

# **Math Plan**

## **Academic Turnaround of Title 1 Elementary Schools**

***An abbreviated guide intended to  
provide an implementation process to  
dramatically raise student outcomes for  
ALL students***

***Elementary School Grades (1<sup>st</sup> through 5<sup>th</sup> grade)***

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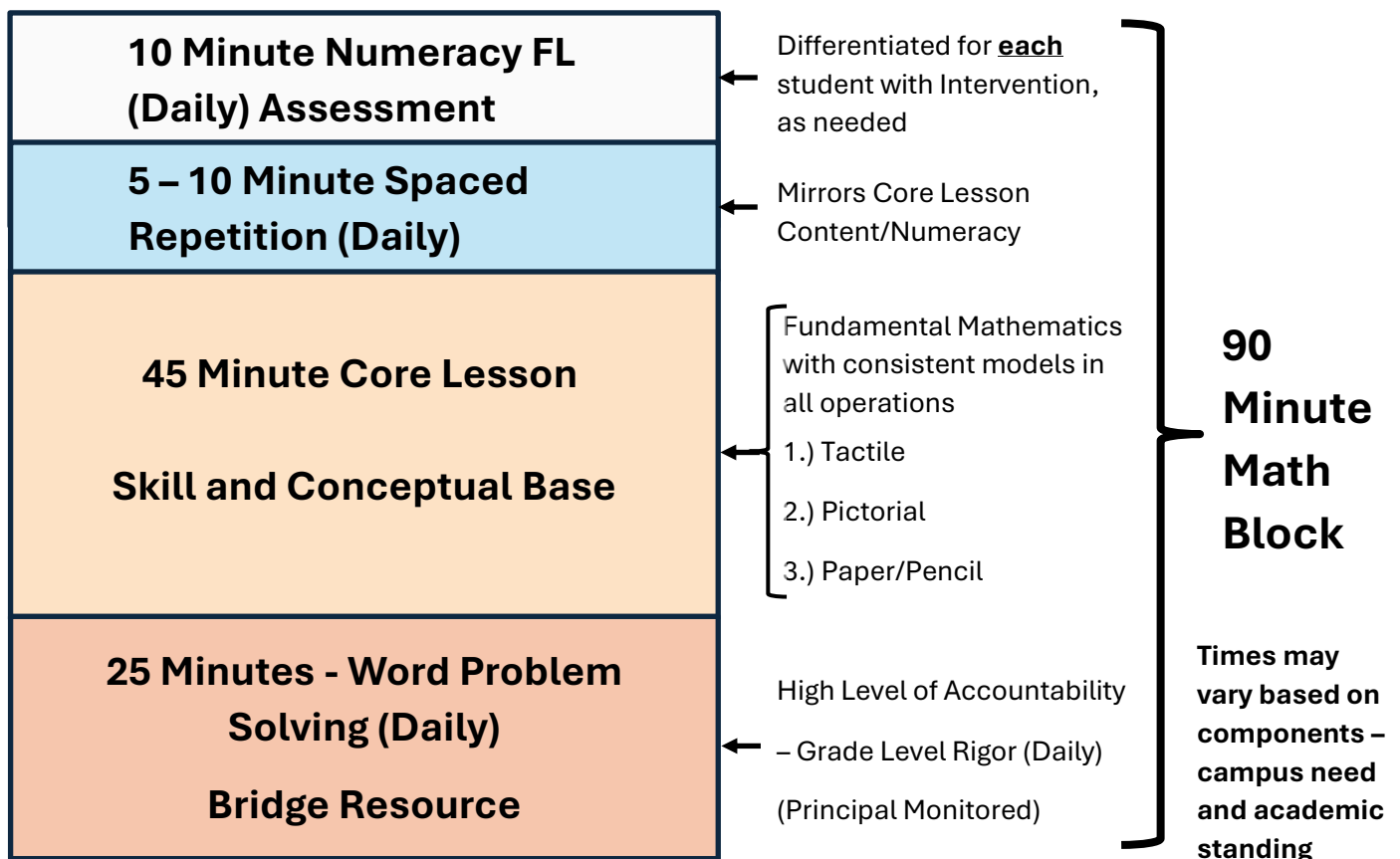
# Elementary Math (and Intervention) Program Overview

This document's primary objective is intended to supply the basic and essential information so principals can understand a process to dramatically improve mathematics outcomes at their campuses in one school year. It is intended as a pragmatic guide for campuses that struggle with a significant number of enrolled students not meeting passing requirements on standardized tests as well greatly improve their numeracy and problem-solving skills.

It is highly recommended that a 90-minute math block be used in elementary schools.

There are FOUR (4) primary components in a 90-minute math block. These 4 components consist of a daily numeracy program, spaced repetition, core lesson and a daily problem session. Usually, 10 minutes is saved if the daily numeracy (both Math Facts and Math Processing Skills) is completed when students first arrive at school at the onset of school in their homeroom. It is important to note the daily numeracy should begin immediately in the intermediate grade levels (third through fifth grades). However, in the primary grades, the daily numeracy program (Formative Loop) should begin 3 to 4 weeks after the start of the school year, so that classroom teachers have an opportunity to provide basic instruction to students in the core math lessons.

The graphic shown below depicts the four components of a typical 90-minute math program.



These components and pragmatic recommendations follow on subsequent pages. Documents will be referenced that should be read in their entirety for an administrator to fully understand the process. These white papers and documents can be downloaded at the website listed in the footer. Failure to read these referenced materials will limit the pragmatic understanding of the process.

# Salient Points Affecting the Mathematics Reformation Process and Student Performance

The following relevant points indicate the rationale for the math reformation process – including instructional leadership focus and pragmatic aspects of the schoolwide numeracy program.

- ❖ Since many Title 1 campuses have low student passing rates on standardized assessments, the campus intervention process must initially focus on the 3<sup>rd</sup> through 5<sup>th</sup> in elementary grades as well as middle school if a charter public school. These are the publicly reported grades for the school, and those grades should be addressed to alleviate external forces (i.e., central office edicts and/or the state's education agency) from initiating curricular programs on the campus that are invariably ineffective. The primary grades (i.e., 1<sup>st</sup> and 2<sup>nd</sup>) can also be addressed simultaneously; however, the process may be implemented differently since available campus personnel to press the intervention program may be limited compared with that of the intermediate grades.

