



## **Case Study #1**

### **Grade One: Math Computation**

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## Grade One: Math Computation

### Purpose of Case Study

The purpose of this case study is to highlight the integral role that progress monitoring (PM) plays throughout any Response to Intervention (RTI) process. This example uses a three-level, responsiveness-to-intervention (RTI) method for identifying students with learning difficulties. Using a fictional first-grade classroom as the setting for this example, readers are provided with a framework of the RTI identification process, along with frequent opportunities to test their comprehension of the information presented. First, an overview of RTI and PM is provided, followed by an introduction to Ms. Lockhart and her first-grade students. The remainder of the case study illustrates the use of RTI as a method for identifying students with learning difficulties, specifically in the area of mathematics computation.

Throughout the text, readers are queried to test their comprehension of material covered, with answers provided for evaluative purposes.

### Overview of RTI

Public school systems in the United States rely largely on two methods for identification of students with learning disabilities (LD). The first method is the traditional IQ/achievement discrepancy, in which students must demonstrate, through formal psychometric evaluation and professional observation, a significant disparity between cognitive ability and actual academic performance level. The second method allows diagnosticians and educators to use “responsiveness-to-intervention,” or RTI, as an alternate method of LD identification.

#### *RTI Model*

Increasingly, states and school districts are considering RTI as an identification method for LD. The RTI method looks at student unresponsiveness to otherwise effective instruction. With RTI, special education is considered only if a student’s performance reveals a dual discrepancy in terms of level and rate: The student a) performs below the *level* demonstrated by classroom peers, and b) demonstrates a learning *rate* substantially below that of classmates.

RTI takes into account that educational outcomes differ across a population of learners and that low-performing students may ultimately perform less well than their peers. All students do not achieve to the same degree of academic competence. However, simply because a student’s academic performance level or rate is low, it does not necessarily indicate the student should receive special education services. Only when a student demonstrates a dually discrepant academic profile (i.e., level *and* rate deficits) should special education be considered.

For example, if a low-performing student is learning at a rate similar to the growth rate of other students in the same classroom environment, then he or she is demonstrating the capacity to profit from the educational environment. Additional intervention is unwarranted. On the other hand, if a low-performing student is not manifesting growth in a situation where others are thriving, then consideration of special intervention is warranted. Alternative instructional methods must be tested to address the apparent mismatch between the student's learning requirements and those represented in the conventional instructional program.

RTI identifies low-performing students with LD when their response to educational intervention is dramatically inferior to that of peers. The premise is that these students who respond poorly to otherwise effective instruction may have a disability that limits their response to conventional instruction and, thus, require specialized treatment to affect schooling outcomes associated with success in life.

#### *Advantages of RTI*

One advantage of RTI is that students are identified as LD only if they fail to respond to instruction deemed effective for the vast majority of students. In effect, RTI eliminates poor instructional quality as an explanation for a student's poor academic performance.

Another advantage of RTI is that students are provided with early intervention. Unlike the more traditional IQ/achievement discrepancy model, an RTI model does not wait years for students to fail before identification and intervention. RTI provides struggling students with prompt opportunities, early in their academic career, to receive quality educational interventions. This timely intervening may help to close the achievement gap between them and their more competent peers at an expedited rate.

Finally, RTI is advantageous because assessment data linked to classroom and curricular objectives are collected frequently and consistently. These data serve to inform the teacher of students' performance and to decide which level of instruction is appropriate for each student. Further, frequent data collection helps the teacher improve instruction, as it provides feedback with which the teacher may self-evaluate the success of his or her lessons and instructional components.

### *Basics of RTI in this Case Study<sup>1</sup>*

RTI uses response to intervention (or lack thereof), at various levels of a prevention system, to identify students with mild to moderate disabilities (e.g., LD or BD). In this school, students are provided effective instruction in the general education classroom, referred to as "primary prevention." Students suspected of being at-risk are identified by a percentile cutoff on a screening measure: a norm-referenced test or a cutoff point on a curriculum-based measurement (CBM) test. The suspected at-risk students are assessed using progress monitoring. Students unresponsive to primary prevention receive research-based preventative treatment, usually comprised of small-group tutoring, during which progress is monitored frequently. In this school, this tutoring is referred to as "secondary prevention" intervention and is under the auspices of general education.

Responsiveness-to-intervention is determined using final status on a norm-referenced test, using a CBM benchmark, and/or considering the amount of progress demonstrated during secondary prevention. The last two options highlight the integral role that progress monitoring (PM) plays throughout any RTI process. Students who respond well to secondary prevention discontinue with small-group tutoring. This highlights the integral role that progress monitoring (PM) plays throughout any RTI process. Students who do not respond to secondary prevention are considered for special education services, referred to as "tertiary prevention." At this point, students may undergo more formal psychometric evaluation to determine the scope and extent of their deficits.

In this case study, tertiary prevention takes place under the auspices of special education. During tertiary prevention, more intensive one-on-one instruction occurs. If a student continues to make inadequate progress, the student receives a more comprehensive and formal evaluation to pinpoint specific strengths and weaknesses, student IEP goals are established, individualized student programs are developed, and student progress is monitored to determine effectiveness of instructional programs and/or decide when a student may move back into secondary or primary prevention.

### *How This Case Study Demonstrates RTI*

The number of levels in the multi-level prevention systems, within RTI, varies from model to model. In this case study, the most widely researched three-level model is used here. Primary prevention takes place in the general education classroom under the auspices of the general education teacher. During primary prevention, an effective research-based curriculum is faithfully implemented in the classroom. As previous research has shown, these interventions work for the vast majority of students. All students are screened at the beginning of the year to determine which students are suspected to be at-risk for academic failure.

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<sup>1</sup> In this case study, we use the terms *primary*, *secondary*, and *tertiary* prevention to describe a three-level RTI model. Often, a three-tier RTI model is used. In this case study, primary prevention refers to Tier 1, secondary prevention refers to Tier 2, and tertiary prevention refers to Tier 3.

To avoid missing any students who will eventually develop problems, a wide net is cast whereby the lower half of the student body, identified from screening (a one-time, brief test), receives weekly progress monitoring. Students whose progress (across the next 6 to 10 weeks of primary prevention in general education) falls below a specified cut-off point are determined to be at-risk for poor learning outcomes and enter secondary prevention.

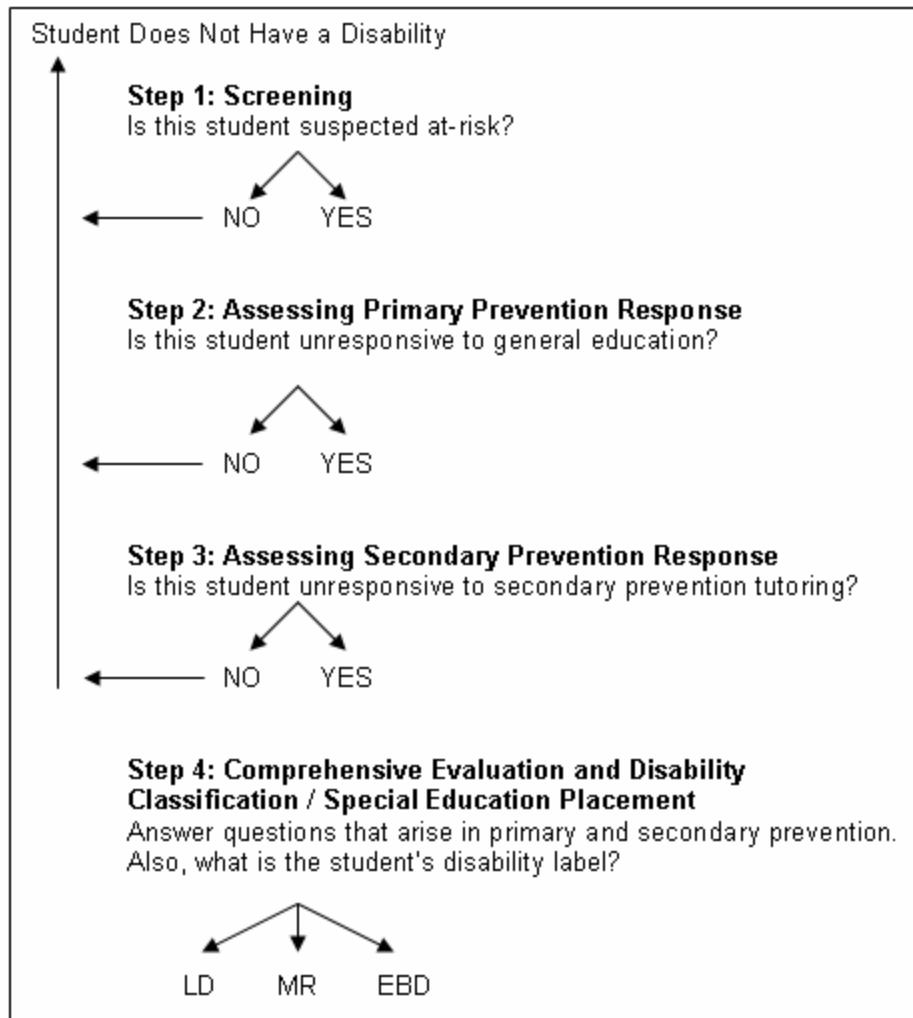
Secondary prevention involves small-group preventative tutoring. The tutoring in secondary prevention is viewed as a test to which at-risk students do or do not respond to determine whether more intensive support is required. This tutoring relies on validated research-based programs, and student progress is assessed weekly.

