

MathPartners Mentor Pre-Training

Sessions 1 and 2:

Notes to Facilitators

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Notes about Training

This training package is designed to give facilitators or leaders of mathematics mentor training the necessary information to run two three-hour training sessions to get mentors ready to begin working with students. The second session may alternatively be used after mentors have begun working with students. There is a suggested outline for each training session, followed by an explanation of each of the activities that is a part of the training. The explanations of the training activities include master copies of any transparencies or handouts needed for those activities. You may choose to use the activities in a different order or to substitute your own activity for one of these activities, but this package will give you a way to begin planning your training.

A separate training package is also available from Mathpartners to guide you through three two-hour follow-up training sessions for mentors, designed to be used after mentors have been working with students. In our experience, mentors benefit from communication with other mentors and with their facilitators while they are mentoring, and the set of follow-up training sessions provides one avenue for formally gathering mentors to discuss their experiences and questions.

To get started, read through this training package and plan how you will use the different activities during your own training. We recommend that you bring a copy of all of the Mentoring Materials (the actual mathematics activities) to the training sessions. During the training mentors will be working with a few specific examples of the math activities, but having the full set of materials available will help them to see how large a resource the materials are.

Mentor Training Information Checklist

Facilitators should read through the list of questions below, making sure to understand the answers to the questions for his or her specific mentoring program. Facilitators will have time during the mentor training to communicate with mentors about any of the logistical issues listed below that are relevant at the particular site. Spend some time deciding what information mentors will need before beginning, and what sort of systems need to be in place to take care of the issues below (such as possible modes of transportation for mentors to the site, or a system of notes to facilitate communication between the teacher and the mentor).

When will mentors meet with their student(s)?

How long should each mentoring session last? (we recommend a minimum of 30-45 minutes)

Where will mentors meet with their student(s)?

What options are there for transportation to the mentoring site?

How will mentors be matched with students?

Is there any screening that needs to be done with the mentors?

How many children will each mentor work with?

How will mentors decide which materials to use—will there be any guidance from teachers or from you about which content strands they should use?

What is the commitment that mentors are agreeing to?

- How long will they continue to meet with their students?
- What will mentors be expected to do in preparation for mentoring sessions?

What responsibilities and avenues does the mentor have for communicating with others?

- Communication with parents?
- Communication with teachers?
- Whom to contact if mentor has a question (about math, about the program, other questions)?
- Any means for getting support from other mentors?
- Whom to contact if the mentor can not get to a session (due to illness, etc.)?
- Communication with facilitator? (interviews before day 2 of training?)

Are there any liability issues that need to be dealt with?

When will the next training session be?

Is it possible for mentors to get school credit, work-study pay, or other compensation? How?

Who will get the materials for mentors—i.e. from the web page?

What happens if students are getting dropped off early or picked up late?

What avenues do mentors have for dealing with behavior issues?

Outline of Suggested Training for Session 1 and Session 2

Up-front Training					
Session 1		(3 hours)	Session 2		(3 hours)
Introductory Activities			Introductory Activities		
<ul style="list-style-type: none"> • Reflective writing • Pairs Discussion • Group Discussion 	30			15	
Program Logistics—Part 1	10		Patterns and Functions		
			<ul style="list-style-type: none"> • Discussion of importance of algebra • Function Machines • Do math together • Discuss math 	40	
Mathpartners Overview	15		Mentoring Dilemmas and Conceptual Difficulties	30	
Geometry Activity	30		Break	15	
Break	15				
Picture of Mentoring Session	30		Mentoring Simulation—Number and Operation	60	
Using Pre-Assessments					
<ul style="list-style-type: none"> • explanation of pre-assessments • do pre-assessment in pairs • group discussion 	30		Plan a Session		
Program Logistics—Part 2	10		<ul style="list-style-type: none"> • vignette • apply vignette to materials 	20	
Closing Reflections	10				

Introductory Activities **(30 minutes)**

Overview of the day (5 min.)

Facilitator: Show the transparency of the day's activities.

Reflective writing activity (5 min.) Individually, write in response to: “Think back to a time when you tried to help someone learn something—as a tutor or mentor, or perhaps in a less formal situation. What did you do? What was effective about what you did? What could you have done better?”

Facilitator: You may have your own introductory activity, which can substitute for this suggested activity. If you do choose to use this activity, start by showing the transparency with the writing prompt. This reflective writing exercise is meant to allow the mentors to ground themselves, and to reconnect with experiences like mentoring, from which they may draw images of effectiveness and questions about what contributes to greater effectiveness.

Pairs discussion (10 min.) In pairs, discuss briefly what you wrote, in particular, what you found effective, and what you could have done better.

Full group discussion (10 min.) Drawing from the experience you wrote about, what insights, concerns, questions do you bring to the planned mentoring experience?

Facilitator: This is an opportunity for you to listen for common concerns and questions, which you can have in the back of your mind for the remainder of the training.

