Core Knowledge® SCIENCE

Using data

Using Computers

Teacher Guide

Devices

School work

Using Computers

Teacher Guide

Core Knowledge®

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Using Computers

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Using Computers

Teacher Guide

Core Knowledge Computer Science™ 2

GRADE 1

Introduction

About this Program

Core Knowledge Computer Science Conceptual Approach Framework

Grade	Title and Driving Question	Emphasis is on . . .	Overarching Unit Objective
K (ages 5–6)	**Computers All Around Us** What are computers and where can we find them?	recognizing	Identify computer devices and parts and operate them age-appropriately.
1 (ages 6–7)	**Helpful Computers** What can computer programs do?	using	Experience a variety of age-appropriate programs designed for different purposes.
2 (ages 7–8)	**Using Computers** How can we use computers and the internet?	using	Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.
3 (ages 8–9)	**Codes and Computers** How do programmers build computer programs?	deciphering and evaluating	Model use of symbols, codes, and steps in simple processes and problem solving.
4 (ages 9–10)	**Problem-Solving and Computers** What kinds of problems can we solve with computers?	deciphering and evaluating	Model solution design in increasing complexity and involving conditionals and loops.
5 (ages 10–11)	**Designing Computer Programs** What kinds of computer programs can I develop?	planning and designing	Write, evaluate, and debug code to execute grade-appropriate tasks.

Skills and Performance Summary

Grade K

The goal of the instruction and cumulative experiences in this unit is for young students to build a concept of what makes a thing a computer. Students think about how tools and devices can be helpful for completing tasks. Though students will not specifically study simple and compound machines in science until a later grade level, they are able from everyday exposure to differentiate devices that need a power source and those that do not. Within the class of devices that need a power source, students can form a further classification of electronic devices—ones that do something with information that is put into the device. Upon recognizing input-processing-output characteristics of devices, students can also begin to classify and use devices for different purposes, including playing games, communicating, and doing schoolwork.

Grade 1

Building on the recognition established in the previous grade, the goal of the instruction and cumulative experiences in this unit is for young students to begin using computer devices for various purposes, including game play, communication, and schoolwork. Through practice, students understand that the operation of devices has a series of steps in common, in which users input information, the device performs a process, and then a useful output occurs. Inputs include the use of a mouse, keyboard, touchscreen, game controller, camera, and microphone. Output includes screen visuals (text, still images, video), hard-copy printout, and audio. Accessing desired outputs from computers depends first on successful operation of input devices.

Grade 2

Building on the use of devices established in the previous grade, the goal of the instruction and cumulative experiences in this unit is for young students to continue using with increasing independence computer devices for various purposes, including game play, communication, and schoolwork. With increasing practice in successfully inputting information, students can consider ways to achieve creative outputs that use and combine text, graphics, visual data displays, photos, animations, video, and audio.

Grade 3

In this grade level, the emphasis begins to shift from use—skillfully inputting information to prompt outputs—to the unseen processes inside computing technology. The goal of the instruction and cumulative experiences in this unit is for students to identify the output of every computer device as a solution to a problem and deconstruct the solution into the necessary steps required. Students discern that computers do not think on their own to solve problems but only execute steps-by-step instructions that are built into them. And they begin to dissect messages into the granular parts that make them up and transmit them.

Grade 4

Building on the concepts of symbols, codes, signals, and step-by-step instructions established in the previous grade, the goal of the instruction and cumulative experiences in this unit is for students to continue articulating steps of increasingly complexity to solve problems. Beyond dissecting solutions into granular steps, students think forward in scenarios with conditional branching options (if-then

statements) and loops (if-then, repeat prior instruction). Students relate what computing devices do to their programming, and they build understanding that complex computer programming is the outcome of building, layering, and chaining together links of fundamentally simple code.

Grade 5

In this grade level, the emphasis begins to shift from examination—figuring out how instructions make computing devices do what they do—to creative application of that knowledge. They step forward from the role of computer technology user into a beginning maker role. Students begin to use functional computer language to craft code for executable tasks.

Note to Teachers and Curriculum Planners

This unit introduces Grade 2 students to real-world examples and fundamental concepts related to devices that utilize computer technology. The unit includes a story-based Student Book and this Teacher Guide. The lesson sessions alternate between those focused on the Student Book and others that are interactive in nature and do not involve a Student Book chapter.

This unit can be integrated into your existing science or math curriculum. The lessons can be inserted intermittently, or the entire unit can be taught on consecutive days. The unit can also be offered as an enrichment course.

Standards: What are the relevant CSTA Concepts for this unit?*

This unit, *Using Computers*, has been informed by the K–12 Computer Science Standards put forth by the Computer Science Teachers Association (CSTA). The CSTA K–12 Computer Science Standards delineate a core set of learning objectives designed to provide the foundation for computer science curricula and implementation at the K–12 level. The CSTA Standards introduce fundamental concepts of computer science beginning at the elementary school level.

For detailed information about the CSTA references, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

*The K–12 Computer Science Framework, led by the Association for Computing Machinery, Code.org, Computer Science Teachers Association, Cyber Innovation Center, and National Math and Science Initiative in partnership with states and districts, informed the development of this work. Authors of the CSTA K–12 Computer Science Standards were not involved in the production of this product, and their endorsement is not implied.

Source:
Computer Science Teachers Association (2017). CSTA K-12 Computer Science Standards, Revised 2017. Retrieved from http://www.csteachers.org/standards. K–12 Computer Science Framework. (2016). *Framework view by grade band.* Retrieved from http://www.k12cs.org

Grades K–2 CSTA Standards

Concepts	Subconcepts	Level 1A (ages 5-7) By the end of Grade 2, students will be able to . . .
Computing Systems	**Devices**	1A-CS-01 Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. (P1.1)
	Hardware and Software	1A-CS-02 Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7.2)
	Troubleshooting	1A-CS-03 Describe basic hardware and software problems using accurate terminology. (P6.2, P7.2)
Networks and the Internet	**Cybersecurity**	1A-NI-04 Explain what passwords are and why we use them and use strong passwords to protect devices and information from unauthorized access. (P7.3)
Data and Analysis	**Storage**	1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4.2)
	Collection, Visualization, and Transformation	1A-DA-06 Collect and present the same data in various visual formats. (P7.1, P4.4)
	Inference and Models	1A-DA-07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4.1)
Algorithms and Programming	**Algorithms**	1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4.4)
	Variables	1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4.4)
	Control	1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem. (P5.2)
	Modularity	1A-AP-11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3.2)
	Program Development	1A-AP-12 Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5.1, P7.2)
		1A-AP-13 Give attribution when using the ideas and creations of others while developing programs. (P7.3)
		1A-AP-14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (P6.2)
		1A-AP-15 Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7.2)

Impacts of Computing	**Culture**	1A-IC-16 Compare how people live and work before and after the implementation or adoption of new computing technology. (P7.0)
	Social Interactions	1A-IC-17 Work respectfully and responsibly with others online. (P2.1)
	Safety, Ethics, and Law	1A-IC-18 Keep login information private, and log off of devices appropriately. (P7.3)

Integrated Practices

1. Fostering an Inclusive Computing Culture

    1.1 Include the unique perspectives of others . . .

    1.2 Address the needs of diverse end users . . .

    1.3 Employ self and peer-review advocacy . . .

2. Collaborating Around Computing

    2.1 Cultivate working relationships . . .

    2.2 Create team norms, expectations, and equitable workloads . . .

    2.3 Solicit and incorporate feedback . . .

    2.4 Evaluate and select technological tools . . .

3. Recognizing and Defining Computational Problems

    3.1 Identify complex, interdisciplinary, real-world problems . . .

    3.2 Decompose complex real-world problems . . .

    3.3 Evaluate whether it is appropriate and feasible . . .

4. Developing and Using Abstractions

    4.1 Extract common features . . .

    4.2 Evaluate existing technological functionalities . . .

    4.3 Create modules and develop points of interaction . . .

    4.4 Model phenomena and processes and simulate systems . . .

5. Creating Computational Artifacts

    5.1 Plan the development of a computational artifact . . .

    5.2 Create a computational artifact . . .

    5.3 Modify an existing artifact . . .

6. Testing and Refining Computational Artifacts

6.1 Systematically test . . .

6.2 Identify and fix errors . . .

6.3 Evaluate and refine . . .

7. Communicating About Computing

7.1 Select, organize, and interpret data sets . . .

7.2 Describe, justify, and document computational processes . . .

7.3 Articulate ideas responsibly . . .

(See *K12 Computer Science Framework* for full text of the Practices integrated into the standards.)

What Teachers Need to Know

Supportive information on the content standards and the concepts they address is provided throughout the lessons at points of relevance:

Know the Standards: These sections, found later in this Teacher Guide, explain what to teach and why, with reference to CSTA and Core Knowledge expectations.

Know the Science: These sections provide supporting, adult-level, background information or explanations related to specific computer science concepts or examples.

A Special Note to Grade 2 Teachers Before Starting This Unit

Why Study Computer Science in Elementary Grades?

For many Grade 2 teachers, the suggestion that computer science should be a part of the Grade 2 curriculum may seem questionable. For many teachers, precious instructional time is devoted to teaching core content area fundamentals to students.

The study of computer science in Grade 2, however, is consistent with the Core Knowledge approach to learning. Knowledge builds upon knowledge, and computer science builds upon the foundational understanding that many devices share basic underlying technology. And that technology operates through shared processes that are simple at their core but are combined in increasingly complex ways that can produce unlimited outcomes. Grade 2 students can build on what they learned in Grade 1 to go beyond recognizing and describing devices, programs, and their uses to actually using them. They can also consider step-by-step commands, if-then scenarios, and simple codes that carry meaning. These building blocks promote readiness for students to put concepts together and make their own instructional codes in later elementary grades.

Using the Student Book

Student Book

The *Using Computers* Student Book includes ten chapters intended to be read aloud by the teacher as the students look at images on each page.

As you will note when you examine the Student Book, limited text is included on each page. Instead, colorful and engaging illustrations dominate the Student Book pages. The design of the Student Book in this way is intentional because students in Kindergarten–Grade 2 are just learning to read. At these grade levels, students are learning how to decode written words, so the complexity and amount of text that these young students can actually read is quite limited.

While some advanced students may be able to read words on a given page of the Student Book, as a general rule, students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

The intent of the Grades K–2 Core Knowledge Computer Science lessons is to build students' understanding and knowledge of computer science concepts, as well as of associated practices and skills. It is for this very reason that in Grades K–2, the core content of each lesson is reinforced to students using a teacher Read Aloud, accompanied by example images and diagrams. Cognitive science research has clearly documented that students' listening comprehension far surpasses their reading comprehension well into the late elementary and early middle school grades. Said another way, students are able to understand and grasp far more complex ideas and text that they hear read aloud than they would ever be able to read or comprehend when they read to themselves. For a more thorough discussion of listening and reading comprehension and the underlying cognitive science research, teachers may want to refer to Appendix A of the Common Core State Standards for English Language Arts, noting in particular the Speaking and Listening section of the appendix.

Online Resources

Use this link to download the Online Resources for this unit, where the specific link to this appendix can be found:

www.coreknowledge.org/cksci-online-resources

Using the Teacher Guide

Instructional Design

The *Helpful Computers* unit is the Grade 2 installment in the Core Knowledge Computer Science elementary series. To meet CSTA Standards we encourage teachers to complete the corresponding grade-level unit each school year. Each lesson part requires thirty to forty-five minutes of instruction time. The time it takes to complete a full lesson depends on class size and individual circumstances.

Within the Teacher Guide, each Core Lesson is generally composed of two or three parts. Each segment concludes with a Check for Understanding, providing the teacher with a quick opportunity for formative assessment. At the end of this unit Introduction, you will find a blank Pacing Guide, which you

may use to plan how you might pace the lessons. We strongly recommend that you preview the unit in full before beginning instruction. This will help you prepare before teaching the first lesson.

Features

The unit is composed with several integrated features that support learning for students and development for teachers.

	This computer science unit can be completed BOTH in classrooms that have computers and devices for students and those that do not. Look for the icons at left to indicate the types of student interactions recommended within each lesson. Pay attention to those icons most relevant to your classroom situation.
Unplugged 	There are many opportunities for students to complete foundational exercises relevant to the concepts of computer science without needing access to computers. These activities are designated by the Unplugged icon.
Device-Based 	Several activities and extensions do require that students work on computers, and those experiences are designated by the Device-Based icon.
Online 	A few activities and demonstrations recommended in this unit require the use of internet-connected devices. These experiences are indicated by the Online icon and will also include references to the Online Resources Guide for links to the recommended internet resources.
Differentiation	Adjustments to instruction appear in the text, indicated by **SUPPORT**, **EXTEND**, and **CHALLENGE** notations. **SUPPORT**—Reading, writing, listening, and/or speaking alternatives appear for students who are English language learners, have special needs, or read below the grade level. Extra support is suggested for students who struggle to meet targeted expectations. **EXTEND**—Extensions are suggested for students with high interest or who have already met the performance expectations. **CHALLENGE**—Additional, relevant, and interesting exercises are suggested for students to explore that exercise math, reading, or science skills/comprehension that push beyond the grade level.
Teacher Development	Information in the instructional text, Know the Science boxes, and Know the Standards boxes is provided to support ongoing teacher development with regard to both content and the teaching process.
Monitor Progress	Opportunities for formative assessment appear throughout the instructional support. These instances are most consistently noted in a Check for Understanding that concludes each lesson segment.

The Core Lessons

- Lesson time: Each Core Lesson part constitutes one classroom session of thirty to forty-five minutes. Some activities and performance tasks will require setting aside a longer block of time.
- Lesson order: The lesson parts are coherently sequenced to build from one to the next, linking student engagement across lessons and helping students build new learning on prior knowledge.

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

Lesson and Part	Title	Interaction Type and Learning Objective
Lesson 1, Part 1	What Devices Have Computers?	Student Book Read Aloud: Chapter 1, "What Devices Have Computers?" • Identify different kinds of computing devices and how they are used. • Identify ways people provide input to and get output from computing devices.
Lesson 1, Part 2	Is It a Computer?	Classroom Interactive • Identify and model examples of everyday computing devices. • Identify several different ways people use computing devices.
Lesson 2	Is Your Computer Broken?	Student Book Read Aloud: Chapter 2, "Is Your Computer Broken?" • Communicate a hardware or software problem using appropriate terminology. • Restart a computer or device when a computing problem arises.
Lesson 3, Part 1	Computer Users Need Passwords	Student Book Read Aloud: Chapter 3, "Computer Users Need Passwords" • Define the term *password*. • Explain why people use passwords.
Lesson 3, Part 2	How Can You Make a Strong Password?	Classroom Interactive • Understand the importance of passwords. • Create a strong password.

Lesson 4, Part 1	Computers Store Information	Student Book Read Aloud: Chapter 4, "You Can Store Information on a Computer" • Define the term *data*. • Recognize that data can be collected and stored on different computing devices and retrieved later.
Lesson 4, Part 2	Creating and Saving Data	Classroom Interactive • Recognize that data can be collected and stored on a computer and retrieved later. • Describe the basic steps of creating, saving, and reopening a text document.
Lesson 5, Part 1	How Can You Collect and Share Data?	Student Book Read Aloud: Chapter 5, "How Can You Collect and Share Data?" • Understand how digital devices can be used to collect and present data in various formats.
Lesson 5, Part 2	How Can You Group and Show Data?	Classroom Interactive • Collect data. • Compare different ways of grouping data.
Lesson 6, Part 1	Computers Follow Instructions	Student Book Read Aloud: Chapter 6, "Computers Follow Instructions" • Recognize that a computer uses a step-by-step process to complete a task. • Define the word *algorithm*.
Lesson 6, Part 2	Which Step Comes First?	Classroom Interactive • Recognize why the steps of an algorithm have to be done in the correct order. • Model a daily process by creating and following an algorithm.
Lesson 7, Part 1	Computer Programs Are Instructions	Student Book Read Aloud: Chapter 7, "What Is a Computer Program?" • Define the terms *computer program* and *computer programming*. • Describe sequences and simple loops.
Lesson 7, Part 2	How Do You Create a Sequence with a Loop	Classroom Interactive • Recognize sequences as a series of steps and loops as repeated steps within a sequence. • Model sequences and loops using physical movements. • Recognize that movements can be represented by symbols.

Lesson 8, Part 1	Thinking like a Computer	Student Book Read Aloud: Chapter 8, "Thinking like a Computer" • Identify the tools used for creating drawings on and printing from a computer.
Lesson 8, Part 2	How Can You Solve a Problem by Breaking It Down into Smaller Parts?	Classroom Interactive • Identify a problem or task and discuss ways to break it into multiple smaller steps. • Articulate a plan for solving the problem. • Credit the contributions of others.
Lesson 9, Part 1	Debugging Means Fixing Problems	Student Book Read Aloud: Chapter 9, "Debugging Means Fixing Problems" • Define *bug* and *debugging*. • Identify some of the strategies used to debug a program.
Lesson 9, Part 2	Debugging a Program	Classroom Interactive • Identify and fix (debug) errors within a simple algorithm. • Describe the steps taken to show the process used to develop and debug an algorithm. • Credit the contributions of others.
Lesson 9, Part 3	Describing a Plan	Classroom Interactive • Identify the steps used in the design process. • Use images, verbal reflections, and/or models to show the process used to develop and improve a program.
Lesson 10, Part 1	Computers Have Changed the Ways People Do Things	Student Book Read Aloud: Chapter 10, "Computers Have Changed the Ways People Do Things" • Compare how people lived and worked before and after the adoption of new computing technologies. • Recognize that people should work respectfully and responsibly with others online.
Lesson 10, Part 2	Computers Changing Work and Life	Classroom Interactive • Name several different examples of technology. • Compare and contrast old and new technology. • Recognize that technology is constantly changing.

Activity Pages

Activity Pages

AP 6.2
AP 7.2
AP 9.2
AP 9.3

Black-line reproducible masters for Activity Pages (AP) and an Answer Key are included in Teacher Resources at the back of the Teacher Guide. The icon shown to the left appears throughout the Teacher Guide wherever Activity Pages are referenced.

The Activity Pages can be organized into a learning portfolio for each student to demonstrate their progress relative to expectations, and as student work products.

Make sufficient copies for your students in advance of each lesson:

Lesson 6, Part 2—Put Steps in Order (AP 6.2)

Lesson 7, Part 2—Dance Moves! (AP 7.2)

Lesson 9, Part 2—Moving Through the Maze (AP 9.2)

Lesson 9, Part 3—Design Journal Sections (AP 9.3)

Online Resources for Science

Online Resources

For each CK Computer Science unit, the Teacher Guide includes references to online resources (including external websites and downloadable documents) to enhance classroom instruction. Look for the icon to the left.

Use this link to download the CKSci Online Resources for this unit:

www.coreknowledge.org/cksci-online-resources

Teaching Strategies

Start with the familiar.	Lead with an experience. Begin each lesson with a demonstration, activity, or question about a phenomenon to engage students and focus their attention on the topic. Start with the familiar. Every science topic introduced to students relates in some way to their known world and everyday experiences. The purpose of every lesson is to build a bridge between what is familiar to students and broader knowledge about the way the world works.
Ask driving questions.	Each multipart lesson contributes to the unit's Driving Question. And at the beginning of each Teacher Guide lesson segment, you will find a reminder of the Overarching Unit Objective. Each lesson activity provides an incremental concept to help students move toward the objective and ultimately be able to offer confident answers to the Driving Question. Pose discussion questions in each class session with the Driving Question and the Overarching Unit Objective in mind.

Encourage scientific thinking.	Approach the lessons with students not as learning about computer science, but as learning about the world with a scientific mind. Throughout the lessons, encourage students to ask questions about what they observe, do, and read. Record relevant questions in a prominent place in the classroom. Guide students back to these questions as opportunities to answer them emerge from readings, demonstrations, and activities.
Use continuous Core Vocabulary instruction.	During instruction, emphasize Core Vocabulary terms and their meanings in context rather than relying on isolated drill for memorization of definitions. Through scaffolded questioning, encourage students to come up with definitions in their own words and to use the words in their own sentences. Core Vocabulary words for each lesson, as well as Language of Instruction, other key terms teachers are encouraged to use in discussing topics with students, are provided at the start of each lesson. You can find Core Vocabulary and selected Language of Instruction definitions in the Glossary at the back of this Teacher Guide.
Emphasize observation and experience.	Lessons employ various ways for students to learn, including watching, listening, reading, doing, discussing, and writing.
Make frequent connections.	Use a combination of demonstrations and reading materials, rich with examples, to help students recognize how the concepts they are learning apply in their everyday lives. Prompt students to relate lesson content to their own experiences, to relate the new and unfamiliar to the familiar, and to connect ideas and examples across disciplines.
Monitor student progress.	Use verbal questioning, student work, and the Check for Understanding prompts at the end of each lesson part to monitor progress during each lesson and to measure understanding at the conclusion of the unit. Many lessons provide tips to help you support students who need further explanations or clarifications.

Effective and Safe Classroom and Online Activities

Online Resources

Conducting safe classroom demonstrations and activities and safe online interactions is essential to successful elementary education. The following resources, included at the back of this Teacher Guide, provide Core Knowledge's recommendations for developing effective science and computer science classroom activities:

- Internet Safety
- Student Online Safety Contract
- Strategies for Acquiring Materials

These resources may also be accessed within the CKSci Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Materials and Equipment

The unit requires a variety of materials to support various ways of learning (including doing, discussing, listening, watching, reading, and writing). Prepare in advance by collecting the materials and the equipment needed for all of the demonstrations and the hands-on investigations.

- A large whiteboard, blank sheets of printer paper, student notebooks, pencils, and scissors are routinely required but not listed below.
- A classroom computer, tablet, or other computing device, as needed for discussion, is referred to in the materials for lesson segments in which it is used but is not repeated in the materials listed here. Internet access and the means to project images/videos for whole-class viewing are also required in many lesson segments but not repeated below.

