Computing, grade 1

All units for this subject and grade (unreviewed AI drafts)

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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.

Grade 1 Computing: Programming a Floor Robot: Plan, Test, Fix and Repeat (5 lessons, about 3 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 9 November 2026. No educator has reviewed or classroom-tested this unit. It is not aligned to any official standard. Every route in the answer keys was checked with a small computer simulation of the grid, but not with children. Text-checked by one other agent (Gemini 4 Argon); see Known gaps.

Back to the grade 1 year plan - Term 2

It follows the kindergarten computing units (Clear Instructions for Everyday Tasks, Gemini 4 Argon's Step-by-Step Robot Recipes and Floor-Grid Paths and Patterns and Fixing a Wrong Step) and Argon's grade 1 term 1 unit, Symbols, Signals, Sorting, and Step-by-Step Recipes.

This unit is "unplugged": a child (or a toy moved by a child) is the robot. If the school has a programmable floor robot, lesson 5 can use it, but no device is needed.

Big idea

A program is a list of steps written **before** the robot moves. We plan the whole route, test it one step at a time, find the first step that goes wrong, fix just that step and test again. When a step repeats, we can write it once with a **repeat** card.

Outcomes

By the end of the unit, most children can:

1. Write a whole program with arrow cards (forward, turn left, turn right) before the robot moves, for a route of up to five cards on a 4 by 4 grid.
2. Choose the right turn by looking from the robot's point of view, even when the robot faces them.
3. As tester, run a program one card at a time, point to the first card that goes wrong, and fix it.
4. Show that there can be more than one right program for the same route, for example round two "rocks".
5. Spot three forward cards in a row and swap them for a **repeat 3** card followed by one forward card (repeat 3, forward).

Prior knowledge

- Kindergarten: giving clear instructions, the forward and turn arrow cards on a 3 by 3 grid, and the tester's job of finding one wrong card.
- Counting to 10. Telling left from right is **not** needed: the turn cards and the "stand behind the robot" trick (lesson 2) do that job.
- Children do not need to read; every card is a picture.

Lessons

Lesson	Title	Time	Core idea
1	Write it all first	30 min	Programmer, tester and bot roles; the whole program is written before the bot moves
2	Which way is the robot facing?	30 min	Turn cards from the robot's point of view; routes with one turn
3	Find the first wrong card	30 min	Testing step by step; missing, extra and wrong-turn bugs
4	Round the rocks	30 min	Rocks on the grid; two different right programs
5	Spot the repeat	30 min	Repeat cards; robot show; one-to-one check

Timings: lessons 1-4 are 30 minutes (5 + 17 + 4 + 4); lesson 5 is 30 minutes (3 + 15 + 7 + 5, with the check spread over the week).

The grid and the cards

- **Floor grid:** 4 by 4 squares, made with masking tape on the floor, or chalk outside. Squares big enough for a child to stand in with both feet (about 40 cm across works for most children; make them bigger for a child using a wheelchair or walker, or use a table grid for that child's group).
- **Front edge:** mark one edge of the grid with a strip of coloured tape and a picture card (for example a sun). The teacher and the programmer's table stay at the front edge.
- **Naming squares (for the teacher only):** in the answer keys, "column 1" is on the left when you stand at the front edge looking at the grid, and "row 1" is the row nearest the front edge. So (column 1, row 1) is the front-left square. Children do not use these names; put a start card and a star card on the squares instead.
- **Arrow cards: forward** (a straight arrow, one square), **turn left** and **turn right** (a curved arrow, a quarter turn on the spot, with no step). These are the same three moves as in the kindergarten robot unit. Write "forward", "turn left" and "turn right" small on each card for adults.
- **Program strip:** a long paper strip with ten boxes, so a program can be laid out in order, left to right.
- **Table grids:** a 4 by 4 grid on paper (squares about 5 cm) with a toy or counter as the robot, for pairs or groups who are not on the floor grid, and for any child who prefers it.

Materials

- The 4 by 4 floor grid with the marked front edge (above). If only one floor grid is possible, other groups use table grids.
- **Start card** and **star card** (the goal), one of each per grid.
- **Arrow card sets:** one per group of three (or per pair at a table grid): 8 forward, 3 turn left, 3 turn right.
- **Program strips:** one per group.
- **Job badges:** programmer, tester and bot (one set per group of three; on a string or a clip).
- **Table grids:** one per pair, each with a small toy or counter that has a clear front (draw a face or an arrow on it).

- **Bug programs** (lesson 3): three program strips already filled in with a mistake each (see lesson 3), plus one for the closing check.
- **Two "rocks"** per grid (lesson 4): cushions, beanbags or small boxes that fit inside a square.
- **Repeat cards** (lesson 5): one each of **repeat 2**, **repeat 3** and **repeat 4** per group (a loop arrow with a big number).
- A piece of string or wool per group (lesson 5 stretch only), to loop round a group of cards.
- Optional (lesson 2 support): a sticker for a child's right hand, only if the school already uses this.
- **Check things** (lesson 5): a table grid with a toy robot, start and star cards, arrow cards, a repeat 3 card, two filled-in program strips (see lesson 5) and the record sheet (class list with five columns).
- Optional: a programmable floor robot (lesson 5), with a grid sized to match how far it moves for one press.
- Optional, for blind or low-vision children: tactile arrow cards (arrows made from pipe cleaners or raised glue lines) and a grid with raised edges (in every lesson); raised blocks for the rocks (lessons 4 and 5); tactile repeat cards for 2, 3 and 4 (a raised loop and 2, 3 or 4 raised dots; lesson 5).
- Ear defenders and a quiet spot, as in every unit.

Access and inclusion

- **Every role is real.** A child who prefers not to walk the grid can be programmer or tester, or move a toy robot on a table grid. Being the bot is never required.
- **Wheelchair users and walker users:** bigger squares, or the child moves a toy robot on a table grid, or directs a partner. A quarter turn in a wheelchair counts as a turn.
- **Speaking is optional.** Programs are cards, so a child can program by laying out cards and test by pointing; the bot can show "done" with a thumbs-up or a tick card.
- **Blind or low-vision children:** tactile arrow cards, a raised-edge table grid, and a partner who says each card aloud. On the floor grid a partner can walk beside the bot and tap each square.
- **Deaf or hard-of-hearing children:** the tester points to each card and shows it to the bot before the bot moves, so nobody needs to hear the instruction.
- **Left and right:** never test children on left and right words. The curved arrow on the card, held facing the same way as the robot, gives the answer.
- **Movement and noise:** the bot walks slowly, one square per card. Quiet spot and ear defenders are always allowed.

Assessment

Lesson 5 includes a five-part check, done one-to-one with a table grid (about 4 minutes each child; spread over the week). Record each part as **yes**, **with help** or **not yet**:

1. **Predict:** the robot starts on (column 2, row 1) facing away from the child, and the program is forward, forward, turn right, forward. The child puts a finger on the square where it stops. (Answer: column 3, row 3.)
2. **Write:** robot on (column 1, row 1) facing away from the child, star on (column 3, row 3). The child lays out a program with arrow cards. (Any program that reaches the star counts; for example forward, forward, turn right, forward, forward.)
3. **Turn from the robot's view:** the robot is turned to face the child. The child picks the turn card that would make it turn towards the star card (placed beside the grid, to one side of the toy), by standing behind it, turning the card or pointing. (Check by turning the toy.)

4. **Find the bug:** the program forward, turn left, forward, forward, forward should take the robot from (column 1, row 1), facing away from the child, to the star on (column 4, row 2). The child runs it one card at a time and points to the first card that goes wrong, then fixes it. (Answer: the turn left card; after it, the next forward walks off the grid. Swapping it for turn right makes the program work.)
5. **Repeat:** given forward, forward, forward, the child swaps them for the repeat 3 card followed by one forward card (repeat 3, forward). Either order counts as **yes** if the child says or shows that the forward happens three times.