**Note:** A principal must possess organizational, analytical and logistic skills to be an effective campus manager and instructional leader. Of course, this skill set is invaluable in any professional field, but in leading a campus with 500 to 1,000 students, it is an essential attribute in the campus' success. If the principal is weak in this skill set area, it is recommended to find a mentor principal to assist in developing this professional work skill. A global school wide curricular stop-gap program will be an indicator on the level of ability the campus administration possesses in this management area. Unfortunately, the reformation process is not successful many times due to the principal's lack of ability in implementing and maintaining the intervention program.

- ❖ The principal must understand the basic elements of human learning – how unmastered prior grade level skills adversely affect student outcomes on **grade level** dependent skills and applications. In arithmetic, the academic numeracy gap fomented in the primary grades and widens each year during the intermediate grades; thus, by the end of fifth and sixth grades, a student can be years behind academically in arithmetic skills. This situation seriously impacts their ability to be competent in seventh grade geometry or algebra when those arithmetic skills need to be mastered.
- ❖ There are two types of arithmetic math skills: **Math Facts** – the four basic operations of addition, subtraction, multiplication and division, and **Math Processing Skills** – are the mass of arithmetic skills: Place Value, Even and Odd Numbers, Computational Skills, Fractions, Decimals, Perimeter, Area, Volume, etc.
- ❖ Students must possess definitional knowledge and operational understanding of math vocabulary words (e.g., sum, difference, proper fraction, decimal, etc.), and it is essential that they are able to recognize the word in print form. A student learning expectation should be that students be adept at writing numerical examples of the vocabulary word. For instance, a Composite Number is a number that has more than two multiplication factors. Given the number 6: (1 x 6) and (2 x 3) are the two factor pairs (or 4 factors). Thus, the factors for 6 are {1, 2, 3, and 6}. Since number 6 possesses four factors, more than 2, it is a composite number. In contrast, the number 3, has only one factor pair – 1 x 3 (or two factors). Consequently, the number 3 is called a prime number since it only has two factors (i.e., 3: {1, 3}).

**Note:** Math vocabulary is not contextually endemic in a standard word or story problem as vocabulary words are in a reading comprehension passage. Hence, students must know the definition of the word since they will not be able to discern the math vocabulary word (e.g., product or dividend) from context clues – again, as they can in a literacy – reading comprehension passage.

- ❖ This global numeracy intervention process is **labor intensive** for the first school year. Upfront, there is work involved; however, pragmatically, educators must show-up to school anyway. They might as well work on an intervention process that is not only effective, but one that will make a difference in their students' mathematical ability.

In short, the majority of academic performance issues are not going away by accident – it takes effort and a structured plan that addresses fundamental root causes of the poor student outcomes. Since the mass of returning students were pressed to grade level during the first school year of the reformation process, the second year and subsequent school years, newly enrolled students will be the central focus. However, the intervention work is much less strenuous since student mobility rates under 25 percent are relatively easily managed. Consequently, new innumerate students are easily identified, and their skill gaps are similarly eradicated.

- ❖ One of the **most important steps** in academic mathematics reformation is that the principal set up a consistent (daily) process with available personnel (external from classroom teachers) to handle the daily numeracy intervention process. Effective academic reformation is an ALL-hands-on deck task the first school year – coaches/administration/counselors and available employees to work an hour a day in a specific task that supports classroom teachers. Principals must also delegate the administration duties to allow them to handle the intervention programs. For instance, the assistant principal and counselor should handle most (90% plus) of the special education ARDs. The elementary principal must focus on the consistent implementation and quality controls of the global, schoolwide stopgap programs and classroom instruction.

Principals MUST be consistent in a curricular program initiative for more than a couple of weeks or months. Without consistency, school reformation operations revert back to the pedagogical and curricular patterns that were the root cause of chronic academic performance in the first place. Another major reason for failure is misuse or inefficient and ineffective roles of the campus math coaches/instructional specialists and other available personnel – more information on this topic in the next section of this paper.

- ❖ A campus principal must be cognizant of other factors that affect student outcomes – and address them, as needed. Four factors are listed due to their importance in student achievement. **First**, effective classroom management – students must be provided a set of viable rules and expectations that are consistently and fairly implemented to prevent and reduce off-task behavior from the student(s) acting inappropriately as well as becoming a distraction to other students in the classroom. **Second**, efficient and effective classroom routines – classroom teachers must establish consistent daily processes for students entering and exiting classroom for arrival, dismissal, transitioning in and out of the classroom, and bathroom procedures. Other processes that must be efficiently implemented are distributing core lesson materials – manipulatives or books as well as collecting daily work or homework. Another daily routine that is important is when students

(early finishers) complete classroom activities much quicker than their classmates. These children must have clear expectations to quietly and independently transition to another learning task, so they do not interrupt their classmates still working on the core lesson. **Third**, the teacher must be prepared each day or with their core lessons materials they will need. It is recommended to use a working table to house these classroom materials needed for those lessons for organization and efficiency. Hence, the teacher moves from the direct teach to the guided instruction seamlessly. **Fourth**, the teacher must design core lessons that are sequential and structured – it is recommended that the “old fashion” lesson format be implemented. These lessons should focus on active student engagement (i.e., active learning) and not on passive learning. These four critical pedagogical and operational factors promote time on task behavior and preserve instructional minutes during the instructional day.

**Note:** Every fifteen minutes lost in classroom instruction or student downtime [each and every day] translates into 8.5 instructional days lost cumulatively in May at the end of the school year. Thus, if 30 minutes of classroom time is lost **each** day, students attending class every day lose 17 (8.5 + 8.5) total days of learning despite never missing a day of school during the entire school year.