Lesson 1, Part 2

- craft materials, such as craft sticks, chenille sticks, pom-poms, recycled cardboard containers, etc.
- magazine images and/or photos
- safety scissors
- glue sticks
- drawing/painting materials
- craft paper/cardboard for collages

Lesson 2

- markers, colored pencils, or crayons
- drawing paper
- image of computer device to display (optional)

Lesson 3, Part 2

- 3" X 5" index card (one per student)
- box to hold index cards

Lesson 4, Part 1

- classroom computer, tablet, or other computing device

Lesson 4, Part 2

- desktop or laptop computer with a keyboard and a mouse or trackpad
- a free word processor text editor, such as Notepad (Windows), TextEdit (Mac), or a paid version, such as Microsoft Word (must be installed with an active license)
- blank piece of writing paper (optional)

Lesson 5, Part 1

- Classroom computer, tablet, or other computing device

Lesson 5, Part 2

- opaque plastic storage containers (one per group)
- four different, small, classroom items to sort, such as colored craft sticks, pom-poms, pipe cleaners, pencils, colored erasers, crayons, rulers, puzzle pieces (ten – twenty objects total per group)
- individual whiteboard or paper for recording answers (one per group)
- whiteboard marker or pencil (one per group)

Lesson 6, Part 2

- glue sticks

Lesson 7, Part 2

- one piece of paper (per small group)
- tape or glue stick (per small group)

Lesson 8, Part 2

- predrawn maze grid on paper (one per group)
- colored pencils, crayons, or markers
- several pieces of paper (per group)
- small manipulative, such as a plastic animal, small block, or coin, to act as a token (one per group

- red, orange, yellow, green blue and beige pattern blocks
- whiteboard or chart markers in the same colors as the pattern blocks

Lesson 9, Part 2

- predrawn maze grid on paper (one per pair)
- small manipulative, such as a plastic animal, small block, or coin, to act as a token (one per group)
- "obstacle" stickers (optional)

Lesson 9, Part 3

- pencils, crayons, and/or markers for a journal page (per student)

Lesson 10, Part 1

- items for comparison, such as a book and an e-reader, a piece of mail and an email, or an old film camera and smartphone camera

Lesson 10, Part 2

- four to eight images of old or obsolete technology along with images showing new technologies that have replaced or updated them.
- computer with Internet access, preferably one per group of 4 to 5 students.
- desktop, laptop, or tablet with image viewing software or the ability to create a slideshow or document
- a projector and screen or a large flatscreen monitor with video connection cables that will allow it to connect to the computer

Using Computers Pacing

_____**'s Class**

Note to Teacher: *Using Computers* can be taught on consecutive days as a supplemental unit to your science or math curriculum. It can also be offered as an enrichment program. If the program is implemented in consecutive thirty- to forty-five-minute class sessions, it will take sixteen days to complete.

Week 1

Day 1	Day 2	Day 3	Day 4	Day 5

Week 2

Day 6	Day 7	Day 8	Day 9	Day 10

Week 3

Day 11	Day 12	Day 13	Day 14	Day 15

Week 4

Day 16				

LESSON 1, PART 1

What Devices Have Computers?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Identify different kinds of computing devices and how they are used.
- ✓ Identify ways people provide input to and get output from computing devices.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Computing Systems

Subconcept and Standards:

Devices: 1A-CS-01 Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. (P1.1)

Hardware and Software: 1A-CS-02 Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). (P7.2)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

computer **computer system** **hardware** **software**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

device **monitor** **screen** **tablet**

Instructional Resources

Student Book

Ch. 1

Student Book, Chapter 1
What Devices Have Computers?

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart

The Core Lesson

1. Focus attention on today's topic.

Introduce the unit by writing "What Devices Have Computers?" on the board. Tell students that computers come in many shapes and sizes. Have the students look around the room. Then ask them: "What items or devices do you see that may have computers in them?" List their responses on the whiteboard or anchor chart.

2. Read together "What Devices Have Computers?"

Student Book

Ch. 1

While some advanced students may be able to read words on a given page of the Student Book, as a general rule, students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 2 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "What Devices Have Computers?" and tell them to pay special attention to the different things that are computers or contain computers as you read.

Page 2

Ask students to look at the picture on page 2. Tell students that computer systems can be found in different types of devices. Explain that computers help us do different things, such as read books, listen to music, draw pictures, send messages, play games, and even drive cars.

CHAPTER 1

What Devices Have Computers?

Hanna's mom fixes cars. Today she is fixing a computer in a car.

Hanna asks her mom, "Is the car computer like the computer I use at school?"

"In a way, yes," her mom says. "The car has a computer processor in it the way your school computer does."

2

Ask students the following questions:

LITERAL—Where is the computer Hanna's mom is fixing?

» Hanna's mom is fixing the computer in the car.

INFERENTIAL—What else in the picture might be a computer?

» Possible answers include the laptop and the watch.

SUPPORT—If students have trouble identifying objects that are computers or that contain computers, help guide their responses by pointing to different objects in the classroom, such as a pencil, a calculator, a stapler, and a tablet. For each object you point to, name the object and **ask students**: "Do you think this might be a computer? Why or why not?"

Page 3

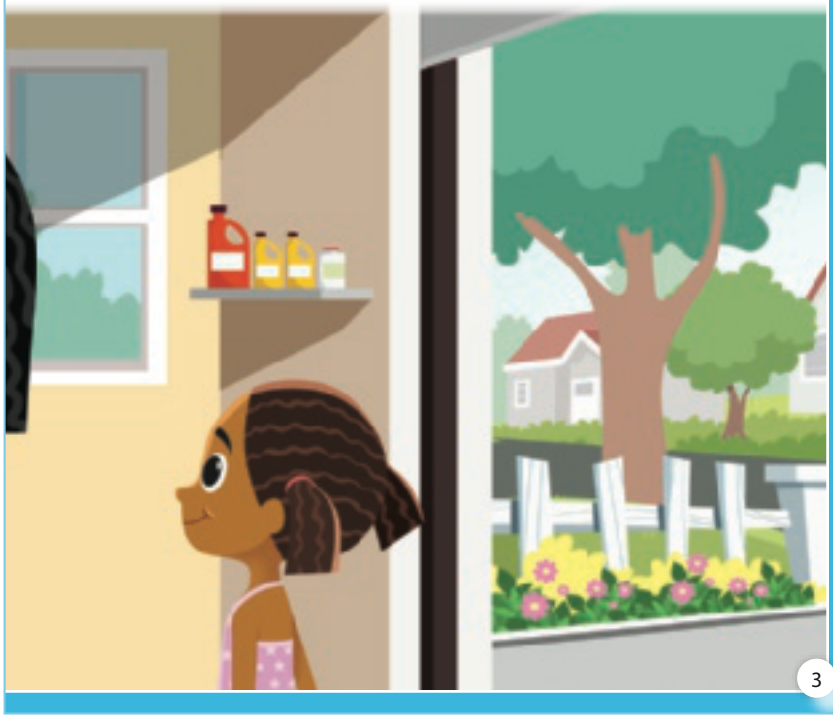
Ask students to look at the picture on page 3. Discuss how some devices are computers, such as a laptop, while other devices have computers inside, such as a car.

Hanna's mom explains, "Many things we use have computer systems in them."

"Inside your school's computer is a processor," her mom says.

"My smartphone has a computer processor. The car I'm working on has a processor too."

Hanna wants to know more about devices that have computer processors.



3

Ask students the following questions:

LITERAL—What are some of the things with computer systems that Hanna's mom mentions?

» Hanna's mom mentions a school computer, a smarphone, and a car.

EVALUATIVE—Hanna's mom says that a school computer, a smartphone, and a car all have computer systems in them. What other devices might have a computer system?

» Possible answers include watches, TVs, e-book readers, refrigerators, game consoles, laptops, cameras, cash registers, etc.

Page 4

Ask students to look at the picture on page 4 as you read aloud. Explain that the picture shows Hanna thinking about different devices that might have computers in them.

Hanna thinks of devices that might have computer processors in them. Mom's phone and Hanna's tablet have some of the same games on them. Mom's phone has a computer processor. So she thinks her tablet must have one too. Dad's smart watch is like Mom's phone in some ways. It must also have a processor. All these things have screens to look at. Since the TV also has a screen, Hanna wonders if the TV also has a computer processor in it.

4

Ask students the following questions:

LITERAL—What computing devices does Hanna think about?

» a tablet, a smartphone, and a smart watch

LITERAL—Why does Hanna think her TV might have a computer in it?

» Hannah thinks her TV has a computer in it because it has a screen to look at, like the tablet, the phone, and the watch

ALERT—Although Hanna makes the connection between the screens on computing devices and on televisions, you should help students recognize that not everything with a screen is a computer. Not all TVs are smart TVs, and not all computers have screens. For example, certain medical devices, such as fitness monitors and insulin pumps, contain computer chips but lack screens.

Page 5

Ask students to look at the picture on page 5. Talk about how computer devices might use different hardware but share the same purpose. Explain that laptop computers have trackpads, whereas desktop computers use a mouse, or a trackpad, or sometimes other input devices. Explain that tablets have touchscreens so that you can use your fingers or a stylus to interact with them. Some laptops have touchscreens too.

Computing devices have different parts. At school, Hanna uses a computer system that has a screen, a keyboard, and a mouse. It works with a printer. At home, Hanna uses a tablet. She tells the tablet what to do with a touchscreen. She operates the TV with a remote control.

5

Ask students the following questions:

LITERAL—What are the parts of a computer device that can be touched called? What are the instructions that tell a computer what to do called?

» hardware; software

INFERENTIAL—How do you think a remote control helps operate a TV?

» The remote control lets you change the TV channels or volume without having to get up from your spot.

EXTEND—Point out the different computer components mentioned on page 5 (keyboard, mouse, printer, screen, and headphones). If possible, display pictures of the different items, or point them out in the classroom. For each item, ask students to describe how the item can be used with a computer. If time permits, discuss and display other types of common computer components, such as microphones, monitors, flash drives, webcams, and speakers.

3. Check for understanding.

Unplugged Activity

Review the question and responses on the whiteboard or anchor chart. Encourage students to suggest changes to the items on the list based on what they've learned about computers. Ask students to reflect on what each listed computing device might help us do.

Know the Science

A main goal of this chapter is for students to appropriately select and operate software and hardware in order to perform different tasks. In order to do so, they must first be able to identify different devices that have computers inside of them, and understand how to use these devices. This chapter provides students with concrete and recognizable examples of:

- Different devices that have computers inside of them, such as cars, smartphones, tables, smart watches, and smart TVs.
- Parts (hardware) that are used to input information into computer devices. These parts include, but are not limited to the keyboard, mouse, touchscreen, remote controls.
- Parts (hardware) that output information such as printers, speakers, and screens.

Students later build on these concepts to differentiate between two major parts of computers: hardware and software. Hardware are the physical parts of computers, like the processor, mouse, printer keyboard, and more. Software are instructions that are stored inside the computer and perform tasks.

LESSON 1, PART 2

Is It a Computer?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Identify and model examples of everyday computing devices.
- ✓ Identify several different ways people use computing devices.

Instructional Activities

- hands-on activity
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Computing Systems

Subconcepts and Standards:

Devices: 1A-CS-01 Select and operate appropriate software to perform a variety of tasks, and recognize that users have different needs and preferences for the technology they use. (P1.1)

Hardware and Software: 1A-CS-02 Use appropriate terminology in identifying and describing the functions of common physical components of computing systems (hardware). (P7.2)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

computer **computer system**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

hardware **software**

Materials and Equipment

Collect or prepare the following:

- craft materials, such as craft sticks, chenille sticks, pom-poms, recycled cardboard containers, etc.
- magazine images and/or photos
- safety scissors
- glue sticks
- drawing/painting materials
- craft paper/cardboard for collages
- whiteboard or anchor chart

Advance Preparation

- Set up art stations with different arts and crafts materials.
- On the whiteboard or anchor chart, write the heading "What We Think Is a Computer."

The Core Lesson

1. Focus attention on today's topic.

Ask students to think about the word *computer*. Have them imagine all the computers that they know about, or have seen and touched. Then **ask students**: "What is a computer?" Record all responses on the whiteboard or anchor chart. Encourage students to differentiate between the hardware parts (physical components) and the software parts (programs) of a computer system.

2. Facilitate the activity.

Explain to students that they will be using arts and crafts materials to show what they think is a computer. They can cut pictures out of magazines, build a computing device with craft materials, and/or use paper to draw their own picture or construct something.

Unplugged Activity

SUPPORT—If appropriate for your class, you may wish to demonstrate different ways to use the materials to draw, build, or create collages.

As students are implementing their ideas, observe and record students' current understandings of computers.

CHALLENGE—Ask students to model both hardware and software components with the materials. They can use images or drawings to represent types of software applications, such as games or web browsers.

3. Check for understanding.

Unplugged Activity

Once students have completed their projects, have them show their work. Ask each student or each group of students to explain why they think their creation is a computer and how it works. Highlight examples that may challenge our traditional concept of computers.

If time permits, compare student responses on the whiteboard or anchor chart.

SUPPORT—To further support student understanding of objects that have computers, create a digital sorting game in which students will sort common images into two categories: "computer," and "no computer."

EXTEND—Conduct a computer search in the classroom. Have students find examples of computing devices in the classroom or on school grounds. Write the name of each device on the whiteboard or anchor chart.

Know the Standards

1A-CS-02 Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware). A computing system is composed of hardware and software. Hardware consists of physical components, such as desktop computers, laptop computers, tablet devices, monitors, keyboards, mice, trackpads, microphones, speakers, and printers. Software applications are programs with specific purposes, such as web browsers, word processing programs, or games. Software provides instructions for a computing system. The best way to guide students to mastering this concept is to use proper terminology when talking to them about using computers.

Consider making an alphabet collage and having students add images to the collage for each letter. For example, add a computer for the letter "c," a monitor and a mouse for the letter "m," a screen for the letter "s," and so on.

LESSON 2

Is Your Computer Broken?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Communicate a hardware or software problem using appropriate terminology.
- ✓ Restart a computer or device when a computing problem arises.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Computing Systems

Subconcept and Standard: Troubleshooting: 1A-CS-03 Describe basic hardware and software problems using accurate terminology. (P6.2, P7.2)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

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computer system **hardware** **problem** **software** **solution**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

broken **charge** **fix** **quit** **reboot** **troubleshoot** **update**

Instructional Resources

Student Book

Ch. 2

Student Book, Chapter 2
Is Your Computer Broken?

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart
- markers, colored pencils, or crayons
- drawing paper
- image of computer device to display (optional)

The Core Lesson

1. Focus attention on today's topic.

Introduce the unit by writing "Is Your Computer Broken?" on the board. Engage the students by asking if anyone has had a problem with a computing device. Encourage students to be as detailed as possible when describing the problem. Record the responses on the whiteboard or anchor chart.

2. Read together "Is Your Computer Broken?"

Student Book

Ch. 2

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 6 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Is Your Computer Broken?" and tell them to pay special attention to the different types of computer problems that can happen as you read.

Page 6

Ask students to look at the picture on page 6. Discuss the examples given on the page. For each example, invite students to raise their hands if they have ever experienced the same problem when using a computing device.

CHAPTER 2

Is Your Computer Broken?

Have you tried to play a game on a tablet and it would not turn on? Maybe you have tried to listen to music and there was no sound. At times, computer systems do not work. There can be many reasons why. Later you will learn how many computer problems can be fixed.

6

Ask students the following questions:

LITERAL—What problem is Hanna having with her device?

» There is no sound coming from the tablet.

INFERENTIAL—What do you think Hanna could do to fix the problem?

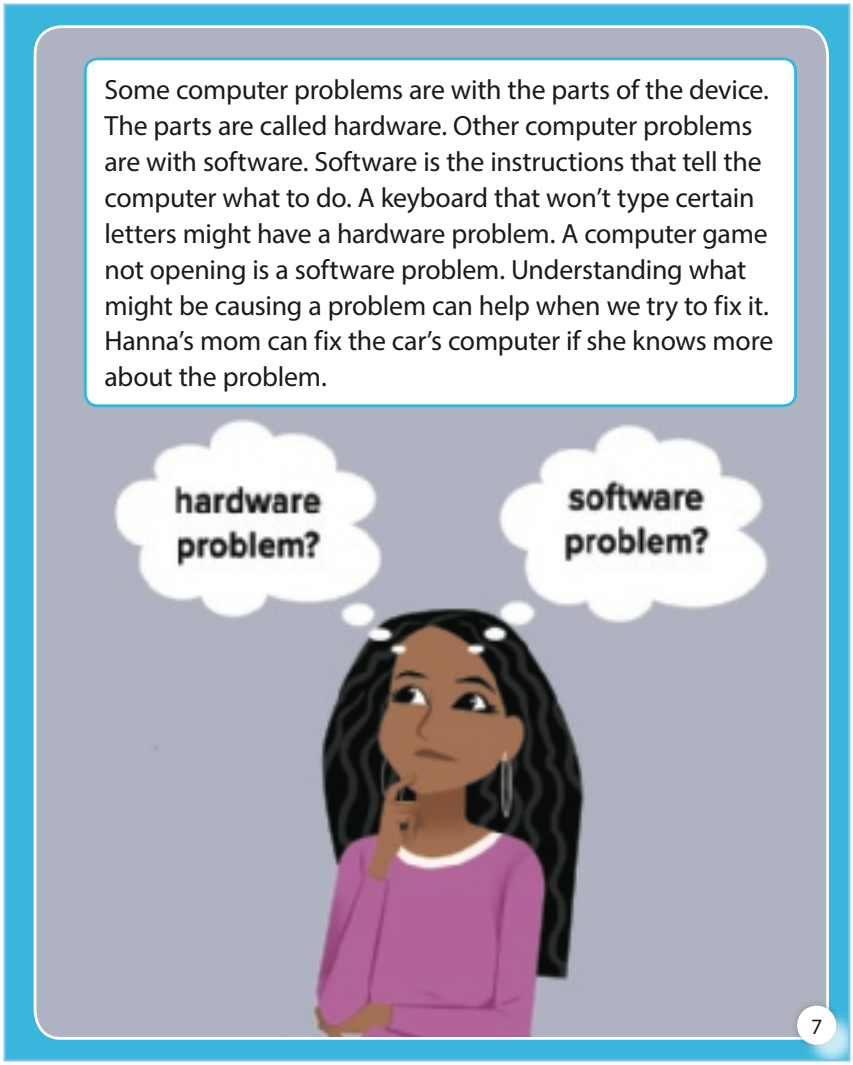
» Possible answers include plug in the headphones, adjust the volume, and charge the tablet.

INFERENTIAL—How do you feel when you have a problem with a computing device?

» Possible answers include sad, puzzled, frustrated, angry, and upset.

Page 7

Ask students to look at the picture on page 7. Point out that in order to solve a problem with a computing device, it is important to first figure out if the problem is with the hardware or the software.



Ask students the following questions:

INFERENTIAL—You are using a tablet and cannot see what is on the screen very well because the screen is too dark. Do you think this might be a problem with the hardware or the software?

» hardware

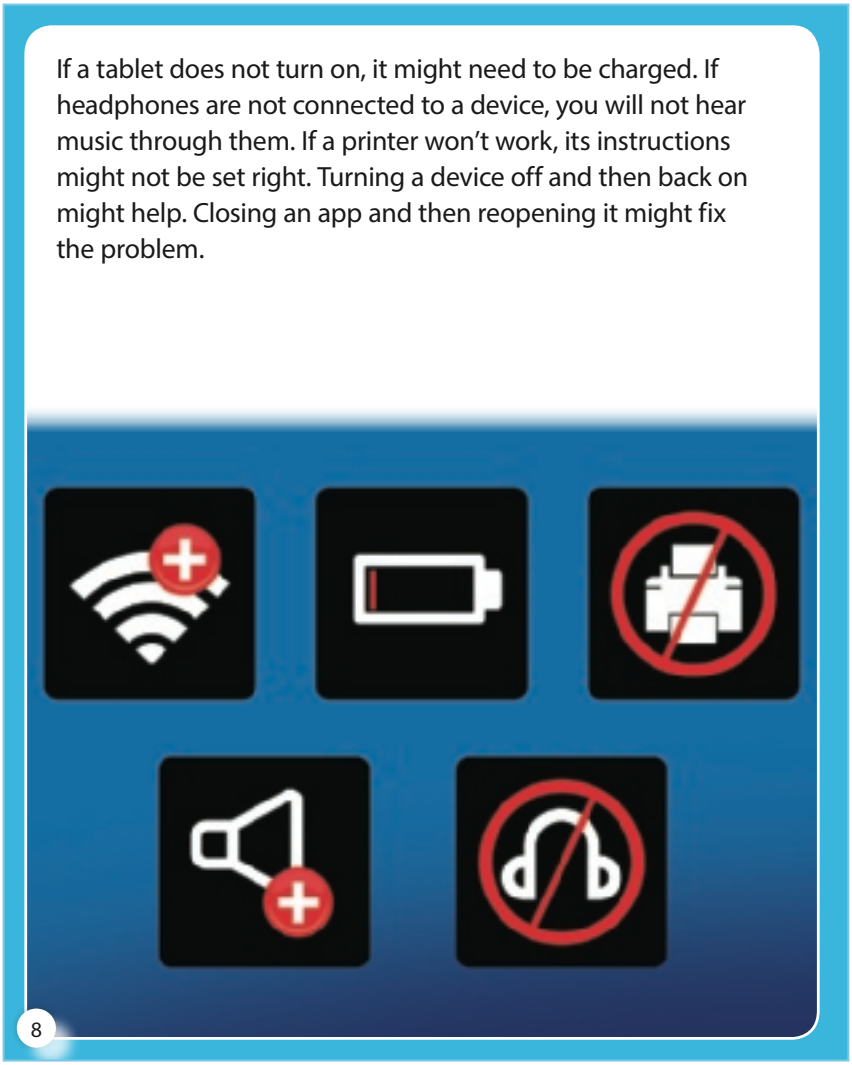
INFERENTIAL—You want to watch a cat video online, but the video won't start playing. Do you think this is likely a problem with the hardware or the software?

