Engagement and Achievement through Computational Thinking (ENACT) Summer Institute: Day 2

Goals for this Summer Institute

- Increase teachers' knowledge of computational thinking (CT) strategies and student-focused practices and understand how this knowledge benefits students' mathematics learning.
- Increase teachers' capacity to integrate CT strategies and student-focused practices into their mathematics instruction.
- Support teachers in planning their first CT-integrated lessons.

Agenda for today

- Warm-up activity
- Diving back into computational thinking (CT)
  - Pattern recognition and mathematics
  - Algorithms and mathematics
- How do our lived experiences impact how we approach teaching math?
- Exploring resources

Warm-up activity

Icebreaker: Find someone who (bingo)…

Photo by Torsten Dederichs on Unsplash

- Take 10 minutes to walk around and try to complete your bingo card.
- When you complete a square, write down the person's name and a little bit about what they share regarding the question.

Diving back into computational thinking

Let's review!

- What is CT?
- What CT strategies did we explore yesterday?
- What CT strategies are still left to explore?

You can use **PRADDA** to help you remember the names of the CT strategies.

Illustration by gilang yuda alyahya on Unslpash

Pattern recognition and mathematics

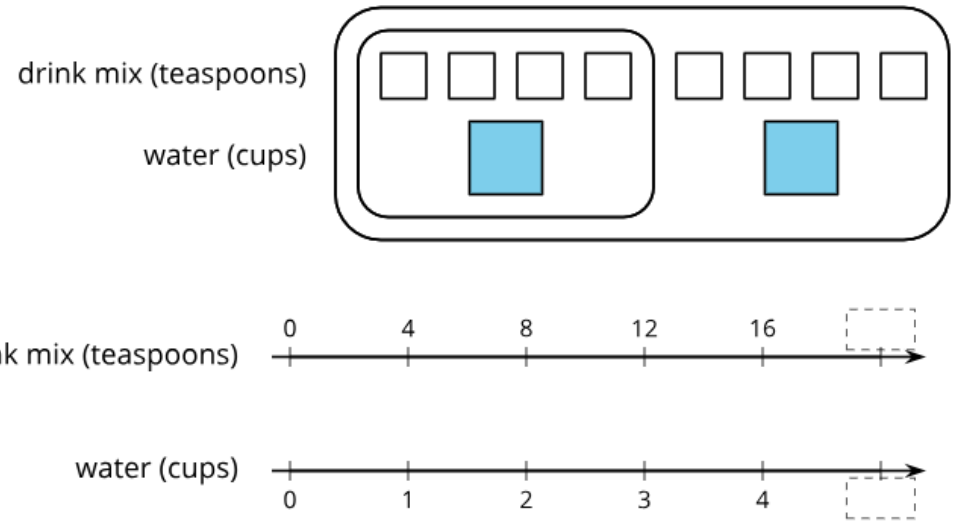
Making patterns meaningful

Photo by Lia Schmidt on Unsplash

We consider a **pattern** as something that is the same or similar across more than one problem or solution.

Making patterns meaningful, part 1

A drink recipe says to mix 4 teaspoons of powdered drink mix for every cup of water. Here are two ways to represent multiple batches of this recipe:



1. How can we tell that **4:1** and **12:3** are equivalent ratios?
2. What do you notice about these representations that is **the same**? How are these representations **different**?
3. How many teaspoons of drink mix should be used with 3 cups of water?
4. How many cups of water should be used with 16 teaspoons of drink mix?
5. What numbers should go in the empty boxes on the double number line diagram? What do these numbers mean? Explain your reasoning.

