Level A - Lesson 1

Unplugged - Sequences and Algorithms

Lesson Information

Overview/Description
Students will become introduced to and define the terms **sequencing** and **algorithms**. Students will learn how coding relates to their lives.

Coding Level: A

Learning Objectives:
Students will:

- Define **sequences** and **algorithms**.
- Relate coding to their lives at home and school.
- Students will design an **algorithm** navigating Dash through a maze to find Dot.

Target Grade Range: 1–2

Group Size (suggested): 2–3 students per group

Time Required: 45–60 minutes

Materials:

- 1 Dash robot per group
- notebook or construction paper cut into quarters
- copies of the Arrow PDF (one per group)
- scissors
- sticky notes
- [Optional] 1 Dot robot per group
- [Optional] access to **Twitter** and **Instagram**

Resources/Downloads:

- Arrow PDF
- Algorithms Video
- [Optional: YouTube Exact Instruction Challenge Video]
- Sequences Video
- **Wonder Journal: Reflection** worksheets
- **Evaluation Rubric**

Review

1. Ask, “What is a recipe?” (Sample response: “A recipe is a set of directions for how to make something.”)
    - Ask, “Who has ever used a recipe to make something? Or who has seen a member of your family use a recipe to cook with?”
    - Say, “Writing a code is like writing a recipe and following a code is similar to following a recipe. When we write a recipe for a computer to follow, it’s called an **algorithm.**”

Direct Instruction

INTRODUCTION

1. Watch *Code.org*’s video about **algorithms**: https://studio.code.org/s/coursea-draft/stage/3/puzzle/1
    - Say, “An **algorithm** is a fancy way to say, ‘directions.’”
    - Say, “When we use **algorithms**, we give directions to the computer.”
    - Say, “We have to be careful with **algorithms** because computers can only follow the instructions we give. If we give bad instructions, the computer follows the bad instructions.”
2. [optional] Watch this **Exact Instructions Challenge** video and end at 4:33: https://youtu.be/_eLM6O9JJvk?t=3m31s. In this video a little girl writes an **algorithm** for her dad to follow to make orange juice.
        - What happens?
        - Were the little girl’s instructions specific?
        - This is an example of what happens when your **algorithm** is not specific enough.

QUICK CHECK

- What is an **algorithm**? (Sample response: “An **algorithm** is a set of instructions written for a computer to follow.”)
- How do you use **algorithms** in your life? (Sample response: “I use **algorithms** every time I give someone else directions. I also use **algorithms** when I follow someone else’s directions.”)

Guided Practice

ACTIVITY: DASH FINDS DOT

1. Watch this video which combines **algorithms** and **sequences**: https://youtu.be/_eLM6O9JJvk?t=3m31s.

2. Say, “How did the children use an **algorithm** in the video?” (Sample response: “The children in the video created an algorithm that helped the Flurb get to the fruit.)

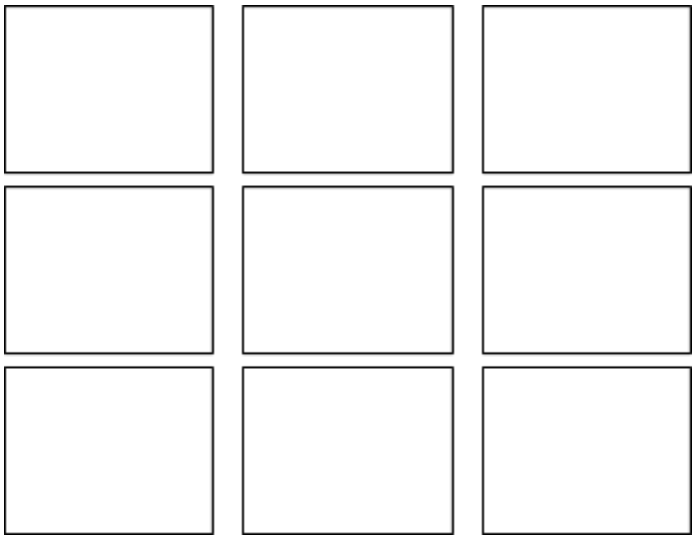
- Ask, “What would happen if the children in the video used the exact same arrows, but put them in a different order?” (Sample response: “The Flurb might not find the fruit.”)
- Say, “It’s important to make sure the instructions in our **algorithm** are in the right order or it might not work.”

3. Say, “We are going to create an **algorithm** that helps Dash find Dot.”

4. Ask the students to sit in a circle on the floor. Place 9 pieces of paper on the floor in the shape of a rectangle (see the diagram below).

Place Dot on one piece of paper. Place Dash on another piece of paper. (It doesn’t matter where the robots are placed.)

- If you don’t have Dot or Dash, use the pictures of the robots on the **Arrow PDF**.



5. Cut out the arrows on the **Arrow PDF**. Go around the circle and ask each child to put an arrow on the ground to direct Dash to Dot.

    - Once the algorithm has been written, have a student move Dash through the squares, following the arrow sequence.
    - Ask, “Was our **algorithm** correct? How do you know?” (Sample response: “Our **algorithm** was not correct because Dash did not find Dot.”)

6. Now take all the arrows that were used in the previous **algorithm** and mix them up. Place them in a random order in a line on the floor.