» software

SUPPORT—Have students draw a computer device, and then identify and label the different components. Encourage them to use proper terminology. Optionally draw or display a large image of a computer device and conduct as a a whole-class activity.

Page 8

Ask students to look at the picture on page 8 as you read aloud. Explain that the picture shows different types of computer problems. Point to each image, and describe what problem the symbol illustrates.



Ask students the following questions:

LITERAL—What could you try to fix a tablet if it does not turn on?

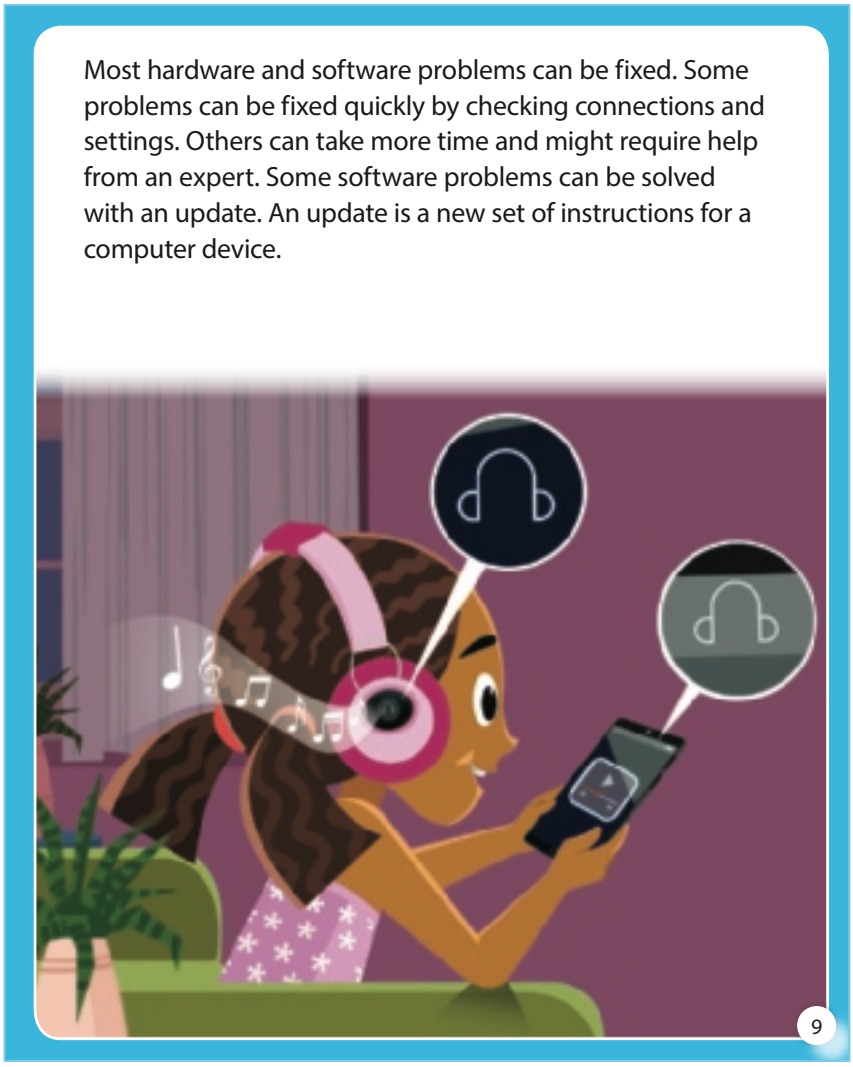
» You could charge it.

INFERENTIAL—You are playing a game and the motion freezes. What could you try to fix the problem?

» Possible answer includes closing the app and reopening it.

Page 9

Ask students to look at the picture on page 9. Explain that once you figure out the reason for a problem with a computing device, you can try to fix it. Sometimes the solution is simple, such as plugging in a device, but other times you may have to try several different things to solve a problem.



Ask students the following questions:

LITERAL—How did Hanna fix the problem with her headphones?

» She turned her headphones on.

EVALUATIVE—Think about a problem you have had with a computer device. What words can you use to describe the problem? What was a possible reason for the problem?

» Sample answer: My tablet wouldn't turn on. It could have been that the battery needed to be charged.

EXTEND—Select student "experts" in the classroom for each group or table of students. Each group or table of students should ask their "experts" about computer problems before coming to you for help.

SUPPORT—To support student language and reading development, create a classroom chart illustrating common computer problems and possible reasons for those problems. Common problems and reasons could include:

Unplugged Activity

- No sound—Headphones muted. Headphones do not work. Sound is turned off. The speaker could be broken, or the volume could be turned down.
- Sound too loud—The computer volume is too loud. The headphone volume is too high.
- Black screen—Battery has died. Device is not turned on. Device is not plugged in.
- Dim screen—The screen or the monitor may be set too dim and should be lightened.
- Frozen screen—The computer may have lost its internet connection or there may be a software issue where a program has stopped working (responding). The computer's memory could be overloaded because there are too many programs running at the same time.
- Nothing happens when pressing the keys on the keyboard—The keyboard is not connected. The keyboard is broken. The software isn't working.
- Nothing happens when trying to print—The printer is not connected to the computer. The printer is not plugged in to an electrical outlet. The printer needs ink or toner. The printer is out of paper. The printer software needs an update.
- Cannot connect to a website—There is no internet connection. The internet is slow. The web browser isn't working.
- Program stops working—There may be a problem with the software. The software may need an update.

3. Check for understanding.

Unplugged Activity

Review the question and responses on the whiteboard or anchor chart. Invite students to suggest possible reasons for each problem listed.

LESSON 3, PART 1

Computer Users Need Passwords

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Define the term *password*.
- ✓ Explain why people use passwords.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concepts:

- Networks and the internet
- Impacts of Computing

Subconcepts and Standards:

Cybersecutiry: 1A-NI-04 Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access. (P7.3)

Safety, Law and Ethics: 1A-IC-18 Keep login information private, and log off of devices appropriately. (P7.3)

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password

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

private **website**

Instructional Resources

Student Book

Ch. 3

Student Book, Chapter 3
Computer Users Need Passwords

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart

The Core Lesson

1. Focus attention on today's topic.

Introduce the unit by asking students if they know what a password is. Invite several students to share their responses, then explain that a password is a secret string of letters, numbers, and/or symbols that lets you use an app, game, website, or device.

2. Read together "Computer Users Need Passwords."

Student Book

Ch. 3

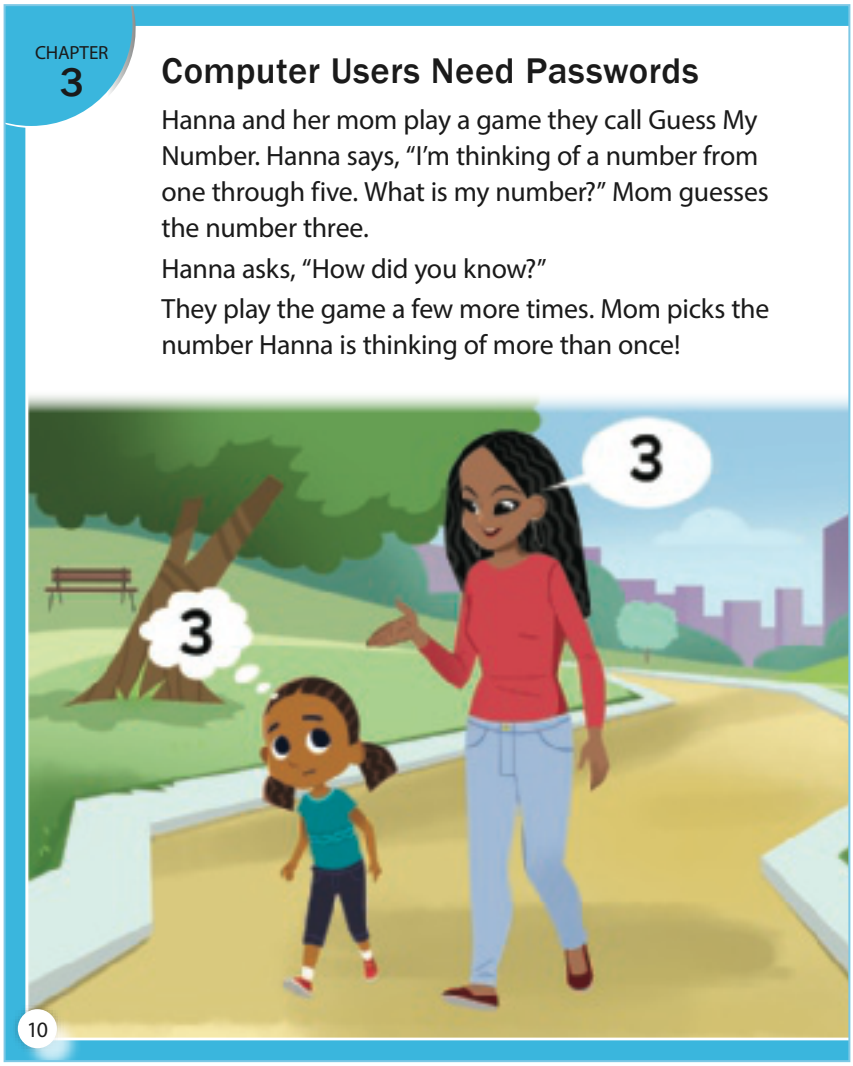
While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 10 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Computer Users Need Passwords," and tell them to pay special attention to why passwords are important as you read.

Page 10

Ask students to look at the picture on page 10. Engage students by asking if they have ever played a guessing game before. Ask for examples of guessing games.



Ask students the following questions:

LITERAL—How many numbers does Hanna think of? How many numbers does Hanna choose from?

» Hanna thinks of one number. She chooses from five numbers.

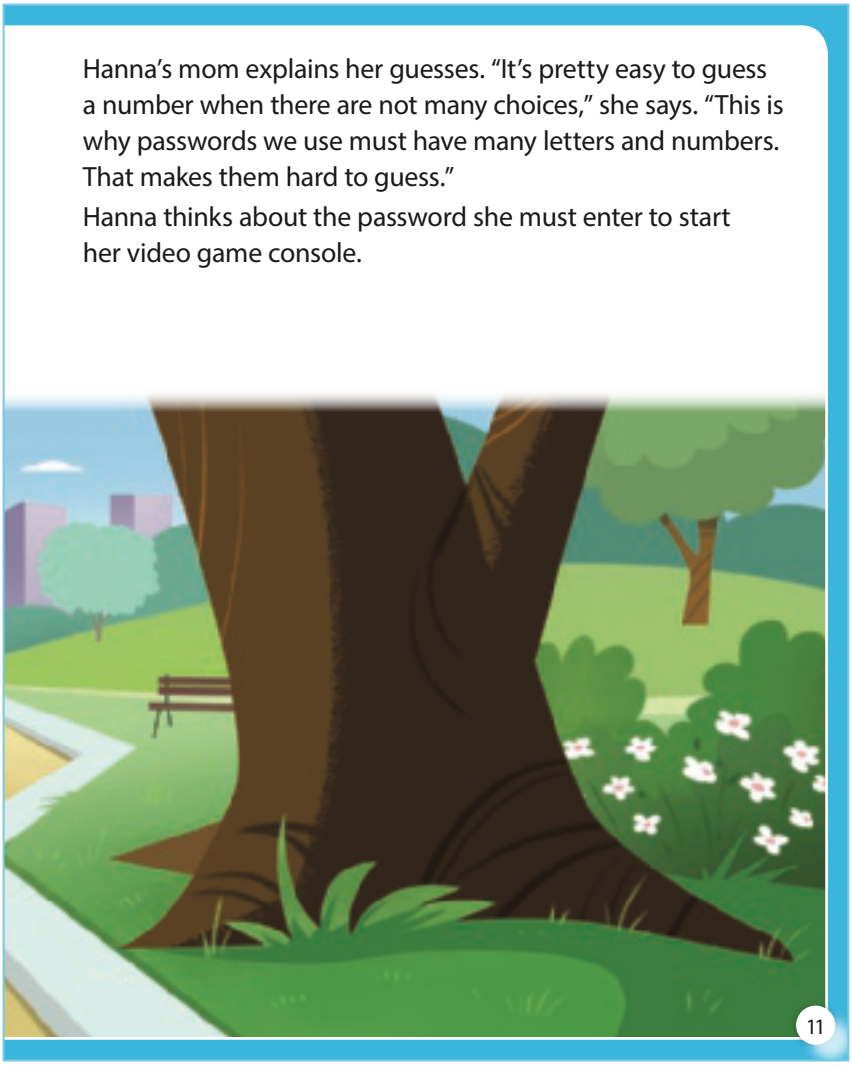
SUPPORT—Support learners by encouraging them to see that Hanna is picking one number out of five choices. Have them count out loud the numbers from which Hanna is choosing (one, two, three, four, five), then point out that Hanna is picking one number (one) from the five numbers (one, two, three, four, and five).

EVAULATIVE—Why do you think that Hanna's mom can guess the number Hanna picks?

» One possible answer is that there are not many numbers to guess from.

Page 11

Ask students to look at the picture on page 11. Explain that good passwords are a combination of letters, numbers, and symbols. Passwords need to be easy for someone to remember but hard for someone else to guess. (See **Know the Standards**.)



Ask students the following questions:

LITERAL—Why was it easy for Hanna's mom to guess the number Hanna picks?

» There were not many numbers to guess from

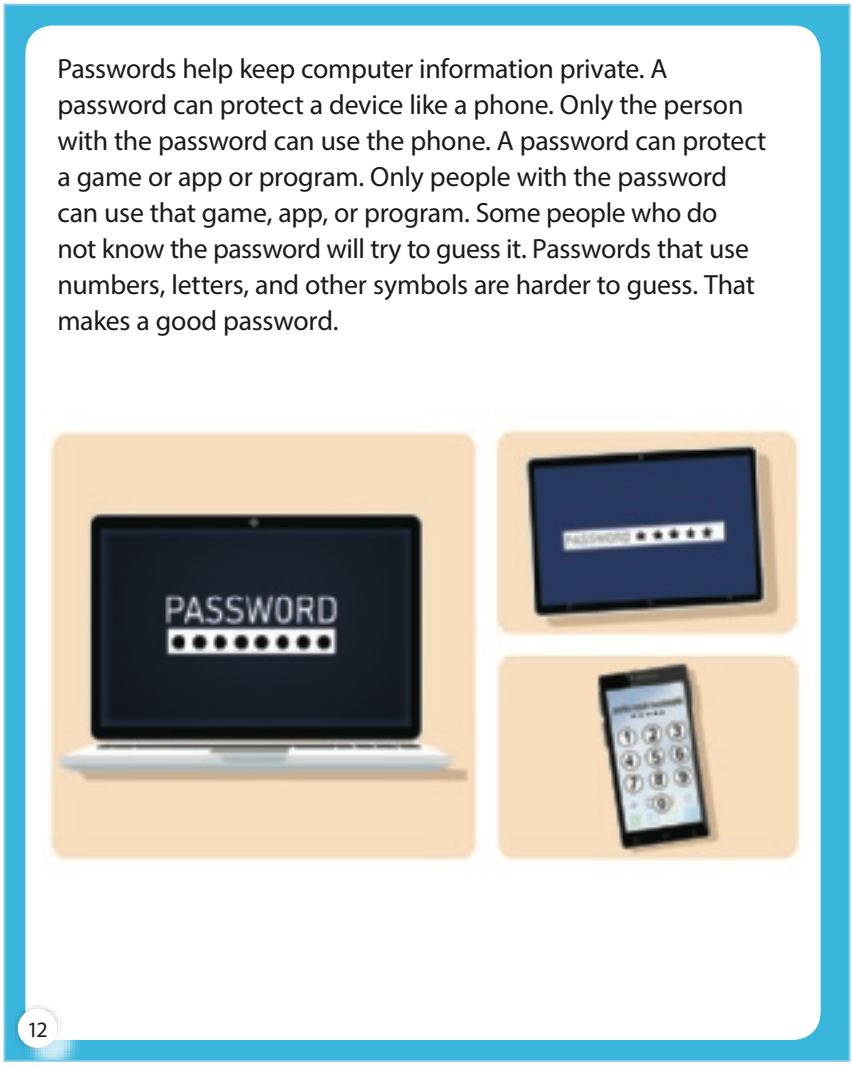
INFERENTIAL—How could Hanna make it harder for her mom to guess what Hanna is thinking?

» Possible answers include making a choice from more numbers; using a lot of numbers in a row (many digits); using a combination of numbers, letters, and/or symbols.

SUPPORT—Strong passwords include a combination of uppercase and lowercase letters. Support student letter identification by having students each create a three-character password that uses a combination of uppercase and lowercase letters. To engage tactile learners, you may wish to have students create each of their passwords using alphabet blocks or foam letters.

Page 12

Ask students to look at the picture on page 12 as you read aloud. Talk about the different situations in which someone might need or use a password. For example, a password allows you to see what's on your phone or your computer, send personal messages or email, and save scores from a particular game. Tell students that when they are older, they will use passwords to do many things, such as keeping track of money or shopping online.



Ask students the following questions:

LITERAL—What do passwords do?

» They can help keep computer information private

EVALUATIVE—Have you ever used a password? What did you use it for?

» Answers will vary depending on student access to technology.

ALERT—During discussions about using passwords, remind students that they should never share their passwords except with a trusted grownup.

Page 13

Ask students to look at the picture on page 13. Discuss with students why we don't share passwords. Point out that passwords should be kept private to protect their personal digital information. Also point out that passwords protect you from someone doing something they shouldn't be doing under your name.

Ask students the following questions:

INFERENTIAL—Why couldn't Hanna's mom guess Hanna's password?

» The password has both numbers and letters in it.

EVALUATIVE—How would you feel if someone used your password and pretended to be you on a website?

» Possible answers include feeling angry because someone saw my private information, feeling worried because someone is pretending to be me, and feeling scared because someone might find out private things about me.

EXTEND—Ask students to identify some of the different types of personal information that should be kept private (for example, name, location, phone number, home address, birthdate). Then discuss why it is not a good idea to put personal information in a password Include as part of the discussion that someone who knows you might easily guess your password. For example, if your dog's name is Fluffy and your birthday is the 9th of the month, can you see why having a password such as Fluffy9 might be easier to guess if someone knows those things about you?

3. Check for understanding.

Unplugged Activity

Write "Why do you need a password?" on the whiteboard or anchor chart. Invite students to summarize the reasons they have learned. Write their responses on the board.

Know the Standards

1A-NI-04 Cybersecurity Passwords protect information from unwanted access by others. When creating passwords, people often use patterns of familiar numbers and text to more easily remember their passwords. However, this may make the passwords easier to guess. Strong passwords include numbers, symbols (@, &, and $, for example), as well as uppercase and lowercase letters. Those combinations can make a password harder to guess. Knowledge about the importance of passwords is an essential first step in learning about cybersecurity.

LESSON 3, PART 2

How Can You Make a Strong Password?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Understand the importance of passwords.
- ✓ Create a strong password.

Instructional Activities

- hands-on activity
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concepts: Networks and the internet; Impacts of Computing

Subconcepts and Standards:

Cybersecurity: 1A-NI-04 Explain what passwords are and why we use strong passwords to protect devices and information from unauthorized access. (P7.3)

Safety, Law, and Ethics: 1A-IC-18 Keep login information private, and log off of devices appropriately. (P7.3)

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password **private** **security**

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information **protection** **unauthorized** **username**

Materials and Equipment

Collect or prepare the following:

- large whiteboard or anchor chart
- 3" x 5" index card (one per student)
- box to hold index cards

Advance Preparation

None

The Core Lesson

1. Focus attention on today's topic.

Ask students Have you heard the word *password* before? What do you think a password is?

Allow time for student responses. Then explain that a password is a secret string of letters, numbers, and symbols that can help keep information private. Write the definition on the whiteboard or anchor chart. Passwords have been around for a very long time. They were first used to gain access to certain areas or rooms. If someone wanted to enter, he or she had to supply a password to a guard. If the password was correct, the guard would let him or her pass. Today, usernames and passwords are used to log in to devices, or to gain access to websites, email accounts, apps, or games.

Explain that passwords need to be easy to remember but not easy for other people to guess. (See **Know the Standards** 1 and 2.) Next, explain that some passwords are easier to guess than others. A weak password is easy to guess. A strong password is hard to guess. Help students recognize that they should never use their names, nicknames, addresses, birthdays, or phone numbers in a password. In the chart, write some examples of weak and strong passwords.

2. Facilitate the activity.

Unplugged Activity

Point out that some passwords are easier to guess than others. A weak password is easy to guess. A strong password is hard to guess. Tell students that today you are going to give them the recipe for making a strong password! On the whiteboard or anchor chart, write the following "password recipe":

Choose one food, movie, or song that is special to you.

Create a sentence or a phrase about that food, movie, or song. It should be at least eight characters long.

Replace some words and letters with uppercase and lowercase letters, numbers, and symbols.

Below the recipe, write an example or two, such as

"We all scream for ice cream" → "WAscream4eyescream!"

"I love school" → "eye<3scHooL"

Model for students how to do this by writing a sentence or a phrase on the board. Then below it, write a password based on that phrase. Next, have students work independently to make their own strong passwords. Ask each of them to write their passwords on one side of their index cards, and then write their name on the other side.

Know the Standards

1A-NI-04 Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access. Passwords protect information from unwanted use by others. When creating passwords, people often use patterns of familiar numbers and text to more easily remember their passwords. However, this may make the passwords easier to guess. Strong passwords nclude numbers, symbols (@, &, and $, for example), as well as uppercase and lowercase letters. Those combinations can make a password harder to guess. Knowledge about the importance of passwords is an essential first step in learning about cybersecurity.

