

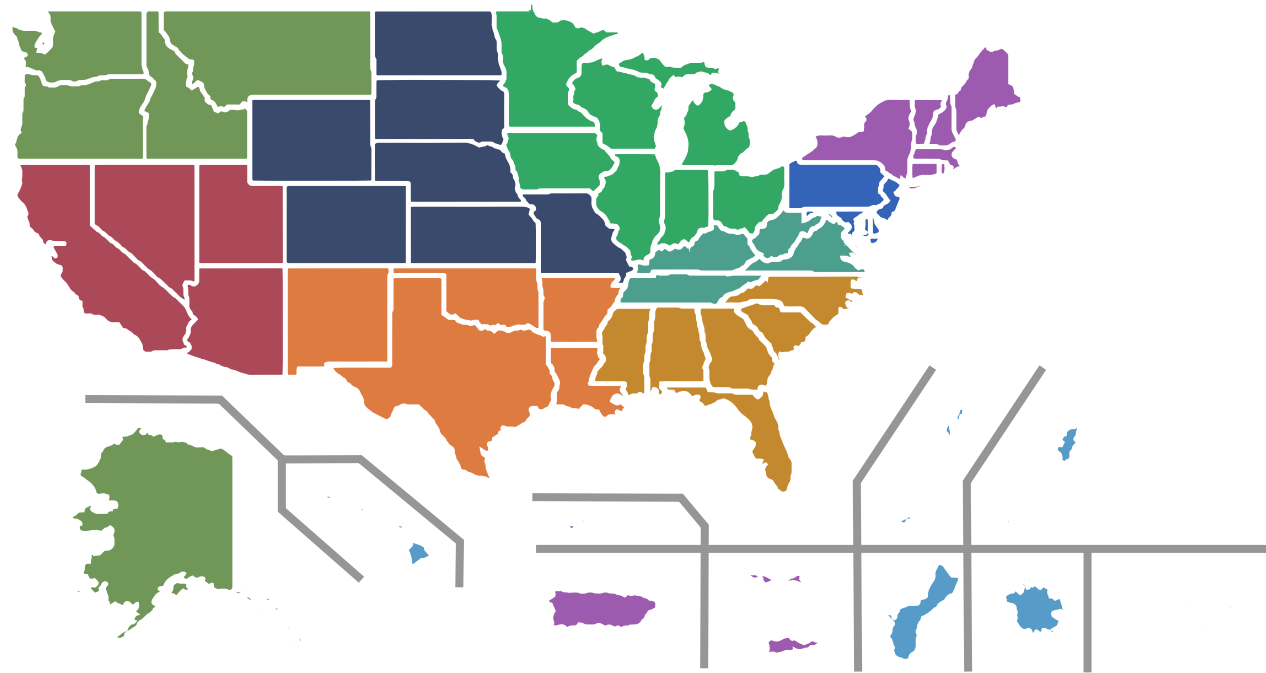
Engagement and Achievement through Computational Thinking (ENACT) Summer Institute: Day 1

Agenda for today

- Welcome
 - ENACT overview
 - Icebreaker
 - Centering ourselves in the work
 - Diving into computational thinking (CT)
 - Decomposition and mathematics
 - Abstraction and mathematics
 - Debugging and mathematics
 - Reflection
 - Coaching project overview
 - Questions and preview of day 2
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ENACT overview

