EDUCATOR INFORMATION – CGI Word Problems

About the Grade Bands

The math skills for each summer grade band are intended to be review of skills taught during the year for that grade.

- Therefore, the student who was in Kindergarten during this spring and is rising to First Grade in the fall would use the Kindergarten packet.

The student pages are coded with pictures icons. When possible, it is helpful to color-code the paper, too. Here are the Grade Band codes and suggested copy paper colors for use in the home:

- Gr K – uses the DOG icon and suggests PINK paper
- Gr 1-2 – uses the CRAYON icon and suggests BLUE paper
- Gr 3-4 – uses the WHALE icon and suggests GREEN paper
- Gr 5-6 – uses the OWL icon and suggests YELLOW paper

Connection to the NYS Next Generation Learning Standards

CGI is the **C**ognitive **G**uided **I**nstruction for primary students to solve math word problems. With a few changes, this chart is in New York State's Next Generations Learning Standards for Pre-K to Grade 2, titled, "Common Addition and Subtraction Situations." *(A copy of the Next Generation word problem charts for Grades K – 4 are located at the end of this Educator Information Guide.)*

Updating the Summer Math CGI Charts

- **For Grades K-2:** NYS Next Generation Learning Standards include the same CGI Chart of word problems, with a few changes:
    - In the Educator Packets, the terms from the original (English) CGI Charts have been updated to represent the Next Generation terminology changes.
    - NYS Next Generation Learning Standards add a new category of word problems called, "Both Addends Unknown." This new category has not been added to these summer math packets.
- **For Grades 3 – 4:** In the Educator Packets, the multiplication/division terms on the (English) CGI Chart have been updated to represent the Next Generation terminology changes.
    - The "Compare" row of addition/subtraction problems remains for use to practice addition and subtraction during the summer.
- ***For Grades 5-6:*** While the NYS Next Generation Learning Standards do not continue the specific word problem charts into grades 5 and 6, students are expected to be able to solve word problems.

Alignment to NYS Next Generation Standards

Kindergarten

NY-K.OA.1: Represent addition and subtraction using objects, fingers, pennies, drawings, sounds, acting out situations, verbal explanations, expressions, equations, or other strategies. **Note**: Drawings need not show details, but should show the mathematics in the problem.

Grade 1

NY-1.OA.1 – Use addition and subtraction within 20 to solve one-step word problems involving situations of adding to, taking from, putting together, taking apart, and/or comparing, with unknowns in all positions.

- …using objects, drawings and equations with a symbol to represent the unknown.

Grade 2

NY-2.OA.1 0 - Use addition and subtraction within 100 to solve one-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions.

- Mastery of all word problem types on the "Common Addition and Subtraction Situations" Chart by end of Grade 2.

Grade 3

NY-3.OA.3 – Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurements quantitates.

- E.g., using drawings and equations with a symbol for the unknown number to represent the problem.

Grade 4

NY-4.NBT.5 – Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations.

- Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.

Grade 5

NYS Power Standard: NY-5.NBT.7 – Using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between operations:

- add and subtract decimals to hundredths;
- multiply and divide decimals to hundredths.

Relate the strategy to a written method and explain the reasoning used.

Note: Students should be taught to use concrete models and drawings; as well as strategies based on place value, properties of operations, *and* the relationship between operations. When solving any problem, students can choose to use a concrete model *or* a drawing. Their strategy must be based on place value, properties of operations, or the relationship between operations.

Major Fluency for Fifth Grade: 5.NBT.5 - Fluently multiply multi-digit whole numbers using the standard algorithm.

Grade 6

NYS Power Standard: NY-**6.RP.3b** – Solve unit rate problems. e.g., If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? What is the unit rate?
Note: Problems may include unit pricing and constant speed.

NYS Power Standard: NY-**6.RP.3d** – Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.
Note: Conversion of units occur within a given measurement system, not across different measurement systems.

Major Fluency for Sixth Grade: **NY-6.NS.3** – Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

General Application of the Cognitive Guided Instruction (CGI) Process

The CGI process allows students to solve the problem in a way they understand, instead of the "right" way. This can provide the Educator with insight about the way the student is thinking. With CGI, the emphasis is on the process more than the actual answer.

Process:

1. ***Pick one word problem.*** Spend time on the process instead of a quick answer.
2. **Read the problem to students,** using the choice of differentiated numbers to fill in the blanks.
3. ***Read again and encourage students to take notes on the graphic organizer***. (modeling, teaching the first time)
4. ***Give students time to solve.*** (If struggling, prompt with, "What number does the problem start with?" Do you want to draw this or use manipulatives to recreate it?)

    a. Have manipulatives and paper for students to choose either medium for solving the problem.
5. ***Ask students to explain their process before asking them for an answer.*** This allows students time to self-correct and gives the Educator a clue about how the student is thinking.
6. ***At the end, look at the final answer together, to decide if it solves the problem***. How would you say this in a sentence?

Virtual Application

In the original application of Cognitive Guided Instruction (CGI), many steps might work in the virtual options.

- The Migrant Educator targets one word problem.
- The word problem is read to students twice.
- The Migrant Educator asks the student(s) to explain their process.
    - While the Migrant Educator listens, one gains insight as to how the student is thinking through the problem.
    - Sometimes in the process, a student is able to self-correct the answer.
    - In NYS, students often have to write an explanation. Having oral practice helps prepare the student for this.