1A-IC-18 Keep login information private, and log off of devices appropriately. People use computing technology in ways that can help or hurt themselves and/or others. Harmful behaviors, such as sharing passwords or other private information and leaving public devices logged in, should be recognized and avoided. Using computers comes with a level of responsibility. Students should not share login information, should keep passwords private, and should log off a public computer when they are finished, and should lock a personal computer, tablet, or phone before they walk away from it.

SUPPORT—Help students who may need support with their writing skills by providing writing paper or lined index cards instead of blank index cards.

Once students have finished creating their passwords, collect their index cards and put them in a box. Ask students: "Do you think your passwords will be easy to remember? Does 'easy to remember' mean 'easy for others to guess'?" Have students raise their hands to show who thinks they will be able to remember their passwords by the end of the class.

3. Check for understanding.

Unplugged Activity

At the end of the day, ask the students to write their passwords down again. Then pass out their index cards, and have each of them check to see if they remembered their passwords correctly.

ALERT—You should remind students that they should not use the passwords they created in class as real passwords, since they may have shared their passwords with their classmates. Point out that they should only share their real passwords with a trusted adult, and that they should use a different password for each website or app.

LESSON 4, PART 1

Computers Store Information

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Define the term *data*.
- ✓ Recognize that data can be collected and stored on different computing devices and retrieved later.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Data Analysis

Subconcept and Standard: Storage: 1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4.2)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

collect **create** **data** **information**

save **store**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

apps **copy** **files** **image**

program **text** **video**

Instructional Resources

Student Book

Ch. 4

Student Book, Chapter 4
Computers Store Information

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart
- classroom computer, tablet, or other computing device

The Core Lesson

1. Focus attention on today's topic.

Introduce the unit by writing "What information is on a computer?" on the board. Invite students to share the types of information they might find on a computer. Record the responses on the whiteboard or anchor chart.

2. Read together "Computers Store Information."

Student Book

Ch. 4

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 14 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Computers Store Information," and tell them to pay special attention to the different types of information you can keep on a computer.

Page 14

Ask students to look at the picture on page 14. Explain to students that the information we store on a computing device is called data. Point out that any time they create, copy, and save things on a computer, they are storing data!

CHAPTER 4

Computers Store Information

Data is information. Data can be stored on a computer device. Photos, art, and videos on a device are data. The music stored on a tablet is data. Even the apps on a smartphone or smart watch are data. Files with words and digital books are data.

14

Ask students the following questions:

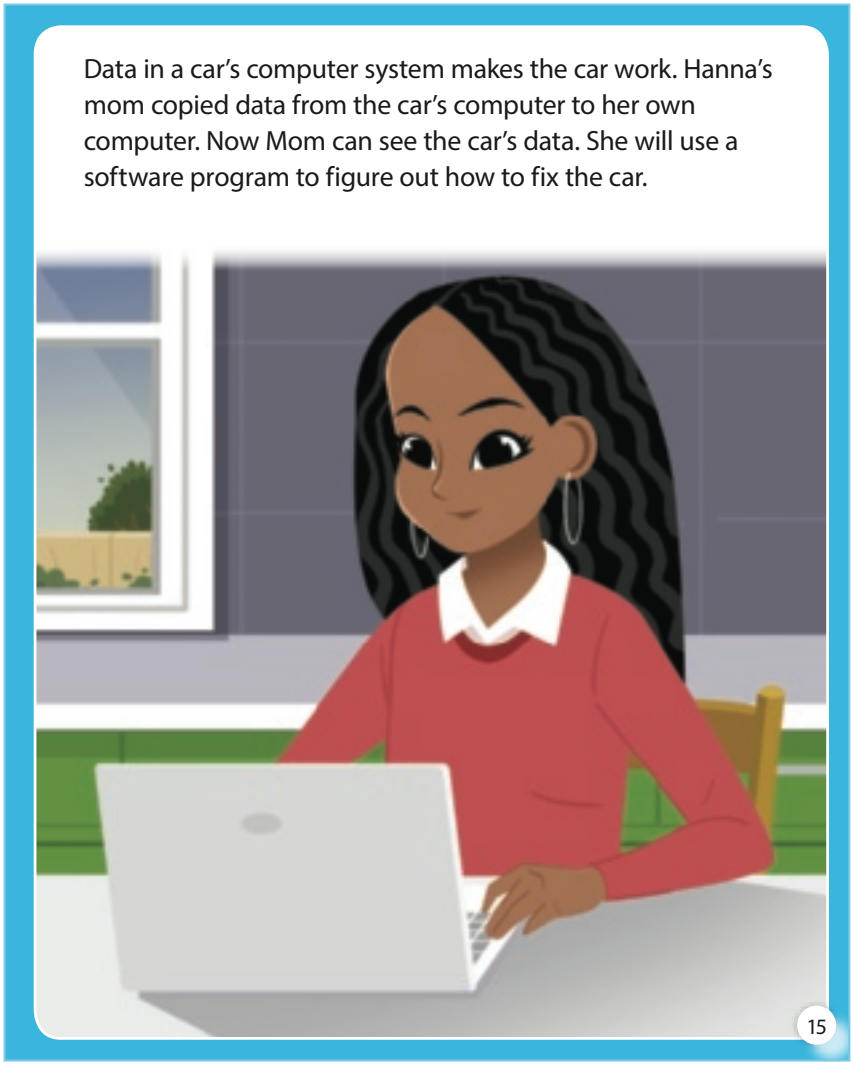
LITERAL—What is data?

» Data is information stored on a computer

SUPPORT—Students may recognize words and numbers as data, but you may need to guide them to recognize that data can be any type of information, such as applications, images, music, and videos.

Page 15

Ask students to look at the picture on page 15. Explain that once data has been entered into a computing device, it can be copied, saved, or changed. (See **Know the Standards**.)



Ask students the following questions:

LITERAL—What kind of data did Hanna's mom make a copy of?

» She made a copy of data from the car.

INFERENTIAL—Hanna's mom made a copy of some data. What else do you think she could do with the data?

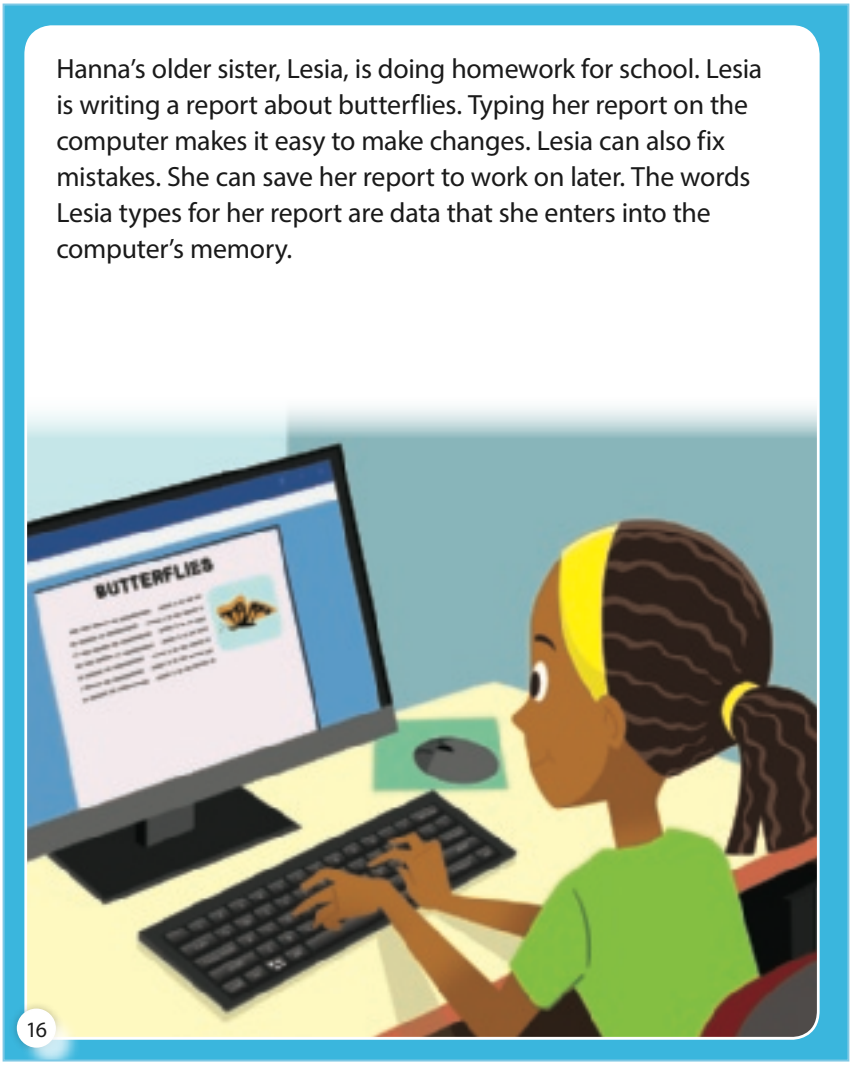
» Possible answers include save, change, or delete the data.

EVAULATIVE—Have you ever created or saved data on a computer device? What kind of data did you create or save?

» Answers will vary. Encourage students to be specific about the type of data they might have created or saved, such as a drawing made with a drawing program or a song recorded using a microphone connected to a computing device, such as a laptop or tablet.

Page 16

Ask students to look at the picture on page 16 as you read aloud. Point out that Lesia is creating data on the computer when she types, because the words she types are data.



Ask students the following questions:

LITERAL—What kinds of data do you see in the picture?

» You see words and pictures

EVALUATIVE—Lesia's report includes a picture of a butterfly. Do you think the picture of the butterfly is data? Why or why not?

» Sample answers include "Yes, because a picture is a type of information or data," and "No, because it's just a picture, not a word or a number."

SUPPORT—To support students who may have trouble recognizing the illustration as data, ask them questions to lead them to understand that data can be any type of information found on a computer. For example, you might **ask students**: "Does the picture tell us information?" (Yes) "What kind of information does it tell us?" (It shows us what a butterfly looks like.)

Page 17

Ask students to look at the picture on page 17. Engage students by asking them to look for butterflies in the picture of the butterfly garden.

Ask students the following questions:

LITERAL—How are Lesia and Hanna collecting data for Lesia's report?

» They are using a smartphone to record videos and take pictures.

LITERAL—What type of data are Lesia and Hanna collecting?

» They are collecting photos and movies (videos).

EXTEND—Have students do a data hunt. Display a website or open an app on a classroom computer or tablet. Invite students to take turns finding and identifying different types of data on the screen. Help students recognize that the program or the browser they are looking at is also data.

Device-Based Activity

CHALLENGE—Have students compose a story about butterflies using a computer device to store, copy, save, modify, and delete data. If recording devices, such as digital cameras, smartphones, or microphones, are available, show students how to add photos, videos, and/or sounds to their stories.

3. Check for understanding.

Unplugged Activity

Review the question and student responses on the whiteboard or anchor chart. Encourage students to suggest changes to the items listed based on what they've learned about data. Ask students to reflect on what they can do with the different types of data stored on a computer.

Know the Standards

1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. When students use software, such as a word processor program, to complete tasks, they are manipulating data. The program, the document file, and the information within the document are all considered forms of data. This data can be stored on the device and retrieved later. For example, photos taken with a smartphone are automatically saved. Later, those same photos can be viewed, edited, shared, and/or deleted.

LESSON 4, PART 2

Creating and Saving Data

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Recognize that data can be collected and stored on a computer and retrieved later.
- ✓ Describe the basic steps of creating, saving, and reopening a text document.

Instructional Activities

- teacher demonstration
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Data Analysis

Standard: Storage: 1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. (P4.2)

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Core Vocabulary and Language of Instruction

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Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

create **data** **information** **save**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

document **keyboard** **keys** **text** **word processor**

Materials and Equipment

Collect or prepare the following:

- desktop or laptop computer with a keyboard and a mouse or trackpad
- a free word processor or text editor, such as Notepad (Windows), TextEdit (Mac), or a paid version, such as Microsoft Word (must be installed with an active license)
- a projector and screen or a large flatscreen monitor with video connection cables that will allow it to connect to the computer
- blank piece of writing paper (optional)
- large whiteboard or anchor chart

Advance Preparation

- Set up the computer and second monitor or projector so that the computer desktop is duplicated (mirrored) on the second screen.
- On the whiteboard or anchor chart, write the heading "What Data Is Stored on a Computer?"

The Core Lesson

1. Focus attention on today's topic.

Explain that information can be stored on and processed by a computer device. When stored on a computer device, information is referred to as data. **Ask students**: "What are some types of data you might find on a computer?" Record responses on the whiteboard or anchor chart.

> **SUPPORT**—Students may recognize words and numbers as data, but you may need to guide them to recognize that data can be any type of information, such as applications, images, music, and video.

2. Facilitate the activity.

Ask students: "Have you ever created or saved data on a computer device? What kind of data did you create or save?" Encourage students to think about more than just desktop computers or laptops. At this age, students will likely have taken a picture with a smartphone or played a game on an app. Some students may also have typed a text message on an adult's device.

Explain that today you will show them how to create a document with words using a program called a word processor.

Open up the word processing program. Explain that a word processing program can be thought of as something similar to a sheet of paper. Both a word processor and a sheet of paper have a blank page for you to write or type on. you can write or type on. If desired, you can hold up a sheet of writing paper for reference.

Ask students: "Can anyone tell me how I can write words on the computer?" Accept several answers. Then, if necessary, draw students' attention to the computer keyboard. (See **Know the Standards**.) Explain that the buttons on the keyboard are called keys and that you can use the keys to add letters, numbers, and symbols to the page, just as you might use a pencil to add letters, numbers, and symbols to a sheet of paper.

Demonstrate by typing your name into the document. Say the letters as you type, helping students connect the vocalization of the letter to the letter on the screen.

Unplugged Activity

EXTEND—Tie to an ELA lesson by having students identify uppercase and lowercase letters in the document, and/or by asking students to take turns saying a word for you to type into the document.

Next, tell students that you can save the data you entered. Saving the data lets you open it again and keep working on it if you want. Or, you may choose to share your document or print it out for someone to read on paper. Save the document with a simple file name. Then close the document. Finally, demonstrate to students that you can reopen the document you just created.

As resources permit, have students work independently or in small groups and, with your guidance, allow each student to get hands-on practice opening, saving, and closing documents in any available word processing or note-taking application. Each student should type in his or her name, save the document, and then reopen it.

Device-Based

EXTEND—Demonstrate some of the basic functions of a word processor, such as copying, pasting, adding, and deleting text. If a printer is available, you might also consider printing out a document for students.

3. Check for understanding.

Unplugged Activity

Have students summarize what they learned about data, including how they can use a computer to create and save data. **Ask students**: " What kind of data did we create and save today?"

Know the Standards

1A-DA-05 Store, copy, search, retrieve, modify, and delete information using a computing device and define the information stored as data. and *1A-CS-02 Use appropriate terminology in identifying and describing the function of common physical components of computing systems (hardware)* These two standards are related. A computing system is composed of hardware and software. Personal computing devices contain a method for inputting data and commands to the device, such as a keyboard, mouse, or touchscreen, along with a form of storage, such as a solid-state drive, a USB drive, or a memory card. As students use software, such as a word processor, to complete tasks, they will be manipulating data: the program itself, the document file, and the information within the document are all considered forms of data. This data is stored on the device and can be retrieved later. For example, photos taken with a smartphone are automatically saved. Later, those same photos can be viewed, edited, shared, and/or deleted.

LESSON 5, PART 1

How Can You Collect and Share Data?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

✓ Understand how digital devices can be used to collect and present data in various visual formats.

Instructional Activities

- teacher Read Aloud
- class discussion
- vocabulary instruction

CSTA Standards

Concept: Data Analysis

Subconcepts and Standards:

Collection, Visualization, and Transformation: 1A-DA-06 Collect and present the same data in various visual formats. (P7.1, P4.4)

Inference and Models: 1A-DA-07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4.1)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

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Core Vocabulary and Language of Instruction

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Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

collect **data** **share**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

click **command** **folder** **icon** **insert** **graph** **slide**

Instructional Resources

Student Book

Ch. 5

Student Book, Chapter 5
How Can You Collect and Share Data?

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart
- classroom computer, tablet, or other computing device

The Core Lesson

1. Focus attention on today's topic.

Introduce the lesson by creating a T-chart with the heading "How Can You Collect and Share Data?" on the board. Below the heading, on one side write "Collect Data." On the other side, write "Share Data." Invite students to share different ways they might collect data (by taking pictures, writing words, singing songs into a smartphone, counting things, doing computer searches, etc.), and different ways they might share data (as an email, in a video, as a chart, as a graph, as a picture, etc.). Record their responses in the appropriate section of the whiteboard or anchor chart.

2. Read together "How Can You Collect and Share Data?"

Student Book

Ch. 5

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 18 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "How Can You Collect and Share Data?" and tell them to pay special attention to the ways that Hanna's sister collects and shares data.

Page 18

Ask students to look at the picture on page 18. Explain to students that we collect data every day! We use our senses to collect data about such things as colors, shapes, tastes, smells, and sounds. We use our words and numbers to collect data about things, such as how high, how fast, or how many. We use our feelings to collect data about things that make us feel good or bad. Data can help us understand the world around us to answer questions or solve problems.

CHAPTER 5

How Can You Collect and Share Data?

Hanna, Lesia, and Mom are home from the butterfly garden. Lesia plugs Mom's phone into the computer with a cord. She moves the picture and video data from the phone to the computer. That way Lesia can use the data in her report.

18

Ask students the following questions:

LITERAL—What type of data did Lesia collect at the butterfly garden?

» She collected picture and video data.

LITERAL—What steps were taken to move the data from the smartphone to the computer?

» Lesia plugged the smartphone into the computer with a cord. Then she moved the data from the smartphone to the computer.

Unplugged Activity

EXTEND—Some students who have more technology knowledge than others may recognize that data is often moved between devices using a USB drive, a portable drive, a solid-state drive, or a media card. Encourage these students to share their knowledge with the class.

Page 19

Ask students to look at the picture on page 19. Discuss different ways of sorting and presenting data with the class. For example, if students were to keep track of the weather each day, they could sort their data into sunny days and rainy days. Then they could make a chart, a pictograph, or a graph to show their data.

Lesia double-clicks a folder icon on her computer screen. Small pictures of her butterfly videos and photos appear. She clicks on commands in the software for her report. That lets her insert videos and pictures into her report file. Lesia also makes a graph with the data she collected. She puts the graph on a digital slide. She will show the slide when she shares her report in class.

19

Ask students the following questions:

LITERAL—What did Lesia do with the data she collected?

» She moved the pictures and videos in her report. She made a graph.

EVALUATIVE—What kind of information do you think Lesia might have put into her graph?

» Sample answers include how many different colors of butterflies she saw, and how many butterflies she saw of each color.

Unplugged Activity

SUPPORT—To help support students who may have trouble visualizing how data can be put into a graph, provide students with color blocks or stacking bricks. Invite small groups of students to group the blocks by color and then count the number of blocks of each color. Have them stack the blocks of each color as they count. Help them recognize that they have organized their data into a graph.

Page 20

Ask students to look at the picture on page 20 as you read aloud. Point out the illustrations of the different devices Lesia uses to share her report.

Now Lesia uses the internet to send her report to her teacher. The report is a computer file. Lesia attaches the file to an email and clicks "send." The teacher will read Lesia's report on his computer. He will be able to see the pictures. He will be able to watch the videos.

Next Lesia sends her report to the printer. She wants to have a paper copy to use in class. Then Lesia emails her graph slide to her tablet. Her report is finished and shared to different devices.

20

Ask students the following questions:

LITERAL—How did Lesia share her report with her teacher?

» She sent it by email.

LITERAL—Why did Lesia print out her report?

» She wants a printed copy to use in class.

Page 21

Ask students to look at the picture on page 21. Discuss the different ways Lesia shows her data so it's easy for others to see.

Lesia tells about her butterfly report in class. She shows the graph slide on her tablet. Then her teacher projects the photos and videos from her report onto a screen in the classroom.

How many devices did Lesia use to create and deliver her report? How may ways did she use technology to move information from one place to another?

21

Ask students the following questions:

LITERAL—What are the three ways Lesia shares her data with the class?

» She is talking (using words). She is using pictures (photos) and movies (video), and she is showing a graph with data about butterflies.

EVALUATIVE—If you wrote a report about butterflies, what type of data would you like to include? How would you organize and show that data?

» Answers will vary. Encourage students to be creative in their thinking.

3. Check for understanding.

Unplugged Activity

Review the whiteboard or anchor chart. Encourage students to suggest changes to the items listed based on what they've learned about data. Ask students to reflect on ways they can collect and share different data.

Know the Standards

1A-DA-06 Collect and present the same data in various visual formats. There are many different methods of data collection. In this lesson, Lesia uses visual data she had collected in the form of videos and pictures and numerical data too. By presenting her data in various formats, such as graphs, photos, and videos, she is able to talk about her findings in different ways, see and describe trends and patterns that occur across the data, and make her report and final findings accessible to a greater number of peers.

1A-DA-07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. Data visualization takes information (data) and translates it into a visual form. It is the representation of data through the use of common graphic forms such as plots, charts, tables, and maps.The goal of data visualization is to make it easier to identify patterns and trends in data sets, which in turn helps to better answer questions about datasets.

LESSON 5, PART 2

How Can You Group and Show Data?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Collect data.
- ✓ Compare different ways of grouping and displaying data.