Regional Educational Laboratories

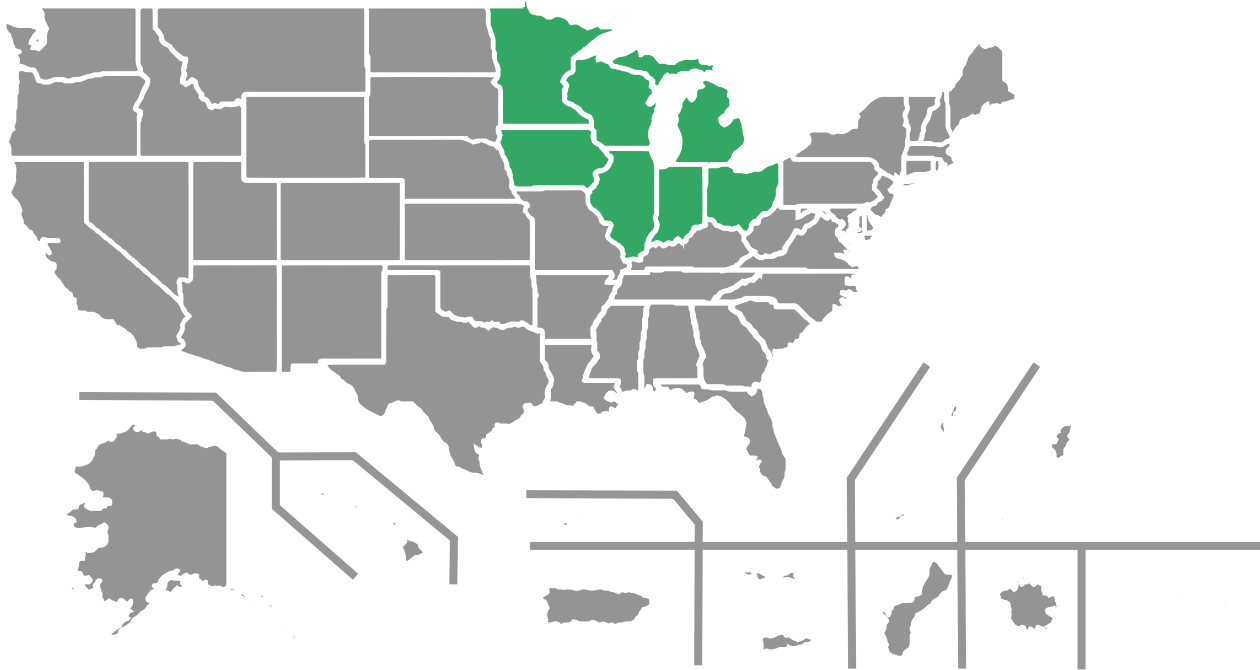


The Regional Educational Laboratory (REL) Program

The ten RELs partner with educators and policymakers nationwide. REL work is change-oriented, supporting meaningful local, regional, or state decisions about education policies, programs, and practices designed to improve learner outcomes.

The RELs are funded by the U.S. Department of Education's Institute of Education Sciences (IES).

REL Midwest



Midwest

REL Midwest partners with educators and policymakers in Illinois, Indiana, Iowa, Michigan, Minnesota, Ohio, and Wisconsin to improve learner outcomes.

<https://ies.ed.gov/ncee/rel/region/midwest>

The RELs are funded by the U.S. Department of Education's Institute of Education Sciences (IES).

Engagement and Achievement through Computational Thinking (ENACT)

ENACT's goals are to build middle school teachers' knowledge and integration of

- **computational thinking strategies** and
- **student-focused practices**

into their mathematics curricula, instruction, and assessments.