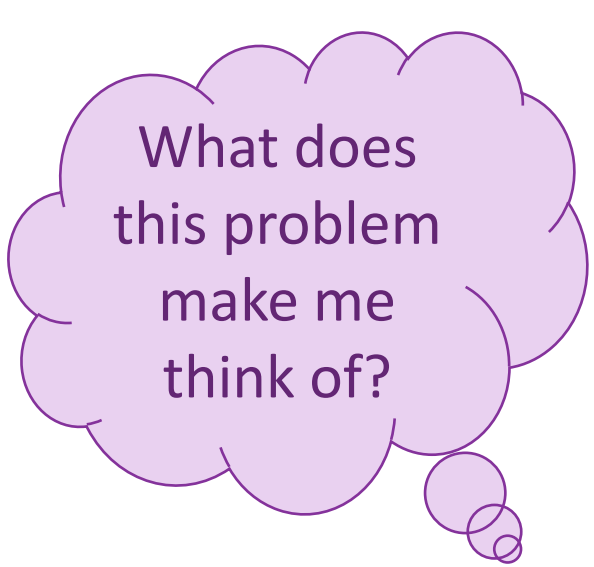
Making patterns meaningful, part 2

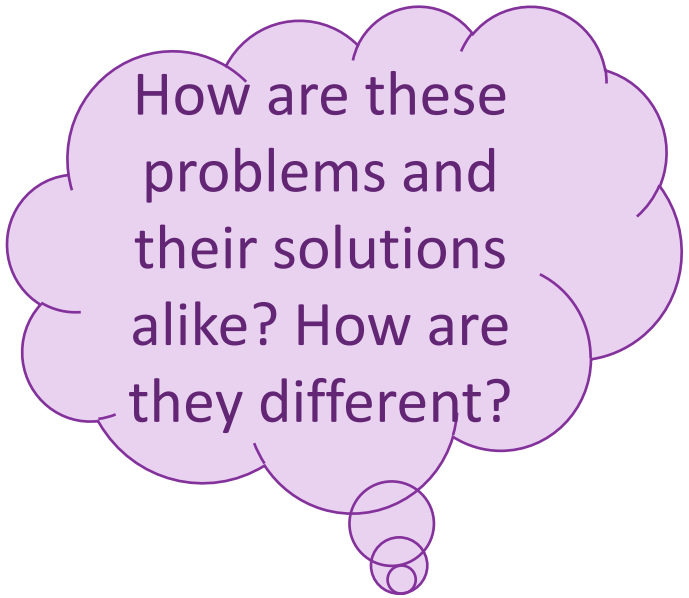
Photo by Lia Schmidt on Unsplash

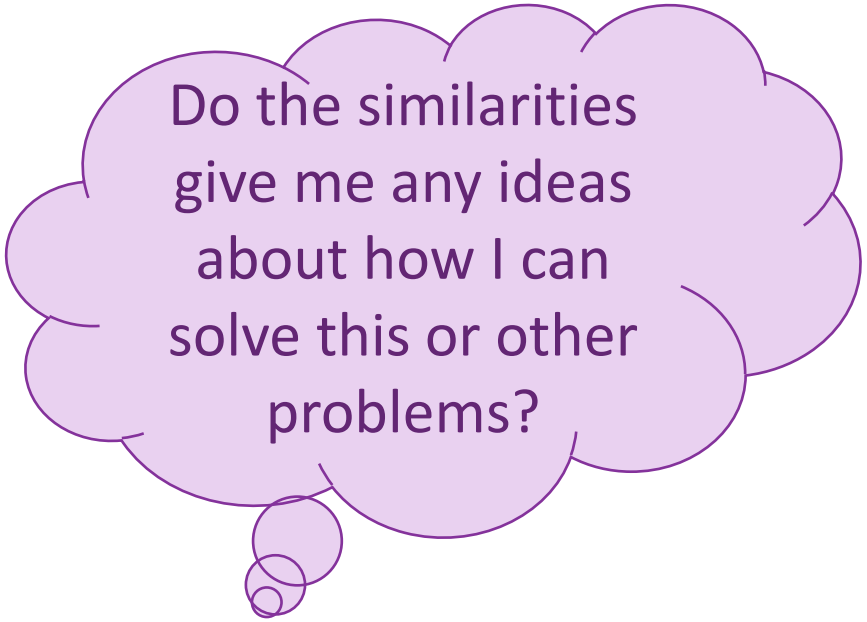
- How could you use the pattern(s) you noticed and explained in this task to solve other problems?
- What patterns could we generalize based on the work you just engaged in?
- How can these patterns be applied to help us solve other problems?

Pattern Recognition

Looking for ways that problems or solutions are similar or different to help me solve other related problems







Reflection: What is student focused about pattern recognition?