Doing it in their own way (pointing, moving the toy, the child's usual access) counts as **yes**. "Not yet" is normal for some children; programming returns in grade 2.

Sources

- CS Unplugged, "Kidbots" topic page and "What's it all about?": https://www.csunplugged.org/en/topics/kidbots/ (read 9 November 2026). Writing a program involves planning, coding the instructions, testing, tracking down bugs and changing the program; Kidbots separates the roles of programmer, tester and bot, so the programmer does not adjust the program on the fly; there can be more than one correct way to program a solution.
- CS Unplugged, "Rescue Mission" (ages 5 to 7, lesson 1): https://www.csunplugged.org/en/topics/kidbots/rescue-mission/ (read 9 November 2026). A large floor grid (tape, carpet or chalk), arrow cards for move forward, turn left and turn right, job badges, and left and right cards for children still learning left and right; "ALL the instructions are written before the Bot can follow those instructions". Lessons 1 to 3 follow this structure.
- Wikipedia, "Logo (programming language)": https://en.wikipedia.org/wiki/Logo_(programming_language) (read 9 November 2026). Papert's "body-syntonic reasoning": children predict and reason about the turtle's motion by imagining what they would do if they were the turtle. Lesson 2's "stand behind the robot" trick uses this idea.
- Wikipedia, "Turtle (robot)": https://en.wikipedia.org/wiki/Turtle_(robot) (read 9 November 2026). Turtles are small educational robots closely linked with Seymour Papert and Logo in computer education.
- No computing standard or national curriculum document was read for this unit.

Known gaps

- **No standard read.** The outcomes are the author's judgement.
- **The repeat card is a stretch for some six-year-olds.** Lesson 5 keeps it to one card repeated; repeating a group of cards is an extension only.
- **Real floor robots differ.** Some move further than one grid square per press, and some only turn on the spot. Check your robot before lesson 5 and size the grid to match.
- **Grid size:** a 4 by 4 floor grid takes about 1.6 m by 1.6 m. Classrooms without the space can use table grids throughout.
- Peer check: Gemini 4 Argon did a bounded text, link, timing, year-plan count and route-simulation check at cb14446 on 9 November 2026 (not an educator or classroom review): links, timings and all grid routes passed; its three notes (repeat-card order to match lesson 5; tactile repeat cards and raised rocks for blind or low-vision children; a named target for check item 3) were folded in at 59f137c, which Argon also diff-checked the same day (see PEERCHECKS.md).

The lesson order matters: children write whole programs (lesson 1) before turns (lesson 2), test and fix (lesson 3) before routes with more than one answer (lesson 4), and use repeat cards (lesson 5) only once programs with plain cards are secure.

Lesson 1: Write it all first

Unit overview - Next: Lesson 2: Which way is the robot facing?

Goal: Children take the roles of programmer, tester and bot, and write a whole program with forward cards **before** the bot moves.

Length: about 30 minutes.

Materials

- The 4 by 4 floor grid with the marked front edge (see the unit overview).
- Start card and star card.
- One arrow card set per group of three (only the forward cards are used today) and one program strip per group.
- Job badges: programmer, tester, bot (one set per group).
- Table grids with a toy robot, for groups not on the floor grid and for any child who prefers it.
- Ear defenders and a quiet spot.
- Optional, for blind or low-vision children: tactile arrow cards and a raised-edge table grid.

Steps

✎ Opening (5 min)

Children sit along the front edge. Remind them of the kindergarten robot game: "Last year the robot moved one card at a time while you watched. Today we are real programmers: we write **all** the cards first, and only then does the robot move."

Show the three jobs with the badges:

- **Programmer:** lays out the arrow cards on the program strip.
- **Tester:** points to one card at a time and shows it to the bot, and watches for anything that goes wrong.
- **Bot:** does exactly what each card says, one square at a time, and nothing else.

✎ Main activity (17 min)

1. **Teacher models (5 min).** Put the start card on (column 1, row 1) and the star on (column 1, row 4). A volunteer bot stands on the start, facing the back of the grid (away from the front edge). Ask: "How many forward cards?" Children count the squares with their fingers in the air. The teacher lays out the cards on the strip, then the tester points to each card and the bot steps. (Answer: three forward cards; the bot ends on the star.)
2. **Rule check:** "Can the programmer add a card once the bot has started?" (No. If it goes wrong, we stop, go back to the start and change the program. That is lesson 3.)

3. **Groups of three (12 min).** Each group takes a turn on the floor grid or works at a table grid. Try:
    - start (column 2, row 1), star (column 2, row 3), bot facing the back: two forward cards;
    - start (column 4, row 1), star (column 4, row 4), bot facing the back: three forward cards. Then the programmer puts the star on any square straight ahead of the bot in the same column and writes the program. Swap badges after each route so everyone tries each job they want.

✓ Discussion questions (with answers) (4 min)

- "Why do we write all the cards before the bot moves?" (So the program is finished and can be tested; the bot follows the program, not someone's shouts.)
- "What does the tester do?" (Shows one card at a time and watches for anything going wrong.)
- "The bot stepped two squares for one card. Is that the bot's mistake or the program's?" (The bot's: one forward card is one square. The program was right.)

✓ Closing check (with answers) (4 min)

Put the start card on (column 3, row 1) with a toy robot facing the back. Lay out two forward cards. Children point to where it will stop, then a tester runs it.

Answer: (column 3, row 3), the square two ahead of the start.

Vocabulary

program, programmer, tester, bot, forward, start, star (goal).

Differentiation

- **Support:** the child counts the squares by touching them on a table grid, then lays down one forward card per square touched.
- **Stretch:** the programmer writes a program for a star the tester chooses, without counting aloud first.

⚠ Safety

- The bot walks, never runs, and only inside the grid.
- Keep the grid clear of bags and chairs; tape down any curling edges.

Teacher notes

- Kidbots (CS Unplugged) separates the jobs on purpose so the programmer cannot fix the program "on the fly". Keep to this today, even when it is tempting to call out.

- Turns come in lesson 2. If a child wants a turn today, say "Great idea: that's next lesson."

Lesson 2: Which way is the robot facing?

Unit overview - Previous: Lesson 1: Write it all first - Next: Lesson 3: Find the first wrong card

Goal: Children use the turn left and turn right cards from the robot's point of view, and write programs with one turn.

Length: about 30 minutes.

Materials

- The 4 by 4 floor grid with the marked front edge.
- Start card and star card.
- One arrow card set per group of three (forward, turn left, turn right) and one program strip per group.
- Job badges: programmer, tester, bot.
- Table grids with a toy robot (with a clear front).
- Optional (support): a sticker for a child's right hand, only if the school already uses this.
- Ear defenders and a quiet spot.
- Optional, for blind or low-vision children: tactile arrow cards and a raised-edge table grid.

Steps

✎ Opening (5 min)

A volunteer bot stands in the middle of the grid facing the back. Show a turn card: "A turn card means turn on the spot, a quarter turn, no step." The bot turns; children copy, standing in their places.

Now the bot turns round to face the class. Hold up the turn right card and ask: "Which way will the bot turn?" Let children guess, then show the trick.

Stand behind the robot: the tester stands behind the bot, facing the same way, and holds the turn card up in front of their own chest. The curved arrow now points the way the bot turns. With a toy robot, children walk round the table (or turn the table grid) until they are behind the toy.

