diagrams, and written expression. Algorithms are commonly implemented using a precise language that computers can interpret.

CONTENT FOCUS

The focus is on multi-step directions and the sequence of steps to complete a task.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions
4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

Practice 6. Testing and Refining Computational Artifacts
2. Identify and fix errors using a systematic process.

Strand	Algorithmic Thinking and Programming
Topic	**Algorithms**
	Practice 7. Communicating About Computing 1. Select, organize, and interpret large data sets from multiple sources to support a claim. 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Algorithmic Thinking and Programming
Topic	**Variables and Data Representation**

ATP.VDR.1.a Categorize a group of items (e.g., numbers, symbols or pictures) based on the attributes or actions of each item, with or without a computing device.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students recognized that numbers, symbols and pictures represent information. In grade 1, students use numbers, symbols and pictures to represent information. In grade 2, students will model the use of numbers, symbols and pictures to manipulate and store information.

IMPORTANT CONCEPTS

- Numbers, symbols or pictures can be categorized by attributes or actions

KEY SKILL/PROCEDURES

- Categorize numbers, symbols and/or pictures based on multiple attributes or actions

Content Elaborations

CLARIFICATIONS

Information in the real world can be represented in computer programs. (K-12 Computer Science Framework, 2016)

Students will manipulate numbers, symbols and pictures to categorize information.

CONTENT FOCUS

The focus is on categorizing data based on attributes and/or actions.

COMPUTER SCIENCE PRACTICES

Practice 4. Developing and Using Abstractions
4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes.

Practice 7. Communicating About Computing
2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Algorithmic Thinking and Programming
Topic	**Control Structures**

ATP.CS.1.a With guidance, model a sequence of instructions (i.e., program) that includes repetition (i.e., loops) to solve a problem or express ideas.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, with teacher support, students modeled simple sequences and ordered steps of an algorithm to solve a problem and express ideas. In grade 1, with guidance, students include loops in their sequence to express an idea or solve a problem. Students utilize loops in a sequence to demonstrate repetition in their sequence and to simplify the steps to create or model their algorithm. In grade 2, students will create a program that utilizes sequencing and loops.

IMPORTANT CONCEPTS

- An algorithm is a sequence of steps
- Programs may be modeled to express an idea or solve a problem
- A loop is a repeated sequence of steps

KEY SKILL/PROCEDURES

- Identify a sequence as an algorithm
- With guidance, identify a repeated sequence as a loop
- With guidance, model algorithms and loops to follow a process

Content Elaborations

CLARIFICATIONS

Students can address this content with or without a computing device.

Loops are repeated sequences.

Modeling a program means the students are provided the program to follow; they are not creating it. Modeling can be done visually or verbally.

CONTENT FOCUS

The focus is on sequencing, process (i.e., steps), loops and problem solving.

Strand	Algorithmic Thinking and Programming
Topic	**Control Structures**
	COMPUTER SCIENCE PRACTICES *Practice 4.* Developing and Using Abstractions 4. Model phenomena and processes and simulate systems to understand and evaluate potential outcomes. *Practice 7.* Communicating About Computing 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Algorithmic Thinking and Programming
Topic	**Modularity**

ATP.M.1.a With guidance, break down (i.e., decompose) a series of steps and separate the necessary from the unnecessary steps to create a precise sequence of instructions to solve a problem or express an idea.

Expectations for Learning

LEARNING PROGRESSION

In grade 1, with guidance, students determine what information is necessary to complete a sequence or process. In grade 2, students will determine what information is necessary to complete a more complex sequence or process.

IMPORTANT CONCEPTS

- Decomposition is to break down a series of steps
- Abstraction is to determine the information that is relevant to solve a problem

KEY SKILL/PROCEDURES

- With guidance, decompose a problem into a series of steps
- With guidance, abstract information relevant to the problem being solved

Content Elaborations

CLARIFICATIONS

Students can address this content with or without a computing device.

Students will start with a simple sequence of at least three steps (e.g., beginning, middle and end) and move to a more complex sequence of more than three steps.

Abstraction is to determine which information is relevant or irrelevant to the problem. Decomposition is taking a problem and breaking it into steps.

CONTENT FOCUS

The focus is on decomposing and the abstraction of information in a sequence of instructions to solve a problem.

COMPUTER SCIENCE PRACTICES

Practice 3. Recognizing and Defining Computational Problems

2. Decompose complex real-world problems into manageable subproblems that could integrate existing solutions or procedures.

Strand	Algorithmic Thinking and Programming
Topic	**Program Development**

ATP.PD.1.a With guidance, plan and create an artifact to illustrate thoughts, ideas and problems in a sequential (step-by-step) manner (e.g., story map, storyboard, sequential graphic organizer).

ATP.PD.1.b With guidance, identify and fix (i.e., debug) a multi-step process that includes sequencing.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, with teacher support, students planned and/or created an artifact to illustrate thoughts, ideas, and problems in a sequential manner. In grade 1, with guidance, students continue to plan and create, as well as begin to debug an artifact in order to illustrate thoughts, ideas, and problems in a sequential manner. In grade 2, students will continue to plan, create and/or debug an artifact to illustrate thoughts, ideas, and problems in a sequential manner.