Students (a) who complete secondary prevention at a satisfactory level and (b) whose progress during secondary prevention, as evidenced by the weekly progress monitoring, are deemed as "responsive," move back into primary prevention. Students who are "unresponsive" (i.e., who do not achieve at an adequate final performance level or do not progress adequately during secondary prevention) are in need of more intensive support. These students move into tertiary prevention which often involves special education resources, such as one-on-one tutoring with an interventionist or special education teacher.

Typical RTI procedure in this school is the following:

1. All students in a class, school, or district are screened (i.e., tested) once in the fall to identify students most at-risk for long-term academic difficulties.
2. The progress of these students suspected to be at-risk is monitored in general education (primary prevention) to confirm risk. These students' needs are not being met with the general education curriculum. Therefore, they require more intensive tutoring (secondary prevention).
3. For the at-risk students, research-validated secondary prevention tutoring is implemented. Student progress is monitored throughout, and upon completion of, the intervention.
4. Students who do not respond to the secondary prevention, as indicated by (a) not completing secondary prevention at a satisfactory level, and (b) not progressing during secondary prevention, as evidenced by weekly progress monitoring, are referred for a comprehensive evaluation to answer questions generated during primary and secondary prevention and to determine special education eligibility.
5. Progress is monitored during tertiary special education to (a) set IEP goals, (b) gauge effectiveness of individualized programs, and (c) define responsiveness-to-intervention in tertiary special education in order to formulate ideas about when to exit students from special education. It should be noted that once a student is identified as eligible for special education, an IEP is developed and special education service provided consistent with that IEP. Progress monitoring continues to determine the student's progress toward meeting annual goals. If the student does not appear to be making adequate progress, then the IEP team should meet to determine whether changes are needed in the IEP.

Another helpful way to understand how students move through the multi-level prevention system is by this flow chart. If the answer is "yes" for Step 1, then the student moves to Step 2. Step 2 assesses student response in the general education intervention in primary prevention. If the answer is "yes," then the student moves to Step 3. Step 3 assesses student response to the intervention tutoring in secondary prevention. If the answer is "yes," then the student is referred to special education. Any time the answer is "no," the student is determined not to have a disability.



### *Progress Monitoring*

Progress monitoring (PM) is a vital aspect of the RTI model. During PM, teachers assess students' academic performance using brief reading or math measures. PM takes place frequently (weekly or bi-weekly), and each alternate test form assesses performance of what is expected at the end of the school year. The score on the PM measure is viewed as an indicator of overall student performance.

In this case study, PM is operationalized through the use of curriculum-based measurement (CBM).

1. CBM benchmarks are used for screening and identifying students suspected to be at-risk for academic failure.
2. CBM slope is used to confirm or disconfirm actual risk status by quantifying short-term response to general education primary prevention across 6 - 10 weeks.
3. CBM slope and final status is used to define responsiveness to secondary preventative tutoring.
4. CBM slope and final status are used to
  - a. Set IEP goals,
  - b. Indirectly formulate effective individualized programs, and
  - c. Define responsiveness-to-intervention to tertiary special education in order to formulate decisions about when to exit students from special education.

## An Introduction to Highland Park Elementary

### *Descriptive Information*

Highland Park Elementary is located in a lower-income area of a western state. The school has 460 students in grades K through 6. Highland Park students are 40% African-American, 25% Caucasian, and 35% Hispanic. Approximately 70% of students in the school receive free or reduced-price lunch.

### *Previous Experience with RTI Model*

Highland Park has used an RTI model to prevent students from being erroneously identified for special education for the past three school years. Initially, the principal and teachers were searching for an alternative to the IQ/achievement discrepancy model that would allow for more intensive, earlier prevention services for low-achieving students and a more efficient referral process for special education. They realized that an RTI approach had the potential to address both concerns.

In the initial year, one first-grade and one second-grade classroom “piloted” the RTI model. At the end of that first year, participating teachers and administrative personnel evaluated the results of using RTI in lieu of the traditional IQ/achievement discrepancy model and decided to continue with RTI.

Prior to the beginning of the subsequent academic year, all teachers participated in a workshop during which the essential components of progress monitoring and RTI were explained, demonstrated, and practiced. Teachers saw that RTI had the means to reach struggling students in a more efficient manner than the school’s current referral process, and that PM could serve a critical role in guiding instruction.

During that second year, one teacher from each grade level used RTI in his or her classroom to provide prevention and identify students with possible LD. The remaining teachers used CBM weekly to progress monitor all students in reading and math. Teachers met bi-weekly at grade-level team meetings to analyze the data, to discuss their students’ progress, and to assist each other with instructional changes to respond to these. Additionally, the teachers using RTI and the principal met monthly, to discuss the positive and negative aspects of the new identification model.

Following additional in-service training on RTI procedures, the third year began with every classroom in the school using RTI to guide the prevention and identification of students with learning difficulties. Bi-weekly grade-level team meetings continued, and a portion of each monthly faculty meeting was devoted to a discussion of PM and RTI.

### A Closer Look: Ms. Lockhart's Class

#### *Descriptive Information*

Ms. Lockhart has 17 years of experience teaching elementary school. She has taught first-grade at Highland Park Elementary School for the last 8 years. This is Ms. Lockhart's first year using RTI in her classroom. The previous year, she used reading and math progress monitoring measures to evaluate her students' response to classroom instruction.

Ms. Lockhart has 19 students in her classroom and utilizes a district-mandated mathematics curriculum to guide her instruction. The district selected this curriculum for its emphasis on integrating reading and writing skills with math activities; basing content on research-based practices; including conceptual- and procedural-based lessons; and providing differentiated instruction for a range of student ability levels. In addition, the scope of topics taught with this curriculum are linked to the state's mathematics content standards, ensuring that the covered material is aligned with the state's end-of-year "high-stakes" assessments.

Ms. Lockhart likes this particular math curriculum for her students. She believes that the "Big Ideas" of the curriculum provide a strong foundation for mathematics understanding at the first-grade level. Topics such as addition and subtraction concepts, data and graph interpretation, geometric shapes, and measurement are introduced, taught, and frequently reviewed across the units. Strategy instruction and problem solving is integrated within and across topics, and optional activities are available for struggling students, higher-achieving students, and students not fluent with the English language. The activities in the textbook promote "hands-on" learning with carefully mediated scaffolding. There is sufficient practice and cumulative review to ensure mastery learning.

Furthermore, the curriculum lends itself well to formative evaluation such as progress monitoring with curriculum-based measurement. Students have repeated opportunities across units to revisit and build upon previously taught skills. If a student fails to master a particular conceptual or procedural skill, the student's data demonstrate that. As a result, Ms. Lockhart is able to adjust her instruction accordingly, perhaps by selecting one or more of the research-based activities provided in the text to strengthen the student's understanding.

#### *Ms. Lockhart and CBM*

Ms. Lockhart monitors her students' math progress using first-grade Math CBM Computation tests. The Math CBM Computation probes consist of 25 math computation problems representing the year-long, first-grade math computation curriculum. The type of problems represented on each test remains constant from test to test. The facts to be tested, however, and their positions on the test are selected randomly.

Here is a sample of one of the CBM Computation tests Ms. Lockhart uses in her classroom.

Sheet #1

Computation 1

Password: ACT

Name: \_\_\_\_\_ Date: \_\_\_\_\_

A $\begin{array}{r} 0 \\ + 3 \\ \hline \end{array}$	B $\begin{array}{r} 7 \\ + 3 \\ \hline \end{array}$	C $\begin{array}{r} 0 \\ + 7 \\ \hline \end{array}$	D $\begin{array}{r} 54 \\ + 33 \\ \hline \end{array}$	E $\begin{array}{r} 7 \\ + 2 \\ \hline \end{array}$
F $\begin{array}{r} 10 \\ - 0 \\ \hline \end{array}$	G $\begin{array}{r} 9 \\ + 0 \\ \hline \end{array}$	H $\begin{array}{r} 0 \\ + 9 \\ \hline \end{array}$	I $\begin{array}{r} 6 \\ - 0 \\ \hline \end{array}$	J $\begin{array}{r} 8 \\ - 5 \\ \hline \end{array}$
K $\begin{array}{r} 10 \\ - 1 \\ \hline \end{array}$	L $\begin{array}{r} 8 \\ - 1 \\ \hline \end{array}$	M $\begin{array}{r} 10 \\ - 7 \\ \hline \end{array}$	N $\begin{array}{r} 1 \\ 7 \\ + 1 \\ \hline \end{array}$	O $\begin{array}{r} 6 \\ - 2 \\ \hline \end{array}$
P $\begin{array}{r} 65 \\ + 23 \\ \hline \end{array}$	Q $\begin{array}{r} 45 \\ - 4 \\ \hline \end{array}$	R $\begin{array}{r} 5 \\ + 1 \\ \hline \end{array}$	S $\begin{array}{r} 8 \\ 1 \\ \pm 0 \\ \hline \end{array}$	T $\begin{array}{r} 7 \\ - 5 \\ \hline \end{array}$
U $\begin{array}{r} 8 \\ + 1 \\ \hline \end{array}$	V $\begin{array}{r} 99 \\ - 8 \\ \hline \end{array}$	W $\begin{array}{r} 10 \\ - 3 \\ \hline \end{array}$	X $\begin{array}{r} 9 \\ - 7 \\ \hline \end{array}$	Y $\begin{array}{r} 9 \\ + 1 \\ \hline \end{array}$

Ms. Lockhart administers CBM Computation to her entire class at one time. She passes the tests out, reads the administration directions, and then allows the students 2 minutes to answer as many problems as they can. At the end of 2 minutes, Ms. Lockhart collects the tests and scores them by the number of digits answered correctly.