Outline of Mentor Training—Session 1

Time	Activity
30 minutes	Introductory Activities
10 minutes	Program Logistics Discussion—Part 1
15 minutes	MathPartners Overview
30 minutes	Geometry Activity
15 minutes	Break
30 minutes	Picture of a Mentoring Session
30 minutes	Using Pre-Assessments
10 minutes	Program Logistics Discussion—Part 2
10 minutes	Closing Reflections

Reflective Writing

Think back to a time when you tried to help someone learn something—as a tutor, or perhaps in a less formal situation.

- What did you do?
- What was effective about what you did?
- What could you have done better?

Program Logistics Discussion **(10 minutes)**

1. Discuss Logistics (10 minutes)

Facilitator: This is the opportunity to lay out for your mentors what their mentoring schedule will look like: where they will go; how often; how they will get there; what choices they have; and so on through the logistical points you need to make about their involvement in your program. See the Mentor Training Information Checklist near the beginning of this training package for ideas about the types of information you will need to share with your mentors.

There is another time allotted for discussing program logistics near the end of the session. These sections of the training are very important because they allow mentors to gather important information about the process, but the information provided to any given group of mentors will depend on the set-up in the area where they will be working. Decide what information your mentors will need before starting their work as mentors, and structure the two blocks of time for “Program Logistics” around those needs.

MathPartners Overview

(15 minutes)

Big Ideas in Mentoring

- The importance of building relationships
- Consistency of contact
- Continuity over time
- A balance between helping students get up to speed and developing richer understanding
- The importance of finding out where the student's understanding is faulty
- The importance of building on what the student does understand

Outline of a mentoring year for a mentor working with 1 to 3 students:

1. Find out in what area student(s) need help
2. Administer MathPartners pre-assessment for that area
3. Choose activities that develop needed skills and concepts (using MathPartners activities or other resources)
4. Meet weekly—one or two 45-60 minutes sessions
5. MathPartners activities may last 1-3 sessions
6. When student(s) have worked through most or all of a MathPartners unit, move on to another content strand and repeat this process, starting by administering the pre-assessment for the new content strand.

Outline of a mentoring session:

1. (5 minutes) *Warm-up*. Welcoming back. Finding out if time should be reserved for addressing work the student has brought.
2. (30 minutes or, if the student has not brought work, the remainder of session) *Mentoring activity*. Doing the activity from the MathPartners materials, next in sequence after the previous session.
3. (Final 10-15 minutes). *Working with student-chosen work*. Helping the student with homework or other work he or she has brought.

Facilitator: Use any of the enclosed transparencies to discuss the ideas and structure of the mentoring process and of the MathPartners materials that are available to help in this process. An explanation of each of the lists follows:

The Big Ideas in Mentoring are some of the ideas that should always be in the back of your mind as you work with mentors, and in the back of mentors' minds as they work with students. They are the basis of the MathPartners program.

The outline of a mentoring year should give mentors an idea of what to expect over the course of the next year as they work with one or a few students.

The outline of a mentoring session transparency shows what a typical meeting between a mentor and his or her student should look like. One message to convey to the mentors is the simplicity of the structure of the session, but the ever-present importance of two challenges: the balancing of new material with what the students bring, like homework, and the management of time during the sessions. Mentors of older students—e.g., algebra students—may want to know if they can dedicate all of the time to what the students bring. Though there may be cases where this is advisable, we would argue against it as the norm. Instead, we would advocate negotiating a balance of the mentoring activities in our materials with the student's textbook or homework. The goal for mathematics mentoring is not just to provide a "quick fix," allowing students to complete the homework for tomorrow, but also to establish deeper understanding of mathematics so that students will be successful in the long run.

What the mentoring materials will do:

- Provide activities and games that emphasize and foster student understanding
- Provide an understandable sequencing to these activities
- Provide a structure for the mentoring session within which these activities can be used successfully
- Describe the key concepts at each grade level and why they are important
- Describe some of the key points of student misunderstanding and how to deal with them
- Provide tips on mentoring moves that can be used productively on a regular basis, in particular, to provide guidance in how to help the students with any work they may have brought from class.
- Provide mathematical explanations within the materials that suffice for most mentors, although some comfort in algebra is necessary for work with the 8-9 Algebra materials

What the mentoring materials look like:

- Divided into four content strands: Number and Operation; Patterns and Functions; Geometry and Measurement; Statistics and Probability for grades K-8. For grades 8-9 there are four different Algebra units.
- Divided into four grade bands: K-2; 3-5; 6-8; 8-9. The overlap in grade 8 is to allow for students in pre-algebra as well as students in formal algebra courses.
- Each unit (e.g., Number and Operation for Grades 3-5) comprises around 8-10 activities, intended to be more than enough for approximately 6-8 mentoring sessions for this content strand
- Any specialized materials required will be provided in Student Pages found at the back of the units. Mentors will be expected to gather some less specialized material, such as grid paper.

Tell the mentors that the session's training activities demonstrate many of the bulleted items in the list of what the mentoring materials will do. It is important to reassure mentors that there are mathematical explanations built into the materials, which should keep most mentors comfortable working with the materials, but that mentors working with the 8-9 Algebra materials do need to have some familiarity with algebra.