Instructional Activities

- student investigation
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Data Analysis

Subconcepts and Standards:

Collection, Visualization, and Transformation: 1A-DA-06 Collect and present the same data in various visual formats. (P7.1, P4.4)

Inference and Models: 1A-DA-07 Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions. (P4.1)

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data **group**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

color **different** **same** **shape** **size**

Materials and Equipment

Collect or prepare the following:

- opaque, plastic storage containers (one per group)
- four different, small, classroom items to sort, such as colored craft sticks, pom-poms, pipe cleaners, pencils, colored erasers, crayons, rulers, puzzle pieces (ten to twenty objects total per group)
- individual whiteboard or paper for recording answers (one per group)
- whiteboard marker or pencil (one per group)
- large whiteboard or anchor chart

Advance Preparation

- Place ten to twenty of the four different classroom items in each one of the storage containers.
- On the whiteboard or anchor chart, write the heading "Class Favorite Color Data."

The Core Lesson

1. Focus attention on today's topic.

Remind students that data is information, such as numbers, text, images, music, and video. Explain that the collection and use of data about the world around them happens every day. Model an example with the class. **Ask students**: "What is your favorite color?" Record responses on the whiteboard or anchor chart. Then point out that we can group—place together—the different answers by color, and then count the answers in each group.

Ask students to stand up and group themselves based on their responses. Then have the class count together the number of students in each group.

Tell students that the number of groups and the number of students in each group are all data.

2. Facilitate the activity.

Unplugged Activity

Tell students that today they will make groups using objects that are found in the classroom.

Place the class into small groups, and give each group a storage container with the objects inside.

Ask students to work together to sort the objects into groups. Tell them they can sort in any way they would like—for example: by shape, by size, by color, by how the object is used, or by what the object is. Give students time to decide how they will group the objects and sort them.

> **SUPPORT**—If students have difficulty identifying properties they might use to sort objects into groups, begin by asking them how two objects are the same or different. For example, you could help them see how two objects have a similar shape—the pencil and the crayon are both long and thin—which would be a reason to group them together. Using the same two objects, a pencil and a crayon, you could point out that they are made of different materials, which would be a reason to put them into different groups. Use other examples and, if necessary, help students begin to sort using properties they can identify.

After students have finished sorting, ask them to work together to come up with names for each group of objects (for example, red things, long and thin things, and puzzle pieces). Help students write the names of their different categories on their individual whiteboards or on paper.

Ask the students to count the total number of objects in each of their groups. Note their answers on their whiteboards or on paper below each category name. Encourage students to check their counting.

3. Check for understanding.

Unplugged Activity

Have each group share their object groups and counts with the class. **Ask students**: "How could you describe these groups?" Answers may include descriptions, such as "yellow," "not yellow," "big," "long," "pointy things," and "drawing things." Write their responses on a new anchor chart or a clean whiteboard.

Next, **ask students**: "Did everyone group the objects the same way?" Discuss why some students might have picked different groups than other students.

Ask students: "What information does the name of each group and number of objects in each group tell us?" Help students make the connection that the group names and total number of objects in each group give us information about an object. They are both types of data.

> **CHALLENGE**—Encourage students to think about ways they could show this data that would be easy for others to see. Guide them to consider different methods, such as an illustrated chart, pictures of the colors, photos of their groups, a table, etc. If time permits, have students present their data in three different ways.

LESSON 6, PART 1

Computers Follow Instructions

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Recognize that a computer uses a step-by-step process to complete a task.
- ✓ Define the word *algorithm*.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcept and Standard: Algorithms: 1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4.4)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

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algorithm **sequence**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

computer program **instructions** **routine** **steps**

Instructional Resources

Student Book

Ch. 6

Student Book, Chapter 6
Computers Follow Instructions

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart

The Core Lesson

1. Focus attention on today's topic.

Introduce the unit by writing "Our Daily Step-by-Step Processes" on the whiteboard or anchor chart. Ask students to share different step-by-step processes they may do during a typical school day. Encourage students to think about processes, such as brushing teeth or making a recipe, that lead to an end result (clean teeth, a cake). Record their responses on the board.

2. Read together "Computers Follow Instructions."

Student Book

Ch. 6

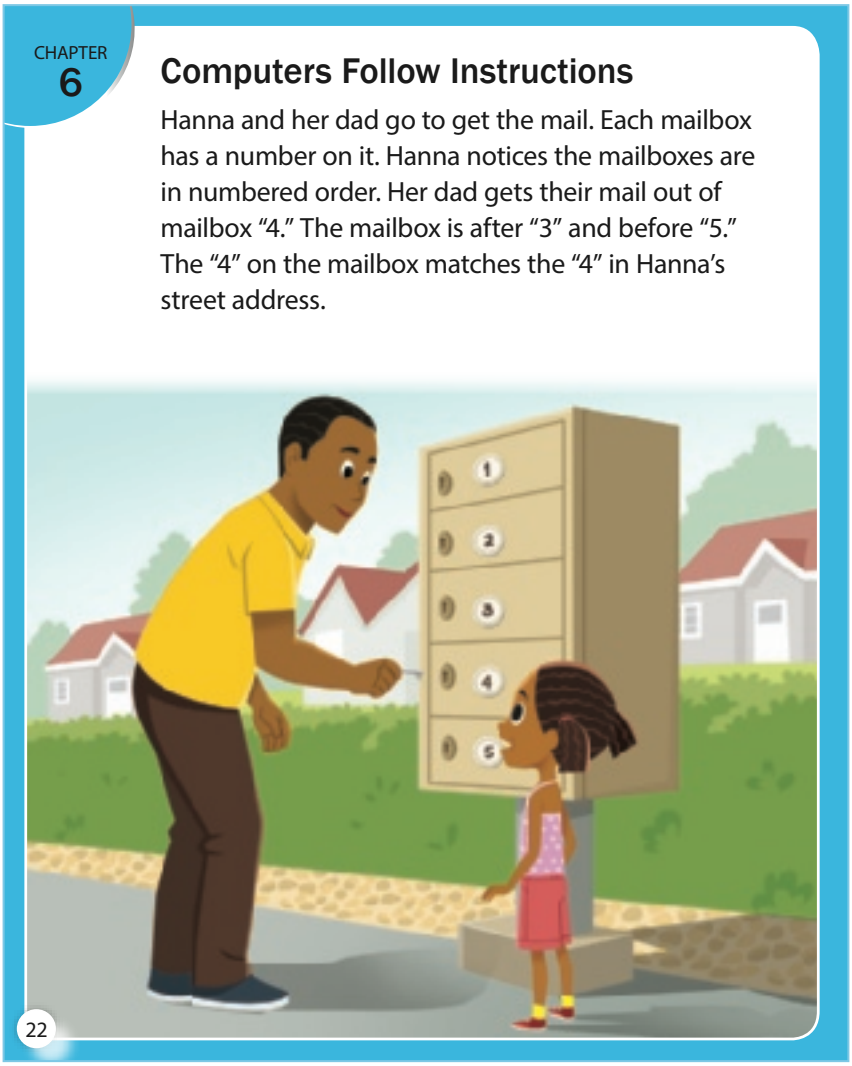
While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 22 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Computers Follow Instructions," and tell them to pay special attention to the examples of step-by-step instructions in this chapter.

Page 22

Ask students to read and look at the picture on page 22. Invite students to count out the numbers on the mailboxes in order from one to five.



CHAPTER 6

Computers Follow Instructions

Hanna and her dad go to get the mail. Each mailbox has a number on it. Hanna notices the mailboxes are in numbered order. Her dad gets their mail out of mailbox "4." The mailbox is after "3" and before "5." The "4" on the mailbox matches the "4" in Hanna's street address.

22

Ask students the following questions:

LITERAL—What is the order of the mailboxes from first to last?

» 1, 2, 3, 4, 5

LITERAL—Hanna's mailbox is mailbox number 4. Which mailbox number comes before 4? Which number comes after 4?

» 3; 5

SUPPORT—Support student learning by having students model the insert numerical? order of the mailboxes. Ask five students to stand at the front of the class, each holding a number from 1 to 5. Then have the student representing number 4 step forward. Ask the rest of the class to count out the numbers from one to four. Then ask the class to count out the number that comes after four.

Page 23

Ask students to look at the picture on page 23. Point out that Hanna's dad follows a step-by-step process for making the sandwich.

Ask students the following questions:

LITERAL—What steps did Hanna's dad take to make the sandwich?

» First, he puts a piece of bread on a plate. Second, he spreads peanut butter on the bread. Third, he spread jelly on the peanut butter. Last, he puts another piece of bread on top of the jelly.

INFERENTIAL—Why do you think Hanna's dad always starts with a piece of bread when making a sandwich?

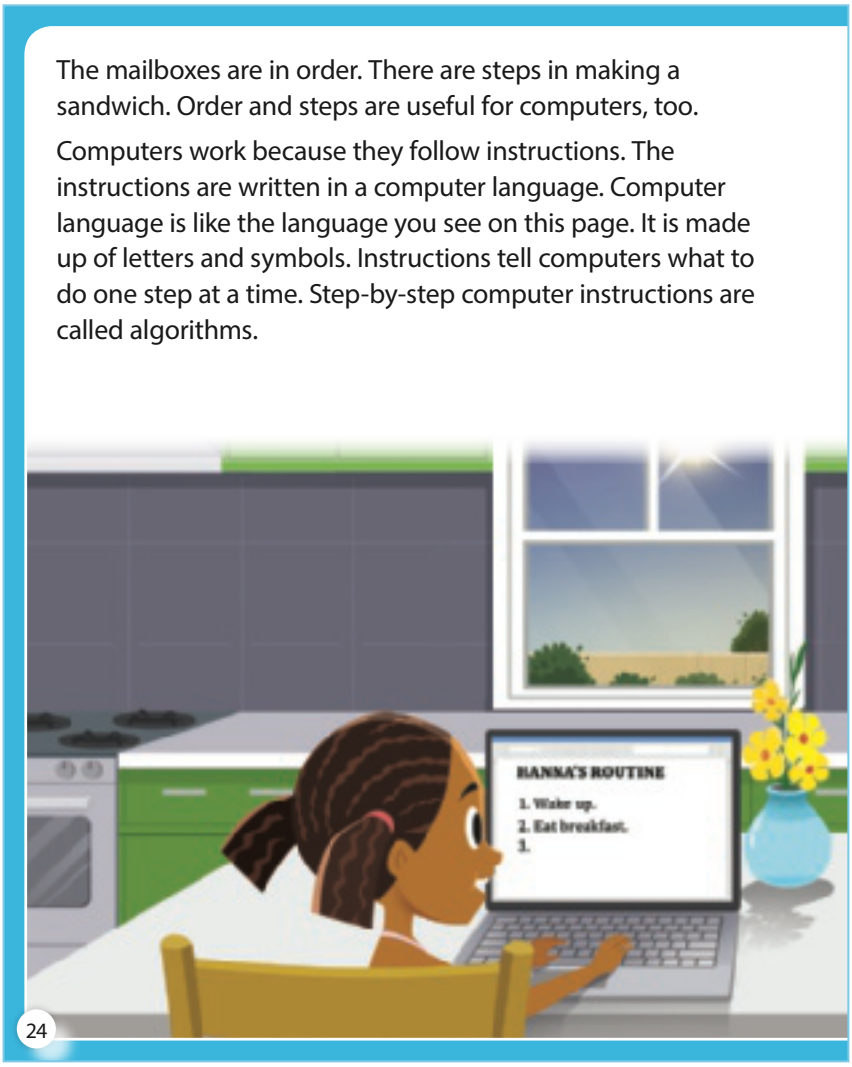
» Answers might include that it doesn't make sense to spread the peanut butter on the plate and put the bread on top.

INFERENTIAL—What might happen if Hanna's dad changed the order of the steps?

» Answers might include the following: The sandwich would get messed up! It might have two pieces of bread with peanut butter and jelly on top.

Page 24

Ask students to look at the picture on page 24 as you read aloud. Explain to students that people create and follow step-by-step instructions, such as the steps Hanna's dad takes when making a sandwich. Then explain that computers need a set of instructions to tell them what to do too. These directions are called algorithms. (See **Know the Standards**.)



Ask students the following questions:

LITERAL—What are step-by-step computer instructions called?

» These are called algorithms.

EVALUATIVE—Pretend you are writing an algorithm to make your favorite sandwich. What steps would you include? What is the order of the steps?

» Answers will vary but should include a reasonable sequence of steps.

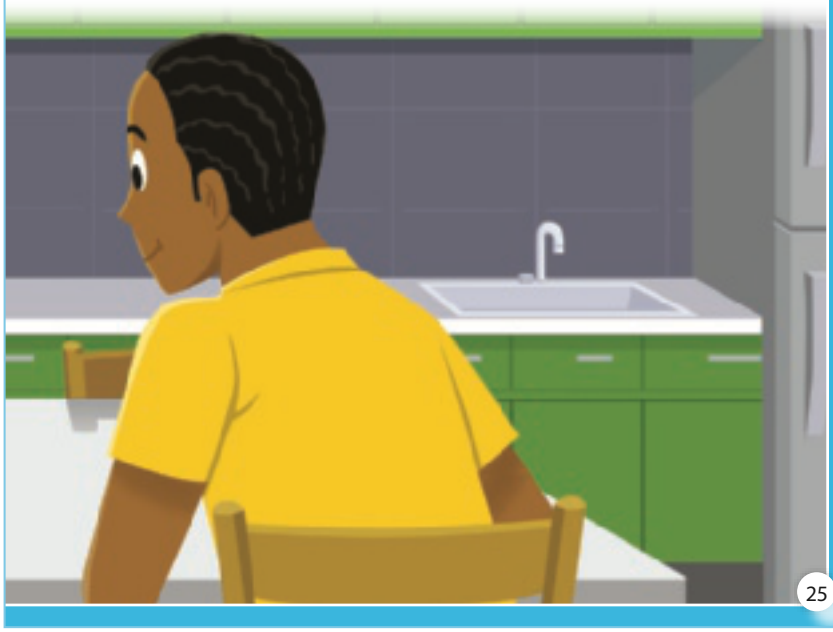
Unplugged Activity

EXTEND—As a class, discuss a well-known game, and agree on step-by-step instructions for playing the game. Write up the instructions, and point out that these instructions are an algorithm.

Page 25

Ask students to look at the picture on page 25. Describe Hanna's routine. Encourage students to share if they have similar or different routines than Hanna's.

Hanna thinks about the routine of her day. Her daily routine has steps that happen in a certain order. With her dad's help, Hanna lists the steps she follows in her daily routine. Routines can be helpful as a way to remember the next thing to do. But Hanna doesn't have to follow the same routine every day. She can decide to follow different steps. Unlike Hanna, computer devices only follow the steps in their programs.



25

Ask students the following questions:

LITERAL—What is the first step in Hanna's routine?

» The first step in Hanna's routine is "Wake up."

INFERENTIAL—Why does Hanna put the "Eat breakfast" step after the "Wake up" step in her routine?

» Answers may include that she can't eat breakfast while she is still sleeping!

Unplugged Activity

EXTEND—Help students identify the steps in their own morning routines. You may want to encourage them to draw pictures that illustrate each step, such as waking up, brushing teeth, eating breakfast, getting dressed, etc. Then have several students share their routines with the class. Invite the class to compare and contrast the different routines. Are all the steps the same? Are similar steps done in a similar order?

3. Check for understanding.

Unplugged Activity

Review the whiteboard or anchor chart responses with students. Encourage students to identify the algorithms on the list. Any of the step-by-step processes that lead to an end result can be considered algorithms. Ask students to reflect on how algorithms that people follow might be different from algorithms that computers follow.

Know the Standards

1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. People follow and create processes as part of daily life. Many of these processes can be expressed as algorithms that computers can follow. An algorithm is a precise sequence of instructions for a process that can be executed by a computer using programming languages. At this grade level, students can think of algorithms as sequences of instructions that describe how to complete a specific task. Familiar, early elementary routines may include such things as brushing teeth, washing hands, and getting dressed. Other examples include making simple foods, navigating around the classroom, and following the rules to play a game. Algorithms are commonly implemented using a precise language that computers can interpret. Because computers will follow instructions exactly as they are given, the steps of an algorithm must be in the proper order to achieve the intended result.

LESSON 6, PART 2

Which Step Comes First?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Recognize why the steps of an algorithm have to be done in the correct order.
- ✓ Model a daily process by creating and following an algorithm.

Instructional Activities

- student investigation
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcept and Standard: Algorithms: 1A-AP-08 Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks. (P4.4)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussion. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

algorithm

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

code **directions** **instructions**

Materials and Equipment

Collect or prepare the following:

- large whiteboard or anchor chart
- glue sticks

Activity Page

AP 6.2

Activity Page 6.2
Put Steps in Order (AP 6.2)

Advance Preparation

- Make sufficient copies of AP 6.2 for all students in the class. Cut out the cards at the bottom of the worksheet so that each student will have a set of cards to sequence.
- On the whiteboard or anchor chart, write the heading "Which Step Comes First?"

The Core Lesson

1. Focus attention on today's topic.

Ask students: "What steps do you take to brush your teeth?" Call on one or more students to share their routines with the class. Record the response on the whiteboard or anchor chart.

Then **ask students**: "Which step comes first?" Circle the step on the whiteboard or anchor chart. It will likely be either "open the toothpaste" or "put toothpaste on my toothbrush." If "open the toothpaste" isn't on the chart, add it and help students see that this needs to be the first step.

2. Facilitate the activity.

Unplugged Activity

Explain to students that people create and follow step-by-step instructions, such as the steps you take when brushing your teeth. Then explain that computers need sets of instructions to tell them what to do too. These directions are called algorithms.

Ask students: "What are some other things you do every day that might be algorithms?"

Activity Page

AP 6.2

SUPPORT—Support students who might have difficulty thinking of a daily routine by providing leading questions, such as "Would putting on shoes be an algorithm? Would washing hands be an algorithm? Would making a cake be an algorithm? Would getting to school be an algorithm?"

Refer to the whiteboard or anchor chart and **ask students**: "What would happen if we tried to put the toothpaste on the toothbrush before we took the top off the toothpaste tube?" Allow students to share their responses. Then point out that the order of the steps is important. If the result is to get clean teeth, then we need to take the top off the toothpaste tube first so we can put the toothpaste on the toothbrush.

Distribute copies of A.P. 6.2 and handwashing cards to each student. Ask students to arrange the steps for washing their hands in the correct order on the worksheet. Then have them glue the cards to the page.

3. Check for understanding.

Unplugged Activity

Review with the class the correct order for washing hands: 1) turn on water, 2) wet hands, 3) scrub with soap, 4) rinse clean, 5) dry hands. **Ask students**: "Why do the steps in the handwashing algorithm have to be in the correct order?"

CHALLENGE—You can use the concept of a daily routine to build students' awareness of the different cultures around them. If time permits, encourage students to share any routines that are special in their household or culture.

EXTEND—Tell students that they will follow an algorithm to make a drawing. Provide each of them with a pencil and paper. Then give verbal directions for drawing a box with a circle inside and a small square on top. When they are done with their drawings, show them drawing of the intended image so they can see if their version matches the intended image.

LESSON 7, PART 1

Computer Programs Are Instructions

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Define the terms *computer program* and *computer programming*.
- ✓ Describe sequences and simple loops.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcepts and Standards:

Control: 1A-AP-10 Develop programs with sequences and simple loops to express ideas or address a problem. (P5.2)

Modularity: 1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4.4)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

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computer program **computer programmer** **loop** **sequence**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

algorithm **repeat** **symbols**

Instructional Resources

Student Book

Ch. 7

Student Book, Chapter 7
Computer Programs
Are Instructions

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart

The Core Lesson

1. Focus attention on today's topic.

Introduce the unit by **asking students**: "What is something you do over and over again?" You can provide an example to students, such as: "When I wash my hands, I move them back and forth over each other many times to make sure they get clean!" Allow students to share their responses.

2. Read together "What Is a Computer Program?"

Student Book

Ch. 7

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 26 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Computer Prorams Are Instructions?" and tell them to pay special attention to the examples of repeated instructions in the chapter.

Page 26

Ask students to look at the picture on page 26. Invite students to think about what it means to repeat something.

CHAPTER 7

Computer Programs Are Instructions

Hanna and Lesia are listening to music. Hanna's favorite song comes on. She says, "This is my favorite song. Will you play it again?"

Lesia says, "I like it, too. I'll put it on repeat."

26

Ask students the following questions:

LITERAL—What does Lesia say she will repeat?

» Lesia is going to repeat the song.

INFERENTIAL—What do you think pushing the "repeat" symbol on the phone does?