Here is the administration script Ms. Lockhart follows:

*It's time to take your weekly math test. As soon as I give you the test, write your first name, your last name, and the date. After you've written your name and the date on the test, turn your paper over and put your pencil down so I know you are ready.*

I want you to do as many problems as you can. Work carefully and do the best you can. Remember, start at the first problem and work left to right. Some problems will be easy for you; others will be harder. When you come to a problem you know you can do, do it right away. When you come to a problem that's hard for you, skip it, and come back to it later.

Go through the entire test doing the easy problems. Then go back and try the harder ones. Remember that you get points for getting part of the problem right. So, after you have done all the easy problems, try the harder problems. Do this even if you think you can't get the whole problem right.

When I say "Begin," turn your test over and start to work. Work for the whole test time. You should have enough room to do your work in each block. Write your answers so I can read them! If you finish early, check your answers. When I say "Stop," put your pencil down and turn your test face down.

When Ms. Lockhart scores the CBM Computation probes, students receive 1 point for each correctly answered digit. The number of correct digits within the 2 minutes is the student's score. Ms. Lockhart could score the tests for the total problems answered correctly, but scoring each digit correct in the answer is a more sensitive index of student change. Overall student growth or deterioration can be detected earlier by evaluating correct digits in the answers.

For scoring CBM Computation tests by digits correct, addition and subtraction problems are scored from right to left (following the same direction the student would use when calculating the answer). Here are some examples:

$$\begin{array}{r} 1 \ 6 \\ + 1 \ 8 \\ \hline 3 \ 4 \end{array}$$

↙  
2 correct digits

$$\begin{array}{r} 1 \ 6 \\ + 1 \ 8 \\ \hline 2 \ 4 \end{array}$$

X ↘  
1 correct digit

$$\begin{array}{r} 1 \ 6 \\ + 1 \ 8 \\ \hline 3 \ 3 \end{array}$$

✓ X ↘  
1 correct digit



Look at the following first-grade CBM Computation test for Leonel.

Question: How many digits did Leonel answer correctly? (Use the answers provided below to score Leonel's Computation test.)

Sheet #2

Computation 1

Password: ALL  
Name: LeoneL

Date: \_\_\_\_\_

A $\begin{array}{r} 6 \\ + 0 \\ \hline 6 \end{array}$	B $\begin{array}{r} 7 \\ + 0 \\ \hline 7 \end{array}$	C $\begin{array}{r} 41 \\ + 21 \\ \hline 63 \end{array}$	D $\begin{array}{r} 3 \\ + 4 \\ \hline 7 \end{array}$	E $\begin{array}{r} 4 \\ - 3 \\ \hline \end{array}$
F $\begin{array}{r} 10 \\ - 9 \\ \hline \end{array}$	G $\begin{array}{r} 9 \\ + 1 \\ \hline 10 \end{array}$	H $\begin{array}{r} 9 \\ - 3 \\ \hline 6 \end{array}$	I $\begin{array}{r} 7 \\ - 3 \\ \hline 5 \end{array}$	J $\begin{array}{r} 1 \\ + 0 \\ \hline \end{array}$
K $\begin{array}{r} 6 \\ 3 \\ + 0 \\ \hline \end{array}$	L $\begin{array}{r} 14 \\ - 0 \\ \hline \end{array}$	M $\begin{array}{r} 5 \\ + 0 \\ \hline 5 \end{array}$	N $\begin{array}{r} 7 \\ + 1 \\ \hline 8 \end{array}$	O $\begin{array}{r} 5 \\ - 0 \\ \hline 5 \end{array}$
P $\begin{array}{r} 1 \\ + 4 \\ \hline 5 \end{array}$	Q $\begin{array}{r} 7 \\ - 4 \\ \hline 2 \end{array}$	R $\begin{array}{r} 9 \\ - 8 \\ \hline \end{array}$	S $\begin{array}{r} 7 \\ + 2 \\ \hline \end{array}$	T $\begin{array}{r} 8 \\ - 5 \\ \hline 3 \end{array}$
U $\begin{array}{r} 5 \\ - 3 \\ \hline \end{array}$	V $\begin{array}{r} 3 \\ - 2 \\ \hline \end{array}$	W $\begin{array}{r} 8 \\ + 2 \\ \hline \end{array}$	X $\begin{array}{r} 10 \\ + 24 \\ \hline 34 \end{array}$	Y $\begin{array}{r} 57 \\ - 4 \\ \hline \end{array}$

**Grade 1 Test 2**

6	9	62	7	1
1	10	6	4	1
9	14	5	8	5
5	3	1	9	3
2	1	10	34	53

Answer: Leonel answered 13 digits correctly.

*Beginning-of-Year Screening*

During the first and second weeks of the school year, Ms. Lockhart administered a CBM Computation probe to all 19 students in her classroom. Ms. Lockhart calculated the mean of each student's two probes. A mean of 5 digits or less indicated that a student's progress should be monitored in primary prevention over the next 6-10 weeks.



*This table displays the CBM Computation scores for the 19 students in Ms. Lockhart's class. First, calculate the mean for each student. Then, identify the students who have a mean of 5 or less. These students will be monitored in primary prevention to determine their responsiveness-to-intervention.*

Student	Week 1	Week 2	Mean
Ariel	4	8	
Cesar	9	12	
Cynthia	8	5	
Daniel	1	1	
Emily	4	4	
Helan	6	7	
Ilene	2	3	
Jamarius	8	8	
Kelly	2	0	
Leonel	5	6	
Martin	4	7	
Michelle	4	7	
NaKeiya	2	3	
Oscar	5	6	
Paul	1	3	
Raimi	9	12	
Sam	8	10	
Taylor	8	5	
Winter	12	16	

*Question: Which students should be referred for progress monitoring in primary prevention?*

**Answer:** Daniel (mean of 1), Emily (mean of 4), Ilene (mean of 2.5), Kelly (mean of 1), NaKeiya (mean of 2.5), and Paul (mean of 2).

### *Primary Prevention in Ms. Lockhart's Classroom*

In addition to the district-mandated curriculum, Ms. Lockhart uses a peer tutoring evidence-based practice at primary prevention.

The peer-tutoring program takes place 3 times per week for 30 minutes each session. During the first part of each session, Ms. Lockhart introduces or reviews the session's math lesson. In the second part of each session, students break into partners (higher-performing students are paired with lower-performing students) and work together on the math lesson. Topics for the peer-tutoring program at first grade include number concepts, comparing numbers, addition and subtraction concepts, place value, double-digit addition and subtraction, and missing addends.

Below is a sample worksheet from the peer-tutoring program. This worksheet focuses on place value by asking students to draw tens and ones.

What number?		Draw how many.		Lesson 12 Day 1B	
17		5		8	
	Tens      Ones		Tens      Ones		Tens      Ones
12		4		15	
	Tens      Ones		Tens      Ones		Tens      Ones
13		10		2	
	Tens      Ones		Tens      Ones		Tens      Ones
19		6		8	
	Tens      Ones		Tens      Ones		Tens      Ones

**Write the number.**

**Read it and break it down.**

*Progress Monitoring in Primary Prevention*

Ms. Lockhart administers CBM Computation probes to Daniel, Emily, Ilene, Kelly, NaKeiya, and Paul for 7 additional weeks during primary prevention. These probes are administered to the students to determine responsiveness to an effective, research-based intervention, i.e., the curriculum.