After showing the transparency that describes what the mentoring materials look like, show the following transparencies:

- *Organization of the Materials, a visual representation of the available materials.*
- *Structure of a Typical Activity, which lists the components of a typical activity. The **Overview** is a quick explanation of what will happen during the activity and a listing of the mathematical foci of the activity. **Preparation and Materials** shows what materials are needed for the activity. **Notes** is a place where mentors can find any special information about how this activity is different or unusual. The **Parts of the Activity** are the actual mathematics problems and games for students and mentors to work on, and sprinkled throughout these parts are **Teaching Tips** which give mathematical explanations and hints about working with students. At the end of most of activities are **Extensions**, which are additional parts to the activity for students who want to extend their learning in the particular area of the activity.*
- *Grades 3-5 Number and Operation Table of Contents. Each unit (there is one unit for each content area for each grade level), begins with a Table of Contents similar to this, which lists all of the activities in the unit.*
- *0—99 Chart Student Page. Student Pages are attached to the back of each unit, and they contain the materials needed for the various activities in the unit.*

Big Ideas in Mentoring

- The importance of building relationships
- Consistency of contact
- Continuity over time
- A balance between helping students get up to speed and developing richer understanding
- The importance of finding out where the student's understanding is faulty
- The importance of building on what the student does understand

Outline of a mentoring year for a mentor working with one to three students:

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3. Choose activities that develop needed skills and concepts (using Mathpartners activities or other resources)
4. Meet weekly—one or two 45-60 minute sessions
5. MathPartners Activities may last 1-3 sessions
6. When student(s) have worked through most of a MathPartners unit, move on to another content strand and repeat this process, starting by administering the pre-assessment for the new content strand

Outline of a mentoring session:

1. (5 minutes) *Warm-up*. Welcoming back. Finding out if time should be reserved for addressing work the student has brought.
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- Provide an understandable sequencing to these activities
- Provide a structure for the mentoring session within which these activities can be used successfully
- Describe the key concepts at each grade level and why they are important
- Describe some of the key points of student misunderstanding and how to deal with them
- Provide tips on mentoring moves that can be used productively on a regular basis
- Provide mathematical explanations within the materials that suffice for most mentors, except for the 8-9 algebra materials, which assume mentors have some comfort with algebra

What the mentoring materials look like:

- Divided into four content strands for grades K-8 as well as four algebra units for grades 8-9.
- Divided into four grade bands: K-2, 3-5, 6-8, and 8-9
- The overlap in grade 8 allows for students in pre-algebra as well as students in formal algebra courses
- Each unit (e.g. Number and Operation for grades 3-5) consists of about 8-10 activities
- Each unit is intended to be more than enough for approximately 6-8 mentoring sessions for that content strand.
- Any specialized materials required (e.g., the Hundreds Chart) will be provided in Student Pages found at the back of each unit.

Organization of the Mentoring Materials

	Number and Operation	Patterns and Functions	Geometry and Measurement	Statistics and Probability
<i>K-2</i>				
<i>3-5</i>				
<i>6-8</i>				
<i>8-9 Algebra</i>	(algebra strand: Variables and Equivalence)	(algebra strand: Operations and Expressions)	(algebra strand: Linear Relationships)	(algebra strand: Non-linear Relationships)

Structure of a Typical Activity

- Overview
- Preparation and Materials
- Notes
- Parts of Activity
- Teaching Tips
- Extensions

Number and Operation

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Hundreds Chart

0	1	2	3	4	5	6	7	8	9
10	11	12	13	14	15	16	17	18	19
20	21	22	23	24	25	26	27	28	29
30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49
50	51	52	53	54	55	56	57	58	59
60	61	62	63	64	65	66	67	68	69
70	71	72	73	74	75	76	77	78	79
80	81	82	83	84	85	86	87	88	89
90	91	92	93	94	95	96	97	98	99

Geometry Activity

(30 minutes)

1. Work on mathematics individually or in pairs (20 min.)

Facilitator: Distribute copies of the Geometry activity. This activity is designed to give mentors the chance to get in the mindset involved in working on mathematics themselves. They will then move on to discussing their strategies and thinking processes.

2. Full Group Discussion (10 min.)

Discuss the solution strategies that different members of the group used. Also discuss what was learned by talking about your thinking with your partner or with the full group.

Facilitator: The materials the mentors will use have at their core an appreciation for the variety of correct and meaningful ways students can think about the same mathematics activity. This valuing of variety in thinking is behind asking the mentors to compare and contrast their approaches. Further, the materials are based on the assumption that, when mathematics learners have difficulty, they often have difficulty for very good and sensible reasons, and it is important for mentors to understand some of the reasons behind several key concepts and skills, so they can help the students deal with the difficulties. The materials we provide are intended to target these difficulties, but we are aware that, on occasion, the mentors will be working with the students' own classroom materials and homework. Be prepared to discuss how to distinguish correct approaches from incorrect approaches, if that concern arises.

Picture of a Mentoring Session (30 minutes)

1. Discuss strategies and norms for watching videos (5 min.):

2. Watch video (10 min.)

3. Full Group Discussion (15 min.)

Facilitator: We are grateful to the mentors from Harvard University's HAND program and the students from the Cambridge Public Schools who allowed us to videotape their tutoring sessions. Remind mentors that what they are seeing in the video segments that are used throughout the training materials are only small glimpses into these mentoring sessions. We trust that discussions of the taped segments will respect the risks taken by those who agreed to videotape by making images public so others could engage in mentoring successfully. (It may help to ask the participants to pretend the people on the tapes are in the room.)

