GRADE 1 - AMARA SPACED REPETITION SEQUENCING RECOMMENDATIONS

Student mastery of skills is highly dependent on adequate exposure and threshold repetitions. For example, a student must correctly practice a skill over a short period (spaced) a threshold number of times (repetition). Spaced repetition is an efficient and effective means to reach the minimum number of repetitions for each student. General guidelines for the number of repetitions for most students are listed in the following table.

Student Classification	Number of Repetitions for Skill Mastery
Gifted and Talented Identified	1 to 3 repetitions
General Education Students	8 to 16 repetitions
Students Receiving Special Education Services	Varies widely from student to student – Consult each student's Individual Education Plan and follow legal guidelines

General recommendations of specific skill areas are sequenced below for Amara supplemental daily resources. Due to varying student dynamics in every classroom, teachers will experience varying levels of intervention during the presentation of each skill in a spaced repetition process. Hence, spaced repetition pedagogy is unique for each classroom due to differing student ability levels in mathematics. Consistency is the key to success in most human endeavors, and this process is not an exception to that thinking.

It is recommended that 2 to 4 skills be presented quickly in a highly accountable and engaging teaching mode for approximately 4 to 7 minutes at the onset of the core daily lesson. Many skills listed require little time for students to demonstrate mastery, but others may take more repetitions to achieve the same effect. During spaced repetition pedagogy, a teacher should observe students to determine the specific students that require more repetitions. Once all students master a skill, the teacher can replace it with a new one. A teacher can also opt to present a specific math skill until only 2 to 4 students have not demonstrated skill mastery. At that point, the teacher can engage those students in a small group setting while the other students complete independent work. Amara's Skill Support Resources are designed for both types of instruction and are available on the Amara4education website for purchase. Also, it is recommended that with the use of Formative Loop's (www.formativeloop.com) daily numeracy program, students are exposed to mastery of math fact operations and process skills.

During a typical spaced repetition session, accountability and comprehension checks can be done with small white boards, raising hands, a show of fingers to represent number answers, paper-pencil, or another visual form of demonstrating student mastery. The teachers can also position themselves amongst the students to observe a paper-pencil response of any students that have demonstrated a lack of mastery on previous days for a particular skill. Finally, the skill list below is a guideline. A teacher should evaluate their students and augment the list as they feel is appropriate.

Recommended Skill List – First Grade

1.) **One-to-One correspondence.** 4 = a set number of objects (e.g. 4 spoons); 9 = a set number of objects (e.g. 9 dots). Quick repetitions each day using different objects. Teacher can vary from providing objects and students write number or vice versa.

2.) **Numerals written in more than one way.** The numbers 9 and 4 may be written in two different ways in print (handwriting) versus the computer. Young children need to know both are correct means to writing the same numeral. Quickly demonstrate both ways and children will possess an adequate understanding.

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3.) Number correlation to objects = word form. The number 6 = (six objects or dots) = six. **Note:** Begin with a small range of numbers – 1 to 5 or 6; expand later during the semester to larger numbers at the appropriate time. **Note:** Children will not be able to spell numbers in word form correctly until much later in the school year. Hence, repeated exposure on each number in word form with a variation of explanation provided in problem 1.) above will assist with ingraining spelling of small numbers as well as correlating objects to their number values.

Examples:

5 = (dots) = five   8 = (tally marks) = eight

Note: Many songs (e.g. choral learning) rapidly assist in teaching students to memorize the spelling of numbers in word form. Example: Frog Street Press.

4.) Whole Number lines and short whole number sequences (with missing numbers). Students should repeatedly see whole number lines – with a slow implementation process during the fall semester to build numeracy and skip counting by 1's. Per standards, students are expected required to count to 120 by year's end. Many students will struggle at the end of a ten multiple series (19, 29, 39, etc.) to determine the next number as well as the number less than a multiple of ten (10, 20, 30, etc.) when they must count backwards. Initially, students also struggle with numbers greater than 109 and less than 120 until students have had sufficient exposure. Use Amara Skill Support Resource to readily facilitate this activity and reduce the teacher preparatory time.

5.) Addition representations with objects. Students need to recognize that a number sentence can be written with objects. For example: 2 dots = 1 dot + 1 dot *and* 1 dot + 1 dot = 2 dots. Highly recommend showing students in equations written in both directions, so they are do not become left to right readers in mathematics sentence equations. **Note:** Same number of dots on each side of the equal (=) sign.