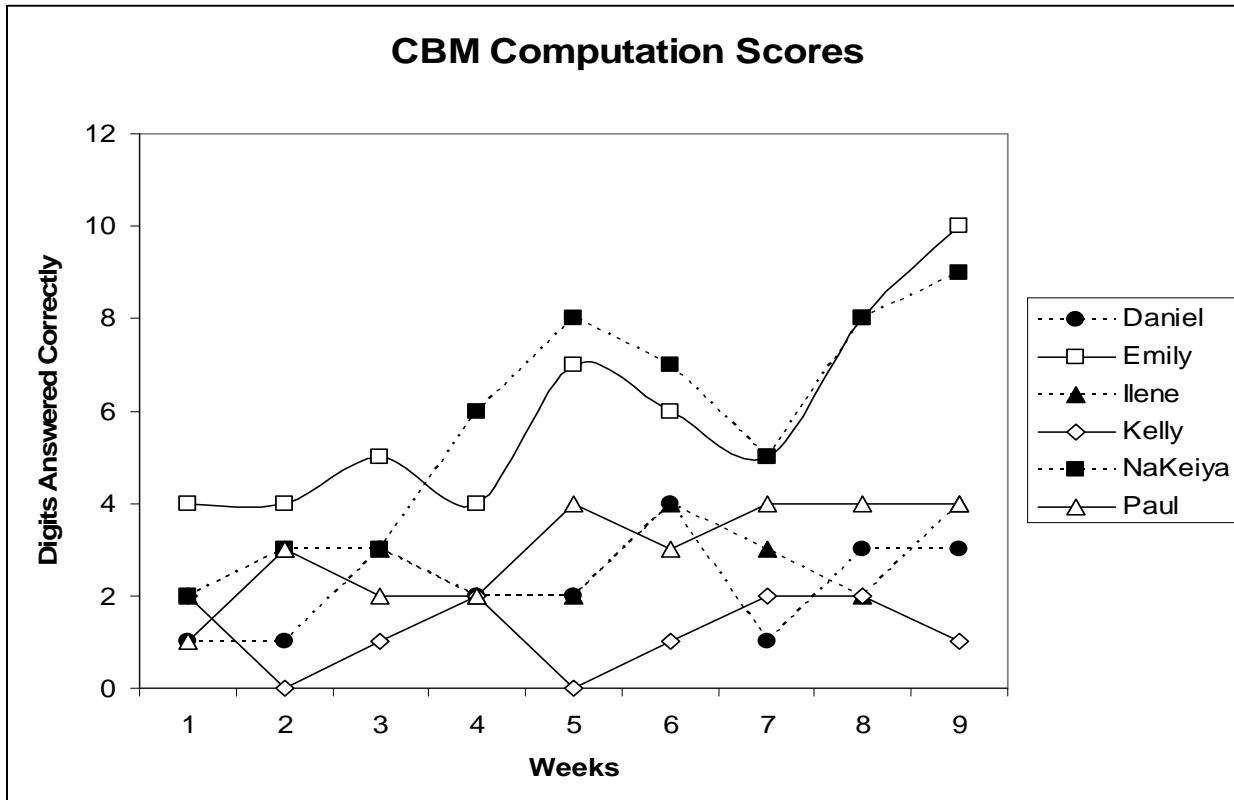
At the end of 9 weeks, Ms. Lockhart analyzes the 6 students' progress in primary prevention. This is how Ms. Lockhart calculates the slope.

1. Divide the probes into 3 (fairly) equal groups.
2. Take the median from the third group and subtract the median from the first group.
3. Divide by the number of probes minus 1.

For example, Daniel's probes can be separated into three groups: (1,1,3) (2,2,4) (1,2,3). The median score in the first group of probes is 1. The median score in the third group of probes is  $2.2 - 1 / (9 - 1) = 0.25$ .

<b>Student</b>	<b>Week 1</b>	<b>Week 2</b>	<b>Week 3</b>	<b>Week 4</b>	<b>Week 5</b>	<b>Week 6</b>	<b>Week 7</b>	<b>Week 8</b>	<b>Week 9</b>	<b>Slope</b>
Daniel	1	1	3	2	2	4	1	2	3	0.125
Emily	4	4	5	4	7	6	5	8	10	1.0
Ilene	2	3	3	2	2	4	3	2	4	0.0
Kelly	2	0	1	2	0	1	2	2	1	0.125
NaKeiya	2	3	3	6	8	7	5	8	9	0.625
Paul	1	3	2	2	4	3	4	4	4	0.25

Here is a graph with scores for the six students.



Question: Based on the graph, which students appear to be making progress in primary prevention? Which students appear to not be demonstrating adequate progress?

Answer: Based on the graph alone, Emily and NaKeiya seem to be making progress in primary prevention. It is hard to tell (without calculating slope) whether Daniel, Ilene, Kelly, and Paul are making adequate progress in primary prevention.

Graphing student progress in primary prevention gives a snapshot of general trends in student performance. The graphs, however, should not be the deciding factor of student responsiveness-to-intervention during primary prevention. Quantitative data, such as slope, is used to make decisions.

In primary prevention, a first-grade student should demonstrate a slope of .25 digits per week or higher. This information comes from CBM Computation normative data collected on first-grade students. (See the Appendix for more information on adequate slope performance in primary prevention.)



*Question 1: Which students are demonstrating adequate growth (a slope of .25 or higher) in primary prevention?*

*Question 2: Which students are demonstrating inadequate growth in primary prevention?*

*Question 3: If inadequate growth indicates a student should receive secondary prevention intervention, which students should participate in secondary prevention?*

Answer to Question 1: Emily, NaKeiya, and Paul are demonstrating adequate growth.

Answer to Question 2: Daniel, Ilene, and Kelly are demonstrating inadequate growth.

Answer to Question 3: Daniel, Ilene, and Kelly should participate in secondary prevention.

*Think ahead: What information might Ms. Lockhart use to make decisions about the secondary prevention program for Daniel, Ilene, and Kelly?*

#### *Secondary Prevention in Ms. Lockhart's Classroom*

Ms. Lockhart uses a structured math tutoring program to address the math difficulties of Daniel, Ilene, and Kelly. This program, university-developed and shown to be effective for remediating the math difficulties of first-grade students, consists of 3 (40 minute) sessions per week delivered in a small-group format. In this school, secondary prevention lasts 9 to 18 weeks while continuing with progress monitoring. The first 30 minutes of each session are spent using scripts and accompanying materials provided with the tutoring program. The final 10 minutes provide the students an opportunity to practice basic addition and subtraction facts from 0-18 with an interactive, game-like, computer program.

The tutoring program is based on the concrete-representational-abstract (CRA) model of instruction. It relies on manipulative objects to introduce, demonstrate, and ensure conceptual understanding of mathematics skills. Each topic has scripts (for the teacher to study and follow), manipulative activities, and worksheets designed to promote the generalization of conceptual understanding. The topics include the following:

1. Identifying and Writing Numbers to 99
2. Identifying More or Less with Objects
3. Sequencing Numbers

4. Using <, >, and = Signs
5. Skip Counting by 10s, 5s, and 2s
6. Introduction to Place Value
7. Place Value (0 – 50)
8. Identifying Operations
9. Writing Number Sentences
10. Place Value (0 – 99)
11. Addition Facts to 18
12. Subtraction Facts to 18
13. Review of Addition and Subtraction Facts
14. Missing Addends
15. Place Value
16. Two-Digit Addition (No Regrouping)
17. Two-Digit Subtraction (No Regrouping)

Based on the information gathered from Daniel's, Ilene's, and Kelly's weekly CBM probes, as well as textbook tests and informal observations of their daily class work, Ms. Lockhart realizes the three students seem to lack a basic understanding of number concepts. She decides to begin with the first topic in the tutoring sequence, Identifying and Writing Numbers to 99.

While the rest of the class is doing individual seatwork and monitored by the classroom assistant, Ms. Lockhart works with Daniel, Ilene, and Kelly at a table in the back of the room. Following scripts provided in the manual, Ms. Lockhart leads the three students through the activities using the manipulatives and worksheets based on the CRA model. For the last 10 minutes of the session, the students use a computer game that affords practice with basic addition and subtraction facts. Ms. Lockhart assesses student mastery of a particular topic each day. If all three students demonstrate proficiency (or after the last day of a topic), they move on to the next topic. Cumulative review is provided frequently. Throughout each session, the students earn points for paying attention and working hard; they trade the points for small "prizes" each week.

Below are examples of the teacher scripts and worksheets Ms. Lockhart uses with the first topic of the tutoring program.

Topic 1  
Identifying and Writing Numbers  
Day 2

Objectives

Students will:

- Count up to 19 objects.
- Identify numbers up to 19.
- Write numbers up to 99.

Materials

Beans  
Topic 1 Day 2 Tutoring Sheet 1  
Topic 1 Day 2 Tutoring Sheet 2  
Topic 1 Day 2 Tutoring Sheet 3  
Topic 1 Day 2 Tutoring Sheet 4  
Paper  
Pencil  
Point Sheet

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*Note to Tutor: Students may need instruction in counting objects or reading/writing numbers, writing numbers higher than 20, or all three. A script for all areas follows. If mastery is met, move to Topic 2. If mastery is not met, continue with Day 3 activities.*

*If students need assistance with all three areas, start with counting objects.*

*Mastery Criteria:*      *Topic 1 Day 2 Tutoring Sheet 2: 10/12*  
                                *Topic 1 Day 2 Tutoring Sheet 3-4: 18/20*  
                                *Writing numbers to 99: 14/16*

**Counting Objects:**

**Tutor:**      **Today we're going to continue working on counting objects.**  
**Remember, you can earn points for working hard and for correctly answering the math problems.**

If you feel your students need specific reminders about how they earn points, discuss staying on task and answering the problems correctly.