The first video shows a mentor working with a student on a geometry activity similar to the one that was used by the mentors in this training session. The second video shows a different mentor working with another student on a Hundreds Chart activity. The Hundreds Chart is a chart that has the numbers 0 to 99 listed in numerical order in rows of 10. It is used as the basis for many activities that help students explore the relationships between numbers and place value. Ask your mentors to watch for features of the tutor-student interactions that appear to contribute to learning.

After watching the video, ask mentors to discuss the features they noticed. Ideas that may be raised during the discussion of the video:

- Wait time (to what extent the mentor allows the student to think, patiently waiting for her to speak up rather than assuming the student doesn't know the answer)
- The benefits of having manipulatives around
- Paying attention to ideas with which the student struggles
- The mentor's participation in doing the

activities along with the student

- *The modeling of thinking strategies by the mentor*
- *The relationship between mentor and student*

Using Pre-Assessments (30 minutes)

Explanation of Pre-Assessments

- Diagnostic pre-tests to help determine areas where students could use work
- The unit for each content strand/age band has a pre-assessment with 6-10 questions
- Pre-assessments are meant to be used like the activities in the actual units—they should not feel like a test
- Each pre-assessment question includes pointers to activities that address the concepts involved in the question
- If a student has an easy time with a pre-assessment for a particular content strand, move up a grade band to choose activities or switch to a different content strand
- If students struggle with an entire pre-assessment, move to a lower grade band to choose activities or switch content strands

Read Through a Pre-Assessment and work on activities with a partner

Group discussion of pre-assessment.

Optional: Watch video of pre-assessment in use from MathPartners Training Video. If you choose this option, pass out copies of the grades 3-5 Number and Operation Pre-Assessment, and ask the mentors to pay attention to any difficulties they see the student in the video having as he works on a couple of the activities from this pre-assessment. After watching the video, discuss the following questions:

- What difficulties do you see the student having in the video?
- Where does the pre-assessment point you in the MathPartners materials?

Facilitator: Show the Pre-Assessments transparency and explain the purpose of the Mathpartners Pre-Assessments.

Walk participants through one pre-assessment from the materials, pointing out the lines underneath each question where specific Mathpartners activities are referenced. Also look at the Teacher Inventory that is attached to the back of the Pre-Assessment, and which can be used if possible to get teacher input into the concepts with which students need help. The Teacher Inventory also contains pointers to specific MathPartners activities based on the concepts marked by teachers.

Distribute copies of Pre-Assessment Instructions and Tips to help mentors understand how to use the Mathpartners pre-assessments.

Emphasize that the Pre-Assessments are not meant to be tests, and that no score will be assigned to students based on these pre-assessments. These pre-assessments are meant only as a support tool for mentors to aid them in determining which types of math activities would be most beneficial to students. The pre-assessments are designed such that the questions involved are similar to the math activities and games that are part of the regular MathPartners units. Mentors can always be paying attention to their students' thinking, whether they are working on a pre-assessment activity or a regular activity. The pre-assessments are a means for determining if a student should work on activities in a different grade band (if the pre-assessment is too easy then move up a

grade band or to a different content strand, and if the pre-assessment is too hard move down a grade band or to a different content strand). In addition, each pre-assessment question provides pointers to specific Mathpartners activities that address the same concepts as that pre-assessment question. In this way, mentors will know that if a student struggled some or was not totally confident with a certain pre-assessment question, then the activities associated with that question should be especially useful for students. All of the Mathpartners activities can benefit most students—the pre-assessments are just an extra tool to help point mentors to the activities where a little extra time should be spent, and to give mentors practice assessing students' comprehension of activities.

Pre-Assessments

- Diagnostic pre-tests to help determine areas where students could use work
- The unit for each content strand/age band has an assessment with 6-10 questions
- Pre-Assessments are meant to be used like the activities in the actual units—they should not feel like a test
- Each pre-assessment question includes pointers to activities that address the concepts involved in the question
- If a student has an easy time with a pre-assessment for a particular content strand, move up a grade band to choose activities or switch to a different content strand
- If students struggle with an entire pre-assessment, move to a lower grade band to choose activities or switch content strands

Handout—Pre-Assessment Instructions and Tips

General Instructions:

1. Choose a content strand (Patterns and Functions, Number and Operation, Geometry and Measurement, or Statistics and Probability) and ask the child's teacher to fill out the age-appropriate teacher inventory for that pre-assessment (found directly behind that pre-assessment.)
2. At the first session on that content strand, work through the age-appropriate pre-assessment with the child (but have available the pre-assessment for one age-group higher and one age-group lower.)
3. If the child has a very easy time with all of the questions, switch to the higher grade-level pre-assessment, or if the child is really struggling with all of the questions, then switch to the lower grade-level pre-assessment.
4. As you go through the pre-assessment with the child, mark the questions with which students have an easy time or a difficult time.
5. Linked with each pre-assessment question and each concept on the teacher inventory are one or more activities within the associated unit. These provide students practice with the concept associated with that pre-assessment question or with that item on the teacher inventory. Make note of the activities within the unit on which you would like to spend extra time, either because the child had a difficult time with that pre-assessment question or the teacher said the child could use work on that concept.
6. Over the course of the next several weeks you can work through the various activities in the unit, paying attention to what you learned from the pre-assessment and the teacher inventory when choosing which activities to work on and which to spend more time on.