Spend five minutes with a neighbor brainstorming responses to the questions below:

- How could you connect pattern recognition to ***student experiences?*** When might they have noticed and applied patterns before?
- What might the benefits be for ***allowing students to choose*** how to find and use patterns?
- How could using pattern recognition ***support student thinking and promote student voice?***
- How can you use pattern recognition to ***facilitate collaboration?***

Share your ideas with the group.

Photo by Nathalia Segato on Unsplash

In what other contexts might students use pattern recognition?

Photo by AbsolutVision on Unsplash

Add your ideas to the posters.

Algorithms and mathematics

Developing algorithm understanding

Illustration by remapstudio on Unsplash

Brainstorm with a partner:

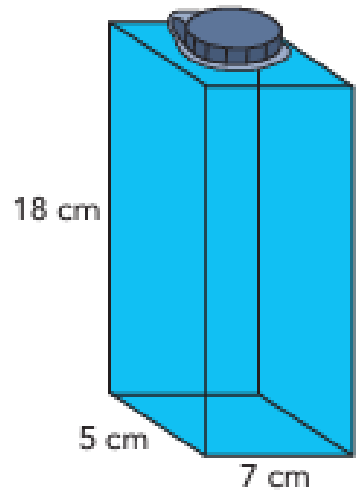
What are some things that go wrong when students use common algorithms in math?

For example, what mistakes do you see when students find surface area of a shape?

Developing algorithm understanding

Illustration by remapstudio on Unsplash

Savannah has a water bottle that is a rectangular prism. The bottle measures 7 centimeters by 5 centimeters by 18 centimeters and she filled it completely with water. Then, she drank $\frac{1}{4}$ of the volume of water in her water bottle. How many cubic centimeters of water were left in the water bottle?



https://ibkmartin.weebly.com/uploads/1/0/3/4/10343187/12.4_book.pdf

Developing algorithm understanding

Illustration by remapstudio on Unsplash

Looking at your completed task. Share with another partner group:

- What steps were used to find solutions to these problems?
- Could the same steps be used on another problem?
- Could the steps be communicated to someone else? How?

Developing algorithm understanding

Illustration by remapstudio on Unsplash

What extra steps might be needed for more complex problems?

Reflection: What is student focused about algorithms?

Spend five minutes with a neighbor brainstorming responses to the questions below:

- How could you connect algorithms to ***student experiences?*** When might they have used algorithms before?
- What might the benefits be for ***allowing students to choose*** which algorithm to use?
- How could using algorithms ***support student thinking and promote student voice?***
- How can you use algorithms to ***facilitate collaboration?***

Share your ideas with the group.