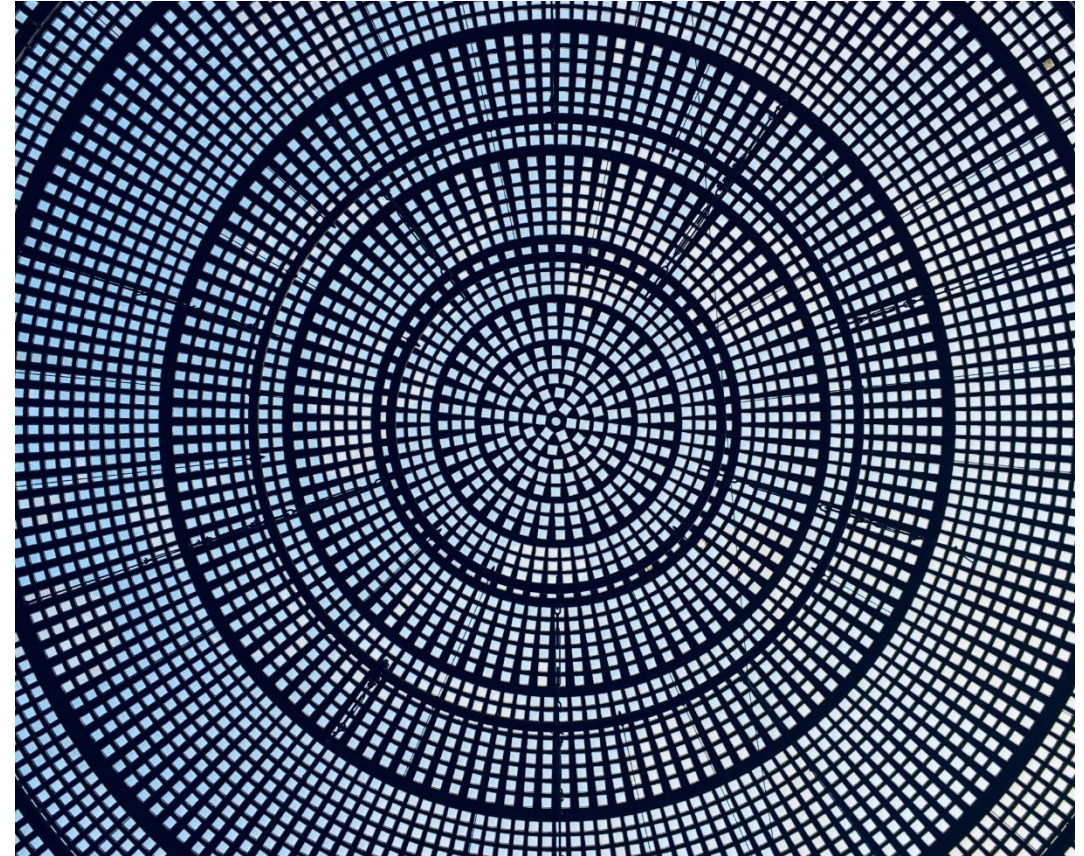


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Computational thinking: What and why?

“Computational thinking refers to the **thought processes** involved in expressing solutions as computational steps or algorithms that can be carried out by a computer.” (k12cs.org)

Although CT strategies, such as **abstraction** and **debugging**, stem from computer science, these skills have been linked to increases in **reasoning skills, general academic achievement, and mathematics achievement.**



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Student-focused practices: What and why?

Student-focused practices are teaching tools and techniques that prioritize **attention to student voices and experiences to support engagement and learning.**

Key student-focused practices include:

- Connecting to student experiences.
- Supporting student choice by enabling multiple approaches to problems.
- Valuing student thinking and voice.
- Supporting student collaboration.



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Questions

What questions do you have?



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Icebreaker

Obscure ornithology



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Find someone you don't normally work with and share the following:

- What led you to work in education?
- What do you enjoy doing in your free time?
- What is one fact about you that others might find surprising?

Be ready to share out. You will introduce your partner and share their facts.

Centering ourselves in the work: Who are you as a student learner?

Who were you as a middle school student?

1. Read the student profiles and identify the one that most accurately describes who you were as a student in middle school.
2. Reflect on how your lived experiences have influenced who you were as a student: your family, habits, life experiences, and values.



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Who were you as a student?

3. Find another teacher with the same student profile number as you.
4. On chart paper:
 - Write the attributes or characteristics of students like you at the top.
 - Write what advice would you give to your teachers to help you be successful on the bottom.

Attributes or characteristics of students like you
(such as being challenged, vocal, creative).

Advice you would give your teachers about how to support you in meaningful learning.

