Case Study #2

Grade Three: Math Concepts/Applications

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Grade Three: Math Concepts/Applications

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 third-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 Mr. Thompson and his third-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 concepts/applications.

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[1]

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. 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 the following 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. 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.

[1] 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 - 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.

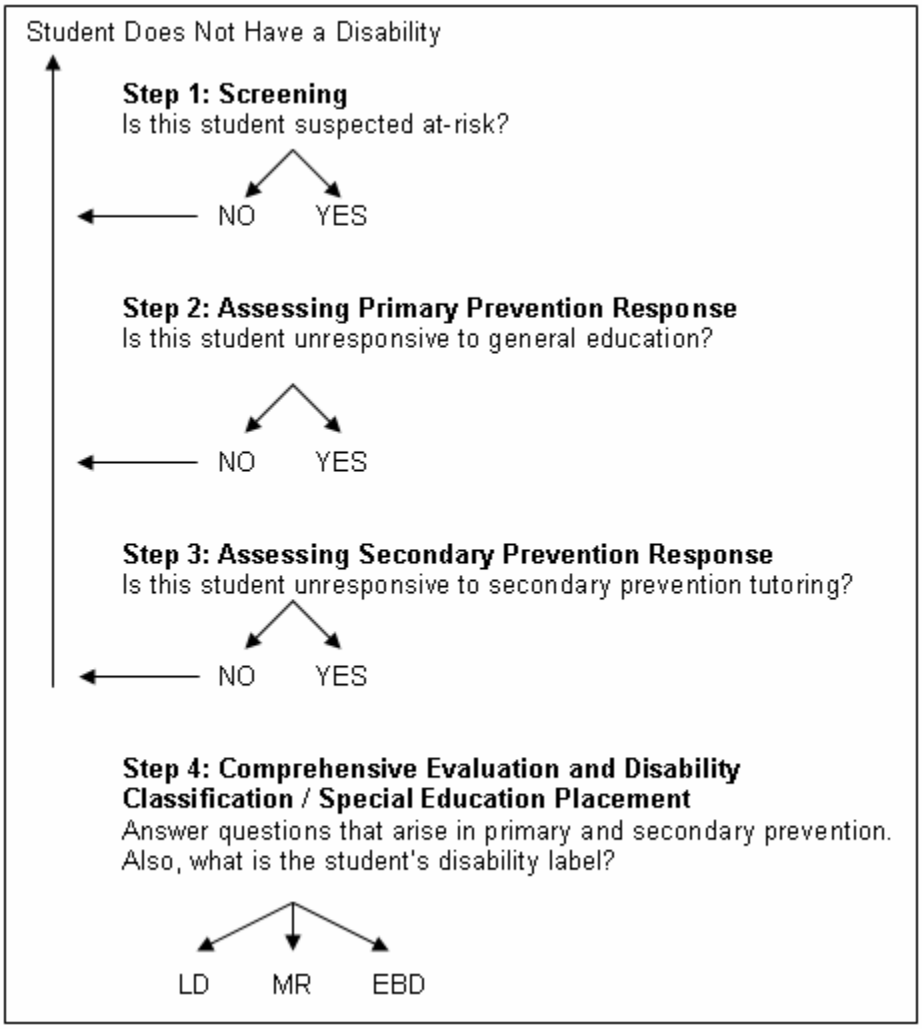
Students (a) who complete secondary prevention at a satisfactory level and (b) whose progress during secondary prevention, as evidenced by the weekly progress monitoring, are deemed as "responsive," move back into primary prevention. Students who are "unresponsive" (i.e., who do not achieve at an adequate final performance level or do not progress adequately during secondary prevention) are in need of more intensive support. These students begin 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 (i.e., 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 Riverbend Elementary

Descriptive Information

Riverbend Elementary is located in a middle-income area of a Midwestern state. The school has 210 students in grades K through 4. Riverbend students are 20% African-American, 75% Caucasian, and 5% Asian. Approximately 55% of students in the school receive free or reduced-price lunch, a general indicator of poverty level.

Previous Experience with RTI Model

This is Riverbend Elementary's first year to use an RTI model for special education prevention and identification. 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 this initial year, one first-grade and one third-grade classroom will "pilot" the RTI model. At the end of this first year, Mr. Thompson, the participating first-grade teacher, and administrative personnel will evaluate the results of using RTI in lieu of the traditional IQ/achievement discrepancy model, to decide how to proceed in subsequent years.

During the summer months, school personnel participated in a workshop at 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.

For the upcoming school year, teachers plan to meet bi-weekly with administrative personnel and the school's special education consultant to analyze data, discuss students' progress, and assist each other with instructional changes in response to these. Additionally, the group agrees to have open and honest discussions of the positive and negative aspects of the new identification model.

A Closer Look: Mr. Thompson's Class

Descriptive Information

Mr. Thompson has 4 years of experience teaching elementary school. He has taught third-grade at Riverbend Elementary School for each of those years. This is Mr. Thompson's first experience with RTI. He has, however, used reading and math progress monitoring measures to evaluate his students' response to classroom instruction.

Mr. Thompson has 24 students in his classroom and utilizes a district-mandated mathematics curriculum to guide his 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.

Mr. Thompson likes this particular math curriculum for his students. He believes that the "Big Ideas" of the curriculum provide a strong foundation for mathematics understanding at the third-grade level. Topics such as addition, subtraction, multiplication and division concepts, data and graph interpretation, geometry, pre-algebra, 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.