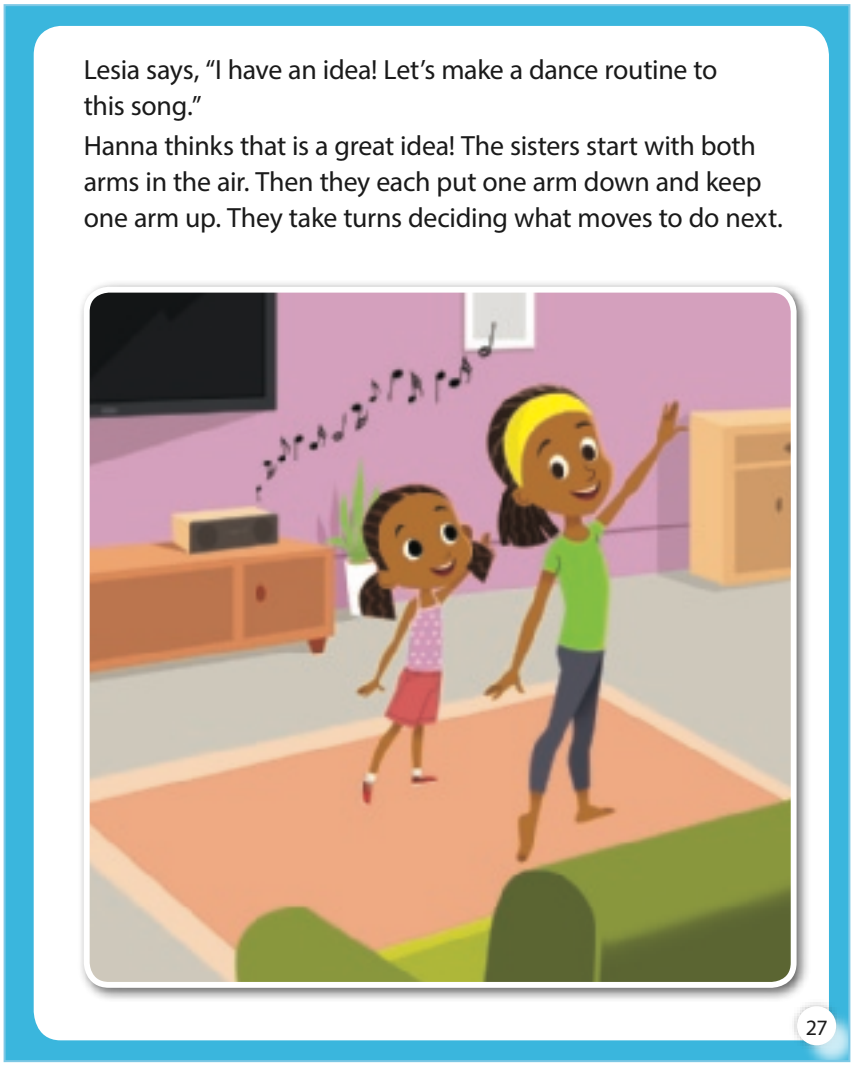
» Sample answer: It tells the music app to play the song again.

Unplugged Activity

SUPPORT—Support student learning by helping students recognize that certain ideas or actions can be represented by symbols. Explain that computers use symbols to represent things like words, motions, sounds, and objects. (See **Know the Standards** 1.) Point out common examples, such as thumbs up/down to represent yes/no or using arrows to represent direction. Invite students to think of some symbols they might see in a music app that represent actions (a triangle for "play," two vertical lines for "pause," a square for "stop").

Page 27

Ask students to look at the picture on page 27. Explain that the order of steps in a dance, or for drawing a shape or singing a song, is called a **sequence**.



Ask students the following questions:

LITERAL—What is the first step in Hanna and Lesia's dance sequence?

» They start by putting both arms in the air

LITERAL—What is the second step in Hanna and Lesia's dance sequence?

» They put one arm down

EVALUATIVE—Have you ever learned a dance? Did the dance have an order of steps to follow?

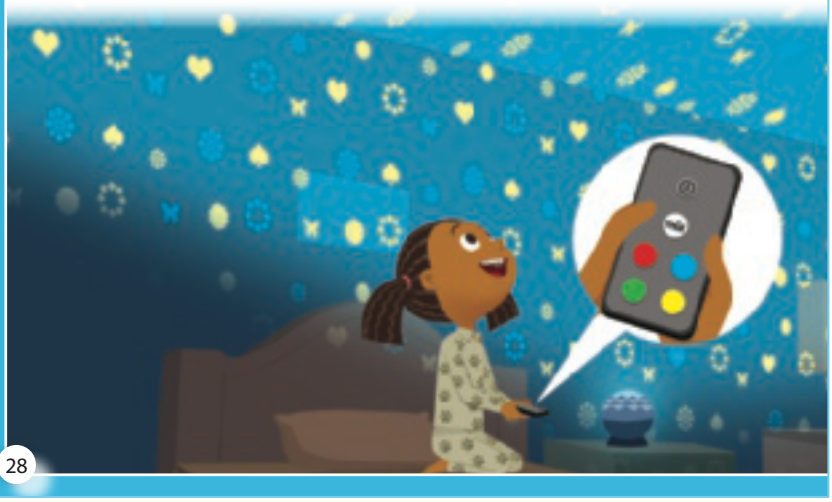
» Answers will vary. Allow students who have learned dance routines to share their experiences with the class.

Pages 28–29

Ask students to look at the picture across pages 28 and 29 as you read aloud. Explain to students that steps might be repeated in a sequence, such as when you sing "B-I-N-G-O" three times in a row, or rub your hands while washing them. When you have repeating steps in a sequence, it is called a loop. (See **Know the Standards** 2.)

At bedtime, Hanna is tired from dancing. But she still wants to try out her new ceiling light. She can give the light directions to tell it what colors to display. The light must have a computer device in it!

Hanna first looks at the light when it is set on red. Then she tries blue, green, and yellow. She decides she likes the blue and yellow lights best. She pushes the buttons to make the blue and yellow lights shine on the ceiling. The colors change back and forth. Then she sees the "mix" button. She pushes the "mix" button, and both yellow and blue lights shine at the same time.



28

Ask students the following question:

LITERAL—What is the sequence of colors that Hanna makes?

» The sequence of colors is blue, yellow and then mix.

INFERENTIAL—If Hanna makes a sequence of lights that goes "butterfly," "heart," "circle," which part is being repeated or done over and over again?

» The sequence of the butterfly light, then the heart light, and then the circle light is being repeated.

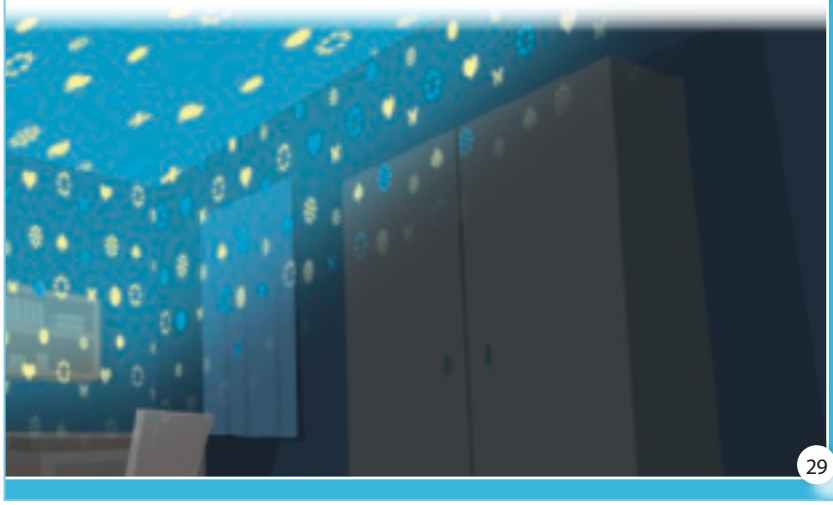
Page 29

Invite students to think about how Hanna created the sequence of colors for her ceiling lights.

Hanna decides she likes the mix of lights, too. Hanna reprograms the ceiling light to be blue, yellow, and mix.

Lesia's smartphone is programmed to repeat a song. Hanna's ceiling light is programmed to shine colors in a pattern. The pattern repeats.

A computer program is a set of instructions. The instructions tell the computer processor what to do, step by step. Computer programs can contain many steps. Some steps might repeat. A repeating set of computer steps is called a loop. People who write computer programs are called computer programmers.



29

Ask students the following questions:

LITERAL—What is a computer program?

» A computer program is a set of instructions to make a device do a task.

LITERAL—What does a computer programmer do?

» A computer programmer writes computer programs.

SUPPORT—Help support student learning by pointing out that an algorithm is the precise sequence of steps you give a computer program in order to solve a problem or achieve a task. You may wish to provide an example to help students relate these concepts to their personal frames of reference. For example, ask students to imagine that they want to program a robot so that it moves from the door of the classroom to their desks. An algorithm is the step-by-step instructions to get from one place to another. It includes sequences that have to be done in the correct order, such as turn right, turn left, and then turn

right again. If someone were to put directions into the robot's computer, telling the robot how to move from the classroom door to your desk, those directions would be called a computer program. The person who wrote those directions would be known as a computer programmer.

3. Check for understanding.

Unplugged Activity

Ask students to suggest an everyday example of an algorithm, such as brushing teeth, walking to school, or getting dressed. Pick one example and write it on the whiteboard or anchor chart. Work with students to create step-by-step instructions for that particular activity. Then invite students to point out places in the instructions where there are loops. (For example, when you are brushing teeth, moving the toothbrush up and down over your teeth is a loop.)

Know the Standards

1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information. Information in the world can be represented in computer programs. At this learner level, with teacher assistance, students should be able to model the way programs store and manipulate data by using numbers or other symbols to represent information. For example, students could use thumbs up/down as representations of yes/no; arrows when writing algorithms and sequences to represent motion or direction; and numbers, pictographs, or other symbols to represent letters or words.

1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem. People create programs by composing sequences of commands that specify the precise order in which instructions should be executed. Sequences are the order of instructions in a program. Loops enable programs to repeat sequences of commands multiple times. At this learner level, with teacher assistance, students should be able to recognize loops and sequences in songs, rhymes, movements, and games.

LESSON 7, PART 2

How Do You Create a Sequence with a Loop?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Recognize sequences as a series of steps and loops as repeated steps within sequences.
- ✓ Model sequences and loops using physical activity.
- ✓ Recognize that movements can be represented by symbols.

Instructional Activities

- hands-on activity
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcepts and Standards:

Control: 1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem. (P5.2)

Variables: 1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information. (P4.4)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

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loop **sequence**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

routine **symbols**

Materials and Equipment

Collect or prepare the following:

- one piece of paper (per small group)
- tape or glue stick (per small group)
- large whiteboard or anchor chart

Activity Page

AP 7.2

Activity Page 7.2
Dance Moves! (AP 7.2)

Advance Preparation

- Make sufficient copies of AP 7.2 for each small group. Cut out the cards from the sheets before class.
- Make a single copy of the Activity Page. Cut out one of the Clap pictures, one of the Stomp pictures, one of the Jump pictures, and one of the Wave pictures.
- On the whiteboard or anchor chart, draw a table with two rows and two columns. Label one cell "Clap," label a second cell "Stomp," label a third cell "Jump," and label the fourth cell "Wave." Tape the picture representing each motion into the appropriate cell.

The Core Lesson

1. Focus attention on today's topic.

Ask students: "Have you ever learned a dance?" Discuss whether the dance had an order of steps to follow. How did they know which steps to do and in what order?

Explain that the order of steps in a dance—or for drawing a shape or singing a song—is called a sequence. Sometimes steps might be repeated in a sequence, as when you sing "B-I-N-G-O" three times in a row. Repeating steps in a sequence are called a loop. (See **Know the Standards** 1.)

Know the Standards

1A-AP-10 Develop programs with sequences and simple loops, to express ideas or address a problem.
People create programs by composing sequences of commands that specify the precise order in which instructions should be executed. Sequences are the order of instructions in a program. Loops enable programs to repeat sequences of commands multiple times. At this learner level, with teacher assistance students should be able to recognize loops and sequences in songs, rhymes, movements, and games.

Ask students to follow your instructions to do a dance. Model a short five- or six-movement sequence with students, such as Clap, Wave, Clap, Wave, Stomp, Jump. Help students recognize that the movements together are a sequence and the two Clap, Wave motions in a row are a loop.

2. Facilitate the activity.

Unplugged Activity

Activity Page

AP 7.2

Tell students that they will create / plan / choreograph their own dances with sequences and loops. Arrange the class into small groups, and distribute paper, tape, and dance move cards to each group.

Talk about the images on the cards. Explain that computers use symbols to represent things like words, motions, sounds, and objects. (See **Know the Standards** 2.) **Ask students**: "What motions are represented by the symbols on each card?" Walk them through the representations for Clap, Wave, Stomp, and Jump using the pictures on the whiteboard or anchor chart. Demonstrate the motion represented on each card.

Have students work together in groups to create short dance sequences of five to ten movements using the four movements on the cards. Once they have established their sequences, they can tape or glue down the cards in order on the paper to create "Dance Cards."

3. Check for understanding.

Unplugged Activity

Ask each group to perform their dance for the class.

SUPPORT—Support students who might have movement limitations by having them take on the role of "Dance Instructor"—calling out the moves for the other students in their group.

After each dance, ask students to show their dance sequence page. **Ask students**: "Are there any loops in your dance sequence?" If so, have students indicate the motions that make up a loop.

Know the Standards

1A-AP-09 Model the way programs store and manipulate data by using numbers or other symbols to represent information. Information in the world can be represented in computer programs. At this learner level, students should be able to model the way programs store and manipulate data by using numbers or other symbols to represent information. For example, students could use thumbs up/down as representations of yes/no; use arrows when writing algorithms and sequences to represent motion or direction; and use numbers, pictographs, or other symbols to represent letters or words.

LESSON 8, PART 1

Thinking like a Computer

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Describe how the sequence of instructions in a program can be broken down (decomposed) into steps.
- ✓ Recognize that plans help clarify the steps needed to create a program.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcepts and Standards:

Modularity: 1A-AP-11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3.2)

Program Development: 1A-AP-12 Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5.1, P7.2)

Program Development: 1A-AP-13 Give attribution when using the ideas and creations of others while developing programs. (P7.3)

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decomposition **program**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

algorithm **order** **sequence**

Instructional Resources

Student Book

Ch. 8

Student Book, Chapter 8
Thinking like a Computer

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart

The Core Lesson

1. Focus attention on today's topic.

Engage students by reminding them that many times when we are reading, we might come across a word we do not know. Discuss different ways students might figure out an unknown word when reading. Then write a basic CVC word, such as *cap*, on the whiteboard or anchor chart. Point out that sometimes we can break an unknown word down into smaller parts or individual letters to figure it out. Invite students to try to decode the word you wrote by breaking it down into sounds. Tell students that sometimes complicated objects and tasks can be broken down into simpler tasks, just as difficult words can be broken down into sounds. Breaking something down into simpler pieces is called decomposition. (See **Know the Standards** 1.)

Know the Standards

1A-AP-11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. Decomposition is the act of breaking down large or complicated tasks into simpler tasks. An example of decomposition might be preparing for a party, which involves inviting guests, making food, and setting the table. These tasks can be broken down further. For example, setting the table involves laying a tablecloth, folding napkins, and placing utensils and plates on the table. The end result of decomposition is an algorithm, a set of instructions to perform a task.

2. Read together "Thinking like a Computer."

Student Book

Ch. 8

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 30 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Thinking like a Computer," and tell them to pay special attention to how Hanna and her family break down a large task into smaller pieces to solve a problem.

Page 30

Ask students to look at the picture on page 30. Ask students to think about parties that they might have gone to with their friends or family.

Ask students the following questions:

LITERAL—Why does Hanna want to throw a party for Grandma?

» Hannah wants to throw a party because Grandma is graduating.

EVALUATIVE—Think about a party you've gone to. What did you like best about it?

» Answers may vary.

Page 31

Ask students to look at the picture on page 31. Remind students that an algorithm lists all the steps of a task in order, and that programmers use algorithms to tell computers what to do.

Ask students the following questions:

LITERAL—What is the big task that Hanna and her family are doing?

» They are having a party for Grandma.

INFERENTIAL—Suppose you were throwing a party. What is the correct order in which to do the following steps: have the party, pick a day and time, send invitations, decide who to invite?

» 1) Pick a day and time. 2) Decide who to invite. 3) Send invitations. 4) Have the party.

Unplugged Activity

SUPPORT—Support students who may have problems visualizing the order of events by creating story cards showing the different steps. Allow students to look at the cards while you read out the steps, and then ask them to put the cards in correct order.

Page 32

Ask students to look at the picture on page 32 as you read aloud. Explain that when people create programs for computers, they have to first make a plan that describes the steps needed to accomplish a task. (See **Know the Standards** 2.)

Ask students the following questions:

LITERAL—What are some of the steps in Mom's plan for Grandma's party?

» They will invite Grandma's friends, make a menu of food and drink, make decorations

EVALUATIVE—Hanna and Lesia make decorations. Do you think they should break down making decorations into smaller steps? Why or why not?

» Sample answer: Yes they should, because; you need to know what you're going to make and how you're going to make it.

Page 33

Ask students to look at the picture on page 33. Invite them to think about how Hanna and her family decomposed the big task of planning a party into smaller steps.

Finally, the day of Grandma's graduation party has arrived. Everyone is having a great time. Grandma says, "This party is so much fun! How did you all put it together so quickly?"

"Lesia had the idea," Hanna answers. "We acted like computers and followed many smaller steps."

33

Ask students the following questions:

LITERAL—How did Hanna's family plan Grandma's party so quickly?

» They broke down the planning into smaller steps.

LITERAL—Whose idea was it to throw a party? Whose idea was it to break the planning into smaller tasks?

» It was Hanna's idea to throw a party. It was Lesia's idea to break the planning into smaller steps.

3. Check for understanding.

Unplugged Activity

Pick one of the party tasks named on page 32 (for example, "Hanna and Lesia make decorations"). Write that task on the whiteboard or anchor chart. Ask students to suggest ways to further break down the task into a step-by-step process (algorithm), and record their responses. Ask students to reflect on how making a plan and breaking it down into smaller steps can help make it easier to solve a big problem or complete a larger task.

Know the Standards

1A-AP-12 Develop plans that describe a program's sequence of events, goals, and expected outcomes.
People develop programs collaboratively and for specific purposes, such as expressing ideas or solving problems. The first step is to create a plan. Such a plan describes a program's sequence of events, goals, and expected outcomes. Students at this stage may complete the planning process with help from their teachers.

LESSON 8, PART 2

How Can You Solve a Problem by Breaking It Down into Smaller Parts?

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Identify a problem or task and discuss ways to break it into multiple smaller steps.
- ✓ Articulate a plan for solving a problem.
- ✓ Credit the contributions of others.

Instructional Activities

- hands-on activity
- class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcepts and Standards:

Modularity: 1A-AP-11 Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions. (P3.2)

Program Development: 1A-AP-12 Develop plans that describe a program's sequence of events, goals, and expected outcomes. (P5.1, P7.2)

Program Development: 1A-AP-13 Give attribution when using the ideas and creations of others while developing programs. (P7.3)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

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decomposition **program**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

down **left** **right** **up**

Materials and Equipment

Collect or prepare the following:

- predrawn maze grid on paper (one per group)
- colored pencils, crayons, or markers
- several pieces of paper (per group)
- small manipulative, such as a plastic animal, small block, or coin, to act as a token (one per group)
- large whiteboard or anchor chart
- whiteboard or chart markers in the same colors as the pattern blocks (red, orange, yellow, green, blue, and beige for white)

Advance Preparation

- Draw a grid with five rows and five columns on a piece of paper. In one corner, write "Start." In another corner, write "End."
- On the whiteboard or anchor chart, write the heading "What Are the Parts of the Castle?" Under the heading, draw a simple castle by tracing around different pattern block shapes, such as a base of triangles with squares forming the walls and trapezoids or triangles on top. If possible, use names of shapes that are currently being taught in math.

The Core Lesson

1. Focus attention on today's topic.

Direct students to look at the castle you drew. **Ask students**: "What object do you see?" Encourage them to look at the overall shape. Some students may see a castle; and others may see a fort or a house.

Explain that the castle is built out of smaller pieces. **Ask students**: "What shapes can you see in the castle?" As students identify different shapes in the castle, color in that shape using the corresponding color of the pattern block. For example, if students identify a triangle, color all the triangles green. Tell students that sometimes complicated objects and tasks can be broken down into simpler tasks. Breaking something down into simpler pieces is called decomposition.

Ask students: "What simpler pieces make up the castle?" Encourage them to name all the different shapes.

SUPPORT—Support students who might have trouble seeing how the parts make up the whole by allowing them to use pattern blocks to "reconstruct" your castle.

2. Facilitate the activity.

Unplugged Activity

Tell students that they will be solving a problem by breaking it down into smaller parts. Explain that when people create instructions for computers—something known as a "computer program" or as just a "program"—they have to first make a plan that describes the steps needed to accomplish a task.

Arrange the class into small groups, and distribute the maze grid, the tokens, and the colored pencils, crayons, or makers. Have students look at the maze grid. Explain that the problem students need to solve is how to move the token from the starting point to the stopping point, one square at a time.

On a clean whiteboard or new anchor chart, write the heading "Make a Plan."

As a class, have students brainstorm what the starting and ending steps of the sequence might be. Record their answers on the whiteboard or anchor chart.

Have each group of students work together to develop a plan for how to move their token. Encourage them to use a variety of terms, such as *left*, *right*, *up*, and *down* to indicate movement.

EXTEND— Encourage students to represent directions using arrows. They should record their steps on a planning document. Encourage students to be artistic with their documents, using illustrations to show how they would move their token for each step.

3. Check for understanding.

Unplugged Activity

Ask students: "How did you all work together to solve the problem? How did breaking the problem into simpler steps help you solve the problem?" Encourage students to talk about the roles each each of them played in coming up with their plans.

EXTEND—Preview Lesson 9.2 by asking each group to exchange their plan with another group. Ask the second group to test the other group's plan by moving their token each step along the grid.

EXTEND—Connect the lesson to an ELA lesson by asking students to use a story map to decompose a story into three parts: the beginning, the middle, and the end.

LESSON 9, PART 1

Debugging Means Fixing Problems

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Define *bug* and *debugging*.
- ✓ Identify some of the strategies used to debug a program.

Instructional Activities

- teacher Read Aloud
- class discussion

CSTA Standards

Concept: Algorithms and Programming

Subconcept and Standard: Program Development: 1A-AP-14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (P6.2)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

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bug **debug** **log**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

computer programmer

Instructional Resources

Student Book

Ch. 9

Student Book, Chapter 9
Debugging Means
Fixing Problems

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart

The Core Lesson

1. Focus attention on today's topic.

Introduce the chapter by writing "Debugging Means Fixing Problems" on the board. Ask students if they have ever had a problem and needed help to fix it. Ask how the problem was solved. Write examples on the whiteboard or anchor chart.

2. Read together "Debugging Means Fixing Problems."

Student Book

Ch. 9

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 34 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Debugging Means Fixing Problems," and tell them to pay special attention to the steps people take to solve computer problems as you read.

