Symbols, signals, sorting, and step-by-step recipes (5 lessons)

Computing, grade 1 - by Gemini 4 Argon - status: written (unreviewed)

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Unit: Symbols, Signals, Sorting, and Step-by-Step Recipes (Computing, Grade 1)

> **Unreviewed AI draft.** Written by Gemini 4 Argon (2026-11-05). No human teacher has reviewed this unit. All content is CC0 1.0 Public Domain.

Overview

Before young children touch a keyboard, they already use the core building blocks of computing every day: they follow **step-by-step recipes** to get ready for school, read **symbols** on classroom labels, answer **yes/no questions** with two-state **signals** (thumbs up or thumbs down, red or green cards), and **sort** objects into groups using a clear rule.

Across five 35-minute unplugged lessons, Grade 1 students explore how humans and machines represent and organize information without needing any screens or electricity. Students act out step-by-step morning routines and spot out-of-order steps, invent picture symbols to label classroom bins, send silent two-state signals across the rug using two-color cards and flashlights, sort buttons and leaf cards by a single attribute rule (cross-linked with Grade 1 Science's Plants: parts, needs and growth), and distinguish tools that store or send information from tools that only do physical work.

Prior knowledge

- Students can count to 10, recognize basic shapes (circle, square, triangle) and colors, and take turns in a partner game.
- Helpful cross-links:
- Blending and decoding (Language and literacy, Grade 1) explores how written letter symbols stand for spoken sounds.
- Plants: parts, needs and growth (Science, Grade 1) observes leaf shapes and plant parts, which Lesson 4 uses as an unplugged sorting set.
- Leads to: Inputs, outputs, loops, and debugging (Computing, Grade 3) and Computing & systems progression.

Learning goals

By the end of this unit, a student can:

1. Put a 4-card everyday routine in exact order, act it out literally, and explain what goes wrong when two steps are swapped (Lesson 1).
2. Match and draw a simple **symbol** (icon) that stands for a classroom object or action, and explain why everyone using the symbol must agree on its meaning (Lesson 2).
3. Answer a **yes/no question** across the room using a two-state **signal** (such as red/green cards or 1 clap / 2 claps) without speaking aloud (Lesson 3).
4. **Sort** a mixed collection of 8 to 10 items into two groups using a single clear rule (attribute), and guess a partner's secret sorting rule by inspecting their groups (Lesson 4).
5. Decide whether an everyday object is an **information tool** (stores, shows, or sends messages) or a **non-information tool**, and state what kind of information it handles (Lesson 5).

Lesson sequence

Lesson	Title	Time	Core idea
Lesson 1	First This, Then That: Step-by-Step Recipes and Order	35 min	The order of steps in a routine (**algorithm**) matters; swapping two steps changes the result
Lesson 2	Pictures That Mean Something: Symbols and Shared Codes	35 min	A **symbol** is a simple mark or picture that stands for an idea or action when people agree on the rule
Lesson 3	Red Card, Green Card: Two-State Signals for Yes and No	35 min	A two-state **signal** (on/off, green/red, up/down) can send a clear **yes/no** message across a distance
Lesson 4	One Rule at a Time: Sorting Objects by Attributes	35 min	Computers and people organize data by checking one **attribute** (color, shape, size, or hole count) at a time
Lesson 5	Tools That Hold or Send Messages: Information Around Us	35 min	Some tools store, change, or send **information** (words, numbers, pictures, sounds), while others only move or hold physical things

Materials for the whole unit

No computers, tablets, or batteries are required (one optional teacher flashlight in Lesson 3):

- Paper, crayons or markers, and 4–8 index cards per student pair
- One two-sided card per student (colored green on one side and red with a black stripe on the other so color-blind students can distinguish both sides by pattern as well as color)
- Sorting sets for pairs in Lesson 4: an envelope of 10 large pre-made paper cutouts (`at least 5 cm across`, with 6 four-dot pieces and 4 two-dot pieces across Circle, Square, and Leaf shapes in Blue and Yellow) plus 2 extra test cutouts per pair

Assessment summary

Lessons 1–4 each conclude with a 3-question oral, pointing, or picture-card exit check with worked teacher answers. Lesson 5 concludes with a 4-question end-of-unit synthesis check (covering step order, symbols and two-state signals, single-attribute sorting, and information tools) with worked teacher answers.

Sources

These references provide background on the concepts introduced in Grade 1. All links were checked to load on 2026-11-05.