Pair share discussion

In pairs:

5. Discuss the guiding questions to the right and jot down your ideas.

- Are there students like you in your classes?
- In what ways do you integrate student voice into your lesson plans?
- What challenges have you faced in doing so?
- What would you like to incorporate into your lesson planning to integrate your students' funds of knowledge?

Share out!

Share the highlights of:

- Who you were as a student.
- What advice you would give your teachers to help you learn.



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ENACT's student-focused practices

- Connecting to student experiences.
- Supporting student choice by enabling multiple approaches to problems.
- Valuing student thinking and voice.
- Supporting student collaboration.

Discuss with a partner:

- How do these practices relate to the advice you gave about interacting with different types of students?
- Which student profiles might benefit most from each of these practices?

Diving into computational thinking

**What do you think of when
you hear about CT?**

Add your ideas to your poster.



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What is computational thinking?

“Computational thinking refers to the **thought processes** involved in expressing solutions as computational steps or algorithms that can be carried out by a computer.” (k12cs.org)

- CT is not (only) thinking like a computer. Humans can do the things computers do, but we can do more!
- CT is about the thinking that **humans need to do** to use computers thoughtfully and effectively.
- It’s about **getting ready to compute** and **making sense of computation results**.
- A focus on CT places an emphasis on the **human sensemaking** parts of mathematics.



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What thought processes are included in computational thinking?

Five CT strategies we'll focus on: **PRADDA**

Pattern recognition: How is this like problems I have solved before?

Abstraction: What is the important information and how can I represent it?

Decomposition: How can I break a complex problem into manageable parts?

Debugging: How can I make changes to improve my work?

Algorithms: How do I develop a systematic method and communicate it to someone else?



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To learn about the computational thinking strategies, we will...



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- Complete an activity focused on each strategy.
- Reflect on how the strategy will fit into your math instruction.
- Watch videos showing examples of how to introduce each strategy in your classroom.
- Plan lessons to introduce each strategy.
- Microteach one lesson to practice implementing CT in your classroom.

To start, share your initial ideas of how students might be using each CT strategy in math.

Decomposition and mathematics

Hanging fractions on a number line



Photo by [Keenan Davidson](#) on [Unsplash](#)

Work together to hang the fraction cards on the string as if it were a number line.

Try to be attentive to your own and others' thinking as you place items!

Afterward we'll think about:

- What you did first and why.
- Whether you all used the same approaches for placing cards.

Follow up: Hanging fractions on a number line



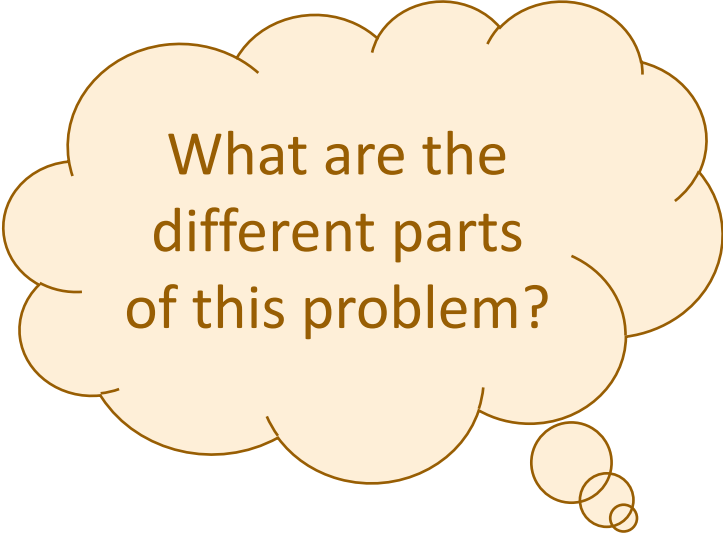
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- What did the group do first and why?
- Would you have approached the problem differently if you were working on your own?
- How did different group members jump in at different points?