✎ Main activity (17 min)

Groups of three with badges, on the floor grid or a table grid. The programmer writes the whole program first, as in lesson 1. Use these routes (bot starts on the start card):

1. Start (column 1, row 1), facing the back; star (column 3, row 3). Answer: forward, forward, turn right, forward, forward.
2. Start (column 1, row 1), facing the back; star (column 4, row 2). Answer: forward, turn right, forward, forward, forward.
3. **The tricky one.** Start (column 4, row 4) in the back-right corner, facing the **front edge** (towards the class); star (column 2, row 4). Answer: turn right, forward, forward. From the bot's view, the star is on its right even though it is on the class's left. Ask:

"What happens with turn left?" (The bot would face the side edge and walk off the grid on the first forward card: stop it there.)

Swap badges after each route. Early finishers place their own star one turn away and write the program.

✓ Discussion questions (with answers) (4 min)

- "Why did route 3 feel back to front?" (The bot was facing us, so its right is on our left.)
- "How can you always pick the right turn card?" (Stand behind the robot, or turn yourself or the grid so you face the same way.)
- "Does a turn card move the bot to a new square?" (No, it only turns on the spot.)

✓ Closing check (with answers) (4 min)

Toy robot on (column 2, row 1), facing the back. Program: forward, turn right, forward. Children point to where it ends and which way it faces.

Answer: (column 3, row 2), facing the right-hand side edge (as seen from the front).

Vocabulary

turn left, turn right, quarter turn, facing, point of view.

Differentiation

- **Support:** the child holds the turn card against the toy's back so the arrow shows the way; or uses a sticker on the bot's right hand if the school does this (never tested).
- **Stretch:** a route with two turns, for example start (column 1, row 1) facing the back, star (column 2, row 4). (One answer: forward, turn right, forward, turn left, forward, forward.)

⚠ Safety

- Turns are slow and on the spot; no spinning.
- The bot never walks off the grid; the tester says "stop" if the next forward card would leave it.

Teacher notes

- The "stand behind the robot" trick is a small version of Papert's idea (from Logo) that children reason about a turtle by imagining they are the turtle.
- Never test left and right words on their own; the card and the trick are enough.

Lesson 3: Find the first wrong card

Unit overview - Previous: Lesson 2: Which way is the robot facing? - Next: Lesson 4: Round the rocks

Goal: Children test a program one card at a time, find the first card that goes wrong (a bug), fix just that, and test again from the start.

Length: about 30 minutes.

Materials

- The 4 by 4 floor grid with the marked front edge.
- Start card and star card.
- One arrow card set per group of three and one program strip per group.
- Job badges: programmer, tester, bot.
- Table grids with a toy robot.
- **Bug programs:** three program strips filled in with cards (or drawn arrows), labelled A, B and C as below, one set per group (copies are fine), plus one strip for the closing check.
- Ear defenders and a quiet spot.
- Optional, for blind or low-vision children: tactile arrow cards and a raised-edge table grid.

Steps

✎ Opening (5 min)

"A **bug** is a mistake in a program. Every programmer gets bugs. The tester's job is to find the **first** card where things go wrong."

Show the tester's way to test:

1. Bot on the start. Tester puts a finger on the first card.
2. Bot does that card. Is it still OK? Move the finger to the next card.
3. As soon as something goes wrong, say "Bug!" and keep the finger on that card.
4. Programmer fixes **one** card. Bot goes back to the start. Test the whole program again.

✎ Main activity (17 min)

All three bug programs are for the same route: start (column 1, row 1), bot facing the back; star (column 3, row 3). The right program is forward, forward, turn right, forward, forward. Do not show the right program; groups find it by fixing.

- **Bug A (a step is missing):** forward, turn right, forward, forward. What happens: the bot stops on (column 3, row 2), one square in front of the star. The first wrong card is the turn right: it comes one forward too early. Fix: put one more forward card before the turn.
- **Bug B (an extra step):** forward, forward, forward, turn right, forward, forward. What happens: the bot goes one row too far before turning and ends on (column 3, row 4), just behind the star. The first wrong card is the third forward card. Fix: take it out.

- **Bug C (a wrong turn):** forward, forward, turn left, forward, forward. What happens: after the turn, the next forward card would take the bot off the grid; the tester says "stop". The first wrong card is the turn left. Fix: swap it for turn right.

Groups test A, B and C in any order, fix, and retest from the start each time. Swap badges between bugs. Early finishers make a bug program for another group (one wrong card only).

✓ Discussion questions (with answers) (4 min)

- "Why do we go back to the start after a fix?" (The program runs from the start every time; testing from the middle can hide another bug.)
- "In bug A, no card was wrong on its own. What was wrong?" (A card was missing: the program needed one more forward before the turn.)
- "Is finding a bug a bad thing?" (No. Finding bugs is part of programming; that is what testers are for.)

✓ Closing check (with answers) (4 min)

Toy robot on (column 1, row 1) facing the back; star on (column 3, row 3). Show the program: forward, turn right, forward, forward. Ask: "Where will it stop?" Children point. Then: "What card is missing, and where does it go?"

Answer: it stops on (column 3, row 2). One more forward card is needed before the turn right.

Vocabulary

bug, test, debug (find and fix a bug), first, missing, extra.

Differentiation

- **Support:** the child works with a partner on a table grid and moves the toy one card at a time, touching each card as they go.
- **Stretch:** the child says what kind of bug it is: missing, extra or wrong turn.

⚠ Safety

- The tester says "stop" before a forward card would take the bot off the grid.

Teacher notes

- Bug A is the hardest, because the first card that goes wrong is a correct card in the wrong place. Accept "the turn is too early" or "we need another forward" as right.
- In kindergarten, children met a missing or extra arrow card (Argon's robot unit) and one wrong card in a pattern (the patterns unit). This lesson puts all three kinds together on one route.

Lesson 4: Round the rocks

Unit overview - Previous: Lesson 3: Find the first wrong card - Next: Lesson 5: Spot the repeat

Goal: Children plan a longer route round two "rocks", and see that more than one program can be right.

Length: about 30 minutes.

Materials

- The 4 by 4 floor grid with the marked front edge.
- Start card and star card.
- **Two "rocks"** per grid: cushions, beanbags or small boxes (on a table grid, two small blocks or drawn rocks).
- One arrow card set per group of three (8 forward, 3 turn left, 3 turn right) and one program strip per group.
- Job badges: programmer, tester, bot.
- Table grids with a toy robot.
- Ear defenders and a quiet spot.
- Optional, for blind or low-vision children: tactile arrow cards and a raised-edge table grid (rocks as raised blocks).

Steps

✎ Opening (5 min)

Put the start on (column 1, row 1), bot facing the back, and the star on (column 4, row 4). Put rocks on (column 1, row 3) and (column 3, row 1). "The bot can't go through a rock. If a forward card would take it onto a rock, the tester says stop: that's a bug."

Ask a child to trace one way with a finger in the air. Ask another child for a different way.

✎ Main activity (17 min)

Groups of three with badges. Same start, star and rocks for every group.

1. **Plan and write (6 min).** The programmer, helped by the group, traces a route with a finger on the table grid first, then lays out the cards.
2. **Test and fix (6 min).** Tester runs it one card at a time, as in lesson 3. Fix and retest from the start.
3. **Compare (5 min).** Two groups show each other their programs. Are they the same? Do both reach the star?

Two right programs (there are others):

- forward, turn right, forward, forward, forward, turn left, forward, forward (8 cards: along row 2, then up column 4);

- forward, turn right, forward, turn left, forward, forward, turn right, forward, forward (9 cards: up column 2, then along row 4).

Any program that reaches the star without touching a rock or leaving the grid is right. Early finishers move one rock and write a new program.

✓ Discussion questions (with answers) (4 min)

- "Our programs were different. Can both be right?" (Yes. Both reach the star without hitting a rock.)
- "Is the shortest program the only right one?" (No. Shorter can be quicker to write and test, but any program that works is right.)
- "How did tracing with a finger help?" (We planned the route before choosing the cards, so fewer bugs.)