Example: 3 + 1 = 4   4 = 3 + 1

(dots) + (dot) = (dots)   (dots) = (dots) + (dot)

Note: Same number of dots on each side of the equal (=) sign (i.e. in the example above, 4 dots total on each side of the equal (=) sign. This conceptual idea of the equal sign is ***imperative*** for students to understand in elementary school.
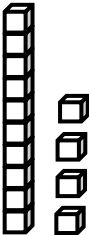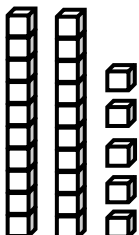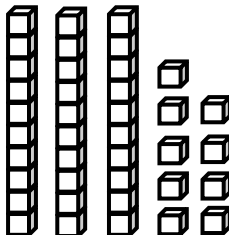
6.) Commutative Property of Addition. Addends can be interchanged. For instance, 5 + 4 = 9 *and* 4 + 5 = 9 are the representation of the same math equation. See Example in problem 5 above.

7.) Direction and location words. The following words should be understood in context with quick and repeated examples until mastered; above, below, inside, outside, next to, between and middle.

8.) 2 Dimensional Shapes. Square, rectangle, circle and triangle. Students should recognize the name of the polygon (straight sided and closed figure) and a circle (not a polygon) with the correct mathematical name. As the semester progresses and at the appropriate time in lesson sequencing – add pentagon, hexagon, rhombus, trapezoid, and octagon.

Note: He**x**agon mnemonic - he**x**agon has an "**x**" in its spelling as does the number 'si**x**.' Octagon mnemonic – An octagon has 8 sides and an 'octopus' has 8 arms.

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9.) **Magnitude (size) words:** The following words should be understood with objects and numbers as the core lessons and daily resources introduce the concepts: largest, most, greatest, fewest, least, smallest.

10.) **Addition Vocabulary:** Addends and sum. Students should be able to identify and write the words given an addition number sentence. For instance: $3 + 6 = 9$; 3 and 6 are addends and 9 is the sum.

11.) **Dimensional Shape attributes –** Sides and vertices (corners) of shapes as presented and introduced in core lesson and Amara daily resources. Begin with triangles, squares, circles, rectangles.

12.) **Place Value Base 10 Blocks.** Start with tens and ones. Include hundred base 10 block at appropriate time during the fall semester. Require students to write the values as well as shade the value of a number.
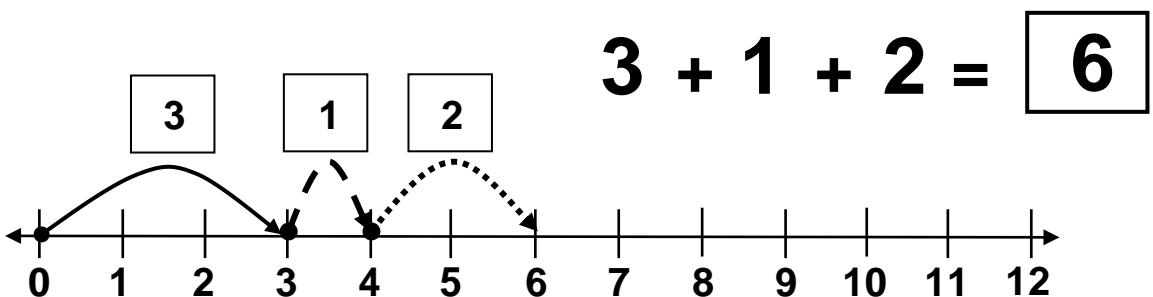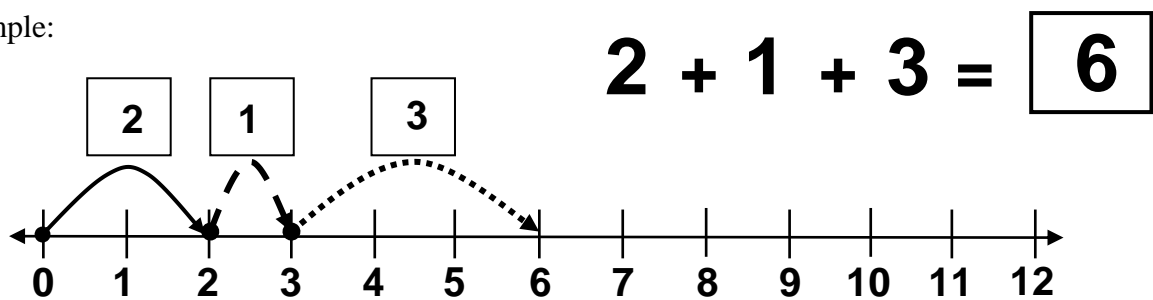
Examples:

Write the correct number of tens and ones.

