UM PRINTABLES

PREMIUM MEGA BUNDLE · 2026 EDITION

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FOR GRADES 3–6 · 12 HANDS-ON ACTIVITIES

COMPUTER SCIENCE UNPLUGGED.

A zero-device activity pack that teaches the **foundational concepts of computer science** — binary, algorithms, debugging, data sorting, and encryption — through movement, paper, and play.

Binary Numbers | Algorithms | Debugging | Data Sorting | Encryption | Pixel Imaging | Loops & Conditionals | Networking | Search & AI

0 ZERO DEVICES REQUIRED

Perfect for CS integration, sub plans, screen-free weeks, STEM nights, and after-school clubs.

UM PRINTABLES
PREMIUM EDUCATIONAL RESOURCES

Table of Contents

60 PAGES · 12 CORE ACTIVITIES · 24 CORE WORKSHEETS · EXTENSION LABS · FULL TEACHER SUPPORT

FRONT MATTER

ACTIVITY PACK (TEACHER + STUDENT)

TEACHER RESOURCES

BACK MATTER

HOW THIS PACK IS ORGANIZED

Each of the 12 activities is presented as a two-page spread. The **Teacher Page** (left) provides the lesson plan: objective, materials, time estimate, step-by-step instructions, differentiation strategies, formative assessment prompts, ISTE & CSTA standard alignments, and a complete answer key. The **Student Page** (right) is a printable worksheet ready for classroom use — copy one per student. Activities are sequenced from concrete (binary numbers) to abstract (AI & search algorithms), but each is self-contained and can be taught in any order.

ENHANCED TEACHER TOOLKIT

Standards Alianment Matrix

ISTE STANDARDS FOR STUDENTS · CSTA 2017 LEGACY CROSSWALK · CROSS-CURRICULAR LINKS

Every activity is mapped to current ISTE identifiers, with a CSTA 2017 legacy crosswalk. CSTA published its new 2026 PK-12 standards in 2026; use local and state adoption guidance for formal alignment.

Activity	ISTE Standard	CSTA 2017 Legacy	Cross-Curricular
A1 · Binary Baubles	1.5 Computational Thinker	1B-DA-06, 2-DA-07	Math 4.NBT.A.2; MP7
A2 · Algorithm Antics	1.5 Computational Thinker	1B-AP-08, 1B-AP-11	ELA CCRA.W.2; Math MP1
A3 · Debugging Detectives	1.5 Computational Thinker	1B-AP-15, 2-AP-17	ELA CCRA.SL.1; Math MP3
A4 · The Sorting Network	1.5 Computational Thinker	1B-AP-08, 2-DA-07	Math 4.NBT.A.2; MP7
A5 · Cryptic Codes	1.5 Computational Thinker	2-NI-06, 2-DA-07	ELA L.4.4; Math MP2
A6 · Pixel Pictures	1.4 Innovative Designer	1B-DA-06, 2-DA-07	Math 5.G.A.1
A7 · Graph Paper Programming	1.5 Computational Thinker	1B-AP-09, 1B-AP-10	Math MP1, MP7
A8 · If/Then Adventures	1.5 Computational Thinker	1B-AP-09, 2-AP-12	Math 4.OA.C.5; MP2
A9 · Data Compression	1.5 Computational Thinker	2-DA-07, 1B-DA-06	Math 4.NBT.A.2; MP7
A10 · Turing Test Talk	1.2 Digital Citizen	2-IC-20, 1B-IC-18	ELA CCRA.SL.1; NGSS SEP 8
A11 · Network Web	1.5 Computational Thinker	1B-NI-04	NGSS SEP 2; Math MP4
A12 · Search Engine Spiders	1.3 Knowledge Constructor	2-DA-07, 1B-IC-18	ELA CCRA.R.7

ISTE STANDARDS FOR STUDENTS (2024)

1.5 Computational Thinker: Students use strategies such as data analysis, abstract models, and algorithmic thinking to explore and solve problems.

1.4 Innovative Designer: Students design, test, and refine solutions.

1.3 Knowledge Constructor: Students critically curate resources and use digital tools to build knowledge and create artifacts.

1.2 Digital Citizen: Students recognize responsibilities and ethical considerations when participating in a digital world.

CSTA 2017 LEGACY CROSSWALK

This table uses the 2017 framework as a legacy crosswalk so the original grade-band references remain interpretable. The 2026 CSTA standards now organize foundational CS around five concepts and four practice categories.

New alignment work should use the 2026 CSTA PK-12 standards and local adoption guidance. AI-related learning is distributed across the 2026 concepts rather than treated as a standalone concept.