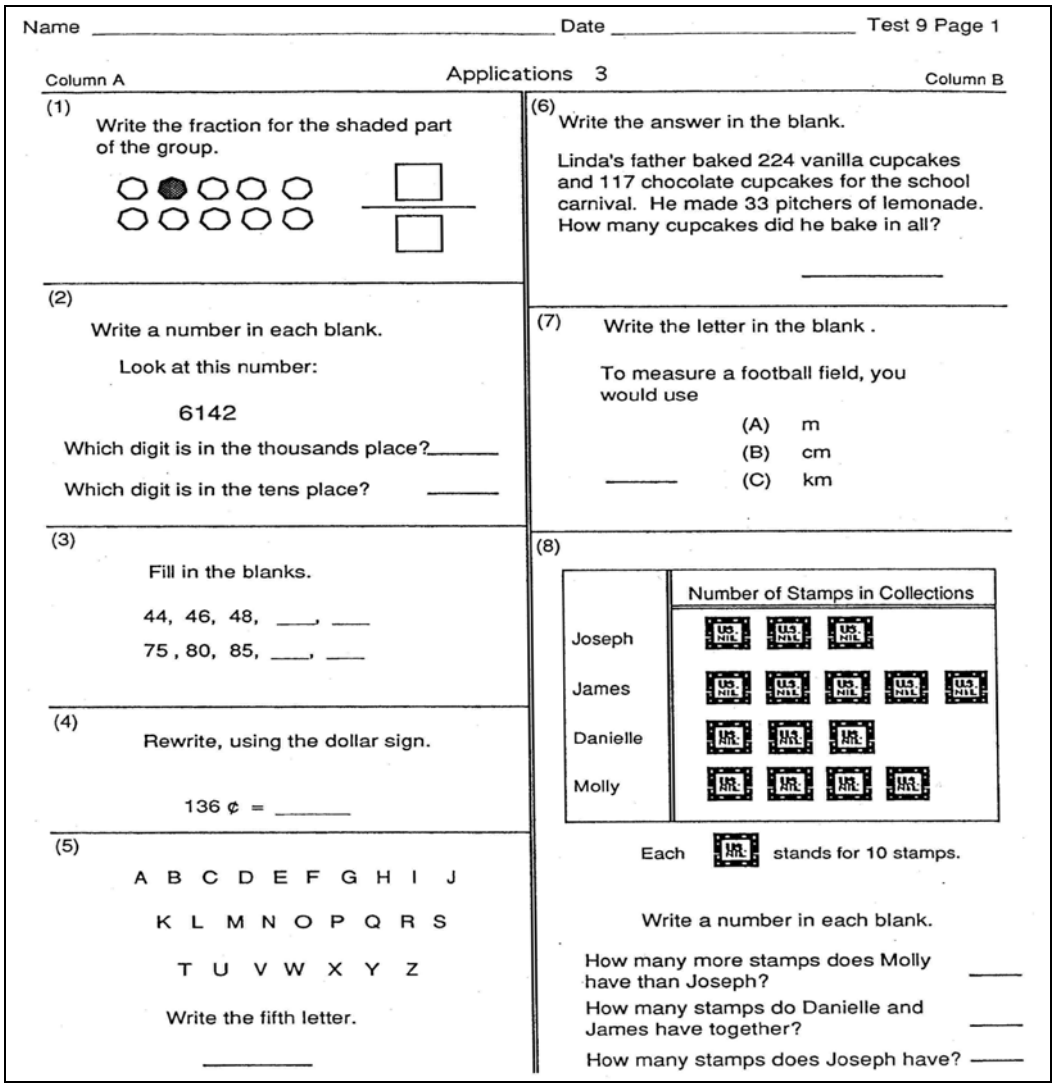
Furthermore, the curriculum lends itself well to formative evaluation such as progress monitoring with curriculum-based measurement. Students have repeated opportunities across units to revisit and build upon previously taught skills. If a student fails to master a particular conceptual or procedural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

Mr. Thompson and CBM

Mr. Thompson monitors his students' math progress using third-grade Math CBM Concepts and Applications tests. The third-grade Math CBM Concepts and Application probes consist of 24 applied math problems representing the year-long, third-grade math applied problems curriculum. Each test is 3 pages long. The type of problems represented on each test remains constant from test to test. The skills to be tested, however, and their positions on the test are selected randomly. For example, at Grade 3, every Concepts and Applications test includes two problems dealing with charts and graphs and three problems dealing with number concepts.

CBM Concepts and Applications probes are administered to all students in the class at one time. Mr. Thompson presents each student with a CBM Concepts and Applications test. Students have 6 minutes to answer the math problems on the test. Mr. Thompson uses a timer set for 6 minutes, because accurate timing of the CBM Concepts and Applications tests is critical to ensure consistency from test to test.

Here is a sample of one of the CBM Concepts and Applications tests Mr. Thompson uses in his classroom.



Name _____ Date _____ Test 9 Page 1

Applications 3

Column A

(1) Write the fraction for the shaded part of the group.

(2) Write a number in each blank.

Look at this number:

6142

Which digit is in the thousands place?_____

Which digit is in the tens place? _____

(3) Fill in the blanks.

44, 46, 48, ___, ___

75 , 80, 85, ___, ___

(4) Rewrite, using the dollar sign.

136 ¢ = _____

(5)

A B C D E F G H I J

K L M N O P Q R S

T U V W X Y Z

Write the fifth letter.

_____

Column B

(6) Write the answer in the blank.

Linda's father baked 224 vanilla cupcakes and 117 chocolate cupcakes for the school carnival. He made 33 pitchers of lemonade. How many cupcakes did he bake in all?

_____

(7) Write the letter in the blank .

To measure a football field, you would use

(A) m

(B) cm

_____ (C) km

(8)

Number of Stamps in Collections

Joseph

James

Danielle

Molly

Each stands for 10 stamps.

Write a number in each blank.

How many more stamps does Molly have than Joseph? ____

How many stamps do Danielle and James have together? ____

How many stamps does Joseph have? ____

Name _____ Date _____ Test 9 Page 2

Column C — Applications 3 — Column D

(9)

Write <, >, or = in each blank.

3326 _____ 3475

3010 _____ 797

(10)

Write the answer in the blank.

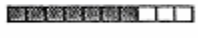
It costs $3.00 to go roller skating and $2.45 to go to a movie. How much less does it cost to go to a movie?

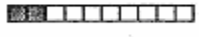
_____

(11)

Write the decimal for the shaded part in each blank.

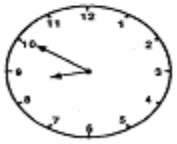
_____ 

_____ 

_____ 

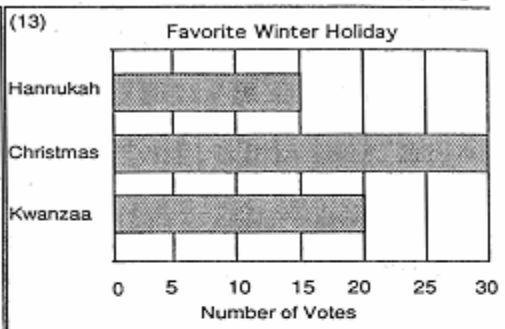
(12)

Write the time.



___ : ___

(13)



Write a number in each blank.

How many more votes did Christmas get than Hannukah? _____

How many votes did Kwanzaa get? _____

How many votes were there in all? _____

(14)