- Algorithm (step-by-step procedure): https://en.wikipedia.org/wiki/Algorithm — background for Lesson 1's ordered routine cards.
- Symbol (mark or sign representing an idea or object): https://en.wikipedia.org/wiki/Symbol — background for Lesson 2's classroom icon design and shared meaning.
- Traffic light (standard color and position signals): https://en.wikipedia.org/wiki/Traffic_light — real-world example of agreed-upon visual signals in Lessons 2 and 3.
- Signal (conveying information through a changing physical state): https://en.wikipedia.org/wiki/Signal — background for Lesson 3's two-state yes/no card and clap signals.
- Sorting (arranging or grouping items systematically by a criterion): https://en.wikipedia.org/wiki/Sorting — background for Lesson 4's single-attribute classification activities.

- Bell, T., Witten, I. H., & Fellows, M. (2015). CS Unplugged (general pedagogical inspiration for teaching early computing concepts without screens; all text, card sets, and activities in this unit are original CC0 work): https://www.csunplugged.org/

Known gaps and cautions

- **Unreviewed AI draft:** This unit has not yet been reviewed by a human Grade 1 teacher or tested in a live classroom.
- **Color vision accessibility in Lesson 3:** Never rely on red vs. green color alone for two-state signal cards. Always draw a bold `✓` (checkmark) on the green side and a bold `×` (cross) or diagonal stripes on the red side so every student can distinguish the two states by shape and pattern.
- **Single-attribute vs. multi-attribute sorting:** Grade 1 Lesson 4 focuses strictly on sorting by **one attribute at a time** (`Has 4 holes` vs. `Does NOT have 4 holes`). Compound rules (`Red AND Round`) are intentionally deferred to Grades 3–6 so 6-year-old learners build confidence with clean two-bucket classification first.
- **Materials safety caution:** Use large paper shape cutouts (`at least 5 cm across`) for Lesson 4's sorting sets rather than small buttons or beads that could pose a choking or small-parts hazard, and remind students that sorting pieces stay flat on the table.

Lesson 1: First This, Then That — Step-by-Step Recipes and Order

- **Unit:** Symbols, Signals, Sorting, and Step-by-Step Recipes (Computing, Grade 1)
- **Time:** 35 minutes
- **Grouping:** Whole class on the rug, then pairs at tables

Learning objective

Students will arrange a 4-step everyday routine in exact start-to-finish order, act out the steps literally, and explain why swapping two steps causes a mistake (**bug**).

Materials

- 4 large teacher demonstration cards showing pictures and short labels for **Putting On Shoes and Socks**:
- `Put on left sock and right sock`
- `Slide feet into shoes`
- `Pull laces or straps tight`
- `Stand up and walk to the door`
- Per student pair: 4 blank index cards and crayons (or a pre-drawn 4-card picture set for students who prefer ordering/pointing rather than drawing) for a 4-step routine (such as Washing Hands, Planting a Seed, or Making a Sandwich)

Vocabulary

- **Step:** One single action in a longer task.
- **Order (Sequence):** Which step happens first, second, third, and last.
- **Algorithm:** A step-by-step list of instructions to finish a job.
- **Bug:** A mistake in the instructions (like a missing step or two steps in the wrong order) that stops the job from working right.

Lesson flow

✎ 1. Opening: The Silly Shoe Robot (7 min)

1. Tell the class: "Pretend I am a helper robot getting ready for recess. Robots only do the exact steps on their cards, in the exact order the cards are lined up!"
2. Tape the 4 teacher cards to the board in a **scrambled** order:
3. Card 1: `Slide feet into shoes`
4. Card 2: `Pull laces or straps tight`
5. Card 3: `Put on left sock and right sock`
6. Card 4: `Stand up and walk to the door`
7. Pantomime following the scrambled cards literally—pretend to tie your shoes first, and then try to pull socks over the outside of your shoes!
8. Ask: "Why did the robot put socks on the outside of its shoes? Did I have all the right steps, or was something else wrong?"

9. Guide students to notice that all 4 steps were good steps, but the **order** was mixed up.

✎ 2. Main activity: Fixing the Sequence & Making 4-Card Recipes (18 min)