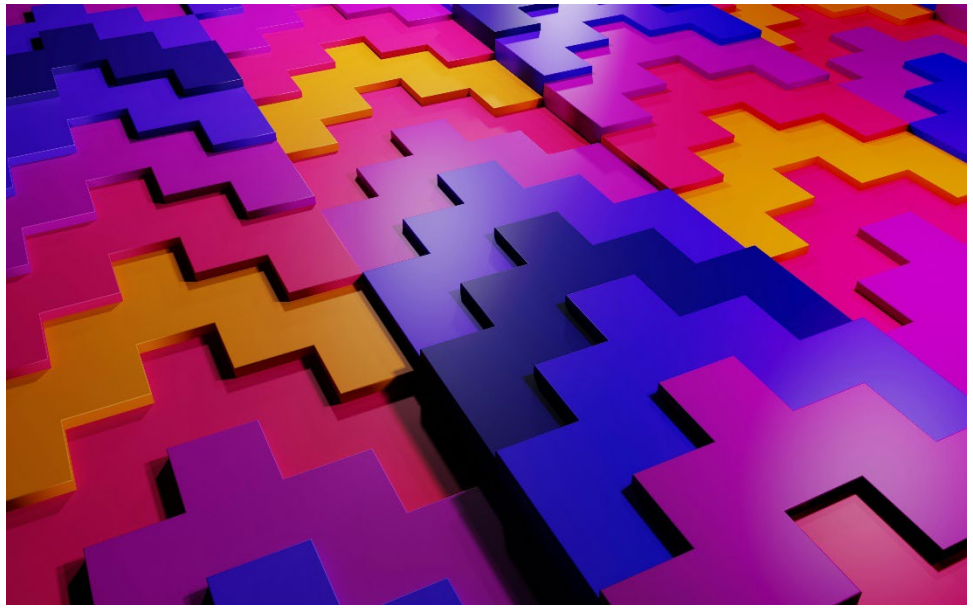


Photo by BoliviaInteligente on Unsplash

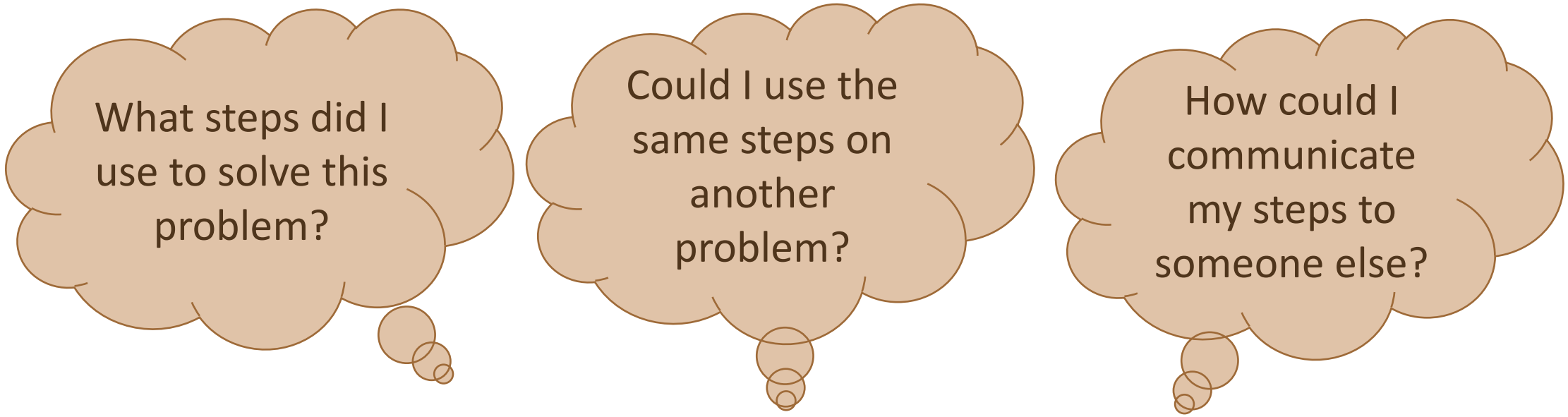
In what other contexts might students use algorithms?

Photo by AbsolutVision on Unsplash

Add your ideas to the posters.

Algorithms

Developing and using systematic, step-by-step approaches to problems



How do our lived experiences impact how we approach teaching math?

Group discussion norms

Remember as we continue into this activity that:

- You can share as much or as little as you'd like to share.
- This is a safe space with like minded educators.
- We are here to think deeply about our motivation and our instruction.
- This is a judgement-free zone.
- Respect the space of others as we engage in activities.

Who are you in society?

Photo by Timon Studler on Unsplash

On the first section of the chart paper, brainstorm the following questions:

- **What roles do you play in society at large?**

  For example: Daughter, mother, friend, softball teammate.

- **What traits or attributes define how you interact with society?**

  For example: Female, queer, Black and Latina.

Who are you in society?

Photo by Timon Studler on Unsplash

On the second section of the chart paper, brainstorm the following questions:

- **What characteristics define you as a teacher?**

  For example: Grades 5–8, National Board certified, math and science teacher, creative approaches.

Who are you in society?

Photo by Timon Studler on Unsplash

On the third section of the chart paper, develop a statement that addresses the following questions:

- Based on your reflections of who you are in society, your past experiences and history, and who you are as an educator:
  - What drives you to teach? Teach math?
  - How do your experiences give you insight into your students' learning?

Sharing out: Partner share

Photo by krakenimages on Unsplash

1. Find a partner and share your last statement on the chart paper. Feel free to share more from your chart paper if you are comfortable.
   - You will have 10 minutes each to share.
   - Take turns sharing.
   - Do not provide feedback or interrupt while your partner is speaking.