Rewrite

15 ÷ 5 = 3

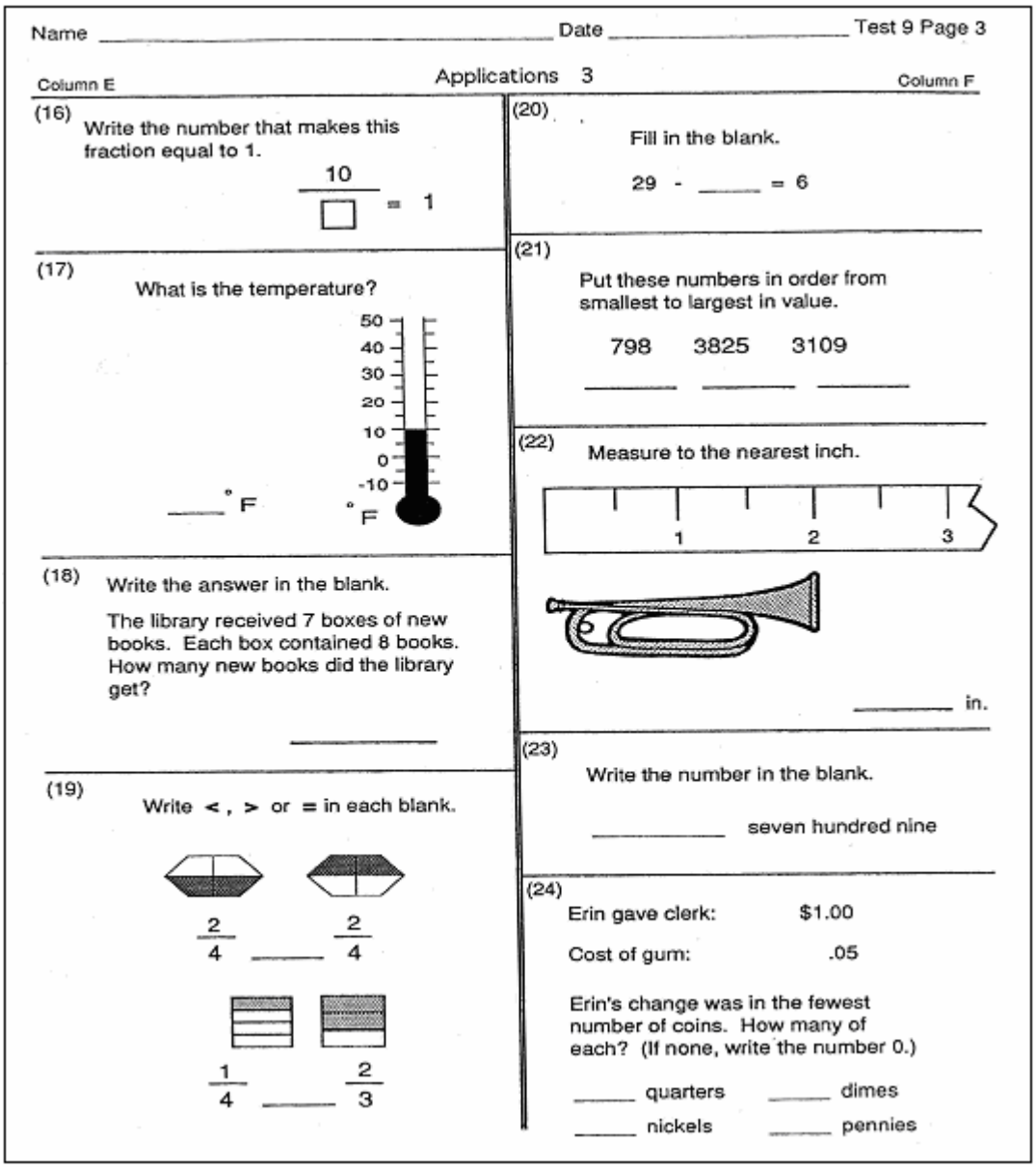
as:

___)___

(15)

Write the letter **E** next to even numbers and the letter **O** next to odd numbers.

_____ 88 _____ 19



Name _____ Date _____ Test 9 Page 3

Column E — Applications 3 — Column F

(16) Write the number that makes this fraction equal to 1.

$$\frac{10}{\square} = 1$$

(17) What is the temperature?

____ °F °F

(18) Write the answer in the blank.

The library received 7 boxes of new books. Each box contained 8 books. How many new books did the library get?

_____

(19) Write < , > or = in each blank.

$\frac{2}{4}$ ____ $\frac{2}{4}$

$\frac{1}{4}$ ____ $\frac{2}{3}$

(20) Fill in the blank.

29 - _____ = 6

(21) Put these numbers in order from smallest to largest in value.

798 3825 3109

_____ _____ _____

(22) Measure to the nearest inch.

_____ in.

(23) Write the number in the blank.

_____ seven hundred nine

(24) Erin gave clerk: $1.00

Cost of gum: .05

Erin's change was in the fewest number of coins. How many of each? (If none, write the number 0.)

_____ quarters _____ dimes

_____ nickels _____ pennies

Mr. Thompson administers CBM Concepts and Applications to his entire class at one time. He passes the tests out, reads the administration directions, and then allows the students 6 minutes to answer as many problems as they can. At the end of 6 minutes, Mr. Thompson collects the tests and scores them by the number of blanks (i.e., from a total of 46) in each problem answered correctly.

Here is the administration script Mr. Thompson 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, work down the first column and then down the second column. Then, move on to the next page. 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 later.

Remember, some problems have more than one blank. You get credit for each blank that you answer, so be sure to fill in as many blanks as you can. The answers to some word problems may be an amount of money. When you write your answer to a money problem, be sure to use the correct symbols for money in order to get credit for your answer.

Go through the entire test doing the easy problems. Then go back and try the harder ones. When I say, "Begin," turn your test over and start to work. Work for the whole test time. Write your answers so I can read them! If you finish early, then check your answers. When I say, "Stop," put your pencil down and turn your test face down.

When Mr. Thompson scores the CBM Concepts and Applications probes, students receive 1 point for each correctly answered blank. The number of blanks filled in correctly within the 6 minutes is the student's score.

Look at the following third-grade CBM Concepts and Applications test for Reilly.

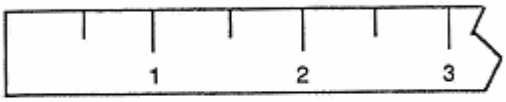
Question: How many digits did Reilly answer correctly? (Use the answers provided, below.)

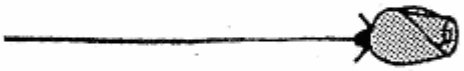
Name Reilly Date _____ Test 16 Page 1

Applications 3

Column A

(1) Measure to the nearest inch.





3 in.

(2) Travis gave clerk: $1.00

Cost of ice cream: .24

Travis's change was in the fewest number of coins. How many of each? (If none, write the number 0.)

3 quarters 0 dimes

0 nickels 1 pennies

(3) Write the fraction for the shaded part.

$\frac{3}{6}$

(4) Put these numbers in order from smallest to largest in value.

860 5194 4630

860 4630 5194

(5) It takes 2 pieces of dry ice to make the witch's brew bubble and 7 apples to fill a tub for the Halloween apple bobbing game. How many apples will it take to fill 14 tubs?

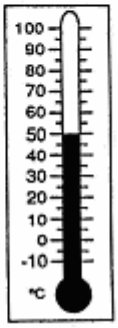
_____

Column B

(6) Write the number in the blank.

_____ nine hundred seventy-three

(7) What is the temperature?



50 °C

(8) Rewrite

$5\overline{)30}$ $= 6$

as:

30 ÷ 6 = 5

(9) Write a number in each blank.

Of these numbers,

4251 4059 2951

2951 is the smallest.

4059 is the largest.