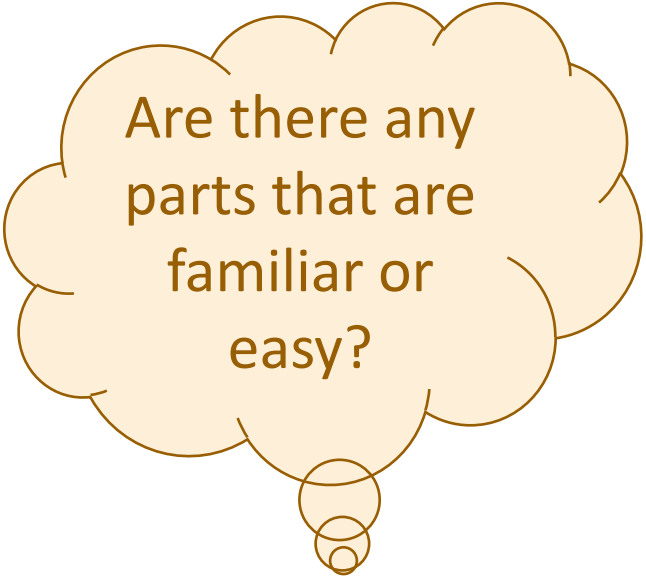
Reflect: Did you make any assumptions of what moves your teammates were making? If so, what were those assumptions?

Decomposition

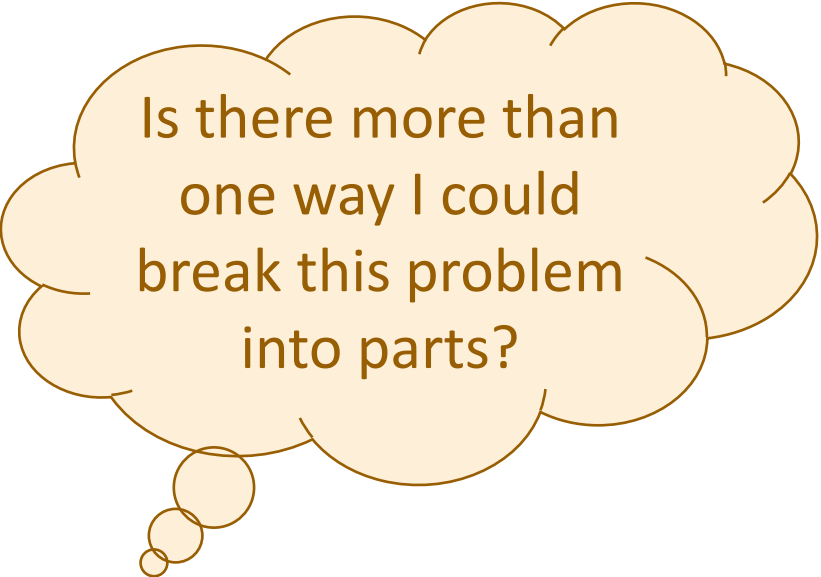
Breaking a complex problem into smaller parts that are easier to address.

A light orange thought bubble with a brown outline and three smaller circles at the bottom right.

What are the different parts of this problem?

A light orange thought bubble with a brown outline and three smaller circles at the bottom.

Are there any parts that are familiar or easy?

A light orange thought bubble with a brown outline and three smaller circles at the bottom left.

Is there more than one way I could break this problem into parts?

Reflection: What is student focused about decomposition?

- How could you connect decomposition to *student experiences*? When might they have decomposed tasks before?
- What might the benefits be for *allowing students to choose* how to decompose a task?
- How could using decomposition *support student thinking and promote student voice*?
- How can you use decomposition to *facilitate collaboration*?

Share your ideas with the group.



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In what other contexts might students use decomposition?



Add your ideas to the posters!

Photo by [Brands&People](#) on [Unsplash](#)

Abstraction and mathematics

Representing what's important, part I



Photo by [Cht Gsmi](#) on [Unsplash](#)

Read the problem.

- What would you consider to be the important information?

Examine the picture and the table.