    - Have Dash start in the same place as before and ask a student to move Dash in the direction of the arrows.
    - Did Dash end up in the same location? Why or why not? (Sample response: “Dash did not end up in the same place because the **sequence** of the arrows was incorrect.”)

7. Move Dash and Dot to different locations on the paper grid and follow the same procedures to create and solve a different algorithm.

8. Say, “Now it’s your turn to create your own algorithms.”

QUICK CHECK

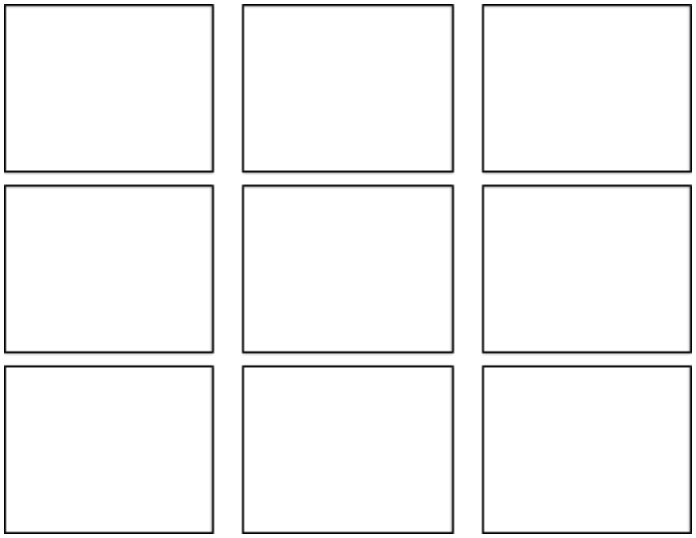
- What happens when the **sequence** of the arrows is wrong? (Sample response: "Dash cannot find Dot if the **sequence** is incorrect.")
- How is an **algorithm** like a recipe? (Sample response: "An **algorithm** is like a recipe because an **algorithm** gives instructions and so does a recipe.")

Independent Practice

Have students work on the following activities in pairs.

When students work together while coding, they're able to help each other identify mistakes and develop creative solutions!

1. Have each pair place 9 pieces of paper on the floor in the shape of a square (see the diagram below).
    - Have them place Dot on one piece of paper and place Dash on another piece of paper. It doesn't matter which pieces of paper the children choose.
    - If you don't have Dot or Dash, use the pictures of the robots on the **Arrow PDF**.



2. Have students cut out the arrows on the **Arrow PDF**.
3. Have students lay the arrows on the floor or a desk in a sequence that will direct Dash to find Dot.
4. Have student pairs switch **algorithms** with another group.
    - Have each new group follow the arrow **algorithm** exactly as is and leave a sticky note of feedback for the algorithm owners.
    - Have the algorithm owners return to their algorithms and respond to the feedback in the **Wonder Journal: Reflection Worksheets**. If the sequence of

arrows in the **algorithm** is wrong, encourage the algorithm owner to make changes.
    - Have groups rotate to another **algorithm** and repeat the process.

5. [Optional] After each rotation group, students can move Dash and Dot to create another **algorithm** using the arrows.

Wrap Up

FOLLOW-UP QUESTIONS/DISCUSSION

- What were the challenges with this activity?
    - Sample response: "I thought it was hard to figure out which direction Dash needed to move. Sometimes we chose the wrong direction."
- Remember how recipes are like **algorithms**? What happens when the recipe is written in the wrong **sequence**?
    - Sample response: "Our finished product probably wouldn't taste very good."

ASSESSMENT

- Use our **Evaluation Rubric** to review students' work.
- [Optional] Share your students' work with the world using @wonderworkshop and #dashanddot!

Standards

CSTA

- 1A-AP-08: Model daily processes by creating and following algorithms (sets of step-by-step instructions) to complete tasks.
- 1B-AP-16: Take on varying roles, with teacher guidance when collaborating with peers during the design implementation and review stages of program development.
- 1A-AP-11: Decompose (break down) the steps needed to solve a problem into a precise sequence of instructions.
- 1A-AP-12: Develop a plan that describes a program's sequence of events, goals, and expected outcomes.
- 1A-AP-14: Debug (identify and fix) errors in an algorithm or program that includes sequences and simple loops.
- 1A-AP-15: Using correct terminology, describe steps taken and choices made during the iterative process of program development.

ISTE

5a: Students formulate problem definitions suited for technology-assisted methods such as data analysis, abstract models and algorithmic thinking in exploring and finding solutions.

NGSS

K-2-ETS1-1: Ask questions, make observations, and gather information about a situation people want to change to define a simple problem that can be solved through the development of a new or improved object or tool.
K-2-ETS1-2: Develop a simple sketch, drawing, or physical model to illustrate how the shape of an object helps it function as needed to solve a given problem.

Common Core

CCSS.ELA-LITERACY.W.2.8: Recall information from experiences or gather information from provided sources to answer a question.
CCSS.ELA-LITERACY.SL.3.4: Report on a topic or text, tell a story, or recount an experience with appropriate facts and relevant, descriptive details, speaking clearly at an understandable pace.
CCSS.ELA-LITERACY.SL.3.3: Ask and answer questions about information from a speaker, offering appropriate elaboration and detail.
CCSS.ELA-LITERACY.SL.3.1: Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 3 topics and texts, building on others' ideas and expressing their own clearly.