# Grade 1 Advanced / Gifted and Talented (GT) Mathematics
# *Oh, the Places You'll Go*: A Unit in Operations and Algebraic Thinking

## Introduction:

This unit models instructional approaches for differentiating the CCSS for advanced/gifted and talented students. Gifted and talented students are defined in Maryland law as having outstanding talent and performing, or showing the potential for performing, at remarkably high levels when compared with their peers (§8-201). State regulations require local school systems to provide different services beyond the regular program in order to develop gifted and talented students' potential. Appropriately differentiated programs and services will accelerate, enrich, and extend instructional content, strategies, and products to apply learning (COMAR 13A.04.07 §03).

## Overview:

This unit is aligned with the first and second grade common core state curriculum, primarily in the domain of operations and algebraic thinking, but includes some number and operations in base ten. Students will build fluency for addition and subtraction within 20 and apply addition and subtraction by solving word problems within 100 with multiple steps and multiple representations. Differentiation strategies for advanced/gifted and talented students have been embedded into the unit, including problem-based learning creation of authentic products, student choice, curriculum compacting opportunities, higher level questioning and problem solving, and interdisciplinary connections with social studies and science standards from grades 1 and 2. Technology integration is used to enhance students' research skills, communication, and problem solving. The lessons and seeds can be used in or out of sequence/ in varying order and lesson activities can be extended over more than one day.

## Teacher Notes:

Problem-based learning (PBL) is a research-based strategy that is effective for providing differentiation for gifted learners. PBL develops critical and creative thinking, collaboration, and joy in learning as it motivates and challenges students to learn through engagement in real-life problems. Students engage in the work of professionals as they collect data, analyze information, evaluate results, and learn to communicate their understanding to others.

PBL organizes curriculum and instruction around interdisciplinary "ill-structured" problems that professionals might actually face, and in which the students see themselves as active stakeholders. While the problem becomes the purpose for learning, this unit carefully structures the problem-solving process so that students achieve the required understandings. The PBL investigation results in student-created products presented to an authentic audiences which can evaluate the effectiveness of the solutions. The problem is presented in a realistic format called a "scenario." A PBL scenario has an engaging social context in which the students play a role, so there is a high motivation to solve the problem.

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This unit includes a model problem scenario in the form of a letter from another teacher who is seeking math games for his/her students. The teacher may choose to revise this scenario in order for it to be timely and relevant to the targeted group of students.

**Important:** In PBL, the teacher must create an authentic audience for student products. This PBL unit requires that the teacher collaborate with another teacher's class in order to provide an authentic audience for the games.

An effective problem scenario identifies and defines the problem and also establishes the conditions/criteria for the solutions which are aligned with the content standards and mathematical practices. The problem statement for this unit can be stated using this frame:

How can we as proficient mathematics students **(role of students)** create an "Our Community" board game **(task/product)** played by students so that they can practice their math skills (**purpose/ audience)**. We must create the game in such a way that it **(the conditions/criteria for the product)**

- Requires players to solve a variety of addition and subtraction story problems to move to the finish line;
- Includes a map of the community;
- Uses different types of transportation;
- Shows places in the community where people work, live, and play;
- Allows players to use student-invented strategies and flexible thinking to apply their understanding of the operations of addition and subtraction.

**Enduring Understandings**: Enduring understandings go beyond discrete facts or skills. They focus on larger concepts, principles, or processes. They are transferable and apply to new situations within or beyond the subject.

- Operations create relationships between numbers.
- The relationships among the operations and their properties promote computational fluency.
- Real world situations can be represented symbolically and graphically.
- There can be different strategies to solve a problem, but some are more effective and efficient than others.
- The context of a problem determines the reasonableness of a solution.
- The ability to solve problems is the heart of mathematics.

- The problem in front of you is a member of a larger class of problems.
- Computation involves taking apart and combining numbers using a variety of approaches.
- Flexible methods of computation involve grouping numbers in strategic ways.
- Proficiency with basic facts aids estimation and computation of larger and smaller numbers.
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**Essential Questions:** A question is essential when it stimulates multi-layered inquiry, provokes deep thought and lively discussion, requires students to consider alternatives and justify their reasoning, encourages re-thinking of big ideas, makes meaningful connections with prior learning, and provides students with opportunities to apply problem-solving skills to authentic situations.