- ❖ Pedagogical philosophy must change from the current model of, *“If the student gets it, they get it. If they do not, they do not! Teacher moves on.”* This common pedagogical practice in the mass of classrooms across the United States results in, *‘The stronger getting stronger, and the weak getting weaker’* in mathematics. This teaching model and its ramification is prevalent when academic numeracy gaps are not directly addressed. Approximately 20 to 80 percent of low-income students are left academically behind with this philosophy in Title 1 elementary schools.

The principal must understand that this type of instructional philosophy harms so many of their students’ education, and that to curtail its practice, academic numeracy gaps must be a priority to dramatically close within one school year. If not, their campus’ chronic academic performance will continue until there is change.

- ❖ After the academic gaps are eradicated, the principal will discover that teachers are more successful in the classroom since their students are ON-GRADE level and prepared for Tier 1 curriculum. Student discipline issues will also be significantly reduced because students can readily engage in classroom activities and not fill their time with off task behavior. Finally, rectifying students’ academic numeracy gaps will also reduce special education referrals since students are ON GRADE level and over identification will be greatly reduced.
- ❖ The school administration must be familiar with their state’s accountability system and how it measures specific performance items. **First**, the administration must know the ‘snapshot date’ of student enrollment. On that date, whoever is enrolled at the campus on that day will be counted on the state’s standardized assessment. For instance, in Texas, that date of student record is the first Friday in October. All students enrolled on that day at a campus are deemed the campus group for standardized assessing. All students who enroll after that date, are not. Knowing this enrollment group and their ethnicity, student classification (e.g., general education or special education), and low-income status allows the school administration to immediately compute their performance rating after the raw assessment data is returned to the school in the spring. **Second**, understand the various performance

Domains of the state's accountability system. For example, in Texas, there are three (3) performance Domains. Domain I is a student achievement measure, and Domain II is a growth measure. The cumulative score for Domain I or Domain II will count for 70 percent of the campus's overall score. Domain II may be the highest of the two, and count; however, if Domain I remains consistently low, it is a potential accountability problem for the campus the following school year. For example, if the campus scores high one year on the growth measure, the next year will be difficult to score high in that Domain again. It is difficult to repeat that growth in consecutive years; it gets 'used up' in one school year. Hence, the school's accountability rating in that second year will come from Domain I, and the school's overall rating can be very low, again. **Third**, Domain III in Texas addresses the 'closing academic gaps' along with a couple other items for 30 percent of the campus's overall performance score. However, if the closing gaps measure is low, then Domain I (student achievement) will invariably be low as well. Translation: If the campus principal can be consistent in their academic reformation and address the academic gaps, then Domain I will ALSO be high every school year since the mass of children are on grade level – the measurement of a standardized assessment.

**Note:** Regardless of the accountability system in a State, the principal must understand how it functions, and how the academic gaps are being addressed in relation to the student achievement of all student classifications. Of course, I used the State of Texas' current accountability and school rating system as an example.

## **Breaking Down the Four Components of the 90-Minute Math Block**

The 90-minute math block shown on page 1 has four (4) main components: Daily Numeracy, Spaced Repetition, Core Lesson, and Problem Solving (Application). Each element will be taken in turn to explain the process that makes it work most effectively.

### **Part 1: Daily Numeracy**

A daily numeracy program must be a global, schoolwide system and focus on both arithmetic math facts and math processing skills. Both skill groups must be addressed because they are the foundational academic skills that result in the student's ability to become highly adept at intermediate grade level application work. If those skills are not addressed, those students will invariably struggle academically in the elementary intermediate grades and their middle school math years. It is important to note that many campus and district administrators believe when their schools have low standardized scores that their students have a problem-solving issue – as opposed to a math skills issue. Of course, they may have issues in problem solving applications, but it is more than probable that it is NOT the reason their students are performing poorly on standardized mathematics examinations. The rudimentary factor in chronic low math performance is due to a lack of mastery of arithmetic math facts and math processing skills. Commercial tutoring services know this situation all too well, and it is a core reason if their business stays profitable. These vendors are well aware parents will not continue to pay them if they do not have rapid success with their clients' children. Basically, what these commercial companies achieve on a small scale in their small tutoring groups can also be accomplished with a large elementary school by employing an effective global numeracy system.

**Note:** The problem-solving aspect of the math block (Part 4 below) is an easy one to address. However, the global numeracy program requires in-depth mathematics knowledge of the numeracy process and how it interacts with the other three components of the 90-minute math block. The campus principal must possess logistical and operational management skills to implement and effectively use available campus personnel to successfully address numeracy skill issues at either a small or large elementary school. However, if the principal does not possess these management skills and the assistant principal does, then it is highly recommended that the assistant principal take the lead in this numeracy part of the math block.

The easiest school wide numeracy program to implement is a pure computer program. Children sit each day in front of a computer, and they play math games and numeracy skill exercises in math facts. It tracks them, and the teacher monitors their daily activity. Without a doubt, it is the easiest means to implement a math fact numeracy program, and it is the least amount of work for classroom teachers. But that numeracy program **has not and will not** yield high achievement results – above 90% of students meeting grade level performance on standardized assessment outcomes.

Independent if the content area is literacy or mathematics, an elementary school enrollment can generally be broken into thirds for student learning success. A third ( $\frac{1}{3}$ ) of the students will master content with sound pedagogical instruction and a quality Tier 1 curriculum. That group of students are higher in cognitive processing ability, and quite simply, they will figure it out – and do well without much effort from the teacher. The second third ( $\frac{1}{3}$ ) will be as successful as the first ( $\frac{1}{3}$ ) group of students **if** they are pressed and motivated. The last third ( $\frac{1}{3}$ ) of students takes real effort – identifying these children and working with them individually – as needed in specific content that they are academically struggling. Of course, this presents an obvious logistical problem. The curricular (e.g., numeracy or literacy) system must be both an efficient and effective process since the last third of that student group usually involves a lot of children (e.g.,  $\frac{1}{3}$  of the grade level, assuming there are as many as 100 to 150 students on each grade level between third through fifth grades). This typical classroom situation is one reason that numeracy-based computer programs do not achieve high academic outcomes as mentioned above. It takes an intervention by a human being – an educator to make a true difference.