Name Reilly Date _____ Test 16 Page 2

Column C — Applications 3 — Column D

(10)

A B C D E F G H I J

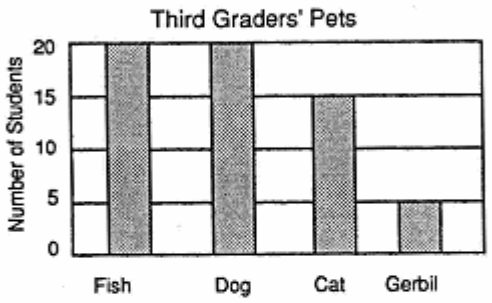
K L M N O P Q R S

T U V W X Y Z

Write the fifteenth letter.

O

(11)



Write a number in each blank.

How many children have gerbils? 5

How many fewer children have cats than dogs? 15

How many children have fish or gerbils together? 25

(12)

Tomika helped her dad wash the car for 47 minutes. Then she helped him wash dishes for 36 minutes. How many minutes did Tomika spend helping her dad?

_____

(13)

Write the letter in the blank.

A cereal bowl would hold about how much milk?

(A) 1 c

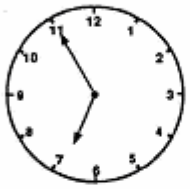
(B) 1 qt

(C) 1 gal

B

(14)

Write the time.



6 : 55

(15)

Fill in the blanks.

60, 70, 80, ___, ___

81, 84, 87, ___, ___

(16)

Write the number in each blank.

9 hundreds 5 tens 3 ones = 953

6 hundreds 2 tens 5 ones = 625

(17)

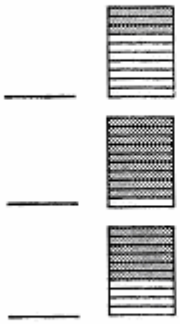
Write the number that makes this fraction equal to 1.

$\frac{\square}{9} = 1$

Name Reilly Date _____ Test 16 Page 3

Column E — Applications 3 — Column F

(18) Write the decimal for the shaded part in each blank.



(19) Round first, then estimate the answer to the nearest 10.

69 - 51 =

Answer to the nearest 10: _____

(20) Kathy bought a pencil for 40¢. Rachel bought a notebook for 86¢. How much more money did Rachel spend than Kathy?

_____

(21) How much money?

$3.27

(22) Write the letter **E** next to even numbers and the letter **O** next to odd numbers.

O 13 E 36

(23) Favorite Arcade Games

Arcade Games	Number of votes
Pac Man	56
Teenage Mutant Ninja Turtles	84
The Simpsons	67
Donkey Kong	10

Write a number in each blank.

How many votes did The Simpsons and Donkey Kong get together? 77

How many more votes did Teenage Mutant Ninja Turtles get than Pac Man? _____

How many votes did Teenage Mutant Ninja Turtles get? 84

(24) Write **<**, **>**, or **=** in each blank.

$\frac{2}{3} < \frac{3}{4}$

$\frac{1}{2} = \frac{3}{4}$

Scoring Sheet for CBM Concepts and Applications Test 16

1.	3 inches	**9.**	2951 smallest	**18.**	0.3
2.	3 quarters		4251 largest		0.9
	0 dimes	**10.**	O		0.6
	0 nickels	**11.**	5	**19.**	20
	1 pennies		5	**20.**	46¢
3.	4		25	**21.**	$3.52
	5	**12.**	83 (1 hr 23 min)	**22.**	O
4.	860	**13.**	A		E
	4630	**14.**	6 : 55	**23.**	77
	5194	**15.**	90, 100		28
5.	98		90, 93		84
6.	973	**16.**	953	**24**	<
7.	50 °C		625		<
8.	30 ÷ 5 = 6	**17.**	9		

Answer: Reilly answered 23 blanks (out of 46) correctly.

Beginning-of-Year Screening

During the first and second weeks of the school year, Mr. Thompson administered a CBM Concepts and Applications probe to all 24 students in his classroom. Mr. Thompson calculated the mean of each student's two probes. A mean of 10 points or less indicated that a student's progress should be monitored in primary prevention over the next 6 to10 weeks.

This table displays the CBM Concepts and Applications scores for the 24 students in Mr. Thompson's class. First, calculate the mean for each student. Then, identify the students who have a mean of 10 points or less. These students will be monitored in primary prevention to determine their responsiveness to intervention.

Student	Week 1	Week 2	Mean
Alexa	9	13	
Brad	15	15	
Chen	23	30	
Darryl	12	10	
Deidre	17	15	
Ebony	17	20	
Franklin	4	8	
Hon-Li	32	34	
Jackson	15	13	
Janel	11	8	
Kristina	31	26	
Lenny	17	15	
Maddy	6	6	
Megan	29	25	
Molina	14	14	
Ned	10	16	
Olivia	14	19	
Pam	37	35	
Preston	14	9	
Reilly	24	15	
Sally	5	9	
Trent	8	7	
Willow	25	28	
Xin	14	17	

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

Answer: Franklin (mean of 6), Janel (mean of 9.5), Maddy (mean of 6), Sally (mean of 7), and Trent (mean of 7.5).

Primary Prevention in Mr. Thompson's Classroom

In addition to the district-mandated curriculum, Mr. Thompson uses an evidence-based practice that focuses on word-problem solving at primary prevention, known as "Hot Math." Mr. Thompson feels Hot Math is an important supplement to the regular mathematics curriculum, as the end-of-year, "high-stakes," testing focuses particularly on student word-problem solving abilities.

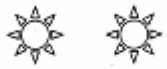
The word-problem solving program takes place 2 times per week for 45-60 minutes each session. Four problem types, which mimic real-life problem-solving experiences, are included in instruction. The types are shopping list, buying bags, half, and pictograph. The sequence of each lesson is as follows. First, problem-solution instruction is delivered, relying on explicit instruction and worked examples (both completely and partially worked examples). Next, students break into pairs to solve additional problems, and check for accuracy. Stronger students are paired with weaker students to allow for peer-guidance and support. Following the pair-work, independent work takes place, and the session ends with homework problems assigned for the next session.

Below is a sample worksheet from the whole-class problem-solving program.

Name _____ P Worksheet 5

Directions: Solve each problem.

1. Levi went to the store to buy a new board game. The sign above the game looked like this:

All board games on sale! This is the sale price: 

Each sun stands for $3. While he was at the store, he also bought a football for $8. How much did Levi spend for the board game and the football?

2. Ashley has to practice piano 9 hours every week. She decided to practice half the hours during the first part of the week and half the hours during the second part of the week. How many hours did Ashley practice during the first part of the week?

Progress Monitoring in Primary Prevention

Mr. Thompson administers CBM Concepts and Applications probes to Franklin, Janel, Maddy, Sally, and Trent for 7 additional weeks during primary prevention. These probes are administered to the students to determine responsiveness to an effective, research-based intervention.

At the end of 9 weeks, Mr. Thompson analyzes the five students' progress in primary prevention. This is how Mr. Thompson 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, Trent's probes can be separated into three groups: (7,**8**,9) (5,7,8) (8,**9**,10). The median score in the first group of probes is 8. The median score in the third group of probes is 9. 9 - 8 / (9 - 1) = 0.25.