IMPORTANT CONCEPTS

- Artifacts illustrate thoughts, ideas and problems in a sequential manner
- When creating artifacts, it is important to review your artifact for errors

KEY SKILL/PROCEDURES

- With guidance, plan and create an artifact to illustrate thoughts, ideas and problems in a sequential manner
- With guidance, evaluate an artifact for errors

Content Elaborations

CLARIFICATIONS

An artifact is anything created by a human. An artifact could be a visual program, story map, story board or sequential graphic organizer.

Debug is defined as "to identify and fix."

CONTENT FOCUS

The focus is on creating and debugging artifacts and programs.

Strand	Algorithmic Thinking and Programming
Topic	**Program Development**
	COMPUTER SCIENCE PRACTICES *Practice 5.* Creating a Computational Artifact 1. Plan the development of a computational artifact using an iterative process that includes reflection on and modification of the plan, taking into account key features, time, and resource constraints, and user expectations. 2. Create a computational artifact for practical intent, personal expression, or to address a societal issue. *Practice 6.* Testing and Refining Computational Artifacts 2. Identify and fix errors using a systematic process. *Practice 7.* Communicating About Computing 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Impacts of Computing
Topic	**Culture**

IC.Cu.1.a Discuss different technologies and their impact on everyday life.

IC.Cu.1.b Identify how people use and are impacted by many types of technologies in their daily work and personal lives.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students identified what technology is and how it has changed and impacted their lives. In grade 1, they recognize the different ways technology impacts and the role technology plays in their lives. In grade 2, students will compare and contrast how technology use has changed and the impact it has on their lives positively and negatively.

IMPORTANT CONCEPTS

- Technology plays a role in our everyday life
- Technology is constantly changing and affects how we live

KEY SKILL/PROCEDURES

- Compare past and present technology and how it affects our lives

Content Elaborations

CLARIFICATIONS

Students can identify and explain the connections between their lives and technology and how technology affects their lives.

CONTENT FOCUS

The focus is on how technology has changed and the impact on students' lives.

COMPUTER SCIENCE PRACTICES

Practice 1. Fostering an Inclusive Computing Culture

1. Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products.
2. Address the needs of diverse end users during the design process to produce artifacts with broad accessibility and usability.

Practice 2. Collaborating Around Computing

1. Cultivate working relationships with individuals possessing diverse perspectives, skills, and personalities.

Strand	Impacts of Computing	
Topic	**Culture**	
		Practice 3. Recognizing and Defining Computational Problems 1. Identify complex, interdisciplinary, real-world problems that can be solved computationally *Practice 7.* Communicating About Computing 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Impacts of Computing
Topic	**Social Interactions**

IC.SI.1.a With guidance, describe safe and responsible behaviors for the use of information and technology.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students used technology responsibly and safely with teacher support. In grade 1, with guidance, students are able to describe how to be safe and responsible using technology. In grade 2, students will be able to compare and contrast safe and responsible technology behaviors.

IMPORTANT CONCEPTS

- Schools develop their own technology rules, regulations and etiquette

KEY SKILL/PROCEDURES

- With guidance, describe appropriate behaviors on how to use technology and apply those rules, regulations and etiquette within the classroom

Content Elaborations

CLARIFICATIONS

Etiquette topics might include cyberbullying, school policy and safe privacy practices.

CONTENT FOCUS

The focus is on the responsible use of technology in and out of the classroom.

COMPUTER SCIENCE PRACTICES

Practice 1. Fostering an Inclusive Computing Culture

1. Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products.
2. Address the needs of diverse end users during the design process to produce artifacts with broad accessibility and usability.

Practice 7. Communicating About Computing

2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.

Strand	Impacts of Computing
Topic	**Safety, Law and Ethics**

IC.SLE.1.a With guidance, discuss appropriate and ethical uses of technology to guide informed decisions.

Expectations for Learning

LEARNING PROGRESSION

In kindergarten, students used technology responsibly and safely with teacher support. In grade 1, with guidance, students are able to describe how to be safe and responsible using technology. In grade 2, students will be able to compare and contrast safe and responsible technology behaviors.

IMPORTANT CONCEPTS

- Guidelines and practices to stay safe on the internet should be discussed and practice
- Awareness of what private information is, what you should and should not share, and what are potential consequences of sharing private information

KEY SKILL/PROCEDURES

- With guidance, identify practices to stay safe on the internet and provide examples of situations where these practices should be applied

Content Elaborations

CLARIFICATIONS

Provide students guidelines for safe navigation of the internet. Provide students opportunities to practice these guidelines by using teacher-selected internet sites.

Provide students guidelines of what constitutes personal information and the consequences of misuse.

Students have the opportunity to apply basic security practices as part of their activities addressing cybersecurity (NI.C.1.a)

CONTENT FOCUS

The focus is to keep students safe when using the internet.

Strand	Impacts of Computing
Topic	**Safety, Law and Ethics**
	COMPUTER SCIENCE PRACTICES *Practice 1.* Fostering an Inclusive Computing Culture 1. Include the unique perspectives of others and reflect on one's own perspectives when designing and developing computational products. 2. Address the needs of diverse end users during the design process to produce artifacts with broad accessibility and usability. *Practice 2.* Collaborating Around Computing 1. Cultivate working relationships with individuals possessing diverse perspectives, skills, and personalities. *Practice 7.* Communicating About Computing 2. Describe, justify, and document computational processes and solutions using appropriate terminology consistent with the intended audience and purpose.