The numeracy program that will make a difference is a hybrid computer-based tracking that possesses a quick writing assessment element. Whether children or adults, the act of writing invokes a cognitive and memory dimension in our long-term learning. In short, if we want to remember information or a process, we can see and hear it; however, the act of writing that content cements the content in both short and long-term recall. A computer-based digital numeracy program accomplishes the first two senses – visual and possibly auditory, but the typing of the keyboard is not the same as physically writing the responses on a piece of paper or in a notebook. It is recommended that the interested educator read the short white paper entitled, *“Writing – An Overlooked Learning Modality.”* This document is a free download on the website located in the footer of this document under the ‘Expertise Resources’ tab. The document should also help the educator better understand the importance of using writing to more actively engage students during their core lessons.

**Formative Loop (FL)** is a global numeracy program that is a hybrid computer tracking and two daily five-minute assessments for both math facts and math processing skills. It allows the teacher

to quickly assess students in each arithmetic skill – usually as the students arrive at school in the morning (e.g., before the instructional day begins). The skill sheets are graded by an educator and entered into the FL computer program. If the student demonstrates mastery, they are moved forward to the next sequenced skill opportunity, but if they do not demonstrate mastery, they are provided more practice on that current skill – that was not mastered. Regardless of the outcome, the FL numeracy program automatically updates the students' progress and provides homework on that specific skill. The next day's assessment and the homework are printed on a copy machine, in student order and returned to the teacher. The student(s) may need an intervention on that skill, if they were unsuccessful. *If they are not provided with an intervention, the probability is high, they will NOT be successful the following day as well as struggle with that homework that night.* As is obvious to the experienced educator, the program stresses mastery of both math fact operations and math processing skills, and it allows an independent progression for each student. A classroom of students may be on all different processing skills or any one of the four math fact operations. As mentioned above, about a third of the students in a classroom will quickly proceed through the two arithmetic skills, and the other  $\frac{2}{3}$  of the class will move through a slower pace; however, if the teacher and administrator are actively involved – pressing and motivating students, 95 to 100 percent of students (including students receiving special education services) will successfully master the both skill types.

Another noteworthy aspect of FL is that it is designed to rectify prior grade level academic numeracy gaps in its math processing skill sequencing. This allows teachers of any skill level – novice to seasoned veterans – to be more successful in the classroom since this process takes place automatically without the laborious need in pinpointing students' skill deficiencies. An administrator or teacher can simply log on to FL and view their classroom of students to determine which students are academically struggling with specific math facts or processing skills, and spend more time with those students, as needed.

However, the dual interaction between the FL numeracy program and the spaced repetition session of the math block is an essential aspect for elevating student performance. The teacher must include specific math skills in their daily spaced repetition block that supports the daily numeracy and vice versa. More on that interaction between the two components in Part 2 – Spaced Repetition. Also, if the daily numeracy is completed prior to the start of the instructional day as students arrive at school, it allows that extra ten minutes designated on the math block to be used in the 90-minute math block for I-ready or problem solving. Finally, it is recommended that the interested educator read the short white paper entitled, *“Math Fact Mastery – Easy to Do.”* This document is also a free download at the website located in the footer of this document under the 'Expertise Resources' tab. Additionally, it covers student math processing skill mastery as an added bonus.

It is imperative to assess two 5-minute learning opportunities, one for math facts and one for math processing skills in the intermediate grades (third through fifth). **Why?** If only the one ~ 5-minute assessment is selected, the sequencing that includes both math facts and math processing skills, many students become bogged down in a math fact operation, such as subtraction or multiplication. Consequently, they are not simultaneously mastering math processing skills, and they are not numerate in math processing skills that are essential for problem solving applications. Thus, when ordering from Formative Loop, the school principal must request the double sequencing runs – one math fact and one math processing skill sequencing. The price is the same for single or double sequencing.

However, in the primary grades (first and second grades), the single 5-minute run that includes both math facts and math processing facts on the same sequencing is recommended. These primary grade FL daily learning opportunities are run by the primary teacher in the classroom each morning, but external grading and inputting are recommended for quality control purposes. As an elementary principal, I had our office clerk grade and input these daily numeracy opportunities, and I monitored student progress via the FL computer tracking program. Finally, the primary grade teacher (as can be the intermediate grade teacher) was responsible for the student intervention on the daily 5-minute assessment, if needed. Attached at the end of this document is an outline laying out a typical school day using Formative Loop.

**Note:** If there is a sufficient number of students struggling on a Formative Loop numeracy skill or a core lesson concept, add that processing skill to the Spaced Repetition session to provide students with more practice.

**Importantly,** FL should begin in the primary grades about a month after school begins, so first and second grade teachers have ample time to teach FL assessed content via their core lessons. Formative Loop daily opportunities can ensure that students ingrain those concepts to mastery. If the majority of primary aged students are struggling with the FL 5-minute daily assessments, it is a clear indication that the content from the core lessons were not taught well with accountability. In intermediate grades, FL should begin as soon as possible after school starts. Fourth and fifth grade content has been designed so that students should be prepared on the first day of school, and third grade FL sequencing is designed to immediately rectify prior grade level numeracy gaps from first and second. Finally, FL has a skill resource library to assist teachers with their core lessons and homework, as needed. There are thousands of skill resources available for immediate download. Classroom teachers will rarely, if ever, need to create a resource for their lessons or homework, greatly reducing the preparation time for their math instruction.

The issue with Formative Loop, although highly effective, is that it is labor intensive for the first school year. It's most effective when the assessments are checked, graded and entered into the FL program by math coaches and administrators, and not classroom teachers. This provides higher quality controls and consistency as well saving 10 extra minutes per day of the 90-minute math block, if the assessment is initiated at the beginning of the school day as students arrive in the morning. Of course, student interventions on the daily assessments, if needed, can be conducted by classroom teachers.