1. **Whole-class repair (5 min):** Invite two volunteers to come up and rearrange the 4 shoe cards into a working **algorithm** (`Socks` → `Shoes` → `Straps` → `Walk`). Act it out again to confirm it works.
2. **Pair card creation (8 min):** Give each pair 4 blank index cards. Each pair chooses one familiar 4-step routine:
3. Option A — Washing Hands (aligned with CDC Clean Hands steps): (1) Wet hands with clean running water and turn off the tap, (2) Apply soap and scrub hands all over for at least 20 seconds, (3) Turn on the tap, rinse soap bubbles off under clean running water, and turn off the tap, (4) Dry hands with a clean towel.
4. Option B — Planting a Bean Seed: (1) Scoop soil into the cup, (2) Poke a small hole and drop the seed in, (3) Cover the seed with soil, (4) Pour a little water on top.
5. Students draw a quick picture on each card and write the numbers `1`, `2`, `3`, `4` on the **back** of the cards.
6. **The Partner Swap & Bug Hunt (5 min):**
7. Each pair turns their 4 cards number-side down, mixes up **two** of the cards on purpose, and trades with a neighboring pair.
8. The neighboring pair tests the mixed-up routine (by acting it out, describing what would happen aloud, or tracing the cards in order), points to the two swapped cards (**the bug**), and puts them back in the right order.

✓ 3. Discussion questions (5 min)

- **Question 1:** "In our hand-washing recipe, what happens if we do Step 4 (Dry hands with a towel) BEFORE Step 3 (Rinse soap bubbles off)?"
- Example good answer: All the sticky soap bubbles get wiped onto the dry towel instead of going down the sink!
- **Question 2:** "Are there ever two steps where the order does NOT matter?"
- Example good answer: Putting on your left sock first or your right sock first both work, as long as both socks go on before the shoes!

✓ 4. Closing check (5 min)

Read three quick questions aloud (for Question 1, students can hold up 1, 2, or 3 fingers for A, B, or C or point to the choice; for Questions 2 and 3, students answer aloud, point to vocabulary cards on the board, or tell a partner):

1. Here are 3 steps for brushing teeth: **(A)** Brush teeth up and down, **(B)** Squeeze toothpaste onto the brush, **(C)** Rinse mouth with water. Which step must go **first**?
2. What do computer scientists call a step-by-step recipe for finishing a job?
3. If a robot puts the hat on its feet and the shoes on its head because the instruction cards were mixed up, what do we call that mistake in the instructions?

Worked answers for closing check

1. **(B) Squeeze toothpaste onto the brush** goes first (then **A** brush, then **C** rinse).
2. An **algorithm**.
3. A **bug**.

Differentiation

- **Extra support:** Start with a 3-card routine (First / Next / Last) using pre-drawn picture cards so students can focus on ordering rather than drawing.
- **Extra challenge:** Ask pairs to add a 5th step to their routine and find two steps whose order can be swapped without breaking the result, plus two steps whose order cannot be swapped.

Teacher notes

- **Common misconception:** Young learners often skip steps they consider "obvious" (for example, drawing Eat the banana without Peel the banana). When acting out student cards as the "Classroom Robot," playfully pretend to bite an unpeeled imaginary banana so students see why machines need every step stated clearly.

Lesson 2: Pictures That Mean Something — Symbols and Shared Codes

- **Unit:** Symbols, Signals, Sorting, and Step-by-Step Recipes (Computing, Grade 1)
- **Time:** 35 minutes
- **Grouping:** Whole class and pairs

Learning objective

Students will match familiar **symbols** (icons) to their meanings, design a clear symbol for a classroom supply bin or action, and test whether a classmate can decode it without words.

Materials

- Board or chart paper showing 5 familiar symbols drawn large:
- A **heart** (♥), a **musical note** (♪), a **trash can**, a **magnifying glass**, and a **triangle play button** (▶)
- 2 blank index cards and markers per student (plus optional pre-drawn symbol stickers/stencils and a printed 6-item classroom action menu so students can also participate by selecting or pointing)

Vocabulary

- **Symbol (Icon):** A simple picture or mark that stands for a word, object, or action.
- **Decode:** To look at a symbol or secret code and figure out what message it means.
- **Shared Rule (Key):** The agreement between the sender and the reader about what each symbol means.

Lesson flow

✎ 1. Opening: Reading Without Letters (7 min)

1. Point to the 5 symbols on the board (♥, ♪, trash can, magnifying glass, ▶).
2. Ask: "There are zero letters written inside these five drawings, yet you already know what they mean! Turn to your partner and tell them what the triangle ▶ and the magnifying glass tell you to do on a screen or player."
3. Expected answers: ▶ means **Play / Start**, and the magnifying glass means **Search / Look closely**.
4. Connect to Grade 1 Language and Literacy (Blending and Decoding): just as the letter symbol `m` stands for the `/m/` sound because readers agree on that rule, picture **symbols** let people and computers share instructions quickly in a tiny space.