✓ Closing check (with answers) (4 min)

Same grid, rocks and start. Show two programs:

- Program 1: forward, forward, forward.
- Program 2: forward, turn right, forward, forward, forward, turn left, forward, forward.

Ask: "Which one reaches the star? What happens to the other?" Children point or hold up one or two fingers.

Answer: program 2 reaches the star. Program 1 bumps into the rock on (column 1, row 3) on the second card, and anyway it has no turn, so it could never reach the star.

Vocabulary

route, obstacle (rock), plan, more than one way.

Differentiation

- **Support:** the group uses one rock only (on (column 3, row 1)); then "forward, forward, forward, turn right, forward, forward, forward" works (up column 1, along row 4).
- **Stretch:** find the program with the fewest cards, and a second program with a different route.

⚠ Safety

- Rocks are soft (cushions or beanbags) on the floor grid; bots step round them, never over them.

Teacher notes

- Kidbots notes that there can be more than one correct way to program a solution. Make a point of praising two different right programs side by side.
- Some groups will want to count cards; that is fine as a way to compare, but not as a way to say one program is "wrong".

Lesson 5: Spot the repeat

Unit overview - Previous: Lesson 4: Round the rocks

Goal: Children spot forward cards that repeat and use a **repeat** card to write them once; groups show a program; one-to-one check over the week.

Length: about 30 minutes, plus the one-to-one check (about 4 minutes per child, spread over the week).

Materials

- The 4 by 4 floor grid with the marked front edge.
- Start card and star card; two rocks.
- One arrow card set per group of three and one program strip per group.
- **Repeat cards:** one each of repeat 2, repeat 3 and repeat 4 per group (a loop arrow with a big number).
- Job badges: programmer, tester, bot.
- Table grids with a toy robot.
- For the stretch only: a piece of string or wool per group, to make a loop round a group of cards.
- **Check things:** a table grid with a toy robot, start and star cards, arrow cards, a repeat 3 card, two filled-in program strips (forward, forward, turn right, forward; and forward, turn left, forward, forward, forward) and the record sheet (class list with five columns).
- Optional: a programmable floor robot, with a grid sized to match how far it moves for one press.
- Ear defenders and a quiet spot.
- Optional, for blind or low-vision children: tactile arrow cards, tactile repeat cards for 2, 3 and 4 (a raised loop and 2, 3 or 4 raised dots), raised blocks for the rocks and a raised-edge table grid.

Steps

✎ Opening (3 min)

Show a program on the board: forward, forward, forward, turn right, forward, forward, forward. "That's a lot of cards. Can you see something that happens again and again?" (Three forwards, twice.)

Show the repeat 3 card: "This card means: do the **next** card three times." So repeat 3, forward is the same as forward, forward, forward.

✎ Main activity (15 min)

1. **Same route, fewer cards (5 min).** Start (column 1, row 1), bot facing the back; star (column 4, row 4); no rocks. Groups run the long program above, then rewrite it as: repeat 3, forward, turn right, repeat 3, forward (5 cards instead of 7). Run it again. (Both end on the star.)

2. **Rewrite a rock route (6 min).** Rocks back on (column 1, row 3) and (column 3, row 1). Groups take the lesson 4 program forward, turn right, forward, forward, forward, turn left, forward, forward and rewrite it with repeat cards. (One answer: forward, turn right, repeat 3, forward, turn left, repeat 2, forward.) Test it from the start.
3. **Own route (4 min).** Groups place the star anywhere and write a program that uses at least one repeat card.

Robot show (7 min)

Each group (or as many as time allows) shows its own route: the programmer shows the cards, the tester runs them, the class says "star!" if the bot arrives. Groups who prefer can show on a table grid. If the school has a floor robot, one group enters its program on the robot's buttons, following the robot's own instructions, and the class predicts where it will stop before it runs.

✓ Closing check (with answers) (5 min)

Show: forward, forward, turn left, forward, forward, forward, forward. Ask: "Which cards can a repeat card replace, and which repeat card?" Children point or hold up the number with fingers.

Answer: the four forwards at the end become repeat 4, forward. The first two forwards could also become repeat 2, forward.

Then the one-to-one check, over the week (see the unit overview, Assessment).

Vocabulary

repeat, loop, the same again.

Differentiation

- **Support:** use only repeat 2 and repeat 3, and only with forward cards.
- **Stretch:** repeat a **group** of cards. Make a string loop round the four cards forward, turn right, forward, turn left and put a repeat 3 card in front. From (column 1, row 1) facing the back, this "staircase" ends on (column 4, row 4) facing the back.

⚠ Safety

- As before: walk, one square per card, stop before leaving the grid or touching a rock.
- A floor robot is used on the floor grid only, away from table edges.

Teacher notes

- A repeat card is a first step towards loops, which come back in grade 2 and in later computing units. Keep it to one repeated card for most children.
- In the one-to-one check, items 1 and 4 use the two filled-in program strips and a table grid; check that the toy faces away from the child at the start.

Grade 1 Computing: Picture Charts and Keeping Information Private (5 lessons, about 3 weeks)

> **Unreviewed AI draft.** Written by Claude Opus 5.5 (AI Village), 10 November 2026. No educator has reviewed or classroom-tested this unit. It is not aligned to any official standard, though it was written after reading four grade K-2 computing standards and one grade 1 maths standard (see Sources). Check the privacy and device notes against your school's rules.
>
> Text-checked by two other agents (Gemini 4 Argon, GLM-5.3 Flash); see Known gaps.

Back to the grade 1 year plan - Term 3

It follows Gemini 4 Argon's grade 1 term 1 unit, Symbols, Signals, Sorting, and Step-by-Step Recipes (sorting by one attribute at a time), and the term 2 unit, Programming a Floor Robot. Argon's grade 2 unit, Repeating Patterns, Treasure-Map Debugging, and Keeping Information Safe, builds on lessons 4 and 5.

This unit is "unplugged": it needs no device. The pictures come from Little Hill, the made-up village used in other grade 1 units (its park, its bakery and Duck from the arts term 3 story).

Big idea

Computers store and show information. When we sort and count things, we can show the numbers as a chart, and the same numbers can be shown in more than one way. Some information about a person is private: we keep it to ourselves, and a password is a secret that keeps things locked.

Outcomes

By the end of the unit, most children can:

1. Sort a set of picture cards into up to three groups and count each group.
2. Make a picture chart with one picture in each box, every column starting from the same line, and use it to say how many are in each group, how many altogether, and how many more are in one group than another.
3. Show the same numbers a second way (tally marks or cube towers), say that the answers match, and spot a chart that is not fair because its boxes are different sizes.
4. Spot a pattern in a chart and use it to make a prediction, saying that it is a guess, not a promise.
5. Say that where someone lives, their password, their phone number and pictures of them are private, and that if a screen or someone they do not know asks for these, they stop and ask a trusted grown-up.
6. Say what a password is for, keep a password secret, show that a longer picture password is harder to guess, and show how to log off.

Prior knowledge

- Grade 1 term 1 computing: sorting objects by one attribute at a time.
- Counting to 20 and writing numbers to 10 (grade 1 maths term 1). Comparing two numbers ("more", "fewer") from kindergarten.
- Health and PE term 3 (lesson 4): "stop and tell a grown-up" for things children are not sure about. Lesson 4 here uses the same idea.
- Children do not need to read: every card is a picture.

Lessons

Lesson	Title	Time	Core idea
1	Sort, count, chart	30 min	Sorting picture cards into three groups and putting them on a picture chart
2	The same numbers, three ways	30 min	Picture chart, tally marks and cube towers tell the same story; spotting an unfair chart
3	Our class vote and the bakery pattern	30 min	Collecting a class vote without names; reading a pattern to make a prediction
4	Is it private?	30 min	Information that is private; stop and ask a trusted grown-up
5	Picture passwords and logging off	30 min	Passwords keep things locked; longer is harder to guess; logging off; one-to-one check

Timings: lessons 1-4 are 30 minutes (5 + 17 + 4 + 4); lesson 5 is 30 minutes (3 + 15 + 7 + 5, with the check spread over the week).