Tens	Ones

Write the correct number of tens and ones.

Tens	Ones

Shade the correct number of tens and ones.

Tens	Ones

13.) **Multiples.** Students should be able to count (skip count) with 1's, 10's, 5's and 2's – in this order of presentation/exposure/initial introduction. Include in the spaced repetition process of each multiple at the appropriate time during the fall semester. Example: After practicing counting by 1's and 2's, for instance, the teacher can ask students to orally/chorally skip count with him/her. Then, when the students are prepared, the teacher can use whole number lines from the Amara Skill Resource Packet and students can practice. Finally, the teacher can ask students to flip over their paper to the blank side and count by 1's, 2's (or 10's and 5's) for 30 to 45 seconds. **Note:** Multiples or skip counting is a tremendous means to build a student's numeracy capabilities.

14.) **Math Facts.** Addition and Subtraction as presented to students in content in core lessons and Amara resources. Note: Number sentences should be shown in a variety of ways. For example: $5 + 7 = 12$ *and* $12 = 7 + 5$. Subtraction, as well. Example: $11 – 8 = 3$ *and* $3 = 11 – 8$. With small amounts of practice students adapt to the differing equation form, and that flexibility is extremely beneficial as students transition into the intermediate grade levels. *__Math fact mastery is essential in arithmetic mathematics for students to master many dependent concepts__*. *__Slow and consistent practice will yield high-end results in time – daily exposure with purpose and an intent to achieve student mastery.__*

15.) **Doubles – Doubles Plus 1/ Less 1.** Implement in spaced repetition as students are introduced to content in core lessons and Amara resources. Use Doubles Plus 1/less 1 for students to master 2 more math facts after learning a double. For instance. $8 + 8 = 16$. Doubles plus 1, then students learn that $8 + 9 = 17$; and conversely, doubles minus 1 shows students that $7 + 8 = 15$.

16.) **Drawing 2 Dimensional Shapes.** Triangle, square, rectangle, circle. Add in pentagon, rhombus, trapezoid, etc. at the appropriate time during the fall months.

17.) **Standard Form Place Value.** Stress that a number written like 25 or 69 is called *standard form* so students recognize that vocabulary not only in the problem directions in daily work, but in later grade levels, when the term is used with much frequency.

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18.) Adding 1 more. Students are given a number and after tactile practice, as needed, add one more. Transition to paper-pencil, when appropriate to do so. For example: Given 5. Add 1 more and obtain the number 6. Use larger numbers as the year progresses in the spaced repetition process.

19.) Patterns with Objects and Numbers. This is a kindergarten skill. However, start with objects…triangle, square, pentagon repeated. Student finish a shape pattern. Transition exercise to numerals – Example: 5, 6, 2, 5, 6, 2, __ , ___ , ___

20.) Adding 2 more. Students should see a number and after tactile practice, as needed, add two more. Transition to paper-pencil, when needed. For example: Given 5. Add 2 more and obtain the number 7. Use larger numbers as the year progresses in the spaced repetition process.

21.) Addition and Subtraction Models. Addition and Subtraction Models. Number lines, circles, dominos, squares, etc. Students should be adept at the physical understanding of addition and subtraction at the appropriate time as presented in core lessons and Amara resources – Math facts and larger number sentences. Use reproducible Amara resources for dominoes, objects, and blank number lines for skill practice and mastery. Then, turn the sheet over for more quick repetitions of additional math skills to master.