Unfortunately, due to the lack of accountability of student outcomes from the state's education agency and their central offices, many campus administrators do not attempt to understand how to elevate math performance at their campus, and/or they are not willing to expend the required effort to have exceedingly high math outcomes. In effect, far too many elementary administrators allow their day to be filled with tasks that do not increase their students' academic standing. It is these administrators that I coined the name, *physical plant managers* since they ensure that students arrive, eat breakfast and lunch, spend 6 to 7 hours and leave without significantly enacting any effective student achievement measures at their campus. As a result, their math, literacy and science student performance is stagnant.

## **Part 2: Spaced Repetition**

Spaced Repetition is a pedagogical technique that was first proposed about 150 years ago that dramatically improves human learning. However, it has not been put in general practice in the public school system. The 'spaced' in the term spaced repetition means that the content is reviewed on subsequent days separated by a space (e.g., one school day). Student or adult learning is retained into long-term memory using this pedagogical technique because targeted content is actively spiraled each day with a guided math group – the entire class at one time that promotes efficiency. However, Spaced Repetition is very simple in its concept, but it difficult to describe in writing since it is a dynamic pedagogical technique that is dependent upon the classroom situation. It is the most effective means to provide students with the minimum number of threshold repetitions to achieve student mastery of math processing skills. Of course, some skills also have an interplay with math fact mastery: Doubles, Multiples, and Making 10. However, in general, spaced repetition will address all math processing skills across the board from place value, to perimeter, to fractions, to decimals, to volume, etc., etc.

The pedagogical technique solves the threshold repetition issue and ends the ineffective, but all too common teaching philosophy of, *"If the student gets it, they get it. If they do not, the don't; teacher moves on."* Listed below are relevant points about the learning and pedagogy of spaced repetition that must be fully understood.

**First**, the number of threshold repetitions is highly dependent upon students' classification. If a student is classified as talented and gifted (TAG), they only require 1 to 3 repetitions of a skill to ingrain it into long-term memory; whereas, if the student is classified as general education, the number of repetitions to secure mastery of the same skill is between 8 to 18 repetitions. If a student is classified as special education student receiving services, the number of threshold repetitions may vary significantly to secure mastery of a given math processing skill. Skill mastery becomes dependent upon their learning disability. Hence, it could take very few repetitions as with the other two student classifications discussed, or it could be a very high number of repetitions. In these cases, it is the students' disability and Individual Education Plan (IEP) that is most relevant. The classroom teacher would need that information for each child receiving those services to be most effective with that small group of students.

**Second**, the pedagogy is dynamic – it must occur at a normal to quickened pace, so students do not become bored. The teacher must be prepared each day for this type of instruction. There are different types of formats that may be employed that assist in the effectiveness of this pedagogy. For instance, the children can write on small white boards with dry erase markers, use hand signals showing numbers with their fingers, write responses in their math journals, or use a small piece of paper (e.g., a warmup) with other content that was distributed by the teacher, or picked up at the classroom door as student entered. The last type of methodology is highly effective for math rotations since as students enter, they pick-up a paper copy and immediately begin engagement in learning.

**Third**, there are free downloadable spaced repetition guides located in the footer the website URL of this document under the 'expertise resources' tab. There are also several white papers in that same area that expatiate to a much greater extent on spaced repetition. It is recommended that

the principal and his/her team download those documents and read them to become familiar with this pedagogical process.

**Fourth**, a teacher must be aware of their students' responses during the spaced repetition part of the math block. It's important that students' responses are visual and/or struggling students are seated in the classroom where the teacher can readily view their work. In effect, a highly successful classroom teacher must be observing their students visually and making mental notes to ensure that ALL children have consistently mastered the processing skill before eliminating it from the list. For example, if the math processing skill list for a morning spaced repetition session for third grade students is the following: Even and Odd (E/O) Numbers, Doubles, Making 10 and Expanded Place Value (10's). Let's assume (after practice) that the classroom of students has mastered the E/O skill and the Expanded Place Value (10's). Then, the following day, the teacher drops those two skills from the review list, and he/she adds Making 100 and Expanded Place Value (100's)  $\sim 104 = 100 + 0 + 4$ . After practicing for a couple days, all students demonstrate mastery of Doubles and Expanded Place Value (100's). In that case, the teacher drops those two skills and augments their list with Halving small numbers and Multiples (2, 10, and 5). This ever-changing content continues throughout the school year, and ALL students can achieve mastery in arithmetic mathematics.

However, it is imperative that the teacher is prepared and ready, so there is little to no down time. The session flows seamlessly in an effective and efficient pedagogical flow throughout the session. Of course, if students have been sufficiently prepared and the teacher distributes a simple warm-up practice sheet on multiples – 1 (i.e., all multiple numbers from 1 through 12) to assess paper-pencil mastery, then the teacher possesses certitude that all students possess mastery of that skill. Moreover, he/she can instruct his/her students to turn that multiples-1 paper over to the blank side and continue the spaced repetition for the other skills listed and continue the spiral review for that day.

**Fifth**, as mentioned above, there is an interaction between the daily numeracy, core lesson, problem solving and the daily spaced repetition. The teacher can spiral any learning that must be mastered or should be mastered during this block.

### **Which Processing Skills should be Included in a Spaced Repetition Learning in the Math Block?**

Again, the author has written a general spaced repetition guide for each elementary grade level from first through fifth grades. As noted before, they can all be downloaded for free at the website URL located in the footer of this document. Those documents are basic guides, and a classroom educator can include a series of skills that will assist them when learning a complicated skill with many dependent skills. For instance, adding or subtracting fractions with unlike denominators is a complicated learning process involving many steps. But if the teacher teaches multiples (numbers 1 through 12) mastery as well as finding the least common denominator (LCD) and converting proper fractions into lowest terms during prior spaced repetition sessions, then when the students are learning the adding/subtracting fraction skill, they only need to put pieces together that have already been learning and mastered. Moreover, the teacher may want to include an application problem in the spaced repetition. For instance, if a significant number of children are demonstrating difficulty with a word problem involving multiplication, then the teacher can practice that type of problem each day until students have had significant exposure to it – as they did with individual math process skills like Even and Odd Numbers or Place Value.