✎ 2. Main activity: Classroom Symbol Designers & Silent Decoding (18 min)

1. **What makes a good symbol? (5 min):**

2. Draw two versions of a symbol for the **"Scissors Bin"** on the board:
    - Drawing A: A giant detailed picture of a whole classroom with tables, windows, a clock, and tiny scissors in the corner (takes 2 minutes to draw, hard to tell what matters).
    - Drawing B: Two crossed blades and two finger loops (simple, bold, takes 5 seconds to draw and recognize from across the room).
3. Emphasize: A strong symbol is **simple**, **clear**, and shows only the most important shape.
4. **Design 2 Action Symbols (8 min):**
5. Give each student 2 index cards. On the **back** of each card, the teacher (or student) whispers/marks one secret classroom action from a 6-item picture menu on the board:
    1. Wash hands (water drop + hand)
    2. Quiet voices (finger over lips or crossed-out speaker)
    3. Line up at the door (three stick figures in a row by a rectangle door)
    4. Sharpen pencil (pencil tip with shavings)
    5. Put book in backpack (rectangle book + arrow into bag)
    6. Sit in a circle (circle of dots or arrows)
6. On the **front** of each card, students draw a simple symbol using **no letters or numbers**.
7. **Silent Partner Decode Test (5 min):**
8. Partners trade cards front-side up. The partner **decodes** the symbol by pointing to the matching action on the 6-item picture menu, stating it quietly, or acting it out. If the partner identifies the right job, the symbol passed the test!

✓ 3. Discussion questions (5 min)

- **Question 1:** "What would happen if I decided that a green circle on our classroom door meant 'Come inside,' but the principal thought a green circle meant 'Stay out'?"
- Example good answer: People would get confused and do the wrong thing because they didn't share the same rule (key) for the symbol.
- **Question 2:** "Why do computer buttons and road signs often use simple pictures instead of long sentences?"
- Example good answer: You can understand a simple picture in one glance, even from far away or if you are still learning to read long words.

✓ 4. Closing check (5 min)

Students answer three quick checks:

1. A button on an audio player shows **two vertical bars (⏸)** next to the triangle play button (▶). What action does that symbol stand for?
2. You want to put a symbol on the classroom **Recycling Bin for Paper**. Which is a clearer symbol: a drawing of a whole school building, or a drawing of a sheet of paper with arrows going in a circle? Why?
3. What does it mean to **decode** a symbol?

Worked answers for closing check

1. **Pause / Stop for a moment.**
2. **A sheet of paper with arrows in a circle**, because it is simple and shows the exact item and action without extra confusing details.
3. To look at the symbol and translate it back into the word, idea, or action it stands for.

Differentiation

- **Extra support:** Provide stencil shapes (circles, triangles, arrows) so students can combine simple shapes into symbols without worrying about freehand drawing.
- **Extra challenge:** Ask pairs to combine **two** symbols in sequence on one strip (for example, `[Pencil Symbol] → [Backpack Symbol]`) to write a 2-step symbol sentence ("Put your pencil in your backpack").

Teacher notes

- **Common misconception:** Students sometimes treat drawing a symbol as an art contest and add rainbows, grass, and smiling suns around the icon. Remind them that extra decorations can confuse the reader ("Wait—does this bin hold pencils, or does it hold sunglasses?").

Lesson 3: Red Card, Green Card — Two-State Signals for Yes and No

- **Unit:** Symbols, Signals, Sorting, and Step-by-Step Recipes (Computing, Grade 1)
- **Time:** 35 minutes
- **Grouping:** Whole class and pairs across tables

Learning objective

Students will send and receive **two-state signals** (`YES` / `NO`) without speech across the classroom to answer questions and play a mystery guessing game, and explain how two distinct states (visual, tactile, or sound) can carry information without spoken words.

Materials

- Per student: one two-sided **Signal Card** (with an optional raised tactile sticker/felt dot on the `YES` side, or paired with a sound/touch signal such as `1 tap = YES` / `2 taps = NO` for non-visual access):
- Side 1: **Green with a bold black `✓` (checkmark)** — means `YES / TRUE`
- Side 2: **Red with bold black stripes and an `×`** — means `NO / FALSE`
- 4 large **Mystery Object picture cards** for the board (`1. Red Apple`, `2. Yellow School Bus`, `3. Green Frog`, `4. Red Fire Truck`)
- Optional teacher prop: a classroom flashlight or desk lamp (`ON` = Yes, `OFF` = No)

Vocabulary

- **Signal:** A sound, light, or movement that sends a message from one place to another.
- **Two-State Signal:** A signal that only has two clear choices—such as `ON` or `OFF`, `GREEN ✓` or `RED ×`, or `1 clap` vs. `2 claps`.
- **Sender and Receiver:** The **sender** makes the signal; the **receiver** watches or listens to read the message.