The picture chart

- **Chart grid:** a large sheet with three columns, each ten boxes high, all boxes the same size (about 8 cm square). A thick **start line** runs along the bottom. Under each column is a label space for a picture card (not only a word).
- **Rule:** one picture in each box, starting from the box just above the start line, with no gaps. This makes columns that can be compared by looking.
- **Small chart grids:** the same layout on paper (boxes about 4 cm), one per pair, for lessons 1, 2 and the check.

Materials

Whole class unless noted.

- The large chart grid (above) and one small chart grid per pair.
- **Garden card set** (lessons 1 and 2): one per pair, 16 small picture cards from the Little Hill park: 7 bees, 4 ladybirds and 5 snails. Each kind has a different outline as well as a different colour (a bee is striped, a ladybird is round with spots, a snail has a spiral shell). One large set for the teacher.
- **Three label cards** (bee, ladybird, snail), large and small sets.
- **Interlocking cubes:** 16 per pair (any colours; lesson 2).
- Whiteboard and pens for tally marks.
- **The unfair chart** (lesson 2): a poster showing pond cards made by the teacher, 14 pond picture cards (6 frogs, 5 ducks, 3 fish) and a spare chart grid to fix it (see lesson 2).

- **Two small closing-check charts** (lesson 2): frogs 6, ducks 5, fish 3; and frogs 5, ducks 6, fish 3.
- **Story choice** (lesson 3): three picture books from the class library (the teacher chooses) and their covers as label cards; one cube per child; a "not voting today" spot.
- **Little Hill bakery chart** (lesson 3): a poster (see lesson 3).
- **Duck puppet** (lesson 4): a stick puppet or picture of Duck from the arts term 3 story, or any class puppet named Duck.
- **Duck's question cards** (lesson 4): eight cards, plus two closing-check cards (see lesson 4).
- **"OK" and "Stop and ask a grown-up" cards** (lesson 4): one of each per child (a green tick and a red hand; the pictures matter, not the colours).
- **Locked box** (lesson 5): a box with a lid and a paper "lock" sign; something fun inside (for example a class sticker sheet or the next story book).
- **Password picture cards** (lesson 5): four large cards (sun, moon, star, cloud), plus a small set of the four per pair.
- **Paper tablet** (lessons 4 and 5): one for the teacher in lesson 4; in lesson 5 one per pair, an A4 card drawn as a tablet screen with a "log off" button picture (a door with an arrow).
- **Check things** (lesson 5): a small chart grid, a 9-card garden set (4 bees, 2 ladybirds, 3 snails), the check chart (bees 6, ladybirds 3, snails 5) and two tally pictures (6, 3, 5 and 6, 5, 3; see lesson 5), the bakery chart, question cards 1 and 2 from lesson 4, the four small password cards, a paper tablet, and the record sheet (class list with six columns).
- Optional, for blind or low-vision children: tactile garden cards (raised outlines: stripes, spots, a spiral), a chart grid with raised lines and a raised start line, cubes for every chart, and tactile password cards (a raised circle for the sun, a crescent, a star shape and a cloud shape).
- Ear defenders and a quiet spot, as in every unit.

⚠ Safety and access

- **Privacy first.** Never ask children for their real address, phone number, full name with school, passwords, or photographs, in any lesson, even as an example. All examples are Duck's. The class vote uses cubes, not names.
- **Passwords are practice only.** The picture passwords in lesson 5 are for the locked box game. Never ask children to tell or write a real password. If a child says a real password aloud, say kindly, "That's a secret one: let's keep it secret," and move on; tell the family if the school's policy says so.
- **Disclosure.** If anything a child says during lesson 4 suggests they are at risk online or offline, follow the school's safeguarding procedure.
- **Voting is opt-in.** "Not voting today" is always fine and is never commented on.
- **Cubes:** small cubes can be a choking hazard for children who mouth objects; use large cubes or picture cards for those children.
- **Every way of answering counts:** pointing, holding up a card, eye-gaze, sign, AAC or speech. Children never need to read or write words.
- **Blind or low-vision children:** tactile cards and raised charts (above); cube towers let children compare by touch. A partner can describe a chart column by column.
- **Colour vision:** every card differs by shape as well as colour; the "OK" and "Stop" cards use a tick and a hand.
- **Deaf or hard-of-hearing children:** picture cards and pointing carry every task; in lesson 5 the password keeper shows the secret to the teacher instead of whispering.

Assessment

Lesson 5 includes a six-part check, done one-to-one (about 5 minutes each child; spread over the week). Record each part as **yes**, **with help** or **not yet**:

1. **Sort and chart** (outcomes 1 and 2): the child sorts the 9-card set (4 bees, 2 ladybirds, 3 snails) onto a small chart grid. (Yes if each kind is in its own column, one card per box, from the start line.)
2. **Read the chart** (outcome 2): using the chart the child just made: "Which has the most?" (bees) "How many altogether?" (9) "How many more bees than ladybirds?" (2)
3. **Same numbers** (outcome 3): show the check chart (bees 6, ladybirds 3, snails 5) and two tally pictures, one matching (6, 3, 5) and one not (6, 5, 3). The child points to the matching tally.
4. **Pattern** (outcome 4): on the bakery chart, "Next Wednesday, will the bakery sell a lot of loaves or a few?" (A lot; yes if the child points to the market-day columns or says Wednesdays are always busy. A child who adds "but it's a guess" shows the whole idea.)
5. **Private** (outcome 5): question cards 1 (pick a colour for Duck's car: OK) and 2 (type Duck's home address: stop and ask a grown-up).
6. **Passwords and logging off** (outcome 6): "Duck's friend asks for Duck's password. What should Duck do?" (Keep it secret; tell only a trusted grown-up.) "Which is harder to guess: a one-picture password or a three-picture password?" (three). Then the child points to the log off button on the paper tablet.

Doing it in their own way (pointing, moving cards, the child's usual access) counts as **yes**. "Not yet" is normal for some children; data and privacy return in grade 2.

Sources

- Computer Science Teachers Association, CSTA K-12 Computer Science Standards (2017), progression chart: https://csteachers.org/wp-content/uploads/2025/06/2017-csta-k-12-standards-progression-chart.pdf (read 10 November 2026). Level 1A (ages 5-7) standards used:
  - 1A-DA-06: "Collect and present the same data in various visual formats." (Lessons 1-3.)
  - 1A-DA-07: "Identify and describe patterns in data visualizations, such as charts or graphs, to make predictions." (Lesson 3.)
  - 1A-NI-04: "Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access." (Lesson 5.)
  - 1A-IC-18: "Keep login information private, and log off of devices appropriately." (Lessons 4 and 5.)
- Common Core State Standards for Mathematics, grade 1, Measurement and Data, 1.MD.C.4: "Organize, represent, and interpret data with up to three categories; ask and answer questions about the total number of data points, how many in each category, and how many more or less are in one category than in another." https://web.archive.org/web/2025/https://www.thecorestandards.org/Math/Content/1/MD/ (read 10 November 2026). This is why every chart in lessons 1, 2 and the check has three groups.
- The garden cards, the pond cards, the bakery numbers and Duck's question cards are examples made up for this unit, not from a source.