Sharing out: Group share

Photo by krakenimages on Unsplash

1. Go to the table that matches the number on your name tag.
2. As a group your coach facilitator will guide you in sharing your summary statement. Again, feel free to share as much or as little as you would like. (5 minutes to present each)

Words of encouragement are appreciated, but do not interrupt or provide feedback as others are speaking.

Share out

Photo by Brands&People on Unsplash

Share your reflections with the group.

Exploring ENACT resources

ENACT lesson log

Photo by Allison Shelley/The Verbatim Agency for EDUimages

As you introduce CT into your classroom, please record which CT strategies you used and how you incorporated student-focused practices in your lesson log.

The log will help you keep track of which CT strategies you have used a lot and which strategies students might need more work with.

ENACT resources

Several kinds of tools and resources were developed to support introducing CT strategies in your classroom in a student-focused way.

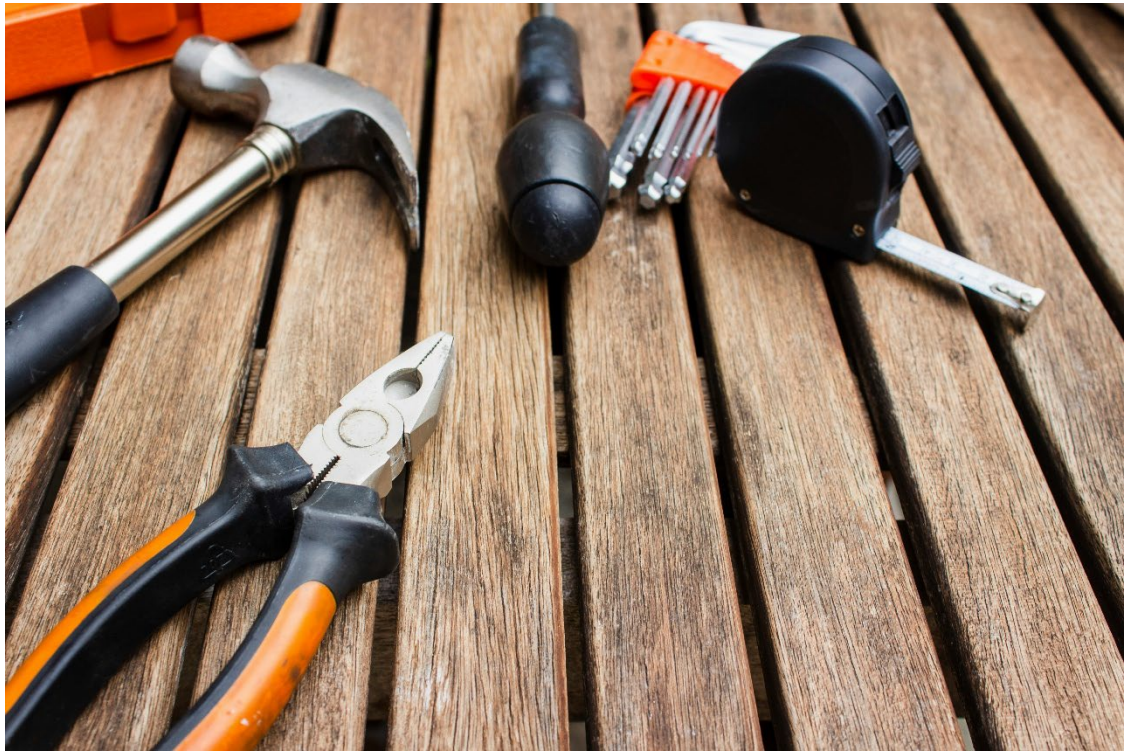
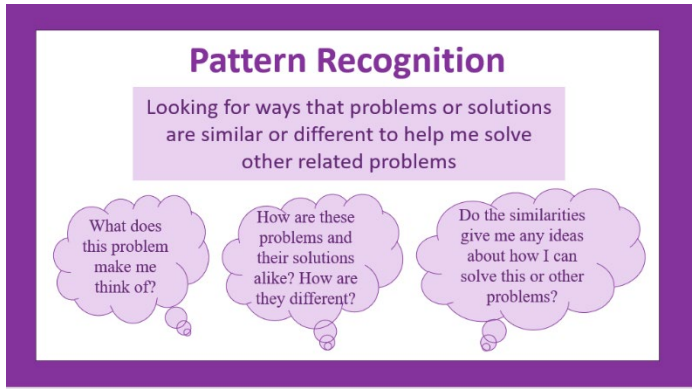
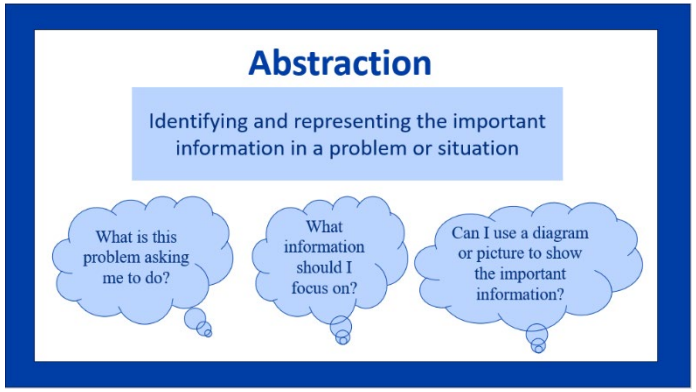