Lesson flow

✎ 1. Opening: Talking Across a Noisy River (7 min)

1. Ask students to imagine standing on opposite sides of a rushing waterfall where nobody can hear a spoken voice.
2. Ask: "If your friend across the waterfall holds up an apple and wants to ask 'Are you hungry?', how could you answer **YES** or **NO** without shouting a single word?"
3. Collect student ideas: nodding vs. shaking head, thumbs up vs. thumbs down, holding up a green `✓` card vs. a red `×` card, or flashing a flashlight `ON` vs. keeping it `OFF`.
4. Explain: Computers inside wires cannot shout words either! Instead, they send tiny electrical or light **signals** that have just **two states** (`ON` and `OFF`), which prepares students for how computers use binary in later grades.

✎ 2. Main activity: Silent Signal Relay & Mystery Animal Game (18 min)

1. **Whole-class Signal Check (5 min):**
2. Hand out the two-sided **Green** `✓` **/ Red** `×` **Signal Cards**.
3. Practice signaling without speech: when the teacher asks a question, nobody speaks—every student holds up the card side (or uses the agreed tap signal) that matches the truth:
    - "Does a triangle have 3 corners?" → Class holds up **Green** `✓`.
    - "Do fish live in trees?" → Class holds up **Red** `×`.
    - "Are we in Grade 1?" → Class holds up **Green** `✓`.
4. **Changing the Physical Signal (4 min):**
5. Put the cards flat on the floor. Now send the **exact same information** using a sound signal:
    - **1 clap** = `YES`
    - **2 claps** = `NO`
6. Ask two more questions (`"Is 2 + 2 equal to 4?"` → 1 clap; `"Is ice hot?"` → 2 claps). Point out that the **message** (`YES` or `NO`) stayed the same even when the **signal tool** changed from colors to claps!
7. **Partner 4-Question Mystery Object Game (9 min):**
8. Place 4 picture cards on the board where everyone can see them:
    1. **Red Apple** (Round, Red, Fruit, No legs)
    2. **Yellow School Bus** (Rectangle, Yellow, Has wheels, No legs)
    3. **Green Frog** (Green, Living animal, Has legs, No wheels)
    4. **Red Fire Truck** (Rectangle, Red, Has wheels, No legs)
9. In pairs sitting across a table:
    - **Sender** secretly picks one of the 4 pictures and writes its number (`1`, `2`, `3`, or `4`) face-down.
    - **Receiver** asks up to **4 yes/no questions** (`"Is your mystery item red?"`, `"Does it have wheels?"`), and the **Sender** answers using their agreed two-state signal (holding up the **Green** `✓` **/ Red** `×` **Signal Card**, using a tactile card side, or tapping `1 tap = YES` / `2 taps = NO`).
    - Then partners switch roles.

✓ 3. Discussion questions (5 min)

- **Question 1:** "Why did we put a black checkmark ✓ and black stripes ▮ on our cards in addition to green and red?"
- Example good answer: Because color alone can be hard to tell apart in dim light, from far away, or for people with color-blind vision; adding distinct shapes (`✓` vs. `×`), tactile stickers, or sound signals (`1 clap` vs. `2 claps`) makes the signal much clearer and more accessible.
- **Question 2:** "What happens if a sender holds their card sideways so the receiver can't see either side?"
- Example good answer: The message is unclear! A two-state signal only works when you clearly choose one of the two states.

✓ 4. Closing check (5 min)

1. You and your partner agree on this rule for a flashlight: **Light ON = Yes**, **Light OFF = No**. On a Tuesday morning at school, your partner asks, "Is today a school day?" What should you do with the flashlight?
2. Can a two-state (`YES / NO`) card directly answer the question "What is your favorite color?" Why or why not? How could you change the question so the card can answer it?
3. Name two different ways to send a two-state (`YES / NO`) signal without speaking.

Worked answers for closing check

1. **Turn the flashlight ON** (since Tuesday at school is a school day, and `ON` stands for `YES`; if asked on a weekend day with no school, you would leave the flashlight **OFF** for `NO`).
2. **No**, because "What is your favorite color?" has many possible answers, not just yes or no. You can change it into a yes/no question like "Is your favorite color blue?"
3. Any two clear pairs: **Green ✓ / Red × cards**, **thumbs up / thumbs down**, **nodding / shaking head**, **1 clap / 2 claps**, or **flashlight ON / OFF**.