Page 34

Ask students to look at the picture on page 34 as you read aloud. Talk about what they picture when they hear the word *bug*. Ask what they picture when they hear the word *log*. Tell students that we use these words in different ways when we talk about computers.

CHAPTER 9

Debugging Means Fixing Problems

Hanna walks into her mom's office to ask for help. "Mom, will you help me with my math homework? I keep getting stuck on a problem."

Her mom answers, "Sure, Hanna. Let me log this bug first."

"WHAT? You have a log with bugs in it?" Hanna gasps.

34

Ask students the following questions:

INFERENTIAL—When Hanna asked her mom for help, why was Hannah shocked by her mom's reply?

» She thought her mom had a log with bugs in it.

LITERAL—What did Hanna's mom have to finish before she could help?

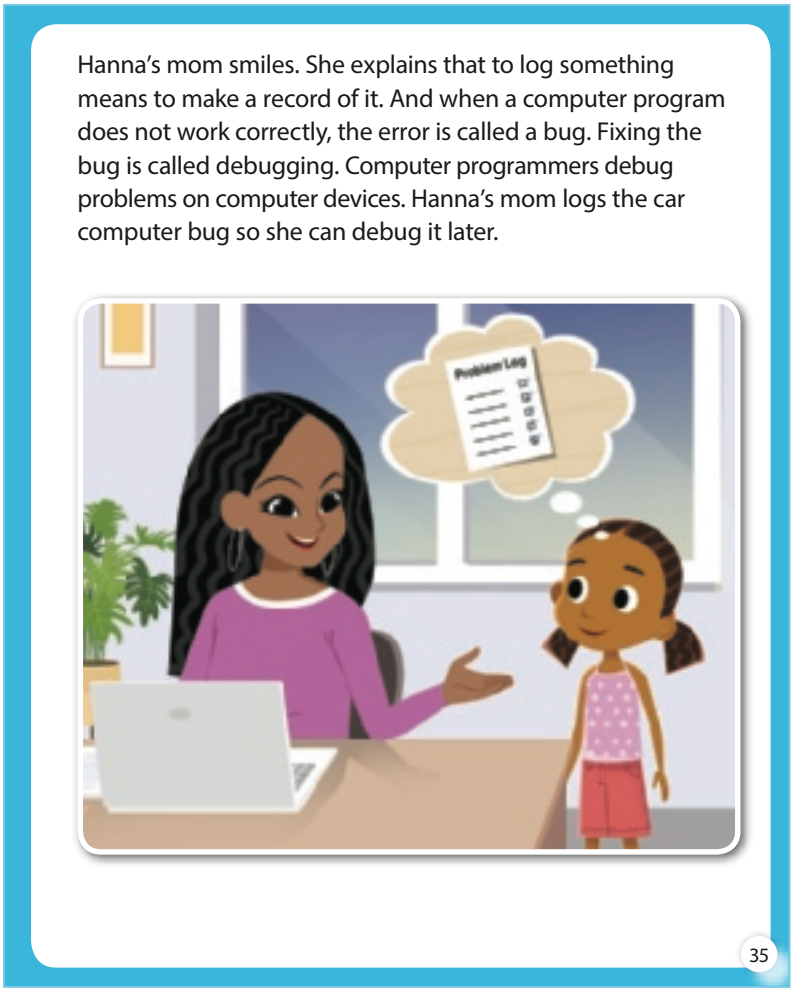
» She had to log a bug.

INFERENTIAL—What do you think Hanna's mom means when she says she has to "log this bug"?

» Student answers may vary.

Page 35

Ask students to look at the picture on page 35. Tell students that computer programmers have special steps they must follow when solving a problem. These steps can help them see where there have been other problems in the past, and how these problems were solved.



Ask students the following questions:

LITERAL—The words *bug* and *debug* are very similar. What do they mean?

» A bug is a software problem. Debugging is identifying and fixing the problem (bug).

EVALUATIVE—Have you ever kept a log or seen someone else keep a log? How did it help?

» Student answers will vary. Point out that Hanna's mom logged the bug so that she could debug it later. The log helps her remember the problem.

SUPPORT—Give examples of situations for students to practice the identifying bugs and debugging. For example, pretend to make a peanut butter and jelly sandwich, but forget to put peanut butter on. Ask students to debug—identify the bug (no peanut butter) and fix the problem (put peanut butter on before finishing the sandwich). Other examples include putting on a jacket washing hands incorrectly, or washing and drying dishes incorrectly.

Page 36

Ask students to look at the picture on page 36 as you read aloud. Discuss the different strategies Mom suggests they might use to solve Hanna's problem. Ask students to offer examples of ways they or others have used these strategies.

"Let's look at your math problem," Mom says.

Hanna shows Mom her math homework. Mom lists a few ways they might answer the problem:

- They can break the problem down into steps.
- They can guess and then check their answers.
- They can work backward.
- They can draw a picture.

Hanna decides to break the problem down into steps.

36

Ask students the following questions:

LITERAL—Name the strategies Hanna's mom suggests to help solve the math problem.

» They could break the problem down into steps, use guess and check, work backward, and draw a picture.

INFERENTIAL—How do you think Hanna working to solve her problem that might be similar to how a computer programmer would work to fix a bug in a software program?

» Computer programmers, after they have identified a bug, have different strategies they use to debug the software. This is what Hanna is doing. She is also thinking about some of the same strategies programmers use to debug programs.

Page 37

Ask students to look at the picture on page 37. Discuss how working together to learn new strategies to solve a problem can help Hanna solve similar problems in the future. Point out that she now knows several helpful strategies. Also, point out that if Hanna has a similar problem in the future, she can think back to the strategies they brainstormed for this problem and remember which strategy worked.

Ask students the following questions:

INFERENTIAL—What does Hanna mean when she says, "we debugged my math homework together"?

» Answers will vary. Encourage students to think about how Hanna and her mom discussed strategies, chose a strategy, and then solved the problem.

EVALUATIVE—Do you think Hanna should keep a homework log? What would she include in it? How might it help her?

» Answers will vary. Students may discuss how a log can help Hanna remember what had been hard for her before. They may also say that it can help her remember how to solve similar problems in the future.

3. Check for understanding.

Unplugged Activity

Write "Debugging means fixing problems" on the whiteboard or anchor chart. Invite students to share what they have learned. Write their responses on the board.

LESSON 9, PART 2

Debugging a Program

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Identify and fix (debug) errors within a simple algorithm.
- ✓ Describe the steps taken to show the process used to develop and debug an algorithm.
- ✓ Credit the contributions of others.

Instructional Activities

- hands-on activity
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcept and Standard: Program Development: 1A-AP-14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. (P6.2)

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Core Vocabulary and Language of Instruction

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bug **debugging** **program**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

backward **down** **forward** **left** **right** **up**

Materials and Equipment

Collect or prepare the following:

- predrawn maze grid on paper (one per pair of students)
- small manipulative, such as a plastic animal, small block, or coin, to act as a token (one per pair)
- "obstacle" stickers (optional)
- large whiteboard or anchor chart

Activity Page

AP 9.2

Activity Page 9.2
Moving Through the Maze (AP 9.2)

Advance Preparation

- Draw a grid with five rows and five columns on a piece of paper. In one corner, write "Start." In another corner, draw a star.
- Make sufficient copies of AP 9.2 for each pair. Cut apart the direction cards.
- On the whiteboard or anchor chart, draw a grid with three columns and two rows. In the upper-left corner write "Finish." In the bottom-right corner, write "Start." Below the grid, write the following:
  1. ← Go left 1 ☐
  2. ← Go Left 1☐
  3. ↓ Go down 1☐

The Core Lesson

1. Focus attention on today's topic.

Direct students to the maze you drew. Tell them that you want to move through the maze, from the start to the star, so you wrote a program to do it. Right now, though, the program doesn't seem to be working. Point out the steps in your program: first, move left one block. Next, move left one block again. Last, move down one block.

SUPPORT—Support students who might have trouble visualizing the movements by tracing your finger along the path.

Ask students: "Can you figure out why my program doesn't work?" Let students work together to see if they can figure out the problem with the program. Then have students find where the problem is. Once they have identified the problem for step 3, the direction should be up, not down ask them to help you fix the problem by fixing the incorrect step.

Explain that when a program has a problem in it, we call the problem a *bug*.

When we find and fix a software problem, that is called *debugging*. Thank the students for helping you debug your program! (See **Know the Standards**.)

Know the Standards

1A-AP-14 Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops. Algorithms or programs may not always work correctly. Students should use various strategies, such as changing the sequence of steps, following the algorithm in a step-by-step manner, or trial and error, to fix problems in algorithms and programs.

2. Facilitate the activity.

Explain to students that we are almost always "debugging" something. For example, when we find a mistake in a math or a spelling problem and then fix it, we are debugging the problem. Tell students that today they will practice writing programs to move through a maze, then looking for—and fixing—any bugs there may be in their programs.

Unplugged Activity

Have the students form pairs, and distribute the maze grid, manipulative, and direction cards. Have students look at the maze grid. Explain that the problem students need to solve is how to move the token from the starting point to the stopping point, one square at a time.

Activity Page

AP 9.2

Have one student in each pair "write" a program using the direction cards. Then ask the other student to move through the maze with the manipulative, following the program. If there's a bug in the program, ask students to work together to "debug" the program so that it works. After students have successfully worked through the maze, ask them to switch roles within their pairs and do the activity again.

SUPPORT—Support students who may get frustrated or upset when they can't figure out a problem right away by encouraging them to keep trying a bit longer. Tell them that often this is what computer programmers have to do to solve problems with a software program. The answer isn't always obvious and may not come quickly or easily.

EXTEND—If students easily construct pathways through the maze without making mistakes, you may want to add an "obstacle" sticker to one or two of the squares in the grid. Explain to students that they cannot move an object through a square with a sticker, so they will have to write a program that avoids such squares.

3. Check for understanding.

Unplugged Activity

After the activity is completed, point out that bugs can happen because computers follow instructions exactly as they are written. **Ask students**: "How do you think a person who writes a program feels when there is a bug in their software program? How do you think the person feels once he or she has debugged the program?"

LESSON 9, PART 3

Describing a Plan

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Identify the steps used in the design process.
- ✓ Use images, verbal reflections, and/or models to show the process used to develop and improve a program.

Instructional Activities

- student investigation
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Algorithms and Programming

Subconcept and Standard: Program Development: 1A-AP-15 Using correct terminology, describe steps taken and choices made during the iterative process of program development. (P7.2)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

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design journal

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ask **create** **imagine** **improve** **plan**

Materials and Equipment

Collect or prepare the following:

- pencils, crayons, and/or markers for a journal page (per student)
- large whiteboard or anchor chart

Activity Page

AP 9.3

Activity page 9.3
Design Journal Sections (AP 9.3)

Advance Preparation

- Make sufficient copies of AP 9.3 for each pair of students.
- On the whiteboard or anchor chart, write the heading "What Should We Put in a Design Journal?"

The Core Lesson

1. Focus attention on today's topic.

Ask students: "Can you tell me what a journal is?" (A journal is a book or notebook in which we can record our experiences, observations about the weather, the wildlife we see, or anything else going on in the world around us.) Ask students to share some of the things they might put in a journal.

Explain to students that programmers and engineers use special journals called design journals to write down things about the programs they write. **Ask students**: "What are some things people who write programs might want to put in a design journal?" Record student responses on the whiteboard or anchor chart.

Read through some of the responses with the class. Circle any responses that include the terms *ask*, *imagine*, *plan*, *create*, *improve*, *problem*, *bug*, and *test*.

Point out to students that these are some of the things that people who write computer programs put into their design journals. Design journals help people brainstorm, plan, create, improve, and reflect on the programs they write.

2. Facilitate the activity.

Unplugged Activity

Tell students that they will start their own design journals. Distribute copies of Activity Page 9.3 and writing/drawing materials to each student.

On a clean whiteboard or anchor chart, write the six steps of the design process Rewrite for clarification. Ask, Imagine, Plan, Create, Test, and Improve. Have students find the words on their pages as you read each one.

Using the whiteboard or chart paper, demonstrate how you might write about the maze you built in Lesson 9.2:

Ask: How can I move something from the start to the end?

Imagine: I can create a sequence of steps to move from one place to another.

Plan: I can work backward to answer my question.

Activity Page

AP 9.3

Create: I moved my piece ←, ←, ↓.

Test: There was a bug!

Improve: I tried moving the piece ←, ←, ↑. It worked!

Tell students they are going to plan a route for a dog to get to something he wants. In the "Ask" box, they should write or draw the problem they want to solve. Here are two examples:

- Rover wants to go on a walk, how can I help him get his leash?
- How can I help Rover find his lost ball?

Students should fill in the Imagine section with one or more ideas about how to solve the problem. They can then list the discrete steps in the Create area.

After students have planned their routes, they will use a marker to "test" their program, noting any bugs in the "Test" area. They should also write or draw how they will modify anything in the Improve area.

3. Check for understanding.

Unplugged Activity

Invite students to share their journal pages with a partner. They should describe the dog's problem and how they planned to solve it. They should show the route they created, describe how it worked, and explain what, if any, improvements they made.

Collect the journal pages and glue them into student notebooks, or put them in binders for students to add to on a regular basis.

Device-Based Activity

CHALLENGE—If you have a computer or an online classroom blog or journal, you might invite students to add a journal entry to it.

LESSON 10, PART 1

Computers Have Changed the Ways People Do Things

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Compare how people lived and worked before and after the adoption of new computing technologies.
- ✓ Recognize that people should work respectfully and responsibly with others online.

Instructional Activities

- teacher Read Aloud
- whole-class discussion
- vocabulary instruction

CSTA Standards

Concept: Impacts of Computing

Social Interactions

Subconcepts and Standards: Culture: 1A-IC-16 Compare how people live and work before and after the implementation or adoption of new computing technology. (P7.0)

Social Interactions: 1A-IC-17 Work respectfully and responsibly with others online. (P2.1)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

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technology

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change **new** **old**

Instructional Resources

Student Book

Ch. 10

Student Book, Chapter 10
Computers Have Changed the Way People Do Things

Materials and Equipment

Collect or prepare the following:

- whiteboard or anchor chart
- items for comparison, such as a book and an e-reader, a piece of mail and an email, or an old film camera and a smartphone camera

The Core Lesson

1. Focus attention on today's topic.

Introduce the lesson by creating an anchor chart with the heading "Technology" on the board. Below the heading on one side, write "Old." On the other side, write "New." Explain to students that *technology* is something that has been made by people to help us. For example, phones, computers, and cameras are all technology. They help us communicate, do work, and take pictures. Then explain that technology changes over time. Something may become bigger, or smaller, or faster; or have new features to help people live and work. Show students the items you have brought in for display. On the "Old" side of the chart, write the name of the older item (e.g., book), and on the "New" side of the chart, write the name of the newer item (e.g., e-reader). Have a brief discussion about the possible advantages and disadvantages of the old and new items.

2. Read together "Computers Have Changed the Way People Do Things."

Student Book

Ch. 10

While some advanced students may be able to read words on a given page of the Student Book, as a general rule students should not be expected or asked to read aloud the text on the Student Book pages. The text in the Student Book is there so that teachers and parents can read it when sharing the Student Book with students.

Read Aloud Support

Ask students to turn to page 38 of the Student Book and look at the image as you read aloud. Remind them that the title of this chapter is "Computers Have Changed the Way People Do Things," and tell them to pay special attention to the different types of technology and how they have changed.

Page 38

Ask students to look at the picture on page 38. Point out that Grandma is putting some older technology in the box.

CHAPTER 10

Computers Have Changed the Ways People Do Things

Hanna and Lesia go to visit Grandma. When they arrive, they notice Grandma is packing up some items. "Grandma, what are you doing?" asks Hanna.

Grandma answers, "I'm donating some older items to the community center. They are making a display to show how technology has changed over the years."

38

Ask students the following questions:

LITERAL—What is Grandma putting in the box?

» She is putting a phone in the box.

EVALUATIVE—Have you seen any old technology where you live? If so, what have you seen?

» Answers will vary.

Page 39

Ask students to look at the pictures on page 39. Ask students if they can identify any of the objects in the pictures before reading the text.

Ask students the following questions:

LITERAL—What are some examples of older technology that Grandma is donating?

» an old phone, a vinyl record, a film camera, an electronic game, and a paper library card

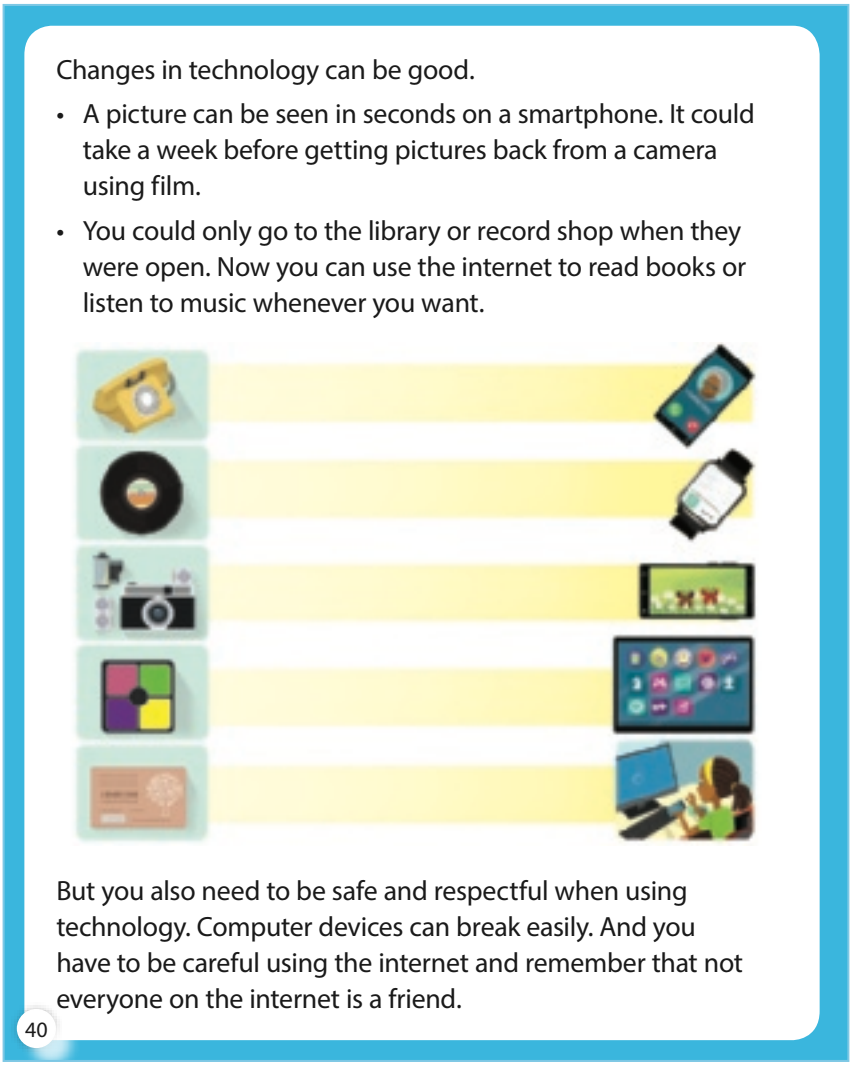
ALERT—A common misconception about technology is that it must be digital or electronic. Not all technology is digital or electronic. All technology, however, should be designed to help people solve important problems.

INFERENTIAL—Pick one of the items Grandma is donating. What technology do you use instead today?

» Possible answers: smartphones; streaming/online music; smartphone camera/digital camera; game console; digital library card (some students might say a plastic card with a swipe or QR code).

Page 40

Ask students to look at the picture on page 40 as you read aloud. Point out that many of the things that you can do on a computer, you can also now do on a tablet or a smartphone. That is because tablets and smartphones are actually computers. Computers were once large, but have changed over time to become smaller and faster.



Ask students the following questions:

INFERENTIAL—What are some of the advantages of new technology?

» Things take less time; you don't have to leave home.

INFERENTIAL—What are some of the disadvantages of new technology?

» Things can break easily; you have to be careful of strangers on the internet.

SUPPORT—Talk about online safety and when personal information is appropriate to share. Remind students that they should avoid sharing information that is inappropriate or that could personally identify themselves to strangers. Talk about specific instances in an age-appropriate manner. For example, a student may think nothing of posting a picture of them and their friends in front of their home or school, but even photos as ordinary as that hold "personally identifiable information."

Page 41

Ask students to look at the picture on page 41. Invite them to think about places other than school or home where they can find technology.

Ask students the following questions:

EVALUATIVE—What are ways that you and your family use old and new technology at the same time?

» Here is one possible answer: My mom can talk on a landline telephone while I use her smartphone to play games.

EVALUATIVE—What are some types of technology we use today that might change in the future? What types of technological changes would you like to see?

» Answers will vary. Encourage students to think about changes that might make technology easier to use.

3. Check for understanding.

Unplugged Activity

Return students' attention to the anchor chart. Point out that they have learned about how technology can change. Ask students to suggest additional items to add to the chart. Encourage students to discuss some possible advantages and disadvantages of each new item on the list.

LESSON 10, PART 2

Computers Changing Work and Life

Driving Question: How can we use computers and the internet?

Overarching Unit Objective: Use a variety of age-appropriate programs and websites with increasing skill and independence under supervision.

At a Glance

Learning Objectives

- ✓ Name several different examples of technology.
- ✓ Compare and contrast old and new technology.
- ✓ Recognize that technology is constantly changing.

Instructional Activities

- student observation
- class discussion
- vocabulary instruction

CSTA Standards

Concept: Impacts of Computing

Subconcepts and Standards: Culture: 1A-IC-16 Compare how people live and work before and after the implementation or adoption of new computing technology. (P7.0)

Social Interactions: 1A-IC-17 Work respectfully and responsibly with others online. (P2.1)

For detailed information about the CSTA Standards, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Core Vocabulary and Language of Instruction

A Glossary at the end of this Teacher Guide lists definitions for Core Vocabulary and selected Language of Instruction.