It is imperative that an educator understand that a typical word problem on STAAR or any standardized test is nothing more than a series of sentences with embedded math facts and math processing skills. If a student has not mastered one or more of those embedded math skills, they will not be able to solve word/story application (STAAR ~ in Texas) problems - efficiently and effectively.

As a general guide, the fundamental math skills listed below are for both the primary and the intermediate grades. Almost all derivative math process skills such as perimeter, area, volume and more involved fraction and decimal problems rely on these (dependent) rudimentary skills.

### **Primary Grades: First and Second Grades:**

- **Math Facts (Addition and Subtraction)**
- **Whole Number Lines (Use FL Resource Library)**
- **Multiples: (1's, 2's, 10's and 5's – First Grade) Add 3's, 4's, 6's – 9's in Second Grade. Note: First Graders must count to 120.**
- **Making 10 ~ 1<sup>st</sup> and 2<sup>nd</sup> Grade and Making 100 ~ 2<sup>nd</sup> grade**
- **Place Value – Whole Number: Expansion, Compression and Value of each digit and Place of that digit.**
- **Even and Odd – 2<sup>nd</sup> grade**
- **Doubles ~ 1<sup>st</sup> and 2<sup>nd</sup> grades and Halves ~ 2<sup>nd</sup> grade**
- **Computational skills – Adding and Subtracting as per standards.**

### **Intermediate Grades: Third, Fourth and Fifth Grades:**

- **Math Facts (Addition, Subtraction, Multiplication and Division)**
- **Whole Number Lines (in FL – third grade to ensure mastery) ~ Rounding Whole #'s**
- **Multiples: Multiples - 1 (1-12) & Multiples – 2 (15, 25, 75 and multiples of 10 to 100)**
- **Place Value – Whole Number: Expansion, Compression and Value of each digit and Place of that digit ~ as per standard for each grade level.**
- **Place Value – Decimals (and Magnitudes) as per standards in 4<sup>th</sup> and 5<sup>th</sup> grades**
- **Making 10 thru 10,000 and Making 1 ~ 4<sup>th</sup> and 5<sup>th</sup> grades**
- **Rounding Whole Numbers and Decimals as per grade level standards.**
- **Even and Odd Numbers**
- **Doubles and Halves ~ Use FL**
- **Basic Fractions and Fractional Number Line Mastery**
- **Basic Decimals, Decimal Magnitudes to Understand Relative Size (Decimal – Fraction Connection ~ 5<sup>th</sup> and 6<sup>th</sup> Grades)**
- **Computational skills – All 4 operations as per standards.**

### **Part 3: Core Daily Math Lesson**

The core lesson is the aged and familiar part of any public-school daily (learning) lesson, and in theory, it should be easy for any teacher to be impactful on that aspect of the 90-minute math block. It is also the one area of the 90-minute math block that administrators and coaches observe to determine if an educator is pragmatically successful with their students' learning. However, it is extremely difficult many times to determine if teachers are effective in their teaching prowess. **Why?** The reason it is often an unreliable formative or summative evaluation of the teacher's pedagogical efficacy is there are so many variables in a daily lesson that influence its effectiveness. For instance:

- Does the teacher have **all** the children's attention before initiating the daily lesson?
- Is the lesson a part of a bigger stream of sequential lessons all fundamentally built upon at each step?
- Did the teacher consider prior grade level and dependent learning skill gaps into the Tier 1 daily lesson?
- How were the children engaged in the lesson, or were they engaged at all – or is the teacher talking for long periods of time while children sit passively?
- How is the learning assessed for the lesson?
- Is it clear how that day's lesson ties in with previous core lessons, if they are content related?
- Is there follow-up nightly homework to the lesson intended to further reinforce the content, and is that homework aligned with the lesson (i.e., no new material appears on the homework that was not covered in the core lesson)?
- Were children adequately prepared for the lesson with prior skill issues rectified, or were there efficient and common routines to minimize the loss of instructional minutes?
- If the students were viewing a video, was there any accountability to the content of video?
- Were there any disruptions in student behavior addressed with the least amount of work, beginning with proximity or some task reminder on specific students' desks?
- Did the teacher have command of the content?
- Were lesson materials distributed and collected with a high degree of efficiency to preserve instructional minutes?
- Was there overall structure to the daily lesson – gradual release method (e.g., *I do. We do. you do.*)?
- Did the teacher control the lesson, so that students were clear of his or her learning and behavior expectations?
- Was the importance of learning the lesson content emphasized and the grade level standard posted so students were cognizant of the lesson's objective?

As one can see, there is a lot going on in a daily lesson of any content area. Thus, a principal and a coach that observes a lesson must spend a tremendous amount of time in the classroom (e.g., more than a typical 15-to-20-minute walkthrough) to fully understand if the classroom is functioning at an acceptable level or hopefully, a high level.

However, one thing is clear, when an administrator or coach observes a lesson, whatever academic numeracy gap issues students had before the administrator or coach walked in the room, it is almost certain that students still possess those same numeracy skill deficiencies when they walked out. It is for this reason that parts 1 and 2 described above are so important, even though those two math elements represent only 15 to 20 minutes total of the 90-minute math block. If the

academic gaps are eradicated, the core lesson – a Tier 1 grade level curriculum, works as it was designed with any teacher of any experience level.

### ***Core Lesson Fundamentals:***

The most important part of core lesson is content – what are we teaching to students? This aspect of the daily lesson is fundamentally rooted in the lesson plan and its learning objective. It is for this reason that I believe teachers should be writing their core daily lessons using the old school Madeline Hunter methodology and format since it provides clear structure to the daily lesson, and it presses the classroom teacher to be organized for materials, objective, content and closure (i.e., an example is included at the end of this math plan unit). It also requires them to focus and ‘think’ through their upcoming lessons in both sequencing and content. Far too many public schools – especially Title 1 schools have evolved into a state of chaos with regard to lesson design, student learning and effective student management.