Give students Topic 1 Day 2 Tutoring Sheet 1.

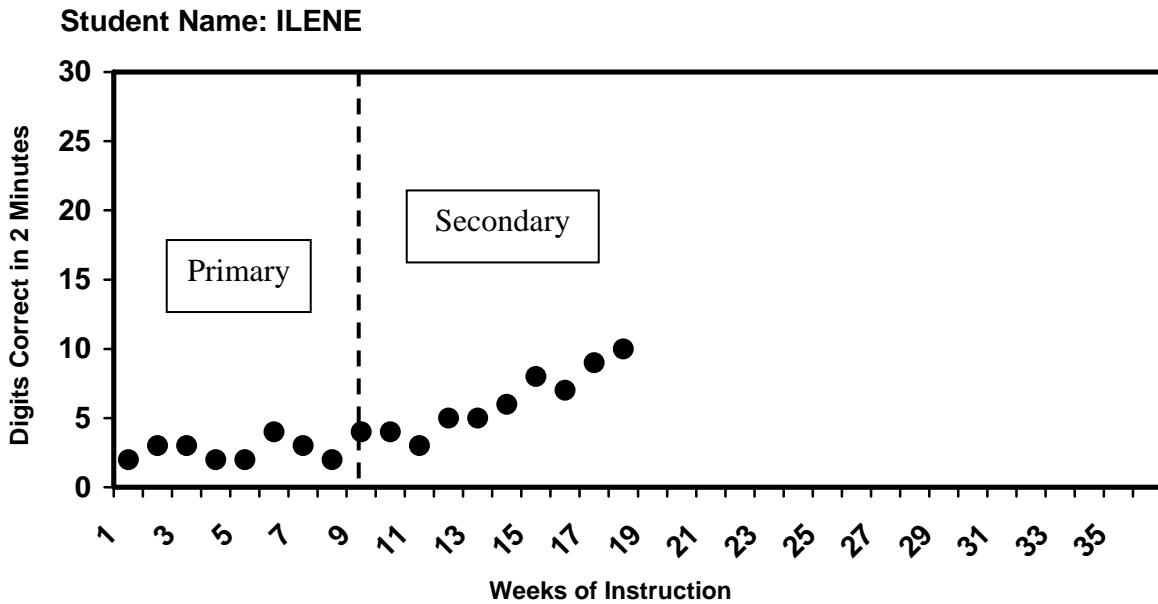
**You're going to count the number of objects in each square and then write the number. Let's do one together. The first square has bikes in it. Let's count the number of bikes, remembering to touch each bike.**

Topic 1 Day 2 Tutoring Sheet 1			
   _____	  _____	   _____	_____
   _____	   _____	   _____	 _____
   _____	   _____	_____	 _____

### Progress Monitoring in Secondary Prevention

While receiving instruction at the secondary prevention level, lasting 9 to 18 weeks at this school, the first-grade assistant administers weekly CBM Computation probes to Daniel, Ilene, and Kelly. These probes are administered to the students to determine their individual responsiveness to the secondary prevention tutoring program. After the assistant scores each probe, the students plot their scores on their own graphs. Research has demonstrated that self-awareness of progress may be particularly motivating. Ms. Lockhart has noticed this with her first graders and uses the graphs to discuss their progress with them.

Here is Ilene's graph. The dotted vertical line shows when Ilene transitioned into secondary prevention.



*Question: Based on Ilene's graph, do you think she is responding to secondary prevention?*



*Answer: Ilene appears to be responsive to secondary prevention. Graphs alone, however, cannot be the deciding factor in whether Ilene leaves or continue in secondary prevention.*

*Think ahead: Why can graphs alone not be used in making RTI decisions?*

Ms. Lockhart also looks at the CBM slopes for Daniel, Ilene, and Kelly to determine their responsiveness to secondary prevention. At secondary prevention, first-grade students should demonstrate a slope of .50 or higher to be deemed “responsive” to intervention.

<b>Student</b>	<b>Week 10</b>	<b>Week 11</b>	<b>Week 12</b>	<b>Week 13</b>	<b>Week 14</b>	<b>Week 15</b>	<b>Week 16</b>	<b>Week 17</b>	<b>Week 18</b>	<b>Slope</b>
Daniel	4	3	3	4	6	4	6	6	5	0.375
Ilene	4	3	5	5	6	8	7	9	10	0.625
Kelly	2	1	4	4	2	3	4	2	3	0.125



*Question 1: Which students move from secondary prevention back to primary prevention? That is, are any students in secondary prevention demonstrating progress which indicates they are ready to cease secondary prevention and return to primary prevention?*

*Question 2: Which students remain in secondary prevention?*

Answer to Question 1: Ilene is ready to move from secondary to primary prevention after only 9 weeks of secondary prevention. Her slope of 0.625 is above the cut-off of 0.50. Students with a slope above 0.50 are demonstrating enough progress to discontinue secondary prevention at this time.

Answer to Question 2: Daniel and Kelly’s slopes are below 0.50. They will remain in secondary prevention for another 9 weeks.

*Think ahead: What information might Ms. Lockhart use to develop the secondary prevention program for Daniel and Kelly in the second semester? How would Ms. Lockhart know Daniel and Kelly’s strengths and weaknesses?*

*What does Secondary Prevention Look Like For the Second Semester?*

During the second semester, Ms. Lockhart again relies on the research-based first-grade math tutoring program to address Daniel and Kelly's math difficulties. She continues to work with the small group three times each week, careful to schedule a time that does not interfere with the class's general math instruction. At this point in the year, Ms. Lockhart determines that the students seem to lack an understanding of place value concepts, which impedes their ability to conceptualize two-digit addition or subtraction. So, she begins the second semester tutoring sessions with the corresponding place value topics from the program.

Topic 6  
Place Value Introduction  
Day 3

Objectives

Students will:

Identify tens and ones to numbers up to 99

Materials

Topic 6 Day 3 Tutoring Sheet 1-5  
Base 10 Block – one set for each student  
Paper  
Pencil  
Point Sheet

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*Mastery Criteria:* Topic 6 Day 3 Tutoring Sheet 2-5: 12/15

**Tutor:** Today we're going to continue working on place value. First we'll review what we did last time. Who remembers what we call the two places?

If students don't respond or respond incorrectly, tutor says, **The two places are the ones and tens. What are the two places called?**

Students: Ones and tens.

**Tutor:** Give each student Topic 6 Day 3 Tutoring Sheet 1.

**Right, the two places are the ones and tens. I'm going to show you some cubes and rods and you're going to write the numbers in the correct places.**

Place 3 rods and 7 cubes in front of students.

**Count the number of cubes and rods and write them in the correct places on your worksheet.**

Allow students time to respond and assist them as needed.

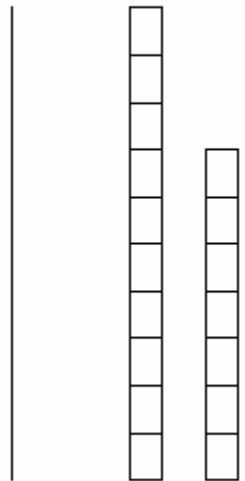
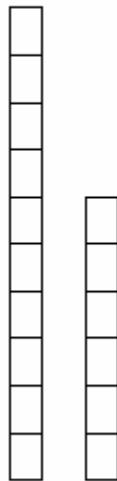
**Great, now show me 37.**

Allow students time to show you 37, providing assistance if needed.

Follow the same procedure with numbers 1-99 until you feel students are comfortable and ready to move on.

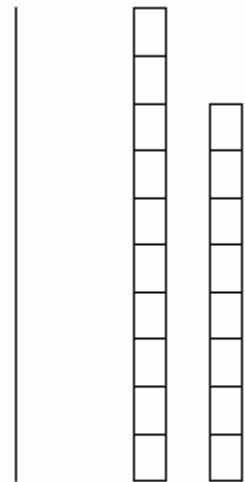
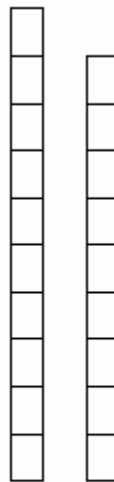
Topic 6 Day 3 Tutoring Sheet 1

Write the tens and ones. Write the number.



\_\_\_\_ tens \_\_\_\_ ones = \_\_\_\_\_

\_\_\_\_ tens \_\_\_\_ ones = \_\_\_\_\_



\_\_\_\_ tens \_\_\_\_ ones = \_\_\_\_\_

\_\_\_\_ tens \_\_\_\_ ones = \_\_\_\_\_

### *Ongoing progress monitoring*

As with the first semester secondary prevention group, Daniel and Kelly receive weekly CBM Computation probes to monitor their progress and to gauge their response to the intervention. See their scores, below.

Student	Week 19	Week 20	Week 21	Week 22	Week 23	Week 24	Week 25	Week 26	Week 27	Slope
Daniel	5	5	7	10	6	7	8	10	10	0.625
Kelly	3	5	2	2	5	4	3	5	4	0.125

-  Remember, to leave secondary prevention and return to primary prevention, first-grade students need to demonstrate a slope of 0.50 or greater.

