DIG INTO EXPRESSIONS: THE LAKE PROBLEM

Presented by MathLinks Authors
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In this session, we will explore a context that motivates students to:

- Use multiple approaches and tools to solve a problem
- To use algebra to generalize a solution for any case.

Stripping away information from a problem

Why?

- Creates interest and anticipation.
- Get more student buy-in and participation.
- Allow information to unfold organically.
- Makes a problem clearer and more understandable to more students.

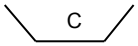
POSING THE LAKE PROBLEM

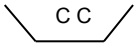
- Some adults and children need to cross a lake on their hike.
- They have a small canoe that can't hold everyone.
- Determine the number of one-way trips needed to get everyone across the lake.

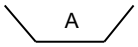
What do you know?

What do you wonder?

THE LAKE PROBLEM - Details

- Only way to get across the lake is to use the canoe
- Everyone can paddle the canoe
- 1 canoe can hold:
  - 1 child alone 

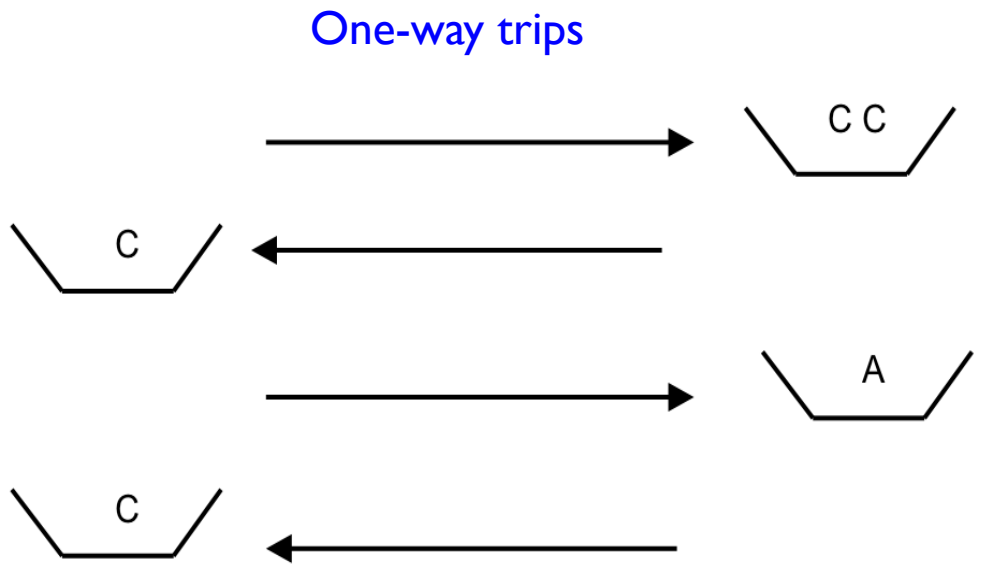
    OR
  - 2 children 

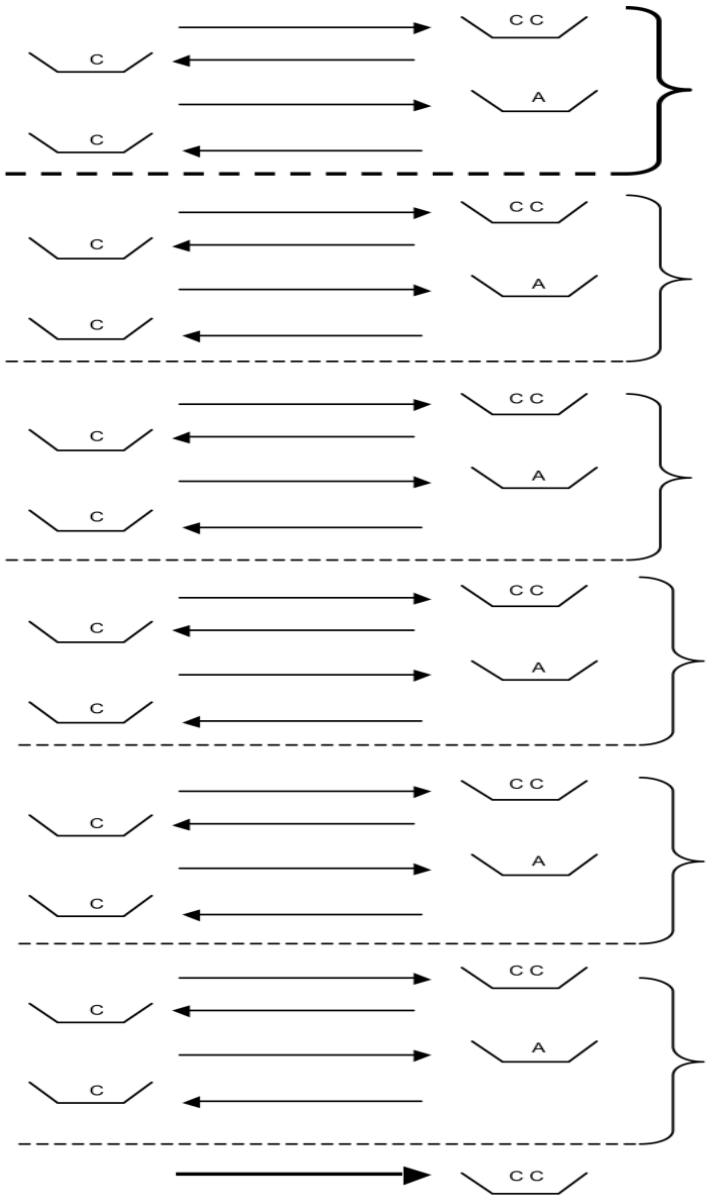
    OR
  - 1 adult alone 

- STOP!!! HOW are you going to go about solving this problem?
- <u>The Payoff</u> 6 adults and 2 children (for starters)

THE LAKE PROBLEM - getting started

6 adults remain since 2 children crossed	1.
6 adults remain and one child who comes back with the canoe	2.
5 adults and 1 child remain	3.
5 adults and 2 children remain since the second child comes back with the canoe	4.





First cycle
Gets 1 adult over and the 2 children are back to the "starting point"

2nd cycle

3rd cycle

4th cycle

5th cycle

6th cycle

Finish up with last trip

Extending the Problem

- 4 adults, 2 children, # of trips? ⟶ 4(4) + 1
- 0 adults, 2 children, # of trips? ⟶ 0(4) + 1
- 20 adults, 2 children, # of trips? ⟶ 20(4) + 1
- 100 adults, 2 children, # of trips? ⟶ 100(4) + 1
- *x* adults, 2 children, # of trips? ⟶ *x*(4) + 1
- 2 children, 201 one-way trips , # of adults? ⟶ *x*(4) + 1 = 201

Planning a Stripped Away Lesson

Prepare ahead

- Choose an appropriate problem and strategically strip away details.
- Plan potential goals and outcomes.
- Think about questions to ask students; anticipate questions they might ask.
- Allow for teachable moments.

In this session, we used The Lake Problem to:

- Help teachers see the benefits of stripping away information in a problem.
- Highlight a rich problem in which students can use multiple approaches and tools to solve it.
- Give an example where algebra is a useful tool for students to generalize a solution for any case.

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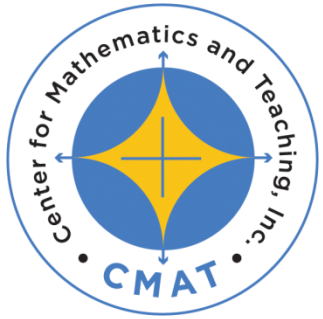

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THANK YOU!

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