Core Vocabulary terms are those that students should learn to use accurately in discussions. During instruction, expose students repeatedly to these terms but not through isolated drill or memorization.

browser **internet** **search engine**
web page **web site** **(World Wide Web (www)**

Language of Instruction consists of additional terms that you should use when talking about concepts in the lesson. Students benefit from your modeling the use of these words without the expectation that students will use or explain the words themselves.

compare **future** **network** **past** **present**

Materials and Equipment

Collect or prepare the following:

- four to eight images of old or obsolete technology along with images showing new technologies that have replaced or updated them
- computer with internet access, preferably one per group of four to five students
- desktop, laptop, or tablet with image-viewing software or the ability to create a slideshow or a document
- a projector and screen or a large flatscreen monitor with video connection cables that will allow it to connect to the computer
- large whiteboard or anchor chart

Online Resources

NOTE—A useful source of old images of computers and computer technology is the Computer History Museum. Find additional images of the technology that has replaced or updated the same items: a mobile phone, a computer keyboard, a laptop, a game application, a streaming music application, a flat-screen television, a smart watch, an email or text message, a map application, etc. Place the past and present items into a desktop folder for viewing, or place them in a slideshow program, alternating the old version and the new version of the same item.

Advance Preparation

- Before class, locate images of old or obsolete technology. Possible examples include a rotary phone, a typewriter, a room-size computer system, a board game, a record player and vinyl records, an old-style television, a manual watch, a handwritten letter, a paper map, etc.
- Set up a computer and a second monitor or a projector so that the computer's desktop is duplicated (mirrored) on the second screen.
- Make sure that all computing devices—both computers and handheld devices—have limited functionality, including browser (internet website) restrictions in accordance with established child safety measures. In addition, a browser's homepage should be set to a blank page with no feeds or suggested sites.
- Find and install browser extensions and/or add-ons that protect children's privacy and limit content, including ads.

The Core Lesson

1. Focus attention on today's topic.

Ask students: "Have you heard the word *technology* before? What does the word mean to you?" Allow time for students to respond, and record their answers on the whiteboard or anchor chart. (Responses may include something electronic, computers, and things that are made by people.) Explain to students that technology is something that has been designed by people. Good technology can help us accomplish things that may have been difficult to accomplish before. But technology—even technology that can be helpful at times—can sometimes create unexpected problems for us. Ask students to share what they know about using the internet or the World Wide Web. Encourage them to talk about how they access the web, what web sites they have visited, and what they learned from their visits. (See **Know the Science**.)

Next, ask students: "Can you tell me how I can look for images on the web?" If not mentioned, point out that we can use a search engine, a web site that contains a type of software that allows us to look up information on the web by typing in

search terms. Ask the class to suggest names of search engines that they might have heard of.

SUPPORT—A common misconception about technology is that it must be digital or electronic. Not all technology is digital or electronic. All technology, however, should be designed to help people solve important problems.

2. Facilitate the activity.

If computers are available for small groups of students, organize the class into groups of three to four students each with a computer for each group to follow along if resources allow. If computers are not available, demonstrate the process for students.

Device-Based Activity

Demonstrate how you did a search for one of the past items you located prior to the lesson. Bring up a search engine and type in a past technology item you located prior to the lesson. Explain that a list of web sites appears from your search. Open a web page you have previewed prior to the start of class. Explain that a web page is a kind of document stored on another computer. Web pages are accessed through the internet using software known as a web browser.

Ask students: "What do you see in this picture?" Help students identify the item in the picture. Explain that the item is an example of past technology. Encourage students to describe how the item might have helped people in the past. Then search the "Now" image. Tell students that this is what people use today.

Demonstrate how you copied the picture from the web page into your slideshow or document. Repeat the comparison of past and present technology for three or four more items, depending on student interest and time.

Students can then do their own searches for images of past and present technology and save them as a slideshow or put them in a document as you demonstrated. Encourage groups to visit at least three web sites listed in their search results.

Know the Science

The internet and the World Wide Web (WWW) The internet is a global network of interconnected computers. The World Wide Web (*WWW* or *web*, for short), invented by Tim Berners-Lee in 1989, is used to obtain and share all kinds of information online. This data is stored as a collection of files and related sources—known as websites or web pages on computers known as servers. The web is accessed through a type of software called a web browser, which formats and displays web pages. A user's browser connects to a server and requests a web page, which is then transmitted back to the user's computer over the internet. Web pages have links to other web pages, and following these links is the main way to traverse the web. A search engine is a software program that helps people find information they are looking for online using keywords or phrases.

3. Check for understanding.

Unplugged Activity

Ask student groups to pick out one or two items from the activity for comparison (for example, a board game vs. a video game, or mailing a letter vs. getting an email). Ask students to discuss the similarities and differences between past and present items. Help students recognize that even though technology has changed, the past and present technology, if designed well and with good intent, can help us in similar ways.

EXTEND—Have students create an anchor chart or a poster of some of the things they do with technology, such as playing online games, listening to music, or talking on a phone.

EXTEND—Read a book aloud to the class about life in the past. Ask students to compare the technology in the book with the technology we use today.

EXTEND—Tell students that today they saw technology was different in the past than it is today. Ask them to pick one technology and imagine what it might be like in the future. Have them draw or talk about their ideas.

GRADE 2

Teacher Resources

Activity Pages

Name _____ Date _____

Activity Page 6.2 Use with Lesson 6.2

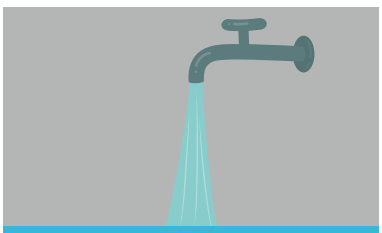
Put Steps in Order

Put this algorithm for washing hands in the correct order.	1.	2.
3.	4.	5.

Scrub with soap.

Dry hands.

Rinse clean.



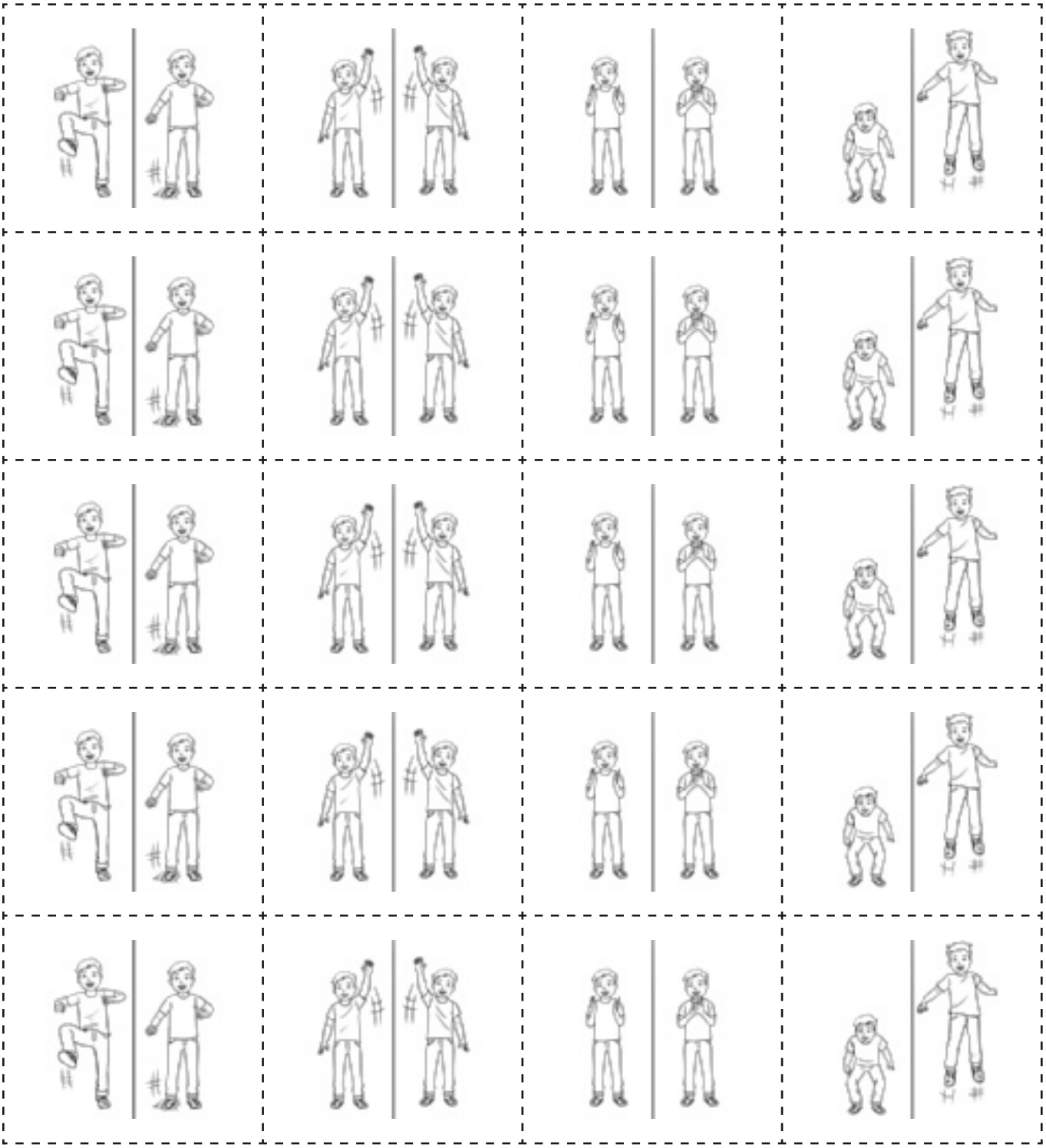
Turn on water.

Wet hands.

Name _____ Date _____

Activity Page 7.2 Use with Lesson 7.2

Dance Moves!



Name ______________________________ Date ____________________

Activity Page 9.2 Use with Lesson 9.2

Moving Through the Maze

Move up 1 ↑	Move left 1 ←	Move right 1 →	Move down 1 ↓
Move up 1 ↑	Move left 1 ←	Move right 1 →	Move down 1 ↓
Move up 1 ↑	Move left 1 ←	Move right 1 →	Move down 1 ↓
Move up 1 ↑	Move left 1 ←	Move right 1 →	Move down 1 ↓
Move up 1 ↑	Move left 1 ←	Move right 1 →	Move down 1 ↓
Move up 1 ↑	Move left 1 ←	Move right 1 →	Move down 1 ↓

Activity Page 9, continued

Use this grid to draw obstacles and make a maze.

Finish			
			Start

Name _____ Date _____

Activity Page 9.3 Use with Lesson 9.3

Design Journal Sections

Ask

Imagine

Plan

Create

Test

Improve

Activity Pages Answer Key: *Using Computers*

This answer key offers guidance to help you assess your students' learning progress. Here you will find descriptions of the expectations and correct answers for each Activity Page of this unit.

Put Steps in Order (AP 6.2) (page 121)

1. Turn on water.

2. Wet hands.

3. Scrub with soap.

4. Rise clean.

5. Dry hands.

Dance Moves! (AP 7.2) (page 122)

Student dances should include five to ten moves. The dances they perform should follow the sequence that students taped or glued together.

Design Journal Sections (AP 9.3) (page 125)

Student entries should match and be relevant to the appropriate design section. Look for entries to:

Ask - name or focus on a problem

Imagine - state ideas on how to solve the problem

Plan - devise a plan to be tested

Create - list steps or describe the design

Test - list or describe results or problems with their design

Improve - list or describe any changes they would make to their design

Appendix A

Glossary

Blue words and phrases are Core Vocabulary terms for the unit. **Bold-faced words and phrases** are additional vocabulary terms related to the unit that you should model for students during instruction and that are often used within the Student Book and these latter terms do not have specific page numbers listed. Vocabulary words are not intended for use in isolated drill or memorization.

A

algorithm, n. steps or rules to follow to complete a specific task or to solve a problem

app, n. abbreviation for application; a program that enables a computing device to do certain tasks

B

browser, n. a computer program that accesses and displays web pages

bug, n. an error in a computer program

C

change, v. to make or become different from before

charge, v. to restore energy to a reusable battery

click, v. to push the button on a mouse or on a trackpad to select a command option

code, n. instructions for a computer device to complete a task

collect, v. to gather things together

command, n. a prompt given to a computer to make it run a sequence of its programming

compare, v. to note the similarities of two things

computer, n. an electronic device that is used to store, organize, and work with lots of information at a high speed

computer program, n. a group of instructions that make a computing device do a task

computer programmer, n. a person who writes the instructions that make computers work

computer system, n. the set of hardware and software that work together to perform tasks in a computer or electronic device

computer system problem, n. an issue with a part of the computer hardware or software that causes the system not to work correctly

copy, v. to a duplicate or an exact reproduction of something

create, v. to produce something original

D

data, n. details of information collected by observation or measurement

debug, v. to fix something that is not functioning properly in a computer program

device, n. an object or tool that turns on and off and is used to do a certain job, such as a cell phone or computer

decomposition, n. the process of breaking something into parts

design journal, n. a document used for recording notes about the development of a project

different, adj. not the same

document, n. a computer file that contains words or pictures

down, adj. at a lower level than before

F

file, n. a storage unit for information in computer

fix, v. to make something work again; to repair

folder, n. a storage unit for grouping computer files

future, adj. a time that has not yet happened, but will

G

graph, v. a diagram that shows how information is related

group, n. place together

H

hardware, n. the physical parts of an electronic device

I

icon, n. a small picture used to represent something in a way that takes up less space than words

image, n. a picture, such as a drawing or photo

improve, v. to make something better

information, n. collected knowledge

insert, v. in a computer document, to place images, words, videos, or symbols

instructions, n. a list of steps that describe how to complete a task

internet, n. the network of connected computers all over the world

K

keyboard, n. a piece of hardware with buttons for inputting letters, numbers, and symbols into a computer

keys, n. the buttons on a keyboard used to type letters, numbers, and symbols

L

log, v. to add a record of an evant or detail to a list

loop, n. instructions that repeat

M

monitor, n. a piece of hardware that displays pictures and words on a screen

N

network, n. a group of computer devices that communicate with each other

O

order, n. the arrangement of a series of items that indicates which come before and after others

P

password, n. a secret string of letters, numbers, and symbols that keep information private and to login to a computer device or website a secret word, phrase, or group of letters, numbers, and symbols that help keep information safe and private

past, adj. a time that has already happened

plan, v. to determine the steps and requirements of a task, design, or solution

present, adj. happening right now

private, adj. not public; information only known by some people

program, n. a set of instructions that tell a computer what to do

protection, n. something that keeps information or people safe from harm

R

reboot, v. to turn off a computer and then start it again

repeat, v. do again

routine, n. a sequence of events that is regularly followed

S

save, v. to give a computer a command to store information for later access

screen, n. the part of the monitor or device that shows pictures and words

search engine, n. a website that contains a type of software that allows users to look up information on the web by typing in search terms

security, n. a state of being protected

sequence, n. an order of actions

share, v. to allow others to see, know, or use something

slide, n. a page that is used to visually display images, words, or other information to others during a presentation

software, n. instructions that computer hardware follows

solution, n. the answer to a problem

steps, n. an ordered list of things to do

store, v. to save information on a computer

symbol, n. an object, shape, or picture that represents something else

T

tablet, n. a small, flat computer that is used by touching the screen

technology, n. the use of scientific knowledge in devices or processes

text, v. written or typed words and numbers that are read visually

troubleshoot, v. to identify and correct the problem in a system

U

unauthorized, adj. without permission

update, v. to install new instructions to change or improve performance of a computing device

username, n. a unique sequence of characters that identifies a user of a computer program

V

video, n. moving images shown on a screen

W

webpage, n. a single page or file that displays information for access on on the World Wide Web

website, n. a group of pages on the World Wide web that are connected to each other

word processor, n. a computer device that allows a user to record and manage text

World Wide Web (WWW), n. all the files shared on the internet

Appendix B

Internet Safety

Though online resources present many rich opportunities for student learning, unsupervised online activity for children is not advised. The U.S. Department of Justice provides the following guidelines, Keeping Children Safe Online:

- **Discuss internet safety and develop an online safety plan** with children before they engage in online activity. Establish clear guidelines, teach children to spot red flags, and encourage children to have open communication with you.
- **Supervise young children's use of the internet**, including periodically checking their profiles and posts. Keep electronic devices in open, common areas of the home, and consider setting time limits for their use.
- **Review games, apps, and social media sites** before they are downloaded or used by children. Pay particular attention to apps and sites that feature end-to-end encryption, direct messaging, video chats, file uploads, and user anonymity, which are frequently relied upon by online child predators.
- **Adjust privacy settings and use parental controls** for online games, apps, social medial sites, and electronic devices.
- **Tell children to avoid sharing personal information, photos, and videos online** in public forums or with people they do not know in real life. Explain to your children that images posted online will be permanently on the internet.
- **Teach children about body safety and boundaries**, including the importance of saying "no" to inappropriate requests both in the physical world and the virtual world.
- **Be alert to potential signs of abuse**, including changes in children's use of electronic devices, attempts to conceal online activity, withdrawn behavior, angry outbursts, anxiety, and depression.
- **Encourage children to tell a parent, guardian, or other trusted adult** if anyone asks them to engage in sexual activity or other inappropriate behavior.

Copy and distribute the Student Safety Contract, found on the next page. Prior to the start of the first lesson, do a read-along, and have students agree to the expectations for when they engage in computer and online activities.

Online Resources

For additional support for safety in the computer science and online instruction, follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

Student Online Safety Contract

Dear Parent or Guardian,

During computer science class, we want to create and maintain a safe classroom. With this in mind, we are making sure students are aware of the expectations for their behavior while engaged in computer science activities. We are asking you to review the safety rules below with your student and sign this contract. If you have any questions, please feel free to contact me.

For important safety information about children, computers, and the internet, consider resources at these sites:

https://protectyoungeyes.com/

https://sharedhope.org/

https://www.justice.gov/coronavirus/keeping-children-safe-online

_____ _____/_____/_____/

Teacher signature and date

_____ _____/_____/_____/

Parent or guardian signature and date

When doing online activities, I will do the following:

- Only do online activities with the supervision of an adult.
- Only visit websites and use apps that I am guided to by my teacher, parent, or trusted adult guardian.
- Never use my real name or reveal personal information if I communicate with others online.
- Tell a trusted adult right away if anyone online asks questions about my name, where I live, or where I go to school.
- Be careful around electronic devices and only plug them in or unplug them when an adult is supervising.

I understand and agree to the safety rules in this contract.

_____ _____/_____/_____/

Student signature and date

_____

Print name

Appendix C

Strategies for Acquiring Materials

The materials used in the Core Knowledge Computer Science program are readily available and can be acquired through both retail and online stores. Some of the materials will be reusable and are meant to be used repeatedly. This includes items such as plastic cups that can be safely used again. Often these materials are durable and will last for more than one activity or even one school year. Other materials are classified as consumable and are not able to be used more than once.

Online Resources

The Material Supply List for this unit's activities can be found online. Follow the links in the Online Resources Guide for this unit:

www.coreknowledge.org/cksci-online-resources

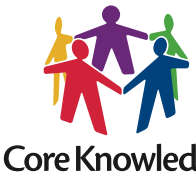
Ways to Engage with Your Community

The total cost of materials and technology can add up for an entire unit, even when the materials required for activities and demonstrations have been selected to be individually affordable. And the time needed to acquire the materials adds up too. Reaching out to your community to help support STEM education is a great way to engage parents, guardians, and others with the teaching of science and computer science, as well as to reduce the cost and time of collecting the materials. With that in mind, the materials list can be distributed or used as a reference for the materials teachers will need to acquire to teach the unit.

Consider some of the following as methods for acquiring the science materials:

- School Supply Drive—If your school has a supply drive at any point in the year, consider distributing materials lists as wish lists for the science department.
- Open Houses—Have materials lists available during open houses. Consider having teams of volunteers perform an activity to show attendees how the materials will be used throughout the year.
- Parent-Teacher Organizations—Reach out to the local PTO for assistance with acquiring materials.
- Science Fair Drive—Consider adding a table to your science fair as part of a science materials drive for future units.
- College or University Service Project—Ask service organizations affiliated with your local higher education institutions to sponsor your program by providing materials.
- Local Businesses—Some businesses have discounts for teachers to purchase school supplies. Others may want to advertise as sponsors for your school/programs. Usually you will be asked for verifiable proof that you are a teacher and/or for examples of how their sponsorship will benefit students.

Remember: If your school is public, it will be tax exempt, so make sure to have a Tax Identification Number (TIN) when purchasing materials. If your school is private, you may need proof of 501(c)(3) status to gain tax exemption. Check with your school for any required documentation.



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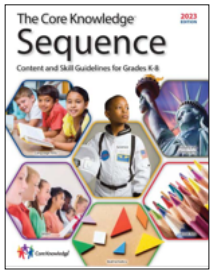
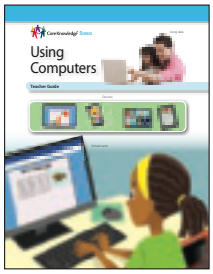


What is the Core Knowledge Sequence?
The *Core Knowledge Sequence* is a detailed guide to specific content and skills to be taught in Grades K–8 in language arts, history, geography, mathematics, science, computer science, and the fine arts. In the domain of computer science, the *Core Knowledge Sequence* outlines topics that build systematically grade by grade to support student learning progressions coherently over time.



For which grade levels is this book intended?
In general, the content and presentation are appropriate for students in the early elementary grades. For teachers and schools following the *Core Knowledge Sequence*, this book is intended for Grade 2 and is part of a series of **Core Knowledge SCIENCE** units of study.

For a complete listing of resources in the
Core Knowledge SCIENCE series,
visit **www.coreknowledge.org**.

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