- Why do I need mathematical operations?
- How do mathematical operations relate to each other?
- How do I know which mathematical operation (+, -) to use?
- How do I decide which representation to use when solving problems (concrete manipulatives, pictures, words, or equations)?
- How do I know which computational method (mental math, estimation, paper and pencil, and calculator) to use?
- What is meant by equality in mathematics?
- How do I know where to begin when solving a problem?

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**Possible Student Outcomes**: The following list provides outcomes that describe the knowledge and skills that students should understand and be able to do when the unit is completed. The outcomes are often components of more broadly-worded standards and sometimes address knowledge and skills necessarily related to the standards. The lists of outcomes are not exhaustive, and the outcomes should not supplant the standards themselves. Rather, they are designed to help teachers delve deeply into the standards and augment as necessary, providing added focus and clarity for lesson planning purposes. This list is not intended to imply any particular scope or sequence.

The student will:

- Quickly solve b + a = c, if they know a + b = c.
- Combine pairs of numbers that make 20 or less or easy combinations within a larger problem to arrive at the solution efficiently.
- Quickly solve c – a = ? by making it a missing addend problem of a + ? = c.
- Explain how they solved the problem or identify the strategy used to solve the problem.
- Justify their solution by using concrete materials to model the problem and solution.
- Identify different ways to solve the same problem.
- Identify the most efficient strategy to use when solving a problem and explain why it was chosen.
- Become engaged in problem solving that is about thinking and reasoning.
- Collaborate with peers in an environment that encourages student interaction and conversation that will lead to mathematical discourse about addition and subtraction.

**Vertical Alignment:** Vertical curriculum alignment provides two pieces of information: (1) a description of prior learning that should support the learning of the concepts in this unit, and (2) a description of how the concepts studied in this unit will support the learning of additional mathematics.

**Key Advances from Previous Grades**: Students enlarge their concept of and capabilities with addition and subtraction by applying their understanding of the following:

**Students in Kindergarten**:

- Represent addition and subtraction with objects, fingers, mental images, drawings, sounds (e.g., claps), acting out situations, verbal explanations, expressions, or equations.
- Solve addition and subtraction word problems, and add and subtract within 10, e.g., by using objects, drawings, and mental math to represent the problem.
- Decompose numbers less than or equal to 10 into pairs in more than one way, e.g., by using objects, drawings, and mental math and then record each decomposition by a drawing or equation (e.g., 5 = 2 + 3 and 5 = 4 + 1).
- When given any number from 1 to 9, find the number that makes 10 when added to the given number, e.g., by using objects, drawings, and mental math and then record the answer with a drawing or equation.
- Fluently add and subtract within 5. (Students in Kindergarten work with addition and subtraction to 10 but must be fluent up to 5.)

**Additional Mathematics**:

**Students in Grade 2:**

- Fluently add and subtract within 100.
- Add up to four two-digit numbers.
- Explain why addition and subtraction strategies work.
- Add and subtract within 1000.

**Students in Grade 3:**

- Lay the foundation for the properties of multiplication and division (Commutative, Associative, and Distributive).
- Lay the foundation for the understanding that division can be thought of as the unknown-factor problem.
- Use the four operations with whole numbers to solve problems, gain familiarity with factors and multiples, and to generate and analyze patterns.
- Write and interpret numerical expressions and analyze patterns and relationships.

## Connections to the Standards for Mathematical Practice:

This section provides examples of learning experiences for this unit that support the development of the proficiencies described in the Standards for Mathematical Practice. These proficiencies correspond to those developed through the Literacy Standards. The statements provided offer a few examples of connections between the Standards for Mathematical Practice and the Content Standards of this unit. The list is not exhaustive and will hopefully prompt further reflection and discussion.

In this unit, educators should consider implementing learning experiences which provide opportunities for students to:

**Make sense of problems and persevere in solving them.**

- Determine what the problem is asking for: the unknown result/total, missing addend, or unknown start of the problem.
- Determine whether concrete or virtual models, pictures, mental mathematics, or equations are the best tools for solving the problem.
- Determine if more information is needed. Identify information not needed.
- Check the solution with the problem to verify that it does answer the question asked.

**Reason abstractly and quantitatively.**

- Use manipulatives or drawings to show the relationship of the numbers within the problem and identify the unknown.
- Identify relationships between the numbers in the problem that will help to find the solution (e.g., combinations that make ten).
- Use the relationship between addition and subtraction to solve problems.