Grades 8-9 Algebra Pre-Assessment Special Instructions:

Two of the algebra units have pre-assessments which are structured slightly different from the rest of the pre-assessments. The Linear Equations Pre-Assessment and the Non-Linear Equations Pre-Assessment are meant to give mentors an idea of whether students have mastered *all* of the concepts on the pre-assessment (or on the teacher inventory) because these concepts are all prerequisites to starting these units. In using these two pre-assessments, if students have trouble with one or more of the questions, then they need more background work in Patterns and Functions units before beginning the unit.

Tips:

- Ask students often to explain why or how they got the answers they gave (whether the answers are right or wrong). This will give you a better understanding of whether students understand the question or not, or where their thinking has led them.
- Do not think of the pre-assessment as a test. The questions in the pre-assessments are meant to be activities, and to be representative of the types of activities and games found within the actual unit. Students should not feel pressure to get the right answer during the pre-assessment, they should just be working to show you what they know and think.
- Be careful not to reveal too much—students can pick up on cues (verbal and non-verbal) about what answer you are looking for
- Give students time to think when you ask them a question.
- Don't worry about being accurate in interpreting the pre-assessments—remember that students can benefit from working on some activities even if they did not have trouble with the associated pre-assessment questions, because it can give them more practice with the skills, new insights into the concepts, and possibly a different way of looking at a particular type of task.

Program Logistics Discussion—Part 2 **(10 minutes)**

1. Discuss Logistics (10 minutes)

Facilitator: This is the second opportunity during Session 1 to lay out for your mentors the logistics of your particular mentoring program and to answer their questions about next steps. See the Mentor Training Information Checklist for ideas about the types of information you will need to consider giving to your mentors.

Closing Reflections **(10 minutes)**

Next Steps

- Read the mentor notes
- Meet with student(s)
- Know when the next training session will be
- Know who to go to with questions

Facilitator: Make sure that all mentors are leaving the session with an understanding of what the next steps are, where and when they'll meet their students, what forms of communication they should have with you or others, and when they will next be seeing you. Strongly encourage mentors to read the MathPartners Mentor Notes before beginning their mentoring sessions.

Introductory Activities **(15 minutes)**

Overview of the Day (5 minutes)

Facilitator: Show the transparency of the day's activities.

Questions (10 minutes)

Facilitator: By Session Two, mentors are likely to have a range of questions regarding their mentoring. List mentors' questions on a piece of chart paper. You can pay attention to these questions over the course of the training session, and any that don't get answered during the session can be answered at the end of the session or through follow-up e-mails or contacts.

Outline of Mentor Training—Session 2

Time	Activity
15 minutes	Introductory Activities
40 minutes	Patterns and Functions
30 minutes	Mentoring Dilemmas and Conceptual Difficulties
15 minutes	Break
60 minutes	Mentoring Simulation—Number and Operation
20 minutes	Plan a Session

Patterns and Functions

(40 minutes)

Discuss the importance of Algebra – Patterns and Functions – throughout the grades

Facilitator: Discuss the Patterns and Functions strand with mentors, and how it is related to “Algebra” as they may know it. Show the Patterns and Functions transparency.

Function Machines Video (Introducing Function Machines)

Facilitator: Show the “Introducing Function Machines” video.

Mathematical activity and discussion (60 min.)

Work on one of the Mathpartners activities that relates to pre-algebra or algebra, depending on the grade level of your students.

Facilitator: Lead the full group through a simulation of one of the patterns and functions activities. Explain the activity to the mentors as if you were their mentor, and then have them work in pairs on the activity after they have tried a few examples as a full group. Choose one of the following activities, depending on the grade level focus of most mentors, to work on with the mentors:

- *K-2 Activity 5: Patterns on a Hundreds Chart*
- *3-5 Activity 2: Function Machines*
- *6-8 Activity 3: Function Machines*
- *8-9 Activity 3: Function Machines and Mystery Machines*

Facilitator: Discuss what was algebraic in the activity as a full group. Show the transparency of discussion questions and have mentors consider the questions on the transparency.

Patterns and Functions

- Children can build the foundation for algebra from a very early age, as they identify number patterns and generalize from their arithmetic experiences
- Studying patterns and functions is an important component of algebraic thinking. Functions are mathematical input-output machines. Consider the following two questions:
 1. Byron started a bank account with \$40, then deposited \$10 each week. How much money will be in the account after 20 weeks?
 2. Byron started a bank account with \$40, then deposited \$10 each week. After how many weeks will there be \$300 in the account?

The first gives input (weeks) and asks for output (total dollars). The second gives output and asks for input. Quite often, algebra word problems require deducing unknown input from given output.