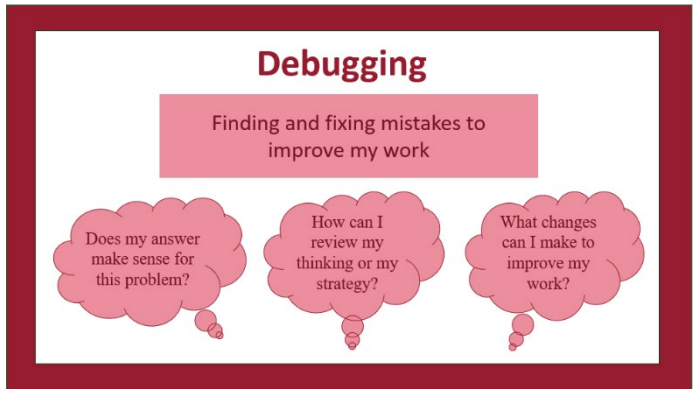
Photo by Louis Hansel on Unsplash

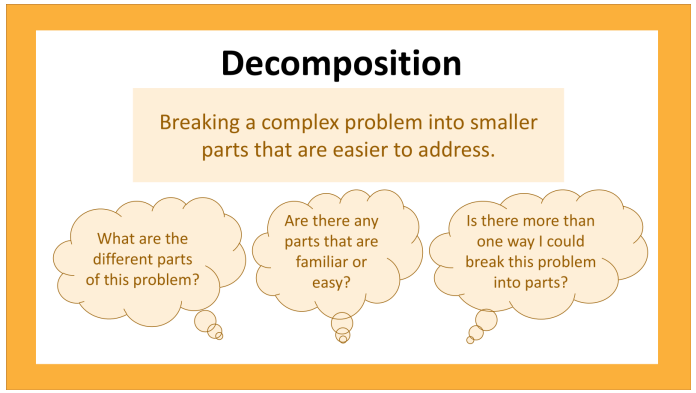
Starting off the year

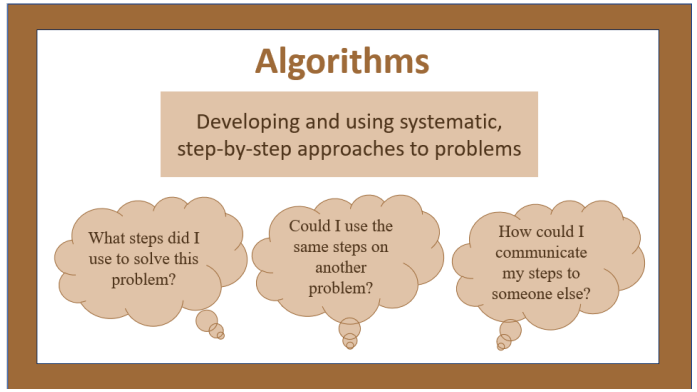
- Two playful activities help introduce the five CT strategies during your first weeks of school.
  - Ordering Octopi will introduce abstraction and pattern recognition.
  - Drawing From Directions will introduce debugging, decomposition, and algorithms.
- Copies of the CT posters to display in your classroom to remind students of the five CT strategies.