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

ACTIVITY 1 · BINARY NUMBERS

Binary Baubles

TIME · GRADE
45–60 min · Gr 3–6

OBJECTIVE

Students will decode secret messages and encode their own name as 8-bit bytes. For letters not shown on the compact key, use a full ASCII alphabet chart supplied by the teacher.

MATERIALS

CS CONCEPT
Binary Numbers

ISTE STANDARD
ISTE 1.5 · CSTA 1B-DA-06

PREP TIME
5 min

GROUP SIZE
Whole class + pairs

STEP-BY-STEP INSTRUCTIONS

1. **Hook.** Write the number 13 on the board. Ask: *How many ways can we represent this same number?* Accept 13, XIII, thirteen, 1101 (binary). Establish that numbers are ideas; symbols are how we write them.
2. **Introduce.** Show students that computers only understand 0s and 1s (off/on). Hold up two cards labeled 0 and 1. Model how 8 bits make a byte. Explain that the position of each bit represents a power of 2: 128, 64, 32, 16, 8, 4, 2, 1.
3. **Model.** Convert binary `01000001` to decimal: 64 + 1 = 65. Look up 65 in the ASCII table → the letter A. Demonstrate decoding the word HI: 01001000 (H) + 01001001 (I).
4. **Activity.** Distribute index cards. Each student writes their name in binary on one side (using the decoder key on page 7) and their actual name on the back. Students swap cards and decode their partner's name.
5. **Reflect.** Bring the class back together. Ask: *What was the hardest part? Why do computers use only two symbols instead of ten?* Connect to the on/off electrical states inside a CPU.

DIFFERENTIATION STRATEGIES

SUPPORT
Provide a partially filled decoder card with the first 5 letters pre-decoded. Pair with a peer coach for the conversion step.

CORE
All students complete the secret-message decode and their own name encoding. Encourage accurate bit placement.

CHALLENGE
Ask students to encode a 4-letter word and design their own binary code for the digits 10–15 (using a 5-bit system). Have them calculate: *How high can you count with 5 bits?* (Answer: 31, since 2^5 − 1 = 31.)

FORMATIVE ASSESSMENT

Circulate during card-swap. Listen for: *Did students align bits correctly? Did they convert binary→decimal→letter in order?* Collect index cards as exit tickets.

ANSWER KEY

✓ TEACHER KEY

Secret message `01001000 01000101 01001100 01001100 01001111` decodes to **HELLO**. Binary values: H=72, E=69, L=76, L=76, O=79. With 5 bits, the maximum count is 31 (11111 in binary).

EXTENSION CHALLENGE

Create your own binary code for the numbers 10–15. Then challenge: *How high can you count using only 5 bits?* Try 6 bits. Try 8 bits (256 values).

A1 A2 A3 A4 A5 A6 A7 A8 A9 A10 A11 A12

ACTIVITY 1 · BINARY NUMBERS

Binary Baubles — Student Page

WORKSHEET
Grades 3–6

NAME _____ DATE _____

1 Binary Baubles

Directions: Use the Binary Decoder Key below to decode the secret message. Then write your own name in binary and challenge a partner to read it.

BINARY DECODER KEY

A 01000001	**B** 01000010	**C** 01000011	**D** 01000100	**E** 01000101	**H** 01001000	**I** 01001001
L 01001100	**N** 01001110	**O** 01001111	**S** 01010011	**T** 01010100	**U** 01010101	**W** 01010111

DECODE THE SECRET MESSAGE

01001000 01000101 01001100 01001100 01001111

YOUR ANSWER:

_____

_____

WRITE YOUR OWN NAME IN BINARY

_____

_____

_____

_____

STRETCH CHALLENGE

How high can you count using only **5 bits**? Show your work below.