**Construct Viable Arguments and critique the reasoning of others.**

- Compare the equations or models used by others with yours.
- Examine the steps taken that produce an incorrect response and provide a viable argument as to why the process produced an incorrect response.

**Model with Mathematics.**

- Construct visual models using concrete or virtual manipulatives, pictures, or equations to justify thinking and display the solution.

**Use appropriate tools strategically.**

- Use base ten materials, snap cubes, counters, hundred charts, or other models, as appropriate.
- Use drawings and/or pictures to represent the problem.

**Attend to precision.**

Use mathematics vocabulary such as addend, difference, digit, equation, etc. properly when discussing problems.

- Demonstrate their understanding of the mathematical processes required to solve a problem by carefully showing all of the steps in the solving process.
- Correctly write and read equations.
- Use +, -, and = appropriately to record equations.

**Look for and make use of structure.**

- Make observations about the relative size of numbers or sets of objects.
- Make use of the Part-Part-Total mat, as appropriate in solving problems.

**Look for and express regularity in reasoning.**

- Use models to demonstrate various combinations to make 20 or another specific number.
- Use models to demonstrate the composition and decomposition of numbers.

## Content Standards with Essential Skills and Knowledge Statements and Clarifications:

The Content Standards and Essential Skills and Knowledge statements shown in this section come directly from the Maryland State Common Core Curriculum Frameworks. Clarifications were added as needed. Educators should be cautioned against perceiving this as a checklist. All information added is intended to help the reader gain a better understanding of the standards.

| Standard | Essential Skills and Knowledge | Clarification |
|---|---|---|
| 1.OA.A.1: Use addition and subtraction within 20 to solve word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions, e.g., by using objects, drawings, and equations with a symbol for the unknown number to represent the problem. | Ability to represent the problem in multiple ways including drawings and or objects/manipulatives (e.g., counters, connecting cubes, base ten materials, number lines)<br>Ability to take apart and combine numbers in a wide variety of ways<br>Ability to make sense of quantity and be able to compare numbers<br>Ability to use flexible thinking strategies to develop the understanding of the traditional algorithms and their processes<br>Ability to solve a variety of addition and subtraction word | 1.OA.A.1 - Teachers should pose a variety of word problems to students:<br>Join Problems Include:<br>Start Unknown ☐ + 6 = 11<br>Change unknown 5 + ☐ = 11<br>Result/Whole Unknown 5 + 6 = ☐<br>Separate Problems Include:<br>Start Unknown ☐ - 5 = 4<br>Change unknown 9 - ☐ = 11<br>Result/Whole Unknown 9 - 5 = ☐<br>Part-Part-Whole Problems Include:<br>Part Unknown<br>  <br>Part Unknown |

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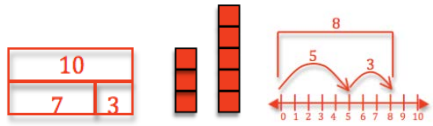
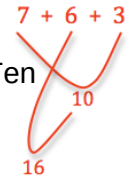
| | problems (CCSS, Page 88, Table 1)<br>Ability to use □ or ? to represent an unknown in an equation |  <br>Whole Unknown<br>  <br>Students should be able represent the problem in multiple ways including drawings and or objects/manipulatives (counters, connecting cubes, number lines, etc…):<br>  <br>Examples of various types of addition and subtraction problem types can be found in Table 2, on Page 88 in the Common Core at<br>http://www.corestandards.org/assets/CCSSI_Math%20Standards.pdf |
| 1.OA.A.2: Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20, e.g., by using objects, drawings, and equations with a symbol for the | Ability to add numbers in any order and be able to identify the most efficient way to solve the problem<br>Ability to solve a variety of addition and subtraction word problems (CCSS, Page 88, Table 1) | 1.OA.A.2 - Students should realize they can add numbers in any order and be able to identify the most efficient way to solve the problem:<br>Making Ten<br>  <br>  |

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| unknown number to represent the problem. | | |

**Interdisciplinary Connections:** Interdisciplinary connections fall into a number of related categories:
Literacy standards within the Maryland Common Core State Curriculum Science, Technology, Engineering, and Mathematics standards Instructional connections to mathematics that will be established by local school systems, and will reflect their specific grade-level coursework in other content areas, such as English language arts, reading, science, social studies, world languages, physical education, and fine arts, among others.