22.) Spelling numbers in word form from 1 to 10. Practice every day correctly spelling 2 words cumulatively, and students will spell 1 to 10 with ease. For instance, teacher writes 1 and 2 on the document camera or white board, and students correctly spell the numbers in word form. Then, add 3 and 4, but cumulatively spell 1, 2, 3 and 4. Students may spell orally/chorally as a class, but students should also physically write the words on a piece of paper or small, erasable white boards. Again, there are many songs that assist/help students memorize the 'word form spellings with ease.

23.) Adding 3 numbers: Recommend beginning with adding small numbers. $2 + 1 + 3 =$ __ . Use a number line example to show physical meaning is unchanged regardless of the size of the numerals or how many numerals are added together. Add larger numbers using 3 numbers as the school year progresses.

Example:

$$2 + 1 + 3 = \boxed{6}$$

| 2 | 1 | 3 |

0 1 2 3 4 5 6 7 8 9 10 11 12

$$3 + 1 + 2 = \boxed{6}$$

| 3 | 1 | 2 |

0 1 2 3 4 5 6 7 8 9 10 11 12

Note: This exercise also proves and reinforces the commutative property of addition where addends can be switched and not change the sum.

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24.) 1 Less. Same as 18.) and 20.) above. Use Amara Skill Resource Packet for ready-made exercises that greatly reduce the teacher preparation.

25.) Expanded Place Value Form. Expand a number in standard form to indicate the value of each digit in a given number. $12 = 10 + 2$ *and* $20 = 20 + 0$. Use 3 digit numbers as core lessons and Amara resources reach that point in their first grade learning.

26.) Adding 10 more. Same as 24.) above. Use a whole number line to demonstrate the physical addition process, as needed. Again, use Amara Skill Set Resource Packet for readymade learning opportunity sheets; thus, reducing teacher preparation for the spaced repetition learning process.

27.) 2 Less. Same as 26.).

28.) Subtraction Vocabulary. Stress the terms: Minuend, Subtrahend and Difference. Note: **S**ubtrahend can be remembered since it is the number **S**ubtracted – both start with '**S**'. For example, $6 – 4 = 2$. Since 4 is the numeral subtracted, it is called the subtrahend. This mathematical terminology is used in word problems when students are in the intermediate grades.

29.) Making 10 using dots. Begin with dot pictorials as needed, and transition to mental math using fingers as well. For example, a teacher can extend 6 fingers and students respond by raising 4 fingers. Use easy visual methods to determine diagnostically any students that have not mastered skills. Use Amara Skill Support Resources to facilitate these rapid, daily exercises.

30.) Comparing small numbers using < , > or = . It is recommended to provide exposure to these symbols for first grade students as the school year is concluding. Teach students to place 2 dots by the <u>larger number</u> and 1 dot by the <u>smaller number</u>. Connect the dots to form a < or >. If equal numbers are compared, place 2 dots by each numeral, then connect with a horizontal line so the dots and lines form an equal (=) sign. **Note: Small numbers should be used with first grade students. The goal is conceptually understanding the relative size of numbers and introduce comparison signs of < , > and = .**

Example: Compare 4 and 6 using < , > or = .

Example: Compare 7 and 7 using < , > or = .

31.) Add Skills at the discretion of classroom teacher based on professional judgement and classroom experience.

Author's Note: A daily spaced repetition session should require between 5 to 12 minutes of time. However, some teachers vary this time depending upon the skill and circumstances in their classrooms. It is important to note that the teacher must be highly organized in order to move quickly through the process and maintain student engagement. It is highly recommended that the teacher use a diagnostic medium in these sessions. For example, students that struggle academically should be seated in the classroom so the teacher can readily observe their work and accuracy. As those students master the skills, then the teacher knows to replace the mastered skill with a new one. The teacher can also work with those few students either individually or in a small group to ensure that they master the skill at a later time in the class or day. *A teacher's objective must be mastery of grade level math skills by ALL students or a numeracy gap will foment and widen in later grades*.

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Additionally, a couple weeks later, for instance, the teacher can **spiral review** to previously presented math skills and guarantee with absolute certitude --- that all students have indeed mastered grade level or prior grade level skill(s). *Application mathematics* in the arithmetic elementary grades are generally given in the form of a short 'story' or 'word' problem. These word problems are nothing more than a combination of discrete arithmetic skills listed in this document. If those arithmetic skills are mastered, there is a high probability that students will not be overwhelmed and easily solve arithmetic application problems correctly.

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