- Where is the important information shown in each representation?
- If it isn't shown, how could you add it?

Representing what's important, part II



Photo by [Cht Gsmi](#) on [Unsplash](#)

Read the problem.

- What would you consider to be the important information?
- Create a representation that shows the important information.

Follow up: Representing what's important

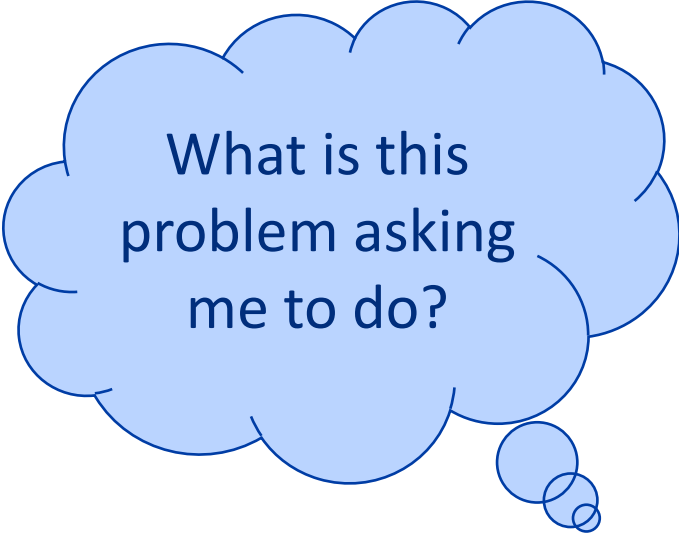


Photo by [Cht Gsmi](#) on [Unsplash](#)

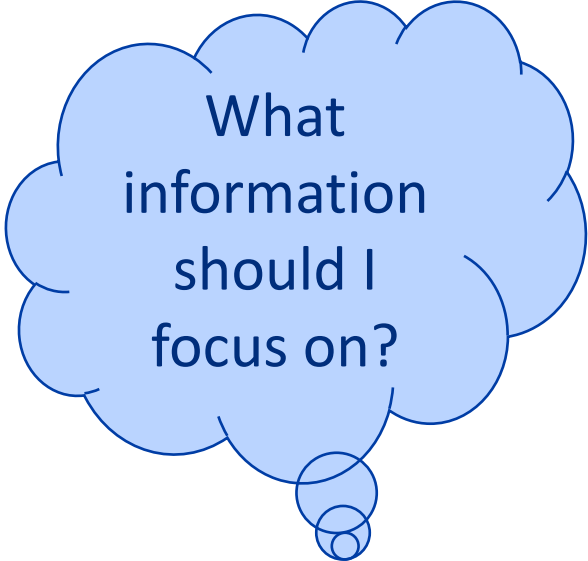
- How were our interpretations of what was important similar? How were they different?
- What support might students need to translate the important information into a representation?

Abstraction

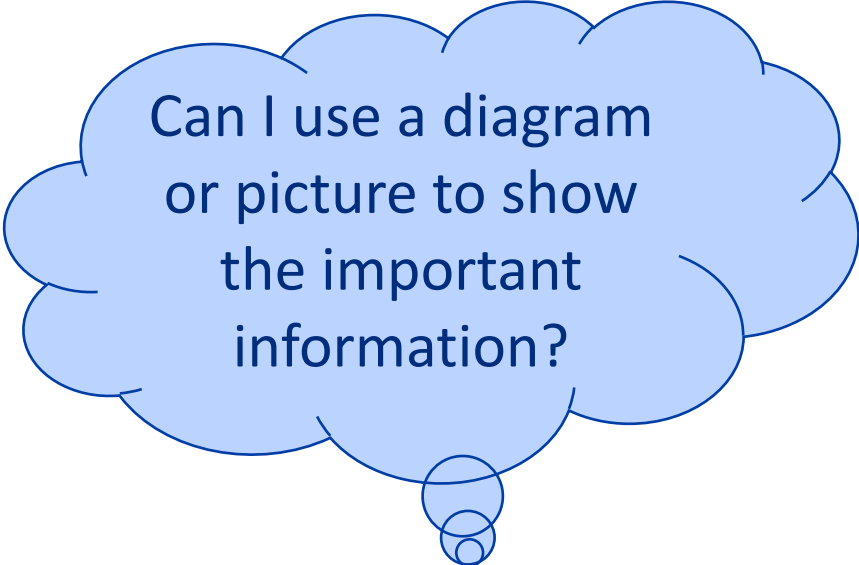
Identifying and representing the important information in a problem or situation.