*Question 1: Based on the above data, which student(s) should return to primary prevention?*

*Question 2: Based on the above data, which student(s) should proceed to tertiary prevention?*

Answer to Question 1: Daniel should return to primary prevention. He appears responsive to secondary prevention.

Answer to Question 2: Kelly has not demonstrated adequate growth in secondary prevention. She needs more intensive, tertiary prevention.

### *What Happens in Tertiary Prevention for Students at Highland Park Elementary?*

At Highland Park Elementary, once a student enters tertiary prevention, the student is referred for a comprehensive evaluation to determine why the student isn't making adequate progress. If the evaluation finds that the student has a disability and is eligible for special education, an IEP team is convened to develop an IEP. The student's progress continues to be monitored on a weekly basis and the student discontinues with specialized educational programming once his or her data demonstrate a certain slope or end level.

### *Special Education Evaluation*

When Kelly is referred to tertiary prevention, a comprehensive evaluation takes place to answer questions that arose in primary and secondary prevention and to consider Kelly's disability classification. The school's assessment team administers standard screening measures (such as the WASI) to determine what disability classification, if any, is appropriate for Kelly.

Kelly was administered the Vineland Adaptive Rating Scale and the 2-subtest Wechsler Abbreviated Scale of Intelligence, and her results ruled out mental retardation. Expressive and pragmatic language measures were administered to Kelly, and her results ruled out speech or language disorders. Rating scales, classroom observations, and parent interviews were conducted for Kelly, and her results ruled out the possibility of an emotional or behavioral disorder.

After ruling out all of the above, Kelly's learning difference received the designation of LD. She continued with tertiary prevention, which for Highland Park students translates into special education services, in March of the school year. Kelly was identified as having a learning disability in mathematics. Students with emotional or behavioral disorders, other specific learning disabilities, or other mild learning differences would similarly receive intensive instruction at this tertiary level.

#### *Setting IEP Goals*

One aspect of Kelly's tertiary prevention services (i.e., at Highland Park Elementary) includes the development of her IEP goals. There are three options for setting IEP goals. The first option is end-of-year benchmarking. For typically developing students at the grade level where the student is being monitored, identify the end-of-year CBM benchmark. This is the end-of-year performance goal. The benchmark is represented on the graph by an X at the date marking the end of the year. A goal-line is then drawn between the median of at least the first three CBM graphed scores and the end-of-year performance goal.

**Typical End-of-Year Benchmarks in Math**

<b>Grade</b>	<b>Computation</b>	<b>Concepts &amp; Applications</b>
1 <sup>st</sup> Grade	20 digits	20 points
2 <sup>nd</sup> Grade	20 digits	20 points
3 <sup>rd</sup> Grade	30 digits	30 points
4 <sup>th</sup> Grade	40 digits	30 points
5 <sup>th</sup> Grade	30 digits	15 points
6 <sup>th</sup> Grade	35 digits	15 points

The second option for setting IEP goals is by using an intra-individual framework. To use this option, identify the weekly rate of improvement (slope) for the target student under baseline conditions, using at least eight CBM data points. Multiply this slope by 1.5. Take this product and multiply it by the number of weeks until the end of the year. Add this product to the student's baseline score. This sum is the end-of-year goal.

For example, a student's first 8 CBM scores were 3, 2, 5, 6, 5, 5, 7 and 4. To calculate the weekly rate of improvement (slope), find the difference between the third median point and the first median point. In this example, the approximate difference is  $6 - 3 = 3$ . Since 8 scores have been collected, divide the difference by the number of data points minus 1. So,  $(6 - 3) \div 7 = 0.43$ .

0.43 is multiplied by 1.5:  $0.43 \times 1.5 = 0.645$ . Multiply the product of 0.645 by the number of weeks until the end of the year. If there are 14 weeks left until the end of the year:  $0.645 \times 14 = 9.03$ . The average score of the first 8 data points was 4.625. The sum of 9.03 and the average score is the end-of-year performance goal:  $9.03 + 4.625 = 13.66$ . The student's end-of-year performance goal would be 13.66. So, 13.66 would be plotted on the student's graph and a goal-line would be drawn.

The third option for setting IEP goals is by using national norms of improvement. For typically developing students at the grade level where the student is being monitored, identify the average rate of weekly increase from a national norm chart. Multiply this weekly increase norm by the number of weeks left in the school year, and add that product to the student's current median score. This sum is the student's end of year goal score.

**CBM Math Norms for Student Growth (Slope)**

Grade	Computation CBM – Slope for Digits Correct	Concepts and Applications CBM – Slope for Points
1	.35	No data available
2	.30	.40
3	.30	.60
4	.70	.70
5	.70	.70
6	.40	.70

#### *Developing and Monitoring Individualized Instructional Programs*

Once IEP goals are set and individualized programs are implemented, it is important to monitor student progress frequently (e.g., weekly). CBM can judge the adequacy of student progress and the need to change instructional programs. Standard decision rules guide decisions about the adequacy of student progress and the need to revise goals and instructional programs. It is possible to utilize these decision rules to inform decision making at the secondary prevention level. Highland Park Elementary, however, uses slope data to guide decision making during secondary prevention. The school uses the following decision rules for instructional decision making at tertiary prevention.

Decision rules based on the most recent 4 consecutive scores:

- If the most recent 4 consecutive CBM scores are above the goal-line, the student's end-of-year performance goal needs to be increased.
- If the most recent 4 consecutive CBM scores are below the goal-line, the teacher needs to revise the instructional program.
- If the most recent 4 consecutive CBM scores approximate the goal-line, no changes are necessary.

Decision rules based on the trend-line:

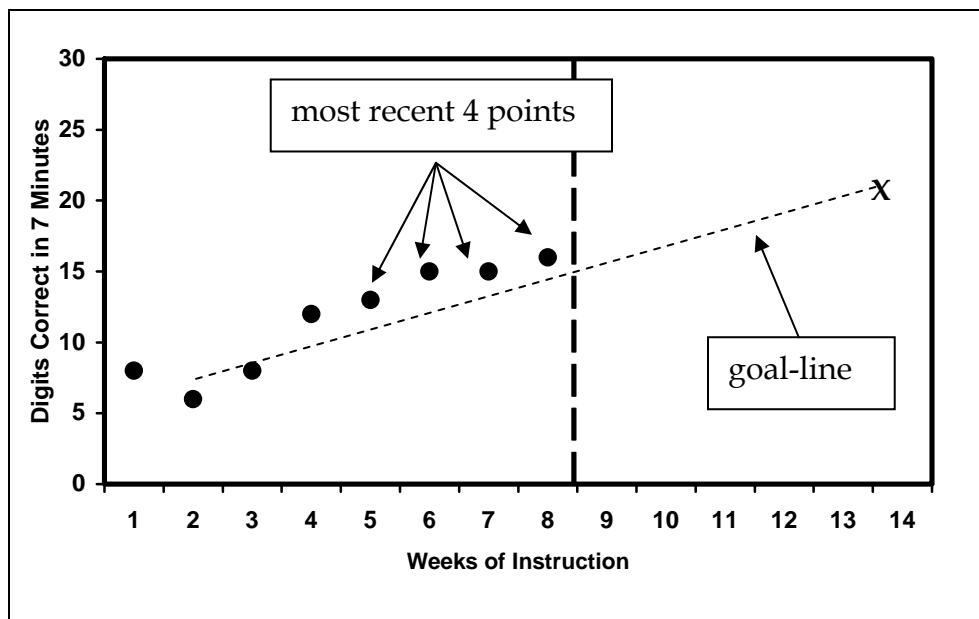
- If the student's trend-line is steeper than the goal-line, the student's end-of-year performance goal needs to be increased.
- If the student's trend-line is flatter than the goal-line, the teacher needs to revise the instructional program.
- If the student's trend-line and goal-line are the same, no changes are necessary.

The following graphs show examples of how each decision rule can be used to make decisions about student goals and instructional programs.

#### **4 Consecutive Scores above Goal-Line**

Here, the most recent 4 scores are above the goal-line. Therefore, the student's end-of-year performance goal needs to be adjusted. The teacher increases the desired rate (or goal) to boost the actual rate of student progress.