Patterns and Functions Discussion

- . What was algebraic about this activity?

- . What was difficult about this activity?

- . How were the tools that you used useful in helping you learn? (Depending on the activity you did, you might have used such tools as Function Machines or 0-99 Charts.)

Video Analysis (Optional Activity)
(60 minutes)

Mentoring video (20 minutes) Watch the mentoring video. Think about the following questions as you watch:

- Is the student experiencing any learning difficulties?
- What does the tutor do about difficulties he notices the student having?
- What might be a next step to help this child?

Pairs discussion (10 minutes) Discuss the questions that you considered during your video viewing with a partner.

Full group discussion (30 minutes) Discuss these same questions with the full group.

Facilitator: Show the transparency with questions to consider during and after watching the video. Remind mentors to focus mostly on the student and his or her thinking, rather than on the mentor and particular mentoring moves.

Facilitator: Emphasize to mentors that there rarely is a single right answer to the question: What is the nature of the student's difficulty? A student will be well served if the mentor makes his/her best attempt at determining the difficulty, then going to next steps.

Mentoring Video Analysis

- Is the student experiencing any learning difficulties?
- What might be a next step to help this child?

Mentoring Dilemmas and Conceptual Difficulties

(30 minutes)

1. Common dilemmas (5 min.)

Typically, two kinds of dilemmas can arise for mentors:

- Those that arise from the mathematics and mathematical thinking involved in the activities
- Those that seem independent of the mathematics and mathematical thinking, and may have more to do with other factors impeding the student and/or threatening the effectiveness of the mentoring session.

Facilitator: Show the transparency of the two kinds of dilemmas. One whole category of dilemmas has to do with mathematical learning; another has to do with non-learning dilemmas—e.g., the student is non-responsive. We have written a discussion scenario to help focus on managing dilemmas of the latter type., Explain to mentors that in the mentor notes and during follow-up training sessions they can learn more about dilemmas of the former type.

2. Read vignette and Mentoring Dilemmas handout (15 min.)

Read the vignette entitled “Running into a Wall.” And the Mentoring Dilemmas handout.

Facilitator: The vignette is in the Mentor Notes, but we also appended to this document a stand-alone copy of the vignette. Distribute the vignette and also the handout that shows mentoring dilemmas and tips for dealing with them, and have mentors read these handouts.

3. Discuss vignette (20 min.)

Facilitator: Use the “tips for dealing with dilemmas” to generate suggestions for how Jackson could deal with the dilemma. Use the Discussion Questions transparency to prompt the discussion.

Types of dilemmas that can arise for mentors:

- Those that arise from the mathematics and mathematical thinking involved in the activities
- Those that seem independent of the mathematics and mathematical thinking, and may have more to do with other factors impeding the student and/or threatening the effectiveness of the mentoring session.

Handout—Mentoring Dilemmas Vignette

Running into a Wall

Jackson began his second mentoring session with Carl at the library on Tuesday afternoon. He had an activity planned for them to work on – “Fracto: The Fraction Order Game” from the fifth grade unit on Number Sense and Operations – but first he wanted to hear from Carl how things were going. They had worked together last week to review for a math test, and he hadn’t yet heard how Carl had done. “How’s math going?” asked Jackson.

“It’s fine,” Carl replied, looking down at the desk.

“Yeah?” Jackson waited a moment to hear more detail, but Carl just sat there. Jackson began to feel a little uncomfortable. He tried again: “How was the test last week?”

“It was okay.”

“Did you do well?”

“I did all right.”

“The materials we went over, with the fraction strips, did that help?”

“I guess so,” Carl said.

This is going nowhere, thought Jackson. He doesn’t want to talk about math or school. And I’m starting to feel more like his mom – with a hundred and one questions – than his mentor. What do I do now?

Handout—Mentoring Dilemmas and Tips for Dealing With Them

1. Child is non-responsive, answers with short answers and doesn't communicate much
 - Ask questions that can not be answered with one word answers
 - Ask what students are thinking about or what they want to be doing
 - Try to get students talking about something that interests them
 - Give students a few options of activities and let them choose which one to do
 - Pick one of the math games found in the activities to play to warm up
 - Talk to teacher/coordinator and find out if there is anything you should know
2. Child has behavior issues . . . acting out, not listening, running around, pushing other kids
 - Talk to teacher/coordinator/parent and find out how best to help child
 - Praise for positive behavior, try not to give too much attention for negative behavior
 - Try to get students engaged in one of the activities that interests them
3. Parent or teacher wants to direct what should happen and not give mentor any leeway
 - Take input from these sources (parents and teachers can be very valuable resources) but also explain that your job is to give child additional help, above and beyond what the teacher or parent is already doing
 - Talk to program coordinator
4. Child seems scared or seems to lack confidence in trying new skills
 - Give students positive reinforcement (praise) for trying new tasks
 - Get students involved in an activity or game where the math feels different than in school
 - Express your confidence that the students can work through these activities
5. Child has learned ways of tackling problems that are different than what mentor knows or what seems to be implicit in the materials
 - Talk to child's teacher or to math coordinator of your program to get help
 - Ask students to explain how their methods work or to explain their thinking to try to understand how their thought process works
6. Child seems tired or can't sit still
 - If possible, try to arrange the mentoring sessions for a time or day that is not overly packed for the child (consult with parent, teacher, coordinator)
 - Give students a few minutes to unwind, ask about their day
 - Try to sit in an area without too many distractions (for example, you may not want to be near a window overlooking the playground where other children are playing)
7. Child seems frustrated by a particular task and doesn't want to go back to it
 - Give the student a break – move on to something else and come back to that task at another time or on another day
 - Break the task down into several steps to make it more manageable, or give students a simpler version of the task
8. Child wants to only work on homework because need that for the next day
 - Remember that helping a child get through his or homework will help them for the next day, but that is a quick fix, working on activities to develop stronger foundations in mathematics will help them in the long run
 - Explain to students that you will reserve some time at the end for homework, but that first you are going to do some activities and games that will help them understand math better, and which could therefore help them with their homework today and in the future
 - In some situations where teachers are closely involved, the mentoring activities could be assigned by the teacher so the child will assign equal importance to them
9. Child is showing signs of some kind of problem outside of school
 - Talk with your program coordinator or another person in charge A.S.A.P.