What is this problem asking me to do?



What information should I focus on?



Can I use a diagram or picture to show the important information?

Reflection: What is student focused about abstraction?

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

- How could you connect abstraction to *student experiences*? When might they have abstraction tasks before?
- What might the benefits be for *allowing students to choose* how to use abstraction for a task?
- How could using abstraction *support student thinking and promote student voice*?
- How can you use abstraction to *facilitate collaboration*?

Share your ideas with the group.



Photo by [Vitaly Gariev](#) on [Unsplash](#)

In what other contexts might students use abstraction?



Add your ideas to the posters.

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Debugging and mathematics

What if math had rough drafts? Part I



Photo by [Mike Meyers](#) on [Unsplash](#)

- Compare the two tasks presented on the slide.
- Talk to a partner about the differences you notice.
- What insights into student thinking might each task give you if a student completed it and turned it in?

Compare the tasks and consider what each task might tell you about student thinking.

Find the prime factorization of:

- A) 36
- B) 100
- C) 47

Determine whether the example shows prime factorization. (Circle yes or no, then explain why you chose yes or no.)

$$36 = 3 \times 3 \times 2 \times 2$$

YES NO

$$47 = 10 \times 2^2 + 7$$

YES NO

$$100 = 10^2$$

YES NO

What insights into student thinking might each task give you if a student completed it and turned it in?

A)

$36 = 3 \times 3 \times 2 \times 2$

YES NO

$3 \times 3 \times 2 \times 2$
 $9 \times 2 \times 2$
 18×2
 36

B)

$100 = 10^2$

YES NO

Exponents are abbreviating
the prime factorizations

C)

$47 = 10 \times 2^2 + 7$

YES NO

$10 \times 2^2 + 7$
 $40 + 7$
 47 $2 \times 2 = 4$

C)

$47 = 10 \times 2^2 + 7$

YES NO

because you can't
add in a prime factorization,
47 is prime number
[Because you can't add in a prime factorization
47 is prime number.]

What if math had rough drafts? Part II



Photo by [Mike Meyers](#) on [Unsplash](#)

- Choose a problem or task from your curriculum.
- What might you want students to turn in as a final product?
- What might you want them to turn in as a rough draft?

Follow up: What if math had rough drafts?