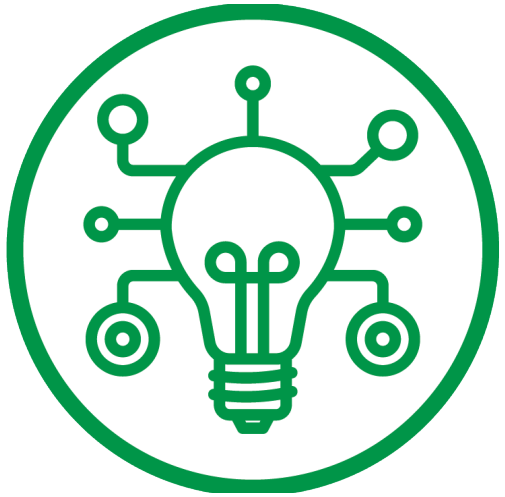
ENACT resources: Videos and viewing guides

Photo by Allison Shelley for EDUimages

Timestamp	Topic	Notes
04:20	Student Focus	Providing multiple ways of recognizing patterns is helpful for helping all students gain entry into the work of looking for patterns. Making sure that all students have access to the work supports a sense of belonging and also gives students more ways to share their thinking.
04:52	CT	Organizing representations or information to see patterns is related to another CT practice: abstraction. Visual organization can help highlight the important information in problems.
06:20	Pedagogy	The list of patterns shown in the video has specific parts underlined to draw attention to when the pattern applies. Engaging students in identifying when the pattern holds—by having them help you decide what to underline—can reinforce their thinking about the idea that a pattern does

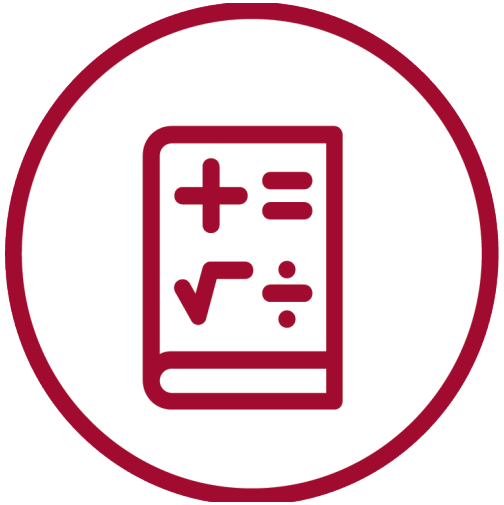
The first five videos show examples of how you can **model each CT strategies for students** by thinking aloud. You'll get a chance to **practice this in a microteaching activity.**

ENACT video icons



Computational thinking

- Scope and sequence of CT strategies.
- How CT strategies are tied to mathematics.
- Links between CT strategies.



Mathematics

- How concepts in the videos to tie to other mathematical concepts.
- Additional background on the mathematical concepts.

Student focus

- Examples of how the coach applies our four student-focused practices in the videos.

Pedagogy

- Examples of teaching practices to support implementation of CT and student-focused instruction.

Progression depicted in the video series

Modeling CT (lessons 1–5)

You: Think aloud as you use CT strategies and invite students to support your thinking.

Students: Gain exposure and experience with CT.

Structuring opportunities for CT (lessons 6–10)

You: Intentionally plan clear opportunities for CT into your lessons.

Students: Engage in structured practice and begin to take ownership of doing CT.

Prompting and pointing out CT (lessons 11–15)

You: Anticipate where students might use CT during a lesson, and prompt or point it out.

Students: Start to use CT on their own and build awareness they are doing so.

Image sources, left to right: Photo by Allison Shelley for EDUimages; Photo by Allison Shelley for EDUimages; Photo by Allison Shelley for EDUimages

Closing

Questions

What lingering questions do you have?

Illustration by Boxicons on Unsplash

Day 3 sneak peek

- Warm-up activity
- Microteaching
- Planning time
- Closing