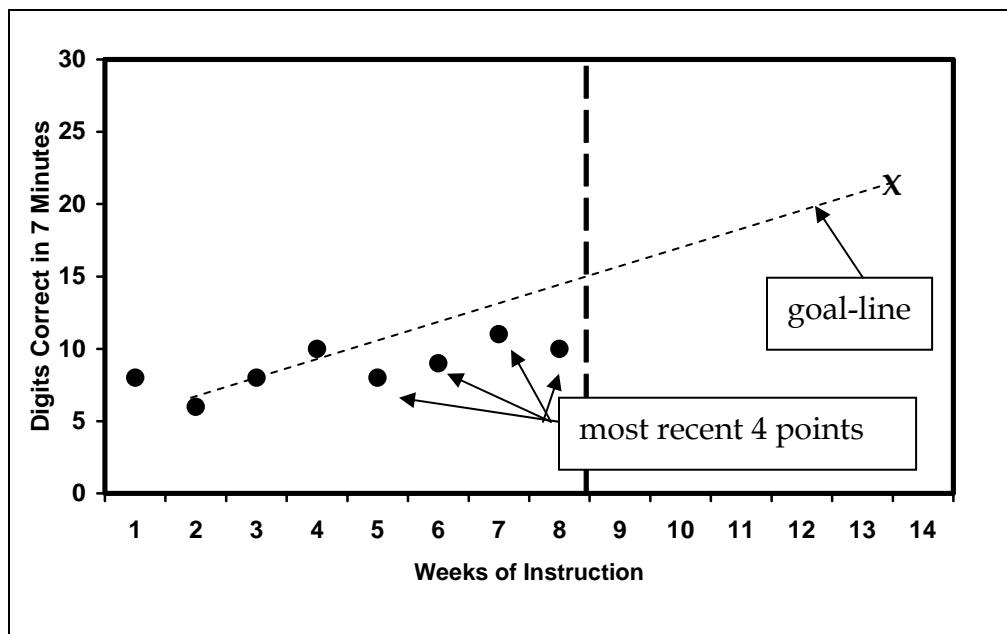
The point of the goal increase is notated on the graph as a dotted vertical line. This allows teachers to visually note when the student's goal was changed. The teacher re-evaluates the student's graph in another 7-8 data points.



#### 4 Consecutive Scores below Goal-Line

Below, the most recent 4 scores are below the goal-line. Therefore, the teacher needs to change the student's instructional program. The end-of-year performance-goal and goal-line never decrease; they can only increase. The instructional program should be tailored to bring a student's scores up so they match or surpass the goal-line.

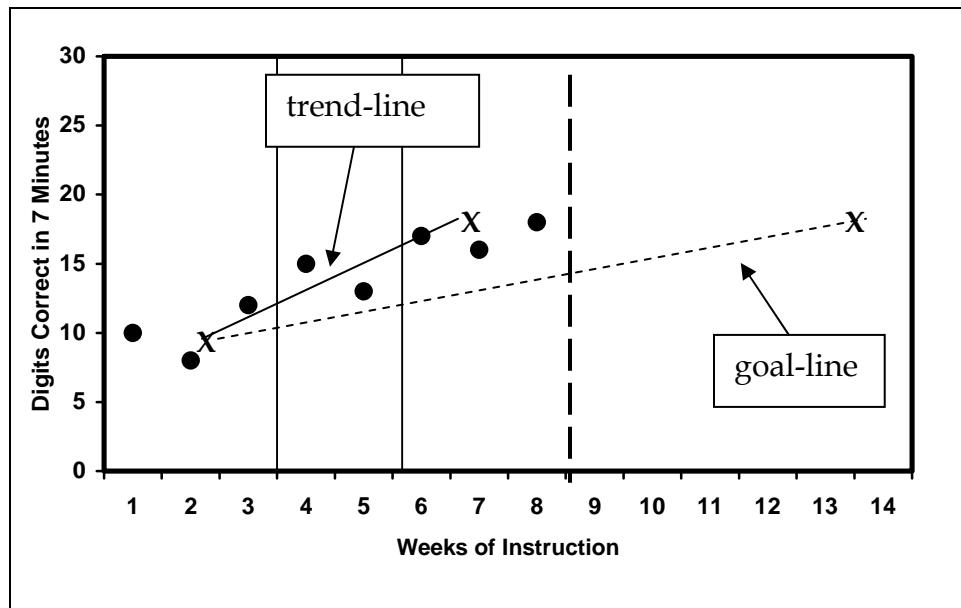
The teacher draws a dotted vertical line when making an instructional change. This allows teachers to visually note when changes to the student's instructional program were made. The teacher re-evaluates the student's graph in another 7-8 data points to determine whether the change was effective.



**Trend-line Above Goal-Line**

Below, the trend-line is steeper than the goal-line. Therefore, the student's end-of-year performance goal needs to be adjusted. The teacher increases the desired rate (or goal) to boost the actual rate of student progress. The new goal-line can be an extension of the trend-line.

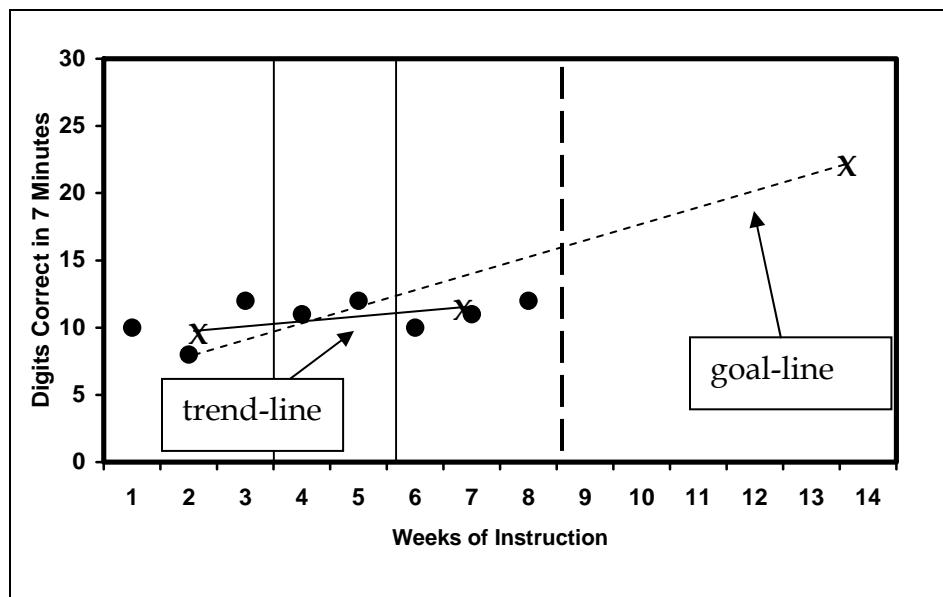
The point of the goal increase is noted on the graph as a dotted vertical line. This allows teachers to visually note when the student's goal was changed. The teacher re-evaluates the student's graph in another 7-8 data points.



**Trend-line Below Goal-Line**

Below, the trend-line is flatter than the performance goal-line. The teacher needs to change the student's instructional program. Again, the end-of-year performance goal and goal-line are never decreased! A trend-line below the goal-line indicates that student progress is inadequate to reach the end-of-year performance goal. The instructional program should be tailored to bring a student's scores up.

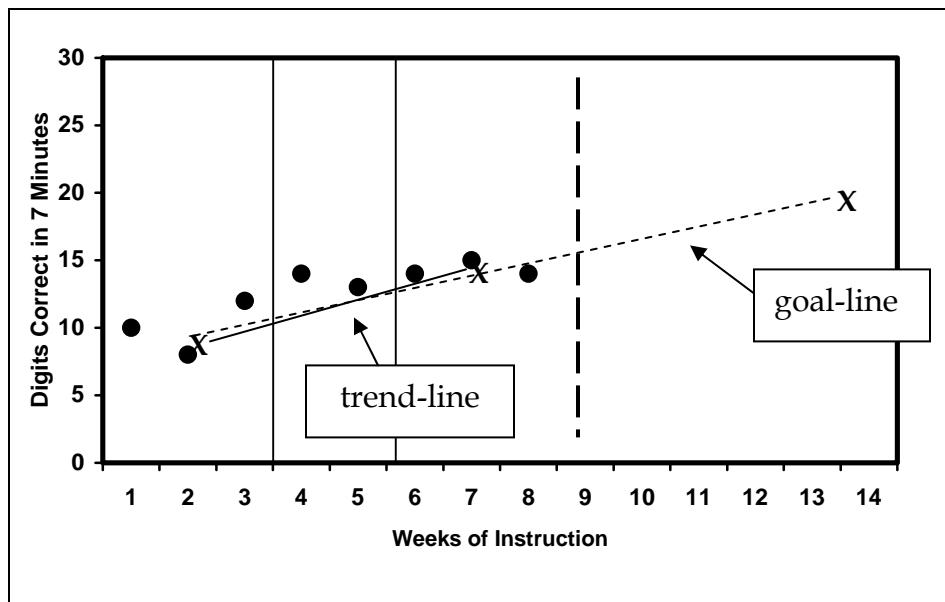
The point of the instructional change is represented on the graph as a dotted vertical line. This allows teachers to visually note when the student's instructional program was changed. The teacher re-evaluates the student's graph in another 7-8 data points.



### Trend-line Matches Goal-Line

Below, the trend-line matches the goal-line, so no change is currently needed for the student.

The teacher re-evaluates the student's graph in another 7-8 data points to determine whether an end-of-year performance goal or instructional change needs to take place.



### *So, What Happens in Tertiary Prevention?*

It is important to note that special education services, as they occur at tertiary prevention, are not automatically delivered on a one-to-one basis. Depending on the needs of the student, some services may be provided on an individual basis, some through small-group instruction, and some may occur through consultation with, and even provided by, the regular education teacher. Further, one-on-one tutoring that can occur in secondary prevention does not mean that the student is receiving "special education" at this point.