Mentoring Dilemmas Discussion

- What's the problem in this vignette?
- How does Jackson react to the problem?
- What does Jackson see as the cause of the problem?
- What are alternative possible explanations for the cause?
- What are possible next steps for Jackson?

Mentoring Simulation—Number and Operation **(60 minutes)**

4. A mentoring simulation (30 min.)

Form pairs to simulate a mentoring situation, using the materials. One person will be the mentor; the other will be the student.

Facilitator: If you anticipate that your mentors will have a mix of individual students and pairs/small groups of students in their mentoring work, you will likely want to divide the students into 2's and 3's.

Hand out the sheets describing each role—mentoring role sheets to the mentors and student role sheets to the students. Also give the mentors who are simulating mentors a copy of the activity that they will be using. Depending on the age group that most of your mentors will be working with, you might choose any one of the following four activities to have the mentors use: K-2 Number and Operation Activity 4: Counting Strategies, 3-5 Number and Operation Activity 1: Exploring the 0-99 Chart, 6-8 Number and Operation Activity 2: Equivalent Fractions, or 8-9 Algebra Linear Relationships Activity 1: Pattern Trains. Give them several minutes to read before starting the simulation.

5. Debriefing and questions (20 min.)

Facilitator: This is a time for debriefing the simulation. In the interests of time, also, ask for only 2-3 mentor comments and 2-3 student comments, along the lines of "What was it like to be the mentor (the student)?" You can also refer to the questions on the role sheets given to the mentors and students. Given the instructions on the role sheets, there should be reflections about the difficulty of asking helpful questions (for the mentors) and about the difficulty of communicating mathematical thinking (for the students).

This also is the time for mentors to ask any questions related to all aspects of what they just engaged in regarding mentoring students in Number and Operation (or Algebra if they used the 8-9 Algebra activity).

Handout—Mentoring Simulation Mentor Role Sheet

You are about to simulate a mentoring situation in which you are a mentor and your partner is a student learning about one of the content strands from the Mathpartners materials.

Preparation:

- Read through the entire activity. Read the Mathematical Focus, Preparation and Materials, Notes, and the parts of the activity your facilitator tells you to use during the simulation.
- Think through how the activity will proceed and make note of any important aspects of the activity.

During the simulation you should:

- Try to ask questions that will get the student to show you his or her thinking.
For example: *What steps did you take to get to this point? Why did you use this number? Why might that work? Explain what you did.*
- Give the student the chance to work problems out his or her own way.
- Help redirect the student's thinking when necessary.
For example: *Encourage the student to try different methods of solving problems. What else could you try? What if you tried this number instead?*
- Make sure the student sees why solutions work. Ask, and then show, if the student doesn't understand why the solution works.

Questions that you should have in mind during and after the simulation:

- What parts of these activities were troublesome for the student?
- What parts were troublesome for you?
- Did you succeed in encouraging the student to try new methods of thinking?
- Were you successful in getting the student to explain his or her thinking?
- What worked or didn't work in finding out about your student's thinking?
- What would you do differently next time?

Handout—Mentoring Simulation Student Role Sheet

You are about to simulate a mentoring situation in which you are a student in grades K-9 learning about one of the content strands from the Mathpartners materials. Your facilitator will specify which age band your mentor will be using, and therefore what age student you are simulating.

During the simulation you should:

- Take on the role of a child in the appropriate grade (one who is cooperative).
- Pretend that this is not easy for you.
For example: *I've never seen stuff like this before. I don't get it.*
- Follow the directions of the mentor.
- Try to explain your thought process, if asked to do so by the mentor.
- Make a mistake or two, or ask questions.
For example: *Make math mistakes. I don't know what you're asking. Why do I do that here?*

Questions that you should have in mind during and after the simulation:

- Did I have chances to explain my thinking?
- What is the mentor doing that is helping me to explain my thinking?
- Is it difficult to fully explain my thinking?
- What difficulties might a child have in explaining their thinking?
- Is the mentor giving me the chance to try my own methods?
- What do I learn by trying these activities?
- What parts of these activities would be difficult for students?
- What might I do differently if I were the mentor?