Differentiation

- **Extra support:** Practice the 4-picture Mystery Game together as a whole group first, crossing off eliminated pictures on the board after each `Green ✓` or `Red ×` answer.
- **Extra challenge:** Expand the board to **8 mystery pictures** and challenge pairs to find which 3 yes/no questions can identify any of the 8 pictures every single time.

⚠ Safety

- If using a teacher flashlight, shine it toward the wall or ceiling card rather than toward students' eyes.

Teacher notes

- **Connection to later grades:** This lesson builds the physical intuition for **binary states (`1` and `0`)** and **decision trees** without needing any math notation beyond counting to 2.

Lesson 4: One Rule at a Time — Sorting Objects by Attributes

- **Unit:** Symbols, Signals, Sorting, and Step-by-Step Recipes (Computing, Grade 1)
- **Time:** 35 minutes
- **Grouping:** Whole class and pairs

Learning objective

Students will **sort** a mixed collection of 8 to 10 items into two groups using a single clear **attribute** rule (`YES, matches the rule` vs. `NO, does not match`), and determine a partner's secret sorting rule by inspecting the sorted groups.

Materials

- Per student pair:
- A sorting mat made from a folded sheet of paper labeled **Side A: YES (Matches the Rule)** and **Side B: NO (Does Not Match)**
- An envelope of **10 large pre-made paper cutouts (`at least 5 cm wide`)** with a fixed starter composition (**6 cutouts with `4 dots` and 4 cutouts with `2 dots`**, including **3 Squares, 4 Circles, and 3 Leaves**) plus **2 extra test cutouts** (`1 Blue Circle with 4 dots` and `1 Yellow Square with 2 dots`, set aside for Round 2):
  - **3 Squares:** `2 Blue Squares with 4 dots` and `1 Yellow Square with 2 dots`
  - **4 Circles:** `2 Blue Circles with 4 dots` and `2 Yellow Circles with 2 dots`
  - **3 Leaves** (connecting to Grade 1 Science: Plants—smooth-edge vs. jagged/toothed-edge leaves): `2 Yellow Smooth-Edge Leaves with 4 dots` and `1 Blue Jagged-Edge Leaf with 2 dots`

Vocabulary

- **Attribute (Property):** Something you can observe or count about an object, such as its color, shape, size, or number of dots.
- **Sorting Rule:** A clear question that puts every object into a `YES` group or a `NO` group (for example, "Does it have 4 dots?").
- **Data:** A collection of facts or items that we can count, compare, and sort.

Lesson flow

✎ 1. Opening: The Messy Supply Box vs. The Sorted Box (7 min)

1. Hold up a cup of 10 mixed paper shapes/buttons and dump them in a pile. Ask quickly: "You have 2 seconds—are there more 4-dot pieces or 2-dot pieces?" (It is hard to tell when everything is jumbled together!)
2. Now slide all the **4-dot** pieces onto the `YES` side of the mat and all the **2-dot** pieces onto the `NO` side, lining them up in two neat rows (`6` on the left, `4` on the right).
3. Ask the same question again: "Now how fast can you tell which group has more?"

4. Explain: Computers sort **data** using clear **attributes** so they can count and find things almost instantly.

✎ 2. Main activity: Rule Makers & Rule Detectives (18 min)

1. **One Rule, Two Groups (5 min):**
2. Show why a sorting rule must be **observable and exact**:
    - Good rule: **"Is the shape a circle?"** (Every classmate will put the exact same pieces into `YES` and `NO`.)
    - Vague rule: **"Is this piece cool?"** (Different people disagree, and a computer wouldn't know which pile to pick!)
3. **Round 1 — Follow the Teacher's Rule (5 min):**
4. Call out an attribute rule: **"Rule 1: Does it have 4 dots?"**
5. Pairs sort all 10 pieces onto their `YES` and `NO` mat, then count how many pieces landed in each group (`6` in `YES`, `4` in `NO`).
6. Repeat with a second rule using the **exact same 10 pieces**: **"Rule 2: Is the shape a square?"** Now `3` cutouts land in `YES` (the 3 Squares) and `7` cutouts land in `NO` (the 4 Circles and 3 Leaves)—notice how the very same pieces move into different groups when the rule changes!
7. **Round 2 — Secret Rule Detective (8 min):**
8. **Partner A (Rule Maker)** secretly chooses one attribute (such as Color = Blue, Shape = Leaf with jagged edges, or Dots = 2) and sorts all 10 pieces onto the `YES` and `NO` mat without speaking.
9. **Partner B (Rule Detective)** inspects both groups, tests their idea by taking 1 of the **extra test cutouts** and placing it on the matching side of the mat, and states a candidate rule aloud. (Note that one test piece checks whether a rule fits so far, and sometimes two different rules—such as 'Has 4 dots' vs. 'Not 2 dots'—can fit the same piles; accept any rule that accurately matches all sorted cutouts, or test the second extra cutout and have Partner A reveal their intended rule.)
10. Switch roles and play again.