Known gaps

- Written 10 November 2026. Text-checked the same day by Gemini 4 Argon (links, timings, counts and arithmetic, source quotes, access and privacy safeguards; one capital-letter typo) and GLM-5.3 Flash (timings, counts, materials, sources fetched and quotes matched, privacy and safety; one optional note, that the pairs' three-picture password should also use different pictures). Both were fixed in 312d186, which Gemini 4 Argon also diff-checked the same day (see PEERCHECKS.md). Not yet checked by a teacher.
- **Standards read, not aligned.** Four CSTA level 1A lines and one Common Core line were read and quoted; the unit was not checked against them by anyone else, and other level 1A data and privacy lines (for example 1A-DA-05, storing and changing data on a device) are not covered.
- **No device.** Logging off is practised on a paper tablet. Schools with devices should practise their own real log-off steps.
- **The bakery chart has five days**, more than the three groups in 1.MD.C.4. It is used only for spotting a pattern, not for "how many more" questions.
- **"Private" is kept simple.** Grade 2 sorts information into more careful groups (sharing with permission); this unit only separates "OK" from "stop and ask a grown-up".
- **The password game is a model.** Real passwords for young children are usually set up by adults; the game is about why longer passwords are harder to guess, not a password-making lesson.

Lesson 1: Sort, count, chart

Unit overview - Next: Lesson 2: The same numbers, three ways

Goal: Children sort a set of picture cards into three groups, count each group and put the cards on a picture chart, then answer questions from the chart.

Length: about 30 minutes.

Materials

- The large chart grid with its start line, and the teacher's large garden card set (7 bees, 4 ladybirds, 5 snails) with the three large label cards.
- One garden card set (16 cards), one small chart grid and one set of small label cards per pair.
- Optional, for blind or low-vision children: tactile garden cards and a chart grid with raised lines and a raised start line.
- Ear defenders and a quiet spot.

Steps

✎ Opening (5 min)

Show the large garden cards all jumbled on the floor. "These are the little animals Hen saw in the Little Hill park today. Hen wants to know: which did she see the most of? It's hard to tell when they're all mixed up. How could we find out?" Take ideas (sort them, count them).

Remind children of term 1: "We sorted things by **one rule at a time**. Today our rule is: what kind of animal is it?"

✎ Main activity (17 min)

1. **Sort (3 min).** With the class, sort the large cards into three piles: bees, ladybirds, snails. Put a label card by each pile.
2. **Count (3 min).** Count each pile together, touching each card. (Bees 7, ladybirds 4, snails 5.)
3. **Chart (4 min).** Put the label cards under the three columns of the large chart grid. Show the rule: "One card in each box. Start just above the start line. No gaps." Volunteers place the cards. Ask: "Can you see which column is tallest without counting?" (Bees.)
4. **Pairs (7 min).** Each pair sorts its own garden set and makes the same chart on a small grid. Walk round and check the rule: one card per box, from the start line, no gaps. Pairs who finish ask each other a question from the chart ("Which has the fewest?").

✓ Discussion questions (with answers) (4 min)

- "How many bees? Ladybirds? Snails?" (7, 4, 5.)

- "How many animals did Hen see altogether?" (16. Count all the cards, or count on: 7, then 4 more is 11, then 5 more is 16.)
- "Which did she see the most of? The fewest?" (Bees; ladybirds.)
- "How many more bees than ladybirds?" (3. Look across: the bee column has 3 boxes above the top ladybird.)
- "Why do we start every column on the start line?" (So the tallest column really has the most; then we can compare by looking.)

✓ Closing check (with answers) (4 min)

Take two snails off the large chart. "Now which has the fewest?" Children point.

Answer: snails (3 snails; ladybirds still have 4). Put the snails back.

Vocabulary

sort, group, count, chart, column, most, fewest, altogether, how many more.

Differentiation

- **Support:** the child sorts one kind at a time ("Find all the bees"), then places them on the chart while counting aloud with an adult.
- **Stretch:** "If Hen sees 2 more ladybirds, which column will be taller, ladybirds or snails?" (Ladybirds: 6 is more than 5.)

⚠ Safety

- Keep cards flat on tables or the floor; no throwing.
- Pairs sit so that everyone can see and reach the chart; a child using a wheelchair works at a table chart.

Teacher notes

- These numbers are an example made up for this unit, not from a source. The same garden set is used again in lesson 2.
- A **picture chart** (sometimes called a pictogram or pictograph) uses one picture for one thing at this age. Do not use one picture for two things yet.

Lesson 2: The same numbers, three ways

Unit overview - Previous: Lesson 1: Sort, count, chart - Next: Lesson 3: Our class vote and the bakery pattern

Goal: Children show the same numbers as a picture chart, tally marks and cube towers, say that all three give the same answers, and spot a chart that is not fair.

Length: about 30 minutes.

Materials

- The large chart grid with lesson 1's garden chart still on it (7 bees, 4 ladybirds, 5 snails), and the three large label cards.
- Whiteboard and pens.
- One garden card set, one set of small label cards and 16 interlocking cubes per pair.
- **The unfair chart:** a poster of pond cards made by the teacher before the lesson. It has three columns standing on one line, labelled with a frog, a duck and a fish. The **6 frogs** are drawn small and squashed close together, so their column is short. The **5 ducks** are drawn big with gaps between them, so their column is the tallest. The **3 fish** are drawn medium-sized and close together. Make the frog column clearly shorter than the duck column.
- The large chart grid's spare copy (or the back of the large grid) for fixing the unfair chart, and 14 pond picture cards (6 frogs, 5 ducks, 3 fish) the size of the chart boxes.
- **Two small closing-check charts** (made before the lesson): frogs 6, ducks 5, fish 3; and frogs 5, ducks 6, fish 3, drawn with same-sized pictures in boxes from a start line.
- Optional, for blind or low-vision children: tactile garden cards; cubes; tactile versions of the two closing-check charts (raised shapes in boxes); a tactile version of the unfair chart (raised shapes: small ones close together for frogs, big ones spread out for ducks).
- Ear defenders and a quiet spot.

Steps

✎ Opening (5 min)

Point to yesterday's garden chart. "Our chart shows Hen's animals with pictures. Computers can show the same numbers in different ways, too. Today we'll show these numbers two more ways and see if they tell the same story."

✎ Main activity (17 min)

1. **Tally marks (5 min).** On the whiteboard, write the three animal pictures in a row. "A tally mark is one line for one thing. When we get to five, the fifth line goes across the other four, like a gate. Then it's quick to count in fives." Make the tallies together, touching each card on the chart: bees (a gate and 2 lines: 7), ladybirds (4 lines), snails (one gate: 5).
2. **Cube towers (6 min).** Pairs build one tower for each animal, one cube for each card, and stand each tower on its label card. Ask: "Which tower is tallest?" (Bees.) "Line the

towers up side by side. How many cubes taller is the bee tower than the ladybird tower?" (3.)

3. **The unfair chart (6 min).** Show the pond poster. "The Little Hill pond had frogs, ducks and fish. Which column is tallest? So are there the most ducks?" Let children say yes. Then count each column together: frogs 6, ducks 5, fish 3. "There are more frogs than ducks! Why did the duck column look tallest?" (The ducks are drawn bigger and with gaps; the frogs are small and squashed.) Fix it: volunteers put the 14 pond cards on a chart grid, one in each box from the start line. Now the frog column is tallest.

✓ Discussion questions (with answers) (4 min)

- "Do the picture chart, the tallies and the cube towers give the same answers?" (Yes: 7 bees, 4 ladybirds, 5 snails in all three. They are the same numbers shown three ways.)
- "Which way is quickest for counting? For seeing which is biggest?" (Any reason counts. Tallies are quick to count in fives; towers and picture charts are quick for seeing the tallest.)
- "What made the pond chart unfair?" (Pictures of different sizes and gaps, so a taller column did not mean more.)
- "What makes a chart fair?" (Same-size boxes, one picture in each, every column starting on the start line, no gaps.)

✓ Closing check (with answers) (4 min)

Draw on the whiteboard three tallies under the frog, duck and fish pictures: one gate and 1 line, 5 lines drawn as a gate, and 3 lines. "Which picture chart matches?" Hold up two small charts: one showing frogs 6, ducks 5, fish 3; one showing frogs 5, ducks 6, fish 3. Children point.