Planning a Session *(20 minutes)*

1. Read vignette (5 min.)

Read the vignette entitled “A Mentor Plans.”

Facilitator: Distribute the vignette to mentors to read. Make sure to point out that pre-assessments associated with each Mathpartners unit are another resource for planning sessions.

2. Full group discussion of vignette (10 min.)

Facilitator: The vignette is designed to make concrete the several structural features of the mentoring model, in particular, the structures of:

- *The six-week unit*
- *The individual mentoring session*

In addition, it is intended to point to the value of and need for thoughtful planning for the use of the materials.

Discussion should highlight these points.

3. Applying the vignette to the materials (20 min.)

Form pairs by preferred grade level. Read through the first Pre-Assessments and activity for your grade level. Plan together for your first (or next) session. Use the “Questions to Consider When Planning” to help guide this discussion.

Facilitator: This activity is intended both to allow the mentors to leave with concrete plans in hand, but also to elicit questions and concerns about the materials or about expectations concerning their use of the materials or their involvement in the program. Circulate from pair to pair and check whether such questions or concerns have arisen. Show the transparency “Questions to Consider When Planning” to help guide the mentors’ discussions. (Also, distribute it as a handout for the mentors to take away with them.)

Handout—A Mentor Plans

Tina had decided to use the Number and Operation unit for grades 3-5 with Jake, a third grader she had been paired with in the math-mentoring program. She had talked with his teacher and his mom, who both said that Jake had really struggled last year with his number facts and with place value. She had not yet had a chance to meet him, but on the basis of the information she'd gathered she laid out the following plan for working with Jake.

- She would focus on place value first, because she wondered if Jake's struggle with number facts was related to a misunderstanding of place value.
- She would start with the 3-5 unit, but was also open to using the K-2 materials, since there were a lot of place value activities there, and since Jake had also struggled with 2nd grade math.
- She decided to always bring some 0-99 Charts, Number Lines, and Digit Cards since that would give her the flexibility to play any of the games they had worked on, especially if Jake didn't bring any homework to talk about.

Here's the plan she made for the first six sessions with Jake, in which they would use this unit:

Session 1	Session 2	Session 3	Session 4	Session 5	Session 6
<ul style="list-style-type: none"> • Check in (5 min) • Explorations on the 0-99 Chart: Look for Patterns; Mystery Patterns (40 min) • Work on homework 	<ul style="list-style-type: none"> • Check in (5 min) • Windows: Addition and Subtraction, and (if time), Multiplication and Division (40 min) • Work on homework or review number facts by playing Mystery Patterns on 0-99 chart 	<ul style="list-style-type: none"> • Check in (5 min) • Twenty Questions (40 min) • Work on homework or review number facts by playing Windows Addition and Subtraction 	<ul style="list-style-type: none"> • Check in (5 min) • Number Line Addition and Subtraction (40 min) • Work on homework or review number facts by playing Windows Multiplication and Division 	<ul style="list-style-type: none"> • Check in (5 min) • Explorations on the 0-99 Chart: Factors, Multiples, Connect Four Multiples (40 min) • Work on homework or review number facts by playing Twenty Questions 	<ul style="list-style-type: none"> • Check in (5 min) • Using Fours (40 min) • Work on homework or review number facts by playing Factor Game
Notes	Notes	Notes	Notes	Notes	Notes
ask lots of questions, use exploration of hundreds chart as assessment to determine what he understands	if he needs a lot of help with place value, could also do more 100's chart activities, using K-2 unit	I'm trying Windows before Twenty Questions and Number Line, since it focuses more on place value		Return to 100s chart to do factors and multiples activities we skipped	

A Mentor Plans (continued)

The vignette illustrates particular features of our model:

- For one, it shows how we thought of the typical mentoring year, namely, that it would comprise four content strands, each about six sessions in length.
- Further, the model assumes continuity in the content across mentoring sessions, at least for the six sessions that form each content unit.
- Each session has three parts—a check-in; work on the content provided in the mentoring materials; attention to any work the student has brought. Time allotted for each depends on whether the student has brought work, and how much.
- Finally, the vignette suggests the importance of planning and preparation in mentoring. Planning for a block of six sessions may not always be necessary, but some advanced planning is always advisable.

The vignette also touches on several of the “big ideas of mentoring”, namely, the importance of consistency of contact and continuity over time. It also suggests, in the mentor’s notes, the importance of another big idea, maintaining a balance between bringing students up to speed and helping them develop deeper understanding.

Questions to Consider When Planning

- What have you learned today that might alter what you do with your student(s)? (new strategies, more insight into learning difficulties, etc.)
- Are there problems you have faced in prior mentoring experiences that you would like to brainstorm about with your partner or the facilitator?
- What strategies have worked well so far?
- What strategies have been less effective and why do you think that is?

Closing Remarks and Questions

Facilitator: Make sure that all mentors are leaving the session with an understanding of what will happen now, how long they'll continue to meet with their students, what forms of communication they should have with you or others at this point, and whether there will be any more meetings of all of the mentors.