Student	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Slope
Franklin	4	8	3	6	8	8	9	7	7	0.375
Janel	11	8	13	16	14	10	16	19	17	0.75
Maddy	6	6	9	6	9	10	9	10	9	0.375
Sally	5	9	9	8	12	13	15	18	14	0.75
Trent	8	7	9	5	8	7	9	8	10	0.25

In primary prevention, a third-grade student should demonstrate a slope of .50 points per week or higher.

Question 1: Which students are demonstrating adequate growth (a slope of .50 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: Janel and Sally are demonstrating adequate growth.

Answer to Question 2: Franklin, Maddy, and Trent are demonstrating inadequate growth.
Answer to Question 3: Franklin, Maddy, and Trent should participate in secondary prevention.

Think ahead: What type of instruction may Mr. Thompson want to provide for Franklin, Maddy, and Trent in secondary prevention? What information might Mr. Thompson use to make his curriculum decisions?

Secondary Prevention in Mr. Thompson's Classroom

Mr. Thompson uses a structured math tutoring program to address the math difficulties of Franklin, Maddy, and Trent. This program, university-developed and shown to be effective for remediating the math difficulties of third-grade students, consists of 3 (30 minute) sessions per week delivered via individual tutoring. The tutoring program, "Pirate Math," focuses on

setting up and solving one- and two-step addition and subtraction word problems, incorporating a counting up strategy to address basic fact deficiencies.

The tutoring program provides instruction on three types of word problems (i.e., "Total," "Difference," and "Change" problems). Instruction begins for each type with fairly transparent problems (e.g., single-digit, one-step, no transfer features) and becomes increasingly more complicated with the introduction of transfer features such as: irrelevant information, double-digit data, money, barcharts, pictograph, scenes, multiple solution steps, and varying the position of the missing information. Students are taught specific solution strategies, and are provided with extensive practice in identifying given problems' types, ignoring extraneous information, and constructing algebraic equations with the variable "X" representing the missing information. Each lesson is scripted (for the teacher to study and follow) and comprises the following 5 activities.

1. Math Fact Flashcards (basic facts practice)
2. Word-problem Warm-up (student "teaches" previously solved item)
3. Guided Instruction on Word Problems
4. Sorting Cards (practice identifying word problems by type)
5. Daily Review (paper-pencil algebra equations and word problem)

Based on the information gathered from Franklin, Maddy, and Trent's weekly CBM probes, as well as textbook tests and informal observations of their daily class work, Mr. Thompson realizes the three students seem to be unable to identify and inhibit irrelevant information in word-problem text or to self-evaluate the reasonableness of their answers. He decides to begin with the introductory unit of "Pirate Math," which provides explicit instruction on skills prerequisite for solving basic word problems.

While the rest of the class is doing individual seatwork and monitored by the classroom assistant, Mr. Thompson works individually with Franklin, Maddy, and Trent at a table in the back of the room. Following scripts provided in the manual, Mr. Thompson leads the three students through the activities included in the tutoring program. Cumulative review of problem types is provided frequently. Throughout each session, the students earn "gold coins" for paying attention and working hard; they trade the "coins" for small prizes regularly.

Below are examples of a teacher script, training poster, and student worksheet from the Total unit of "Pirate Math."

Pirate Math: RUN! Script

When we solve a word problem, we always use "RUN!" (Show RUN! poster to student.) **Let's RUN! through the problem now.**

R stands for "Read the problem." (Point to poster.) **Go ahead and read it now.** (Student reads the problem. RA assists, as needed.)

U stands for "Underline the question." (Point to poster.) **Remember, the question is the sentence that ends with the question mark. Underline the question now.** (RA assists, as needed.)

N stands for "Name the problem type." (Point to poster.) **What type of problem is this?**

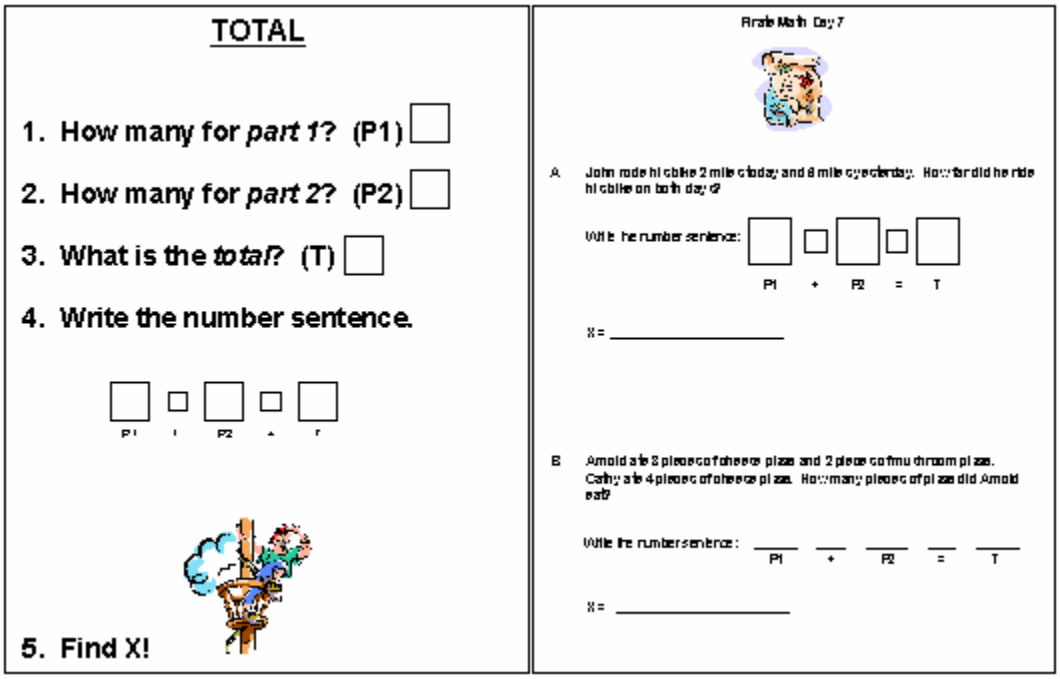
Yes, this is a Total problem, because _____ and _____ are being put together, or combined, into a total.

Great! What's being totaled in this story? (Student. RA assists, as needed.) **Good, circle _____. That will be our label for our answer.**

Do you see the word _____ anywhere else in the story? Circle it, and circle the numbers that go with _____. (RA assists, as needed.)

Is there any irrelevant information in this story? Remember, irrelevant information is extra information we don't need to know to solve the problem. If there's any irrelevant information, cross it out now. (RA assists, as needed.)