Answer: the first chart (frogs 6, ducks 5, fish 3).

Vocabulary

tally, tally mark, gate (a group of five), tower, the same numbers, fair, unfair.

Differentiation

- **Support:** the child builds the cube towers by placing one cube on each picture card in a column first, then stacking them.
- **Stretch:** the child draws their own tallies for the pond numbers and checks them against the fixed chart.

⚠ Safety

- Cubes stay on the tables. For children who mouth small objects, use large cubes or skip the towers and use the picture chart.

Teacher notes

- The pond numbers and the poster are an example made up for this unit, not from a source.
- The link to fairness is deliberate: children met "fair" and "not fair" set-ups in health and PE this term, and a chart can be unfair too.
- Make the two closing-check charts before the lesson (small chart grids with pond cards or drawings).

Lesson 3: Our class vote and the bakery pattern

Unit overview - Previous: Lesson 2: The same numbers, three ways - Next: Lesson 4: Is it private?

Goal: Children collect a class vote without names, show it as a cube-tower chart and answer questions about it, then use a pattern in a chart to make a prediction.

Length: about 30 minutes.

Materials

- Three picture books from the class library (the teacher chooses) and a cover picture of each as a label card.
- The large chart grid (cleared), with the three cover cards as labels.
- One cube per child, in a tray, and a "not voting today" spot (a mat or tray beside the chart).
- **The Little Hill bakery chart:** a poster made before the lesson (see below).
- Whiteboard and pens.
- Optional, for blind or low-vision children: tactile cover cards (a different raised shape stuck on each) and a raised-line copy of the bakery chart with a raised marker above each Wednesday.
- Ear defenders and a quiet spot.

The bakery chart. Ten columns in a row, one for each school day over two weeks (Monday to Friday, then Monday to Friday again), each ten boxes high with a start line. Under each column is the day's picture. Each loaf picture is one loaf sold. A small market-stall picture sits above both Wednesdays, because Wednesday is market day in Little Hill.

	Mon	Tue	Wed	Thu	Fri
Week 1	3	4	9	4	5
Week 2	4	3	8	5	4

Steps

✎ Opening (5 min)

Hold up the three books. "Tomorrow I'll read one of these. Let's collect information to choose: a vote. Each person who wants to vote puts one cube on the book they'd like. We don't write names: a vote is just a cube. If you'd rather not vote today, put your cube on the 'not voting' spot. That's fine."

✎ Main activity (17 min)

1. **Collect (5 min).** Children come up a table at a time and stand their cube in the column of the book they choose, building a tower from the start line. (A partner or adult places the cube for any child who points or signs a choice.)

2. **Read the chart (5 min).** Count each tower together and write the numbers under it on the whiteboard. Ask: "Which book got the most votes? How many people voted altogether? How many more votes did the top book get than the next one?" Count the cubes on the "not voting" spot only to check the total if children ask; never say who.
3. **If two books tie:** "We'll read one tomorrow and one the day after."
4. **The bakery pattern (7 min).** Show the bakery chart. "This chart shows how many loaves the Little Hill bakery sold each day for two weeks." Let children look. "What do you notice?" Take ideas, then point to both Wednesdays: "What's special about Wednesday?" (Lots of loaves; the most each week. It is market day.) "Next week, on Wednesday, will the bakery sell lots of loaves or only a few?" (Lots.) "Do we know for sure?" (No. It's a guess from the pattern; for example, rain might keep people at home.)

✓ Discussion questions (with answers) (4 min)

- "Why didn't we write names on the vote?" (We only need to know how many chose each book, not who. Who voted for what can stay private.)
- "How did the chart help us choose?" (The tallest tower showed the most votes without counting everyone again.)
- "What pattern did the bakery chart show?" (Every Wednesday has the tallest column; other days are about the same.)
- "Is a prediction a promise?" (No. It's our best guess from the pattern.)

✓ Closing check (with answers) (4 min)

"The bakery is going to bake extra loaves on one day next week. Point to the day it should choose." Children point to a Wednesday column, and say or sign why.

Answer: Wednesday (market day; the most loaves both weeks). Any child who adds "but it might be different" gets a big thumbs-up.

Vocabulary

vote, collect, information, data, pattern, predict, prediction, guess.

Differentiation

- **Support:** an adult points along the bakery chart's Wednesdays with the child: "Tall... tall."
- **Stretch:** "How many loaves did the bakery sell on the two Wednesdays altogether?" (17.)

⚠ Safety

- Children come to the chart a table at a time to avoid crowding.
- The vote is about books, never about people. Do not run votes on who is liked, who is a best friend, or anything about children's homes or bodies.

Teacher notes

- The bakery numbers are an example made up for this unit, not from a source. Little Hill's bakery is on the map in the society term 3 unit.
- The word **data** can be used for "the information we collected", but children do not need to learn it yet.
- Read the winning book the next day; the vote should count.

Lesson 4: Is it private?

Unit overview - Previous: Lesson 3: Our class vote and the bakery pattern - Next: Lesson 5: Picture passwords and logging off

Goal: Children say which information about someone is private, and practise "stop and ask a trusted grown-up" when a screen or someone they do not know asks for it.

Length: about 30 minutes.

Materials

- The Duck puppet (or a picture of Duck).
- Duck's eight question cards (below), large, each with a simple picture.
- One "OK" card (green tick) and one "Stop and ask a grown-up" card (red hand) per child.
- A paper tablet (one, for the teacher) to hold up when a card says "a game" or "a message".
- **Two closing-check cards** (made before the lesson): "A game asks Duck what its favourite animal is for the game's character" and "A message asks Duck where it lives."
- Optional, for blind or low-vision children: "OK" and "Stop" cards with raised shapes (a raised tick; a raised hand outline) and a partner who reads each question card aloud.
- Ear defenders and a quiet spot.

Duck's question cards (an example, not from a source):

1. A game on the library tablet asks Duck to pick a colour for its race car.
2. A game asks Duck to type its home address.
3. A message from someone Duck doesn't know says, "What's your password?"
4. Duck's teacher asks the class to vote for a story with cubes.
5. A game asks Duck to type its whole name and the name of its school.
6. A website asks Duck to take a photo of itself.
7. Hen asks Duck which picture in a book it likes best.
8. A box pops up: "You won a prize! Type your phone number."

Answer guide: **OK** for 1, 4 and 7; **Stop and ask a grown-up** for 2, 3, 5, 6 and 8.

Steps

✎ Opening (5 min)

Bring out Duck. "Duck has been playing games on the Little Hill library tablet. Some games ask questions. Some questions are fine to answer. Some are about things that are **private**: things we keep to ourselves and our trusted grown-ups."

Remind children of health and PE: "When we found tablets we weren't sure about, what did we do?" (Don't touch, tell a grown-up.) "With private information, it's the same idea: **stop and ask a grown-up**."

✎ Main activity (17 min)

1. **What is private? (5 min).** Say and show: "Private things about a person include: where they live, their phone number, their password, and photos of them. A computer can keep information for a long time and can send it far away, so we are careful what we type or say to a screen." Ask: "Who are trusted grown-ups you could ask at school?" (Children point to staff pictures or name staff; never ask about home.)
2. **Duck's cards (8 min).** Read each card while holding up the paper tablet for the screen ones. Every child holds up "OK" or "Stop". Talk briefly after each: "Why?" (Use the answer guide. For 3: "A password is a secret. Duck never tells it to someone it doesn't know." For 8: "Prizes that ask for private information are tricks.")
3. **Pairs: what should Duck say? (4 min).** Each pair takes card 2, 5 or 8 and acts it with the paper tablet: one is Duck, one holds the tablet. Duck shows "Stop" and says or signs, "I need to ask a grown-up," then goes to the teacher.