_____

_____

ACTIVITY 4 · DATA SORTING

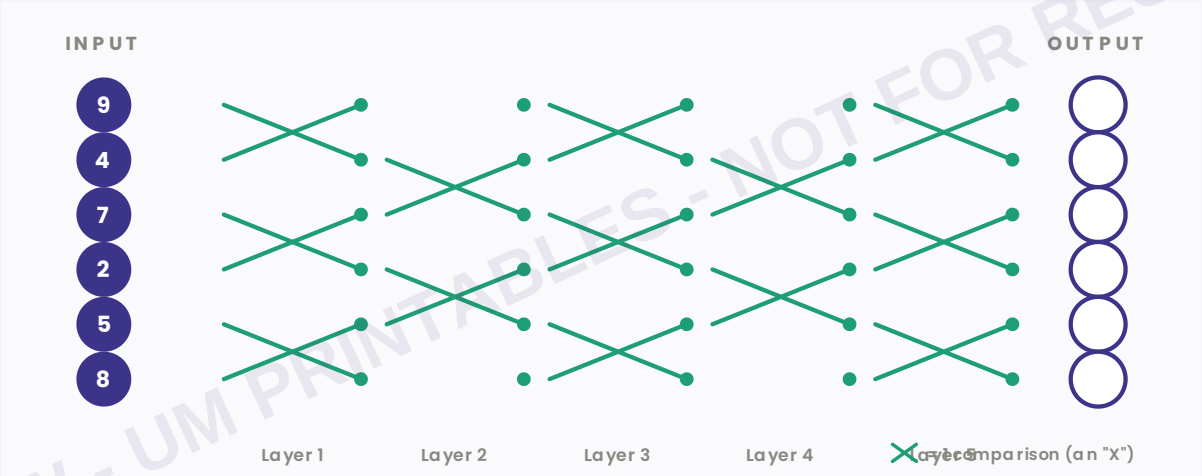
The Sorting Network — Student Page

WORKSHEET
Grades 3–6

NAME _____ DATE _____

4 The Sorting Network

Directions: You have the numbers 9, 4, 7, 2, 5, 8. Walk through the sorting network on the floor. At each comparator, the **lower number goes left** and the **higher number goes right**. Write what you observe in each layer below.



Layer	Top → Bottom After This Layer
Input	9, 4, 7, 2, 5, 8
After Layer 1	____, ____, ____, ____, ____, ____
After Layer 2	____, ____, ____, ____, ____, ____
After Layer 3	____, ____, ____, ____, ____, ____
Final Output	____, ____, ____, ____, ____, ____

Reflect: How many total comparisons did the network make? (Hint: each green "X" is one comparison.)

ACTIVITY 10 · ARTIFICIAL INTELLIGENCE

Turing Test Talk

TIME · GRADE
40 min · Gr 3–6

OBJECTIVE
Students will explore how we determine if a machine is "intelligent" by attempting to fool a partner with human-vs-robot answers to the same question.

MATERIALS
Student worksheet (page 25), pencils.

CS CONCEPT
Artificial Intelligence

ISTE STANDARD
ISTE 2.2 · CSTA 2-IC-20, 1B-IC-18

PREP TIME
2 min

GROUP SIZE
Whole class + pairs

STEP-BY-STEP INSTRUCTIONS

1. **Hook.** Ask: *How do you know the person you are texting is really a person and not a chatbot?* Solicit clues: typos, slow responses, emotional tone, creativity. Most students already have intuition for this.
2. **Introduce.** Tell the story of Alan Turing, the British mathematician who in 1950 proposed the **Turing Test**: if a human can't tell whether they are chatting with a human or a machine, the machine "passes." Discuss: *Is this a fair test of intelligence?*
3. **Worksheet.** Hand out the worksheet (page 25). Students answer Question 1 ("What is your favorite food and why?") as themselves. Then they answer the same question on Question 2 as if they were a robot trying to fool a human into thinking they are human.
4. **Guessing Game.** Partners swap worksheets. The partner reads both answers and guesses which is human and which is robot. Discuss: *What gave it away?* Common tells: overly formal language, lack of sensory detail, "too perfect" grammar.
5. Reflect. Modern AI systems can perform many impressive tasks, but their outputs can still contain errors, invented details, or context-sensitive mistakes. Ask students what evidence they would use to evaluate an answer.

DIFFERENTIATION STRATEGIES

SUPPORT
Provide a sentence frame: "My favorite food is ___ because ___." Allow drawing instead of writing for Q1.

CORE
All students complete both answers. Most partners successfully guess which is human vs. robot, and articulate at least one "tell."

CHALLENGE
Research modern chatbots. What can they do well, and where do they still have limitations? Bonus: research the former Loebner Prize, last held in 2019.

FORMATIVE ASSESSMENT

Listen for: do students articulate *why* an answer sounds robotic? Do they mention specific tells (formal language, lack of emotion, too-short answers)? Collect worksheets to read their reasoning.

ANSWER KEY

✓ TEACHER KEY
No single correct answer. Look for: (1) Q1 answer is genuine and personal, (2) Q2 answer attempts to sound human but usually has tells, (3) partner guess with reasoning. Common robot tells: overly generic ("I enjoy many foods."), too-perfect grammar, no sensory details, no emotion.

EXTENSION CHALLENGE

Research modern chatbots. Do they pass a Turing-Test-style evaluation? What are the limits of AI today? Bonus: research the former Loebner Prize, last held in 2019.