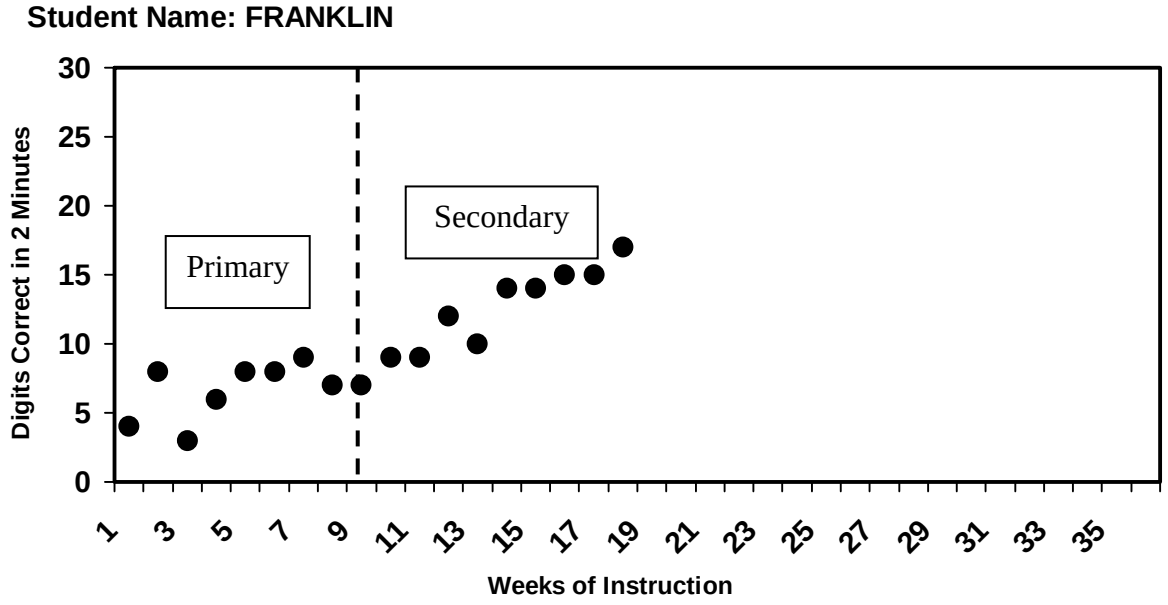
Good! Now that we know what type of problem it is, let's use that poster to solve the problem.



Progress Monitoring in Secondary Prevention

While receiving instruction at the secondary prevention level, lasting 9 to 18 weeks at this school a parent volunteer administers weekly CBM Concepts and Applications probes to Franklin, Maddy, and Trent. These probes are administered to the students to determine their individual responsiveness to the secondary prevention tutoring program. After the volunteer scores each probe, the students plot their scores on their own graphs. Research has demonstrated that self-awareness of progress may be particularly motivating. Mr. Thompson has noticed this with his third graders and uses the graphs to discuss their progress with them.

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



Question: Based on Franklin's graph, do you think he is responding to secondary prevention?

Answer: Franklin appears to be responsive to secondary prevention. Graphs alone, however, can not be the deciding factor in whether Franklin leaves or continues in secondary prevention.

Question: Based on prior decisions made about Franklin, what may be used as the deciding factor in whether Franklin leaves or continues in secondary prevention?

Answer: In primary prevention, slopes were calculated and used to determine whether students were responding to primary prevention. So, in secondary prevention slopes will again be used to determine responsiveness-to-intervention.

Mr. Thompson also looks at the CBM slopes for Franklin, Maddy, and Trent to determine their responsiveness to secondary prevention. At secondary prevention, third-grade students should demonstrate a slope of .70 or higher to be deemed "responsive" to intervention.

Student	Week 10	Week 11	Week 12	Week 13	Week 14	Week 15	Week 16	Week 17	Week 18	Slope
Franklin	9	9	12	10	14	14	15	15	17	
Maddy	12	13	12	10	14	13	12	15	14	
Trent	10	12	9	10	13	10	14	12	13	

First, calculate the slope for Franklin, Maddy, and Trent. Here are the steps to calculate each student's 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.

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: Franklin is ready to move from secondary to primary prevention. His slope of 0.75 is above the cut-off of 0.70. Students with a slope above 0.70 are demonstrating enough progress to discontinue secondary prevention at this time.

Answer to Question 2: Maddy's (0.25) and Trent's (0.375) slopes are below 0.70. They will remain in secondary prevention.

Think ahead: What might Mr. Thompson do during secondary prevention for Maddy and Trent that was different than what he did during Weeks 10-18 of the school year? What information could Mr. Thompson use to make this decision?

What does Secondary Prevention Look Like For the Second Semester?

During the second semester, Mr. Thompson again relies on the research-based third-grade math tutoring program to address Maddy and Trent's math difficulties. He continues to work with the students 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, Mr. Thompson determines that the students seem to lack an understanding of interpreting data from barcharts and pictographs, which impedes their ability to solve word problems incorporating charts and graphs. So, he begins the second semester tutoring sessions with additional explicit instruction and extended practice reading charts and graphs. See below for an example of word problems from "Pirate Math" using charts and graphs.

Pirate Math Day 37

A.

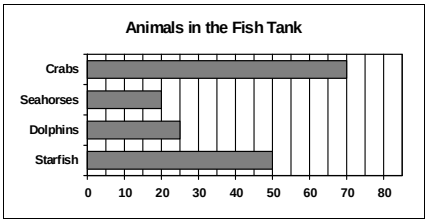
Prices at Grocery Store	
Ham	
Laundry Soap	
Fruit	
Dog Food	

Each stands for $2.

Kyle had $33. Then, he bought dog food at the grocery store. How much money does Kyle have now?

B. Ellen had $49. She spent $13 on a t-shirt. The t-shirt has 7 stripes. How much money does Ellen have left?

C.



There were many different animals in the fish tank. How many more crabs were in the tank than dolphins?

Ongoing Progress Monitoring

As with the first semester secondary prevention group, Maddy and Trent receive weekly CBM Concepts and Applications 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
Maddy	15	15	17	20	21	24	22	23	25	
Trent	12	10	11	14	10	8	12	13	13	

Calculate the slopes for Maddy and Trent.

Remember, to leave secondary prevention and return to primary prevention, third-grade students need to demonstrate a slope of 0.70 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: Maddy should return to primary prevention intervention. She appears responsive to secondary prevention with a slope of 1.0.

Answer to Question 2: Trent has not demonstrated adequate growth in secondary prevention. His slope of 0.25 does not meet or exceed the 0.70 slope for third-grade students taking CBM Concepts and Applications tests. Trent needs more intensive, tertiary prevention.

What Happens in Tertiary Prevention for Students at Riverbend Elementary?

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

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

After ruling out all of the above, Trent's learning difference received the designation of LD. He began tertiary prevention in March of the school year.

Setting IEP Goals

One aspect of Trent's tertiary prevention services (i.e., at Riverbend Elementary) includes the development of his 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

Grade	Computation	Concepts & Applications
1st Grade	20 digits	20 points
2nd Grade	20 digits	20 points
3rd Grade	30 digits	30 points
4th Grade	40 digits	30 points
5th Grade	30 digits	15 points
6th 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, Trent's last 8 CBM scores were 10, 11, 14, 10, 8, 12, 13, and 13. 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 13 - 11 = 2. Since 8 scores have been collected, divide the difference by the number of data points minus 1. So, (13 - 11) ÷ 7 = 0.29.