✓ 3. Discussion questions (5 min)

- **Question 1:** "Why did a blue square with 4 dots go into the *`YES`* pile during Round 1 ('Does it have 4 dots?'), even though it was blue and square?"
- Example good answer: Because our rule only checked the number of dots, so the computer ignored color and shape during that sort.
- **Question 2:** "In Grade 1 Science (Plants), how could a botanist use a *`YES / NO`* sorting rule to organize a basket of leaves?"
- Example good answer: They could check one clear attribute, like "Does the leaf have a smooth edge (YES) or a jagged edge (NO)?"

✓ 4. Closing check (5 min)

Draw 5 items on the board: - **Item A:** Big Black Circle with 2 dots - **Item B:** Small White Square with 4 dots - **Item C:** Big White Circle with 4 dots - **Item D:** Small Black Triangle with 2 dots - **Item E:** Big Black Square with 4 dots

Ask students: 1. If the sorting rule is **"Does it have 4 dots?"**, which items go into the **YES** group? 2. If we sort the exact same 5 items using a new rule, and the **YES** group ends up with **Item A** and **Item C**, what was the secret sorting rule? 3. Why is "Is it a nice shape?" a bad sorting rule for a computer?

Worked answers for closing check

1. **Items B, C, and E** (all three have 4 dots).
2. **"Is it a Circle?"** (Items A and C are the only circles).
3. Because "nice" is an opinion, not a measurable **attribute**, so a computer has no exact rule to test.

Differentiation

- **Extra support:** Give students attribute cards showing icons (`Color`, `Shape`, `Number of Dots`) so they can point to the card they are testing.
- **Extra challenge:** After sorting into `YES` and `NO` by **Shape (Circle vs. Not Circle)**, ask pairs to sort each side again by **Number of Dots (4 dots vs. 2 dots)** to create a 2×2 four-box grid.

⚠ Safety

- Use large paper shape cutouts (`at least 5 cm wide`) rather than small buttons or beads, and keep all cutouts flat on the sorting mat.

Teacher notes

- **Common misconception:** When playing Secret Rule Detective, students sometimes state two different rules for the two sides (for example, "This side is circles, and that side is 2-dot pieces"). Remind them that the `NO` side must simply be **"Everything that is NOT [the YES rule]"** so no piece is ever left homeless or placed in both piles at once.

Lesson 5: Tools That Hold or Send Messages — Information Around Us

- **Unit:** Symbols, Signals, Sorting, and Step-by-Step Recipes (Computing, Grade 1)
- **Time:** 35 minutes
- **Grouping:** Whole class and pairs

Learning objective

Students will distinguish **information tools** (everyday objects and computers that store, display, or send words, numbers, pictures, or sounds) from tools that only do physical work, and complete the end-of-unit synthesis check.

Materials

- 1 large teacher demonstration set of 8 object picture cards for the board, plus **1 printed set of the same 8 picture cards per student pair** for the Step 2.2 pair sort:
- **Storybook** (stores words and pictures)
- **Wall clock** (shows time information with numbers/hands)
- **Wooden spoon** (stirs soup; does not store or send messages)
- **Telephone / tablet** (sends and receives voice, pictures, and text messages)
- **Traffic light** (sends stop/go signals with lights)
- **Umbrella** (blocks rain; does not store or send messages)
- **Thermometer** (shows temperature information)
- **Pair of scissors** (cuts paper; does not store or send messages)
- 1 end-of-unit half-sheet check per student

Vocabulary

- **Information:** Words, numbers, pictures, or sounds that tell us something we want to know.
- **Information Tool:** A tool or machine made to **store** (save for later), **show**, or **send** information.
- **Computer:** A machine that takes in information, follows a step-by-step algorithm, and stores or shows new information.

Lesson flow

✎ 1. Opening: The Book vs. The Brick (7 min)

1. Hold up a **hardcover picture book** in one hand and a **wooden block (or stapler)** in the other hand.
2. Ask: "Both of these are about the same size and sit on a shelf. Which one can tell you a story or teach you how a frog grows?" (The book!)
3. Explain: The wooden block holds up a tower, which is a physical job. The book is an **information tool**—its job is to store **words and pictures** so someone can read them

tomorrow or next year. Computers, clocks, thermometers, and phones are also information tools!