Teacher Quick Start

How to make the enhanced pack lucid, active, and easy to teach.

TEACHER REFERENCE

TEACHER TOOLKIT

USE THIS PAGE FIRST

The 3-part lesson rhythm

1. Launch: ask one concrete question.
2. Explore: let students manipulate, predict, and test.
3. Consolidate: name the CS idea and connect it to the activity they just completed.

Teacher move that matters

Do not front-load every definition. Let students encounter a pattern first, then name the concept. Ask for evidence: "What did you observe?" "What rule explains it?"

BEFORE THE FIRST LESSON

1. **Print selectively**

   Teacher pages are for preparation and facilitation; student pages are for copying or individual work.

2. **Set one norm**

   Students explain their reasoning before the teacher gives the answer.

3. **Prepare a visible model**

   Use cards, arrows, tokens, or a floor network so the concept can be seen.

4. **Plan a check**

   Decide in advance what one student explanation would prove understanding.

5. **Keep the correction language stable**

   Use the misconception clinic on page 55 when students use an inaccurate shortcut.

Current standards note

The enhanced toolkit uses current CSTA 2026 concepts/practices and current ISTE identifiers at a high level. Formal district alignment should follow local/state adoption decisions.

AI Classifier and Testing Lab

30-35 min · Grades 5-6 · AI literacy

TEACHER PAGE

TEACHER TOOLKIT

7 AI CLASSIFIER AND TESTING LAB

LEARNING TARGET

Students model a simple rule-based classifier, test it on new examples, identify false positives and false negatives, and discuss why evaluation depends on the examples selected.

Materials

12 mystery cards with visible features (e.g., color, shape, number of parts); label cards YES/NO.

Teacher framing

This is a toy classifier, not a machine-learning system. The goal is to reason about inputs, labels, rules, errors, and testing.

TEACH IT

1. **Choose a rule**

   Example: predict YES if the card is blue AND has 3 or more shapes.

2. **Train with examples**

   Give students labeled examples and ask them to describe a rule that matches the examples.

3. **Test on new cards**

   Use cards they have not seen. Record prediction versus actual label.

4. **Name the error**

   False positive = predicted YES when actual label is NO. False negative = predicted NO when actual label is YES.

5. **Change the test set**

   Ask whether the result would change if the examples were unbalanced or missing an important kind of case.

Big idea

A model can appear accurate on familiar examples yet fail on new or underrepresented examples. Testing matters.

CSTA 2026 connection

Use this page to discuss Computing & Society, Data & Analysis, Computational Thinking, and responsible evaluation of AI-related systems.

WHAT THE FULL BUNDLE INCLUDES

60 PAGES OF READY-TO-TEACH CS

Grades 3-6 | Zero devices required | 12 core hands-on activities | Enhanced teacher toolkit | Printable student work and teacher support

60	12	24	16
TOTAL PAGES	CORE ACTIVITIES	CORE WORKSHEETS	TOOLKIT COMPONENTS

12 CORE HANDS-ON ACTIVITIES

- Binary Baubles - binary numbers and ASCII
- Algorithm Antics - precise instructions
- Debugging Detectives - finding and fixing bugs
- The Sorting Network - parallel sorting
- Cryptic Codes - Caesar cipher
- Pixel Pictures - coordinates and pixels
- Graph Paper Programming - sequences and loops
- If/Then Adventures - conditional logic
- Data Compression - Run-Length Encoding
- Turing Test Talk - AI and the Turing Test
- Network Web - packets and routing
- Search Engine Spiders - crawling and indexing

ENHANCED TEACHER TOOLKIT

- Teacher Quick Start + Scope & Sequence
- Binary Builder + Parity Check
- Search Strategy Showdown + Text Compression Lab
- Routing and Deadlock + Public-Key Lockbox
- AI Classifier and Testing Lab
- Human-Centered Design Sprint
- Culminating Challenge - Build a Mini Unplugged Computer
- Misconception Clinic + Assessment Toolkit
- Progress Tracker + Home Challenge Cards
- Teacher Reflection & Research Notes

TEACHER SUPPORT + PRINTABLES

- Teacher Facilitation Guide; Master Materials List and 12-Week Pacing Guide
- Standards Alignment Matrix with current ISTE identifiers and a CSTA 2017 legacy crosswalk
- Glossary of CS Terms; 4-Point Assessment Rubric; Differentiation Guide
- Parent Connection Letter; Certificate of Completion
- Enhanced activities add deeper practice, assessment, extension, reflection, and home-learning options.

Preview pages are selected to show the resource scope, instructional approach, teacher usability, and student-facing quality.