0.29 is multiplied by 1.5: 0.29 × 1.5 = 0.435. Multiply the product of 0.435 by the number of weeks until the end of the year. If there are 9 weeks left until the end of the year: 0.435 × 9 = 3.915. The average score of the last 8 data points was 11.375. The sum of 3.915 and the average score is the end-of-year performance goal: 3.915 + 11.375 = 15.29. The student's end-of-year performance goal would be 15.29. So, 15.29 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.

CBM Math Norms for Student Growth (Slope)

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

Monitoring and Developing Individualized Instructional Programs

Once IEP goals are set and individualized programs are implemented, it is important to monitor student progress. 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.

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:

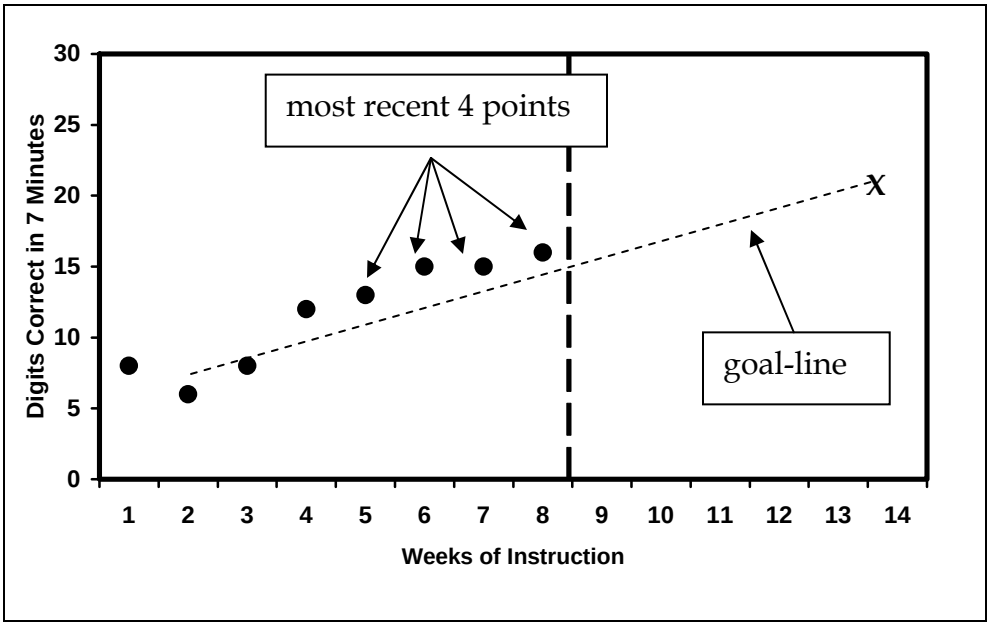
- If the student's trend-line is steeper than the goal-line, the student's end-of-year performance goal needs to be increased.
- If the student's trend-line is flatter than the goal-line, the teacher needs to revise the instructional program.
- If the student's trend-line and goal-line are the same, 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 <u>above</u> 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.

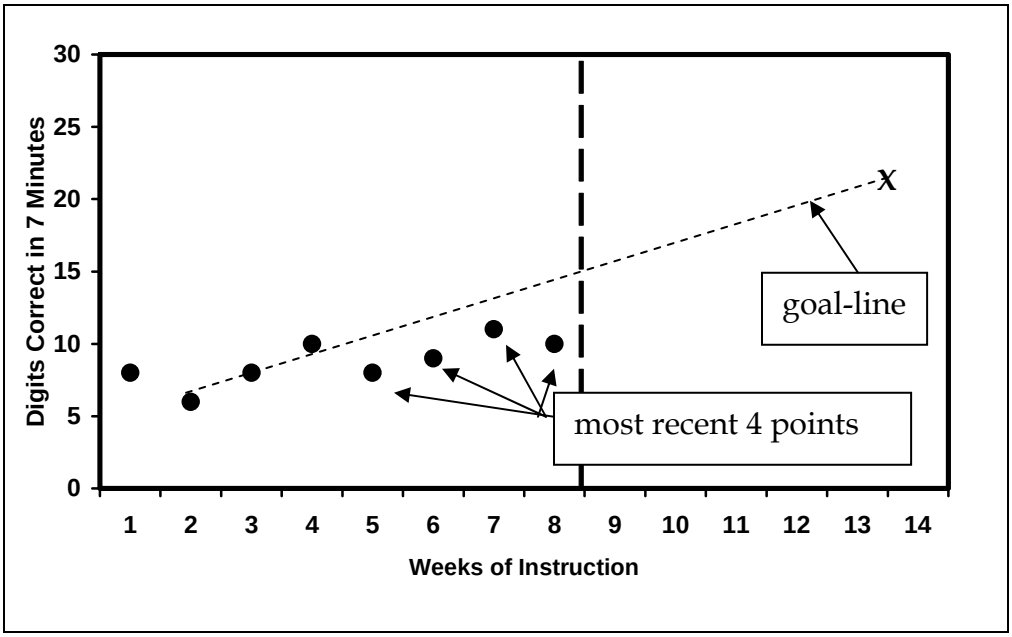
The point of the goal increase is notated on the graph as a dotted vertical line. This allows teachers to visually note when the student's goal was changed. The teacher re-evaluates the student's graph in another 7-8 data points.



4 Consecutive Scores below Goal-Line

Below, the most recent 4 scores are <u>below</u> 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.

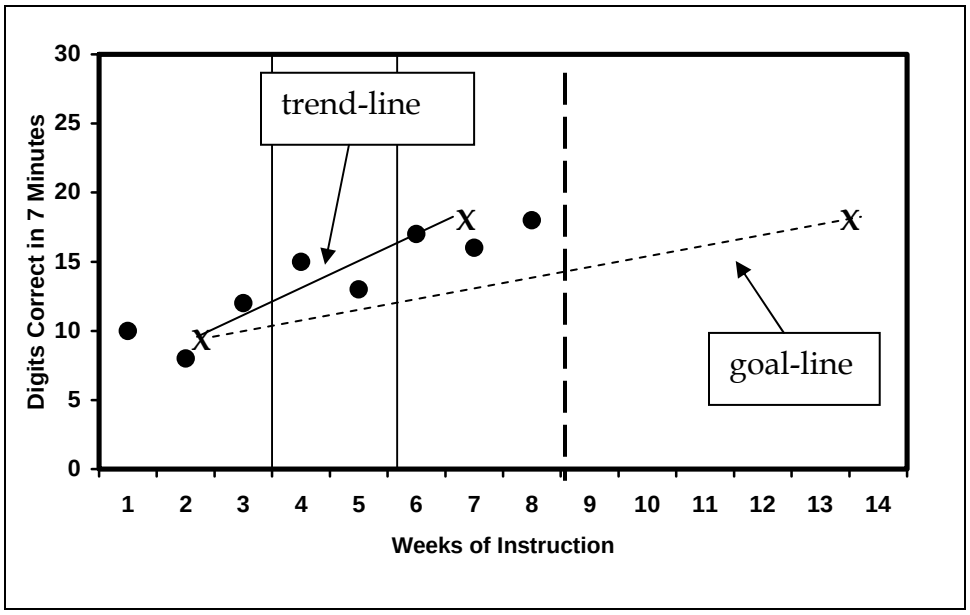
The teacher draws a dotted vertical line when making an instructional change. This allows teachers to visually note when changes to the student's instructional program were made. The teacher re-evaluates the student's graph in another 7-8 data points to determine whether the change was effective.