In Kelly's case, tertiary prevention translates to continued progress monitoring combined with explicit instruction on the mathematics skills for which she has demonstrated deficits while in primary and secondary prevention. For Kelly, her tertiary prevention is a combination of instruction in a small-group setting, provided by her regular classroom teacher for 3-4 lower-achieving students, as well as individual instruction provided by the school resource teacher.

*Progress Monitoring in Tertiary Prevention*

CBM Computation tests are administered weekly in tertiary prevention. Below are the cut-off points for tertiary prevention appropriate response to instruction in math.

**Quantifying Response to Tertiary Prevention in Math**

<b>Grade</b>	<b>Computation</b>		<b>Concepts &amp; Applications</b>	
	> Slope	> End level	> Slope	> End level
1 <sup>st</sup> Grade	> .50	> 20 digits	> .40	> 20 points
2 <sup>nd</sup> Grade	> .40	> 20 digits	> .40	> 20 points
3 <sup>rd</sup> Grade	> .40	> 20 digits	> .70	> 20 points
4 <sup>th</sup> Grade	> .70	> 20 digits	> .70	> 20 points
5 <sup>th</sup> Grade	> .70	> 20 digits	> .70	> 20 points
6 <sup>th</sup> Grade	> .70	> 20 digits	> .70	> 20 points

### Discussion Questions

*How well did RTI appear to work in Ms. Lockhart's class?*

*What additional responsibilities did Ms. Lockhart have to handle during the school year that he didn't have to handle when Highland Park was not implementing RTI?*

*What changes would you make (if any) for the subsequent year?*

*Traditional special education referrals have been based on an achievement/IQ discrepancy. What are the pros and cons of this traditional way?*

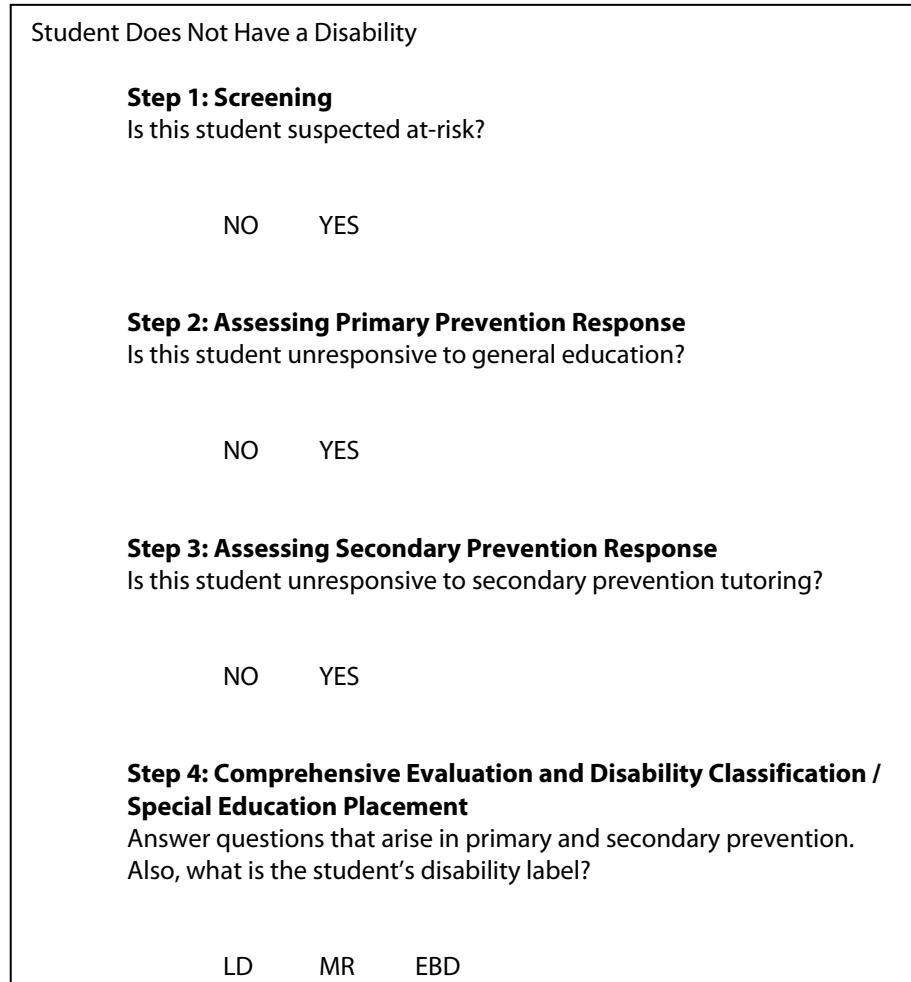
*How is RTI different from the achievement/IQ discrepancy method for special education referral and placement?*

*What are the pros and cons of RTI?*

*Why might school districts want to implement RTI for special education placement decisions instead of the traditional method?*

*Which method for identifying special education students would you choose? Why?*

Look at this flow chart. First, draw NaKeiya's path under the RTI model. Next, draw David's path. Finally, draw Kelly's path.



Draw your own flow chart, diagram, or picture depicting a three-level RTI model.

How were progress monitoring and specific interventions used in each of the three levels?

**Primary Prevention:**

**Progress Monitoring:**

**Interventions:**

**Secondary Prevention:**

**Progress Monitoring:**

**Interventions:**

**Tertiary Prevention:**

**Progress Monitoring:**

**Interventions:**

## Appendix

### **Math Risk with Fall CBM Screening**

<b>Grade</b>	<b>Computation Cut-off</b>	<b>Concepts &amp; Applications Cut-off</b>
1 <sup>st</sup> Grade	< 5 digits	< 5 points
2 <sup>nd</sup> Grade	< 10 digits	< 10 points
3 <sup>rd</sup> Grade	< 10 digits	< 10 points
4 <sup>th</sup> Grade	< 10 digits	< 5 points
5 <sup>th</sup> Grade	< 15 digits	< 5 points
6 <sup>th</sup> Grade	< 15 digits	< 5 points

### **Inadequate Math Slopes - Primary Prevention**

<b>Grade</b>	<b>Inadequate math computation slope</b>	<b>Inadequate math concepts &amp; applications slope</b>
1 <sup>st</sup> Grade	< .25	< .30
2 <sup>nd</sup> Grade	< .20	< .30
3 <sup>rd</sup> Grade	< .20	< .50
4 <sup>th</sup> Grade	< .50	< .50
5 <sup>th</sup> Grade	< .50	< .50
6 <sup>th</sup> Grade	< .50	< .50

### **Quantifying Response to Secondary Prevention in Math**

<b>Grade</b>	<b>Computation</b>		<b>Concepts &amp; Applications</b>	
	< Slope	< End level	< Slope	< End level
1 <sup>st</sup> Grade	< .50	< 20 digits	< .40	< 20 points
2 <sup>nd</sup> Grade	< .40	< 20 digits	< .40	< 20 points
3 <sup>rd</sup> Grade	< .40	< 20 digits	< .70	< 20 points
4 <sup>th</sup> Grade	< .70	< 20 digits	< .70	< 20 points
5 <sup>th</sup> Grade	< .70	< 20 digits	< .70	< 20 points
6 <sup>th</sup> Grade	< .70	< 20 digits	< .70	< 20 points

### **Typical End-of-Year Benchmarks in Math**

<b>Grade</b>	<b>Computation</b>	<b>Concepts &amp; Applications</b>
1 <sup>st</sup> Grade	20 digits	20 points
2 <sup>nd</sup> Grade	20 digits	20 points
3 <sup>rd</sup> Grade	30 digits	30 points
4 <sup>th</sup> Grade	40 digits	30 points
5 <sup>th</sup> Grade	30 digits	15 points
6 <sup>th</sup> Grade	35 digits	15 points

**CBM Math Norms for Student Growth (Slope)**

<b>Grade</b>	<b>Computation CBM – Slope for Digits Correct</b>	<b>Concepts and Applications CBM – Slope for Points</b>
<b>1</b>	.35	No data available
<b>2</b>	.30	.40
<b>3</b>	.30	.60
<b>4</b>	.70	.70
<b>5</b>	.70	.70
<b>6</b>	.40	.70

**Quantifying Response to Tertiary Prevention in Math**

<b>Grade</b>	<b>Computation</b>		<b>Concepts &amp; Applications</b>	
	> Slope	> End level	> Slope	> End level
1 <sup>st</sup> Grade	> .50	> 20 digits	> .40	> 20 points
2 <sup>nd</sup> Grade	> .40	> 20 digits	> .40	> 20 points
3 <sup>rd</sup> Grade	> .40	> 20 digits	> .70	> 20 points
4 <sup>th</sup> Grade	> .70	> 20 digits	> .70	> 20 points
5 <sup>th</sup> Grade	> .70	> 20 digits	> .70	> 20 points
6 <sup>th</sup> Grade	> .70	> 20 digits	> .70	> 20 points

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