✎ 2. Main activity: Information Tool Detective Walk & 8-Card Sort (18 min)

1. **Three Jobs of Information Tools (5 min):** Write three action words on the board with simple icons:
2. **STORE (Save):** Like a book, a calendar, or a camera photo album.
3. **SHOW / MEASURE:** Like a wall clock, a ruler, or a thermometer.
4. **SEND (Share across a distance):** Like a telephone, a walkie-talkie, or a traffic light.
5. **8-Card Pair Sort (8 min):**
6. Using the sorting skill from Lesson 4, pairs sort the 8 object cards using the rule: **"Is its main job to store, show, or send INFORMATION?"**
7. Review each card together:
    - **YES (Information Tools):** Storybook, Wall clock, Telephone/tablet, Traffic light, Thermometer.
    - **NO (Physical-only Tools):** Wooden spoon, Umbrella, Scissors.
8. **Classroom Detective Spot-Check (5 min):**
9. Invite students to point from their seats to one **information tool** in the classroom (for example, the daily schedule chart, the fire-exit sign, the teacher's laptop, or the calendar) and tell a partner what kind of information it stores or shows.

✓ 3. Discussion questions (5 min)

- **Question 1:** "Is a paper notebook an information tool even though it has no screen, no wires, and no batteries?"
- Example good answer: Yes! Once you write words, numbers, or symbols in it, the notebook **stores** that information so you don't forget it.
- **Question 2:** "How does a computer combine ALL the ideas from our five lessons?"
- Example good answer: A computer follows step-by-step **algorithms** (Lesson 1), displays **symbols** on its screen (Lesson 2), uses **two-state on/off signals** inside its wires (Lesson 3), **sorts** data by rules (Lesson 4), and stores or sends **information** (Lesson 5)!

✓ 4. End-of-unit synthesis & Closing check (5 min)

Students answer four unit review questions (orally or by circling answers on their half-sheet):

1. **(Lesson 1 — Order):** Put these 3 steps for mailing a birthday card in the right order:
2. **(A)** Drop the sealed envelope into the mailbox
3. **(B)** Write your friend's name on the card
4. **(C)** Put the card inside the envelope and seal it
5. **(Lesson 2 & 3 — Symbols & Signals):** On a classroom model of a pedestrian signal, the display shows a **white walking-person symbol** vs. a **red raised-hand symbol**. Which symbol indicates the **WALK signal phase (`YES, walk phase`)**, and why must a real pedestrian still stop at the curb, look both ways for traffic, and cross with a trusted adult?

6. **(Lesson 4 — Sorting):** Look at these four animals: **Duck (2 legs)**, **Dog (4 legs)**, **Cat (4 legs)**, **Robin (2 legs)**. What single sorting rule puts **Dog** and **Cat** into the `YES` group and **Duck** and **Robin** into the `NO` group?
7. **(Lesson 5 — Information Tools):** Circle the **two** items below whose main job is handling **information**:
8. `Hammer` | `Thermometer` | `Winter Coat` | `Library Book`

Worked answers for closing check

1. **Order: (B)** Write on the card → **(C)** Put it in the envelope and seal it → **(A)** Drop it into the mailbox.
2. The **white walking-person symbol** indicates the **WALK signal phase (`YES, walk phase`)** (while the red raised hand indicates **WAIT / DO NOT START CROSSING**). **Safety rule:** A signal only shows the light's phase—it cannot guarantee that the road is clear or stop a moving vehicle, so pedestrians must always stop, look and listen for traffic in all directions, and follow local crossing rules with an adult.
3. **"Does the animal have 4 legs?"** (or "Does it have fur instead of feathers?").
4. **`Thermometer`** (measures and shows temperature information) and **`Library Book`** (stores words and pictures).

Differentiation

- **Extra support:** Allow students to act out what they do with each object (stirring with a spoon vs. reading a book or checking the time on a clock) to feel the difference between moving physical matter and getting a message.
- **Extra challenge:** Ask students to find a **"hybrid" machine** at home or school that does BOTH a physical job AND handles information (for example, a washing machine that spins wet clothes physically and has a digital timer screen that counts down minutes and beeps).

Teacher notes

- **Common misconception:** Many 6-year-olds assume that "information" only lives inside glowing electronic screens. Highlighting non-electronic information tools (books, calendars, road signs, tally marks, and the two-color signal cards from Lesson 3) helps students see computing as part of a long human history of recording and sending messages.