The whole problem can be read and explained during a phone call. The Migrant Educator might text the problem to the student (parent) before their appointment, so the student has something to look at during the Migrant Educator's call.

The student might be able to take a picture of how they figure out the problem and send to the Migrant Educator in order to explain.

Using the Summer Math CGI Charts

- Pick one word problem to concentrate on the process more than the answer.
- For all charts, the easiest word problem for students to understand is in the top, left corner.
    - The problems are more difficult as you move to the left, and as you move down.
- **Differentiating Instruction:** Each word problem has three sets of numbers that can be inserted when reading the problem. Educators can select the number complexity for appropriate for each student.

Kindergarten CGI Charts ()

For summer Kindergarten assessments: Prioritize the word problems with a STAR. 

Grade Band 1-2 CGI Charts ()

For summer:

- Introduce the process with the easiest word problem – in the top, left corner of the chart.
- Grade 1 summer assessments – prioritize the word problems with a STAR 
- Grade 2 summer assessments – prioritize the word problems with a TRIANGLE

Grade Band 3-4 CGI Charts (WHALE)

For summer:

- Introduce the process with the easiest word problem – in the top, left corner of the chart.
- Grade 3 summer assessments – Prioritize the word problems with a STAR 
- Grade 4 summer assessments – Prioritize the word problems with a TRIANGLE 

Grade Band 5-6 CGI Charts (OWL)

For summer:

- Introduce the process with the easiest word problem – in the top, left corner of the chart.

e.g., using objects or drawings to represent the problem

In the chart below, *the four unshaded (white) subtypes are expectations in Kindergarten*. Grade 1 and 2 students work with all subtypes. Darker shading indicates the four difficult subtypes that students should work with in Grade 1 but need not master until Grade 2.

Common Addition and Subtraction Situations

		Result Unknown	Change Unknown	Start Unknown
Add To		*A* bunnies sat on the grass. *B* more bunnies hopped there. How many bunnies are on the grass now? $A + B = \square$	*A* bunnies were on the grass. Some more bunnies hopped there. Then there were *C* bunnies. How many bunnies hopped over to the first *A* bunnies? $A + \square = C$	Some bunnies were sitting on the grass. *B* more bunnies hopped there. Then there were *C* bunnies. How many bunnies were on the grass before? $\square + B = C$
Take From		*C* apples were on the table. I ate *B* apples. How many apples are on the table now? $C - B = \square$	*C* apples were on the table. I ate some apples. Then there were *A* apples. How many apples did I eat? $C - \square = A$	Some apples were on the table. I ate *B* apples. Then there were *A* apples. How many apples were on the table before? $\square - B = A$
		Total Unknown	**Both Addends Unknown**	**Addend Unknown**
Put Together/ Take Apart		*A* red apples and *B* green apples are on the table. How many apples are on the table? $A + B = \square$	Grandma has *C* flowers. How many can she put in her red vase and how many in her blue vase? $C = \square + \square$	*C* apples are on the table. *A* are red and the rest are green. How many apples are green? $A + \square = C$ $C - A = \square$
		Difference Unknown	**Bigger Unknown**	**Smaller Unknown**
Compare		*"How many more?" version:* Lucy has *A* apples. Julie has *C* apples. How many more apples does Julie have than Lucy? *"How many fewer?" version:* Lucy has *A* apples. Julie has *C* apples. How many fewer apples does Lucy have than Julie? $A + \square = C$ $C - A = \square$	*Version with "More":* Julie has *B* more apples than Lucy. Lucy has *A* apples. How many apples does Julie have? *Version with "Fewer":* Lucy has *B* fewer apples than Julie. Lucy has *A* apples. How many apples does Julie have? $A + B = \square$	*Version with "More":* Julie has *B* more apples than Lucy. Julie has *C* apples. How many apples does Lucy have? *Version with "Fewer":* Lucy has *B* fewer apples than Julie. Julie has *C* apples. How many apples does Lucy have? $C - B = \square$ $\square + B = C$

NYS Next Generation Expectations for Grade 3 and Grade 4
Multiplication and Division

	Unknown Product	Group Size Unknown ("How many in each group?" Division)	Number of Groups Unknown ("How many groups?" Division)
	$a \times b = ?$	$a \times ? = p$ and $p \div a = ?$	$? \times b = p$ and $p \div b = ?$
Equal Groups	There are a bags with b plums in each bag. How many plums are there in all? *Measurement example:* You need a lengths of string, each b inches long. How much string will you need altogether?	If p plums are shared equally into a bags, then how many plums will be in each bag? *Measurement example:* You have p inches of string, which you will cut into a equal pieces. How long will each piece of string be?	If p plums are to be packed b to a bag, then how many bags are needed? *Measurement example:* You have p inches of string, which you will cut into pieces that are b inches long. How many pieces of string will you have?
Arrays & Area	There are a rows of apples with b apples in each row. How many apples are there? *Area example*: What is the area of an a cm by b cm rectangle?	If p apples are arranged into a equal rows, how many apples will be in each row? *Area example*: A rectangle has area p square centimeters. If it is a cm long, what is its width?	If p apples are arranged into equal rows of b apples, how many rows will there be? *Area example*: A rectangle has area p square centimeters. If it is b cm wide, what is its length?

Array problems can also be stated in terms of columns, exchanging the order of a and b, so that the same array is described. For example: There are b columns of apples with a apples in each column. How many apples are there?