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.

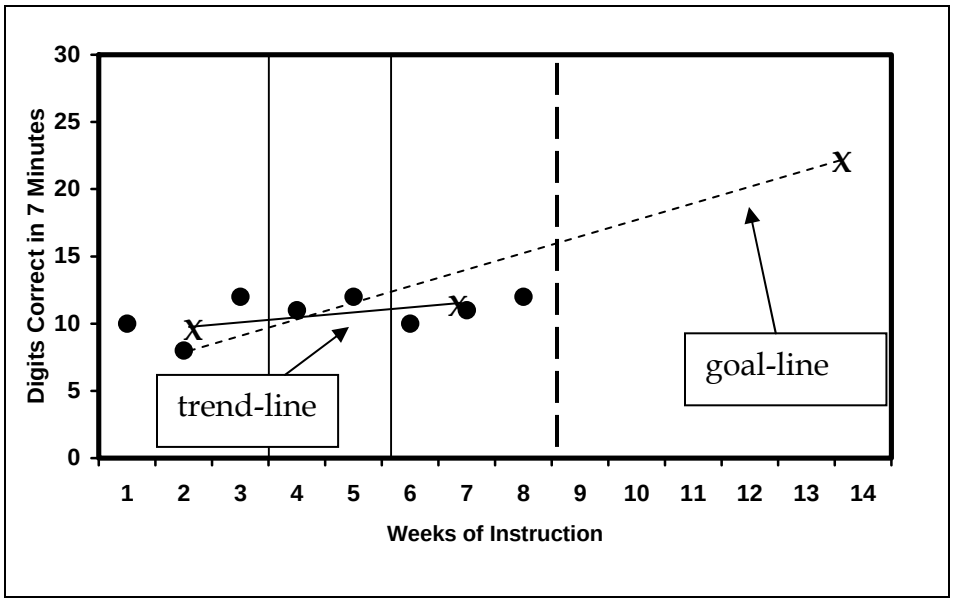
The point of the goal increase is notated on the graph as a dotted vertical line. This allows teachers to visually note when the student's goal was changed. The teacher re-evaluates the student's graph in another 7-8 data points.



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.

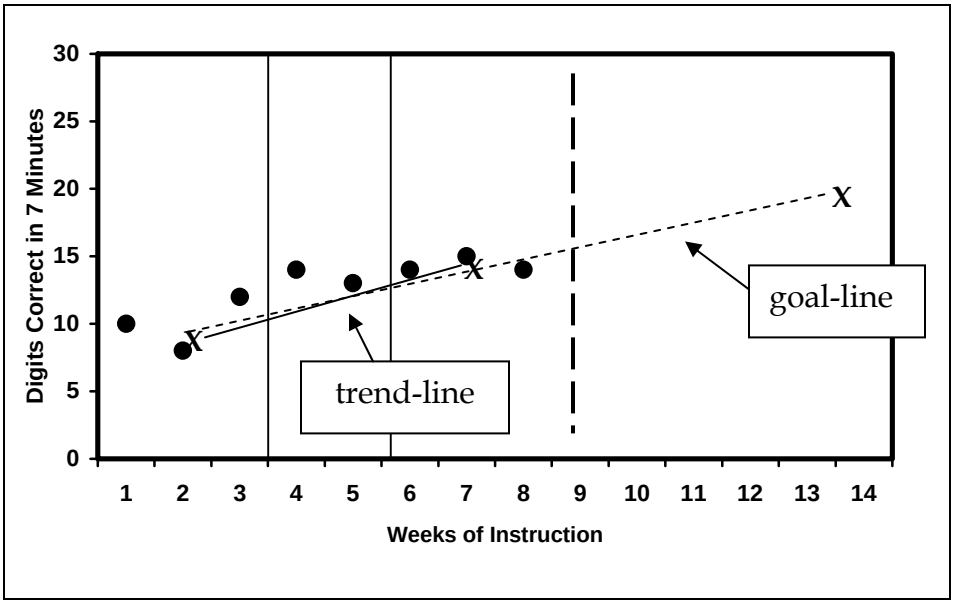
The point of the instructional change is represented on the graph as a dotted vertical line. This allows teachers to visually note when the student's instructional program was changed. The teacher re-evaluates the student's graph in another 7-8 data points.



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.



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

Grade	**Computation**		**Concepts & Applications**	
	> Slope	> End level	> Slope	> End level
1st Grade	> .50	> 20 digits	> .40	> 20 points
2nd Grade	> .40	> 20 digits	> .40	> 20 points
3rd Grade	> .40	> 20 digits	> .70	> 20 points
4th Grade	> .70	> 20 digits	> .70	> 20 points
5th Grade	> .70	> 20 digits	> .70	> 20 points
6th Grade	> .70	> 20 digits	> .70	> 20 points

Discussion Questions

How well did RTI appear to work in Mr. Thompson's class?

What additional responsibilities did Mr. Thompson have to handle during the school year that he didn't have to handle when Riverbend 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 Franklin's path under the RTI model. Next, draw Maddy's path. Finally, draw Trent's path.

Student Does Not Have a Disability

Step 1: Screening
Is this student suspected at-risk?

NO YES

Step 2: Assessing Primary Prevention Response
Is this student unresponsive to general education?

NO YES

Step 3: Assessing Secondary Prevention Response
Is this student unresponsive to secondary prevention tutoring?

NO YES

Step 4: Comprehensive Evaluation and Disability Classification / Special Education Placement
Answer questions that arise in primary and secondary prevention. Also, what is the student's disability label?

LD MR EBD

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

Grade	Computation Cut-off	Concepts & Applications Cut-off
1st Grade	< 5 digits	< 5 points
2nd Grade	< 10 digits	< 10 points
3rd Grade	< 10 digits	< 10 points
4th Grade	< 10 digits	< 5 points
5th Grade	< 15 digits	< 5 points
6th Grade	< 15 digits	< 5 points

Inadequate Math Slopes - Primary Prevention

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

Quantifying Response to Secondary Prevention in Math

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

Typical End-of-Year Benchmarks in Math

Grade	Computation	Concepts & Applications
1st Grade	20 digits	20 points
2nd Grade	20 digits	20 points
3rd Grade	30 digits	30 points
4th Grade	40 digits	30 points
5th Grade	30 digits	15 points
6th Grade	35 digits	15 points

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

Quantifying Response to Tertiary Prevention in Math

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

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