Consequently, as a Title 1 principal, the first step I would take is to require teachers to be structured in their lesson planning and content areas. I would also try and use rotational classroom systems in literacy and math/science, so the classroom teachers only are required to plan one or two high quality lessons each day. However, I would also require that transitions are well planned and organized so the transfer time of students between classrooms is kept at a bare minimum, and for the Spaced Repetition part of the math block, I would stress a paper pencil warm-up that students pick up as they enter the classroom to promote immediate learning engagement.

**Note:** If there is a lack of structure in a classroom or if an educator believes that classroom structure is not a valued commodity, then that classroom will ALWAYS demonstrate chronically low academic performance. A lack of structure in any human activity will always be inefficient, and ultimately, ineffective.

The initial lesson design for NEW CONCEPTS should **always** be CONCRETE, PICTORAL, PAPER PENCIL (i.e., physical to most abstract learning). Thus, the teacher must know what concept is new to their grade level, and what one is not. For example, third through fifth grade teachers should NOT be using a concrete manipulative for addition and subtraction. That concept is a primary grade concept. Use a pictorial model (e.g., a number line) or paper-pencil for those grades, as what meets students’ needs. Of course, the primary grades will be much heavier in manipulative work daily – generally speaking – since so many new math concepts are introduced in those grades. However, any NEW CONCEPT in the intermediate grades (3<sup>rd</sup>-5<sup>th</sup> grades) should begin with a manipulative approach. For instance, in third grade, teachers should begin their multiplication and division instruction with a manipulative approach due to the fact that multiplication/division are first introduced at that grade level.

The sequencing of content is invariably the most difficult aspect for many teachers that possess under 3 to 4 years of classroom experience. Unfortunately, most mathematics Tier 1 adoptions today begin too high in skill level for our Title 1 students in the intermediate grades. Those curricula adoptions are more viable for non-Title 1 public schools since those students generally possess less prior grade level academic gaps. Of course, these textbooks are not written with any malicious intent. They are written for teaching grade level standards independent of any student academic gaps that children possess. The textbook is a grade level Tier 1 resource, and it assumes that students do not possess academic gaps; however, any educator who has spent more than a day

in a typical Title 1 elementary school knows that this is most definitely not the case. Thus, in Title 1 elementary schools, it is recommended to use the textbook as a guide but begin daily instruction at the most fundamental level of place value and build sequentially and conceptually from that point. For example, in the first year of academic reformation in mathematics, I recommend beginning each intermediate grade level with the following skills: Multiples, Making 10, Doubles, Whole Number Lines (Grade 3), and Place Value Expansion beginning with the tens place (e.g.,  $32 = 30 + 2$ ). These skills should be a one-to-one correspondence with the spaced repetition session skills at the beginning of the school year. Assess your students and adjust your math processing skills as needed at each grade level. A teacher should take their time and not rush. There are 8 months to cover the curriculum and state standards, and mathematics is the easiest subject area in comparison to any other elementary level content area. However, in this process of academic reformation, a teacher (and principal) cannot leave academic gaps unaddressed; since he/she is able to reach each student and systematically fill those gaps with a systematic process outlined in this document.

Finally, the core lessons should focus mostly on arithmetic math skills – math facts and math processing skills. Of course, that does not imply that this portion of the 90-minute math block should not involve and engage students in problem solving activities. It should and can. However, there is a separate section (Part 4) that specifically includes daily problem solving: hence, that part of the 90-minute math block addresses problem solving, using a consistent daily structure.

#### **Part 4: Problem Solving Component**

The problem-solving aspect of the 90-minute math block is the overriding objective of the educator. Mastering arithmetic skills is essential, but educators' objective must be to use those mastered discrete skills in an application setting. For example, both addition and multiplication math facts as well as computational skills of multi-digit operations of those two processing skill areas are critically important to master. However, their application use in perimeter and area problems are an application that provides meaning to those mastered skills. It affords them with a proverbial Bloom's Taxonomy arithmetic skill-based toolbox to solve meaningful and real problems that they will be confronted with throughout their life. In a word, skill mastery leads to adept problem solvers in varied application areas of mathematics.

It is highly recommended that students begin problem solving activities and practice on paper-pencil exercises, and these exercises should be aligned with skill learning of their core math lessons. Otherwise, the misalignment of skills to application presents the exact same issue that prior numeracy gaps have with learning dependent grade level (Tier 1) skills.

There are **fall and spring** semester problem-solving application resources for free downloads for 1<sup>st</sup> and 2<sup>nd</sup> grades that align with state standards at the website provided in the footer. There is also 3<sup>rd</sup> through 5<sup>th</sup> grade **fall** semester resources located on that same website for free download. In the spring months for the intermediate grades, students need practice with the digital format of the standardized assessment as well as problems that are at a rigor of that assessment. Consequently, it will require digital format practice during the spring semester (at a minimum), and quite possibly this practice time may be outside of the standard 90-minute math block. If students are not prepared for the format and a teacher's assessment expectations on showing work and answering questions, students' overall performance can be adversely impacted.

On these daily activities, it is recommended that the teacher requires students to have a set problem solving strategy for **each** word or story problem on the page. It is strongly recommended that students solve these problems NOT in the student book (bound with a spiral edge), but on a separate piece of notebook paper. **Why?** Since almost all state agencies in the United States have moved to digital testing on their standardized tests, solving problems with paper pencil separately in a math journal EMULATES the digital computer screen model where the problem is shown on the computer, but students compute the solution on a concisely written separate piece of paper.

### ***Problem Solving Attributes***

Lastly, classroom teachers should MODEL the daily problem-solving resource for a minimum of 2 to 4 weeks. Teachers should work the problems step-by-step with their students conveying to them – “**THIS IS WHAT I WANT YOU TO DO!**” When the students are doing INDEPENDENT work with a resource, the teacher should walk around – actively and monitor the resource work completed by students. The teacher can check each student’s work and place a CHECK by each problem the student works correctly. Assist each student, as needed.