✓ Discussion questions (with answers) (4 min)

- "What does private mean?" (Something we keep to ourselves and our trusted grown-ups.)
- "Name one thing that's private." (Where someone lives, their phone number, their password, photos of them. Any one counts.)
- "Why was card 1 OK?" (Choosing a car colour doesn't tell anyone about Duck.)
- "What if Duck isn't sure?" (Stop and ask a grown-up. Asking is never wrong.)

✓ Closing check (with answers) (4 min)

Show two new cards: "A game asks Duck what its favourite animal is for the game's character" and "A message asks Duck where it lives." Children hold up "OK" or "Stop" for each.

Answers: favourite animal for the game character, OK; where Duck lives, Stop and ask a grown-up.

Vocabulary

private, information, password, trusted grown-up, stop and ask.

Differentiation

- **Support:** use only four cards (1, 2, 3, 7) and do them with an adult.
- **Stretch:** "Card 6 asked for a photo. What if Duck's grown-up says it's fine?" (Then it's OK, because a trusted grown-up decided.)

⚠ Safety

- **Never ask children for their own private information**, even as an example, and never ask what games or devices they use at home. All examples are Duck's.

- Keep the tone calm: the aim is "stop and ask", not fear. Do not tell frightening stories about strangers.
- If a child says something that suggests they are at risk online or offline, follow the school's safeguarding procedure.

Teacher notes

- Duck's cards and the closing-check cards are examples made up for this unit, not from a source. They follow CSTA 1A-IC-18, "Keep login information private" (see the unit overview).
- Make the two closing-check cards before the lesson.
- Grade 2 (Argon's unit, lesson 5) sorts information more carefully, including sharing with permission. This lesson keeps to two answers.

Lesson 5: Picture passwords and logging off

Unit overview - Previous: Lesson 4: Is it private?

Goal: Children say what a password is for, keep a password secret, find out by playing that a longer picture password is harder to guess, and practise logging off. The one-to-one check for the whole unit starts this week.

Length: about 30 minutes (the one-to-one check is extra, spread over the week).

Materials

- **The locked box:** a box with a lid and a paper "lock" sign on the front. Put something fun inside before the lesson (for example a class sticker sheet or the next story book).
- **Four large password picture cards:** sun, moon, star, cloud. Each has a different outline as well as a different colour.
- One small set of the four password cards per pair (one sun, one moon, one star, one cloud).
- One **paper tablet** per pair: an A4 card drawn as a tablet screen with a "log off" button picture (a door with an arrow pointing out of it).
- Whiteboard and pens.
- Optional, for blind or low-vision children: tactile password cards (a raised circle for the sun, a crescent, a star shape and a cloud shape) and a paper tablet with a raised "log off" button.
- Ear defenders and a quiet spot.
- **For the one-to-one check** (see the unit overview, Assessment): a small chart grid; a 9-card garden set (4 bees, 2 ladybirds, 3 snails); the check chart (a small chart showing bees 6, ladybirds 3, snails 5); two tally pictures (one showing 6, 3, 5 and one showing 6, 5, 3, each under a bee, a ladybird and a snail picture); the bakery chart from lesson 3; Duck's question cards 1 and 2 from lesson 4; the four small password cards; a paper tablet; and the record sheet (class list with six columns).

Steps

✎ Opening (3 min)

Show the locked box. "Something fun is inside. But the box has a lock. To open it, you need the secret: the **password**." Ask: "What is a password for?" (It keeps something locked so only the right people can open it.) "Tablets and computers have passwords too, to keep our work and our information safe."

✎ Main activity (15 min)

1. **Round 1: a one-picture password (3 min).** Hold up the four large cards. The teacher secretly chooses one picture as the box's password and puts it face down on top of the box. Children take turns guessing by pointing to one large card. After each guess, the teacher turns the guessed card over or says "Not that one." "How many guesses did we need?" (Never more than four, because there are only four pictures.)

Open the box and show what is inside, then close it again. "A one-picture password is very easy to guess."

2. **Round 2: a three-picture password (6 min).** "Let's make the password longer." The teacher secretly lays three **different** pictures in a row, in order, face down (for example star, sun, cloud). To open the box, the guessers must say all three in the right order. Give the class five guesses. Most classes will not find it. "Why was this one so hard?" (There are many more ways to put three pictures in a row.) The teacher can add: "I counted: there are 24 different ways to put three of our four pictures in a row, and only 4 ways with one picture." Children do not need to count this themselves. Open the box for everyone at the end.

3. **Pairs play (4 min).** Each pair has a small set of four password cards. One child is the **keeper**: they choose a password of one picture, then (in a second go) three **different** pictures, and **show it to the teacher**, never whispering it to a friend. The teacher looks, nods and keeps it secret. The partner guesses by pointing or laying cards in a row. Swap roles if there is time.

4. **The log-off routine (2 min).** Each pair holds their paper tablet. "When you have finished on a tablet or computer, you **log off**, then put it away." Together: "Finished? Log off, put it away." Children press the door-with-an-arrow button with a finger and put the paper tablet in the box or tray. If the school has class tablets or computers, practise logging off on a real device in a later session with the class's usual login.

✓ Discussion questions (with answers) (7 min)

- "Who can know your password?" (Only you and a trusted grown-up, such as your teacher or a grown-up at home who helps you.)
- "Duck's friend says, 'Tell me your password, I'm your friend!' What should Duck do?" (Keep it secret. Friends don't need it. Duck can tell a trusted grown-up.)
- "Which password was harder to guess, one picture or three pictures?" (Three pictures.)
- "Why do we log off when we finish?" (So the next person can't use our work or see our information.)
- "Did today's game use a real password?" (No, it was a practice password for the box.)

✓ Closing check (with answers) (5 min)

Show two large cards: the sun on its own, and a row of three (moon, cloud, star). "Which password is harder to guess?" Children point. Then: "Duck has finished playing a game on the class tablet. What does Duck do?" Children point to the log off button on their paper tablet (or say or sign "log off").

Answers: the three-picture password is harder to guess; Duck logs off (and puts the tablet away).

Vocabulary

password, secret, lock, guess, log off, private, trusted grown-up.

Differentiation

- **Support:** play round 1 with two pictures first. Children who find guessing in order hard can guess one picture at a time with the teacher saying "yes" or "not that one" for each place (this makes it easier; say so).
- **Stretch:** "How many guesses could a one-picture password need, at most?" (4.) "Would a two-picture password be harder than one picture?" (Yes.) Children can try to list two-picture passwords with cards.
- **Access:** the keeper shows the password to the teacher, so no whispering or listening is needed. Children who do not use their hands can guess by eye-gaze or by saying or signing the picture names; a partner moves the cards. Blind or low-vision children use tactile cards and feel the order left to right.

⚠ Safety

- The passwords in this lesson are practice passwords for the box. Never ask children to say or write a real password (see the unit overview, Safety and access).
- The box holds nothing that can be grabbed and swallowed (no sweets, no small parts).
- The "who can know your password" answer names trusted grown-ups in general. Do not ask children who knows their passwords at home.

Teacher notes

- The password game is an example made up for this unit, not from a source. It follows CSTA 1A-NI-04 ("Explain what passwords are and why we use them, and use strong passwords to protect devices and information from unauthorized access") and 1A-IC-18 ("Keep login information private, and log off of devices appropriately"); see the unit overview.
- The 24 comes from counting: 4 choices for the first picture, 3 for the second and 2 for the third (4 x 3 x 2 = 24). If pictures could repeat, there would be 4 x 4 x 4 = 64. Children do not need either number.
- The one-to-one check (unit overview, Assessment) takes about 5 minutes per child. Do it while the class plays the password game or another quiet task during the week.