

## Professional Development Series

### Series 4 Thinking Algebraically

The *Math Can Take You Places* “Thinking Algebraically” training is designed to be approximately one hour in length. The length can vary according to time constraints and participation.

To begin and end the session, use your own icebreaker/introductory/conclusion activity or choose one from the *Math Can Take You Places* Icebreaker/Introductory/Conclusion Ideas list. You may also want to begin the session by sharing an overview of the *Math Can Take You Places* curriculum toolkit.

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#### ► Materials

- *Math Can Take You Places* Professional Development Series “Emphasizing Algebraic Thinking” video
- A copy of the Thinking Algebraically “Algebra Autobiography,” “Video Reflections,” “Planning a Lesson,” “Working at Home” and “Closing Activity” handouts for each participant
- Optional: PDF slideshow “Thinking Algebraically”

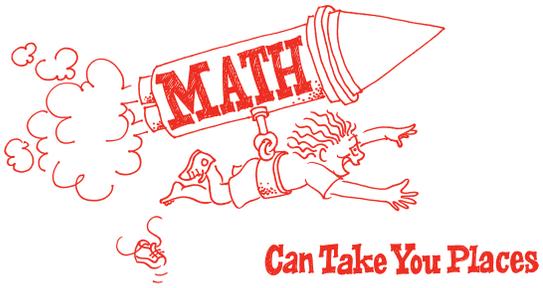
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#### ► Preparation

Make copies of the handouts listed above.

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#### ► Introductions/Icebreaker (5-6 minutes) *Slide 2*



► **Session Goals** (2 minutes) *Slide 3*

- Establish that algebraic thinking is a strand of mathematics that begins before formal instruction in Algebra I.
  - Investigate connections between different forms of algebraic representations, such as models, symbols, tables, graphs and verbal expressions.
  - Discuss tips for lesson planning,
  - Share professional expertise.
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► **Focus Statement/Question – Algebra Autobiography** (15 minutes) *Slides 4 and 5*

Say to the group, “Think back to your days as a student in an algebra class. Please write a brief description of your experiences on the 'Algebra Autobiography' sheet.” Allow about 2 minutes for this part of the activity.

Next, have participants at each table share what they have written. Allow about 3-4 minutes. Have someone record similarities and differences in their stories. Ask for volunteers to share their thoughts with the group. Have one person from each table share with the larger group.

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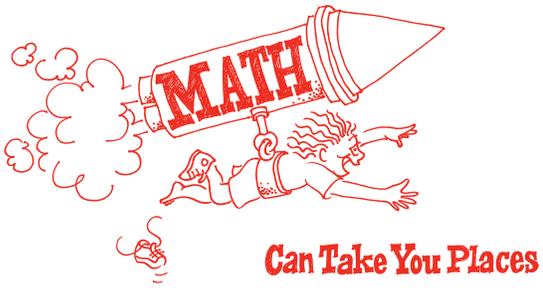
► **Opening Discussion** (8 minutes) *Slide 6*

Say to the participants,  
“How would you explain to the parent or guardian of an elementary school student that their child is learning algebra?”  
Allow volunteers to share their ideas with the group.

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► **Activity I Video Focus/Reflections** (20 minutes) *Slide 7*

1. Hand out the “Video Reflections” sheet and ask the participants to think through and answer the questions as they watch the video. Show the *Math Can Take You Places* Professional Development Series “Emphasizing Algebraic Thinking” video.
2. Review the tips that are highlighted in the video:
  - Build tables to record data.
  - Allow students to describe the process aloud.
  - Develop number sentences using variables.



3. Participants will complete the three sections of the observation sheet during and after the video.
    - How does my current instruction encourage students to think algebraically about patterns? (Sample answer: *Multiples of a number are derived by using a constant factor; this idea leads to the concept of a constant, as rate of change, in algebra.*)
    - How does my current instruction encourage students to think algebraically about numbers? (Sample answer: *Multiplication and division are inverse operations; we use inverse operations in algebra to solve equations.*)
    - How does my current instruction encourage students to think algebraically about writing and solving equations with unknowns? (Sample answer: *Students write equations to represent a situation in a word problem.*)
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► **Activity 2 Planning a Lesson/ Working at Home**  
(20 minutes) *Slides 8 and 9*

1. Hand out the “Planning a Lesson” and “Working at Home” sheets.
  2. Ask each group to develop a lesson plan idea focusing on algebraic thinking, which centers on a school-related event. For example, student lunches in the cafeteria cost \$1.30, juice is \$0.50 extra. You could organize the data in a table to illustrate the pattern or you could give students partial information in the table and have them derive the missing information.
  3. Then, ask them to create a list of tips and activities for parents/guardians, related to algebraic thinking that students can do at home. The home activities do not have to relate directly to their lesson plan idea.
  4. Ask each group to share its best ideas with the rest of the groups.
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► **Closure** (5 minutes) *Slide 10*

Allow participants to work individually to complete the “Closing Activity” sheet. Ask for a few volunteers to share their responses.

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► **Evaluation** (Optional)