Checking students’ work in this manner is highly beneficial in student learning in the following ways, despite the added work on the teacher via high levels of actively monitoring students. **First**, students solve problems faster. They are being checked in real time. They know that there is immediate accountability in their effort. **Second**, the teacher receives immediate feedback on the students’ work. Are they getting the concepts or not? Where do I need to diagnostically spend more time? **Third**, it eliminates the need to check student work globally, and quite frequently, students do not really understand ‘the why’ reasoning on the problem that was worked incorrectly. Each student is held accountable in real time, and this process also eliminates classroom management issues. **Fifth**, the teacher must set clear expectations for early finishers with their students (e.g., Early finishers may read quietly until all students have completed the assignment.) **Lastly**, if the problem-solving resource is bounded in a spiral, it provides the teacher with a work sample for parents and possibly evidence of special education evaluation over time. It also provides the administrator with a resource that shows student work in the classroom over time - independently if the administrator was in the classroom at the time the students completed the exercises. Thus, the quality of teacher instruction and accountability is also on display over time.

The teacher should also require students to implement a consistent problem-solving strategy that they employ on each word or story problem. At some point, this methodology or process is ingrained into long-term memory, and students will use it unconsciously. I have always implemented **RACE**. However, any effective and efficient model/acronym can be selected.

### **RACE Explanation ~ Problem Solving**

**Students should Write RACE above each problem, and they should make a small check above each letter after that step has been completed.**

**R** = Read the problem and underline (or write what the problem is asking you to find).

**A** = All relevant data circled, and any extraneous data crossed out.

**C** = Computational work. SHOWN, Neatly

**E** = Evaluate the reasonableness of the solution, “Does my answer make sense?”

### **Author's Final Thoughts and Comments**

There is a common theme in this math intervention plan – a structured approach to success. There are so many people that have lofty and noble aspirations in their lives, but they do not accomplish them. They do not accomplish them because they do not have a structure plan.

In 98 percent of the Title 1 elementary campuses, I entered as a teacher, administrator and a consultant, they all have a common denominator. They consistently have poor student outcomes, school year after school year, and they are operating via an unstructured and overwhelmed campus administration. These school administrators hope and want their campuses to academically perform better, but they do not understand the fundamental issues of what they need to change – to make it a reality. In this document, I have attempted to put an emphasis on the items that do matter. However, there is work, planning and analysis involved. Organization and consistent management of systems and classroom pedagogy are involved. And, if those elements are not valued, then poor academic performance for ad infinitum at that campus. However, on the positive side, if those items are valued, then an administrator has a plan in this document to initiate the reformative work.

# A Typical Day in the Numeracy Program

The following steps are intended to outline the daily process of using the Numeracy Program available at [FormativeLoop.com](https://formativeLoop.com)

## STEP 0 Print First Set

Login to [formativeLoop.com](https://formativeLoop.com), select each classroom and press the **Get First Set of Worksheets** button to generate the Numeracy Sheets for each classroom. Print them.

## STEP 1 Distribute, Monitor, Collect

In-class, pass out the Numeracy Sheets, set a timer for 5 minutes, and monitor students as they complete them. Collect the completed Numeracy Sheets in numerical order (including any sheets from absent students)

## STEP 2 Grade

Login to [formativeLoop.com](https://formativeLoop.com) and select the classroom. Choose the **Start Grading** button. Numeracy Sheets are easily graded and numerically scored: There is a black star on the answer key to represent a recommended level of sheet completion for mastery, but the teacher may also make that determination for their students. For each student, click the appropriate **Pass**, **Fail** or **Absent** button (or press **P**, **F**, or **A**).

## STEP 3 Print Next Set

When the last student numeracy sheet has been graded, press the **Get Next Set of Worksheets (PDF)** button. This will generate a packet for you to print, including homework for each student, and the next set of Numeracy Sheets.

## STEP 4 Targeted Intervention and Assistance

Hand out the homework. Assist students that did not master their current skill (failed), so those students may successfully finish their homework and rectify their numeracy performance on the next school day.

**REPEAT STEPS 1 to 4 each school day**

# Daily Lesson Plan Format – Mathematics (5<sup>th</sup> Grade EXAMPLE)

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

## Objective:

TLW master Place Value Expansion of two (2) to four (4) digit numbers – Focus on PV and V of each digit.

## Anticipatory Set:

Numbers come in different sizes based on their digits – Let's look at these numbers so we can understand the value of these digits.

## Resources:

Amara – Grade 5 Problem Solving, English; each student has resource book, Practice Problems (FL Resource Library; Amara Resource Guide (5<sup>th</sup>), integrative wall board – Students (White Boards and Dry Erase Markers). HW page copies for each student.

## Direct Teach:

- Present 2, 3 and 4 digit numbers (with zeroes) and work – emphasize the place and value - Example  $203 = 200 + 0 + 3$  (PLACE is hundreds but VALUE is 200; PLACE is tens but VALUE is 0; PLACE is ones, V=3
- T will demonstrate the process in a whole group setting.

## Guided Practice:

- Sts. Work with Teacher – working examples – answering T's Q's
- T works examples – comprehension hinges with students

## Independent Practice:

- After several repetitions, students will work independently....teacher monitors and corrects – Note Students having/experiencing difficulty.

## S.R. Numeracy

- Multiples 1  
(2, 10, 5, and 3)
- Making 10  
(10, 9, 8, 7)
- Halves (2, 4, 6, 8, 10, 12, 14)
- Even/Odd's
- Doubles (2, 4, 6, 7)
- Vocabulary: Sum, PV and Value (Word Spellings – see below)

## Closure

- Globally check students' work. Finally, quick oral check students' understanding
- Homework that emphasizes skill sent home.

## Problem Solving:

Use Amara Page 1 – Model for Students – Emphasize (CUBE) or (RACE)

Carefully Model – Students work with Teacher Concurrently. Carefully Set up the Process so TEACHER EXPECTATIONS ARE CLEAR to students.

**Tomorrow** – PV Expansion to 5 digit numbers – Emphasize PV and V of each number – Begin to Write Number and ask for PV and its Value. Then, on following day, 6 and 7 digit numbers.

**Begin** spelling exercises of 'word' numbers – tens, hundreds, thousands, millions. – Quick – all students spell words correctly. Extra Time – Review Spaced Repetition Skills.