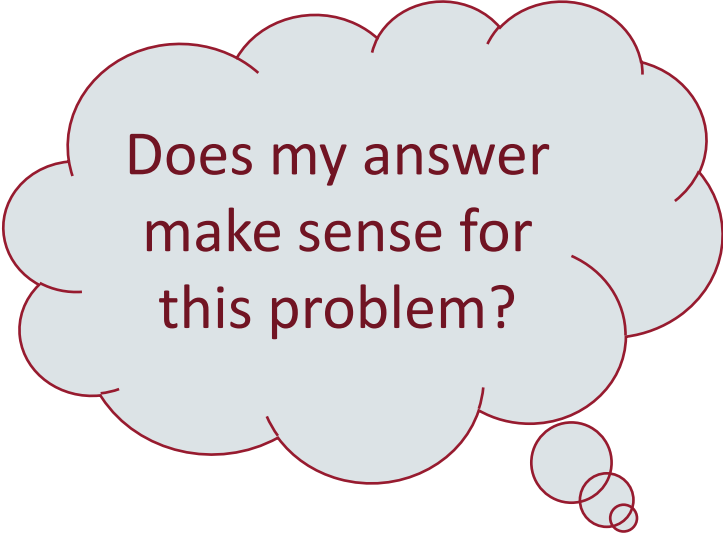


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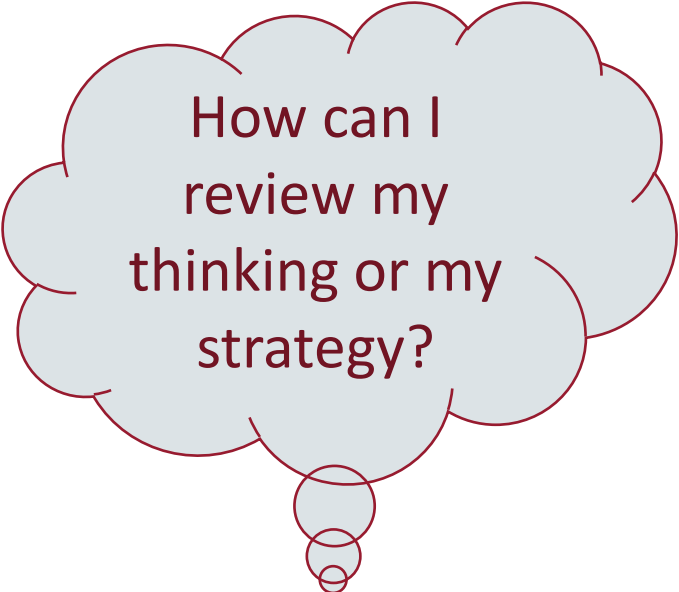
- What did you or could you change about the tasks in the lesson to support making students' thinking visible?
- How can making thinking visible support students' mathematical learning?
- How could you help students think of their work as a rough draft?

Debugging


Finding and fixing mistakes to improve my work.

A light blue thought bubble with a dark red outline and two smaller circles at the bottom right.

Does my answer make sense for this problem?

A light blue thought bubble with a dark red outline and two smaller circles at the bottom.

How can I review my thinking or my strategy?

A light blue thought bubble with a dark red outline and two smaller circles at the bottom.

What changes can I make to improve my work?

Reflection: What is student focused about debugging?

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

- How could you connect debugging to **student experiences**?
When might they have debugged tasks before?
- What might the benefits be for **allowing students to choose** how to debug a task?
- How could using debugging **support student thinking and promote student voice**?
- How can you use debugging to **facilitate collaboration**?

Share your ideas with the group.



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In what other contexts might students use debugging?



Add your ideas to the posters!

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Reflection

How has your understanding of computational thinking changed today?



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Add your ideas to the posters.

- Has your idea of CT become broader? If so, how?
- Are there additional places you have been using CT that you didn't realize until today?

Coaching project overview

ENACT coaching overview

Exploration of CT	Summer Institute Reflections on student-focused instruction Starting to plan
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Four individual coaching sessions

- ***Individual session 1:*** Classroom support as needed and planning & reflection support
- ***Individual session 2:*** Classroom support as needed and planning & reflection support
- ***Individual session 3:*** Co-scoring videos on a rubric and planning & reflection support
- ***Individual session 4:*** Co-scoring videos and reflection support

Three group coaching sessions

- ***Group session 1:*** Sharing experiences and exploring new ways to integrate CT strategies
- ***Group session 2:*** Sharing experiences and preparing to co-score videos with the rubric
- ***Group session 3:*** Sharing experiences and reflecting on your own and students' growth

CT-integrated lesson log



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 ones students might need more work with.

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Teacher reflections



Before each of your coaching sessions,
complete the teacher reflection form.

*These reflections will serve as a guide to
our coaching process and help you reflect
on how everything is going.*

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Questions and preview of day 2

Questions

What lingering questions do you have?



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Day 2 sneak peek

- 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