| **Available Model Lesson Plans** | | |
|---|---|---|
| **Standards Addressed** | Title | Description/Suggested Use |
| 1.OA.B.3-4; 1.OA.C.6; 1.OA.D.7-8 | Grade 1 Advanced/Gifted and Talented Lesson Plan 1: *Oh, the Places You'll Go!* | Three activities center on understanding and applying properties of operations and the relationship between addition and subtraction. |
| **Available Lesson Seeds** | | |
| **Standards Addressed** | Title | Description/Suggested Use |
| MP1. Make sense of | Lesson Seed 1. *Introducing the Problem-* | Students will be introduced to the |

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| problems and persevere in solving them.<br>MP4. Model with Mathematics. | *Based Learning Scenario* | unit task of creating a "My Community: Oh, the Places You'll Go" Board Game. **Complete this Seed after students have completed Lesson Plan One.** |
| 2.OA.A.1, 1.NBT.C.4 | Lesson Seed 2. *Through Maryland We Will Go* | Students will apply strategies to make sense of problems involving unknowns in all positions, with and without multiple steps. |
| 2.OA.A.1 | Lesson Seed 3. *To the Boardwalk We Will Go* | Students will use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions. |
| 1.OA.C.6, 2.OA.A.2, 2.OA.B.3 | Lesson Seed 4. *To the Zoo We Will Go* | Students explore the many different combinations of addends result in the same sum and work with even numbers plus even numbers to determine an even sum. |
| 1.NBT.C.4, 2.NBT.C.5, 1.MD.B.3 | Lesson Seed 5. *Rock Around the Clock* | Students use the properties of addition to add 6 numbers in order to find equivalent sums. |
| 2.OA.A.1 | Lesson Seed 6. *Fundraising We Will Go* | Students make sense of quantity and by comparing numbers, taking numbers apart, and combining numbers. |
| 1.OA.A.1-2 | Lesson Seed 7. *Visit to a Restaurant* | Enrichment Lesson Seed with two activities |

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| 1.OA.A.2 | Lesson Seed 8. *Problem Choice Board* | Extension Lesson Seed<br>Students will use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with unknowns in all positions. |

Vocabulary/Terminology/Concepts: This section of the Unit Plan is divided into two parts. Part I contains vocabulary and terminology from standards that comprise the cluster which is the focus of this unit plan. Part II contains vocabulary and terminology from standards outside of the focus cluster. These "outside standards" provide important instructional connections to the focus cluster.

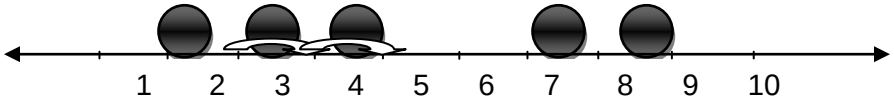
**Part I – Focus Cluster:**

*inverse operations:* two operations that undo each other. Addition and subtraction are inverse operations. Multiplication and division are inverse operations. Examples: 4 + 5 = 9; 9 – 5 = 4 6 x 5 = 30; 30 ÷ 5 = 6

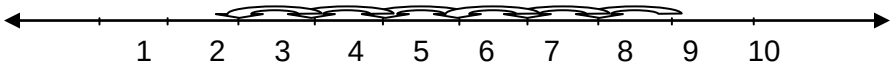
*Counting All:* the very first addition counting strategy in which a student counts all of the objects, pictures, or items in a problem to determine the total and solve the problem. This is the least efficient counting strategy to use and should lead to the more efficient Counting On strategies. Example: Bobby has two counters and Susie has three. How many do they have all together?

*Counting On:* an addition counting strategy in which a student starts with one set of objects and counts up to solve the problem. Example: Bobby has two counters and Susie has three. How many do they have all together?

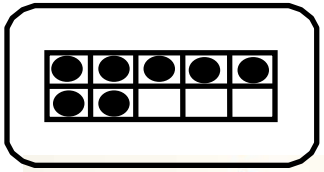

*Counting On from the Larger Number:* an addition counting strategy in which a student starts with the largest set of objects and counts up to solve the problem. Example: Bobby has two counters and Susie has three. How many do they have all together?

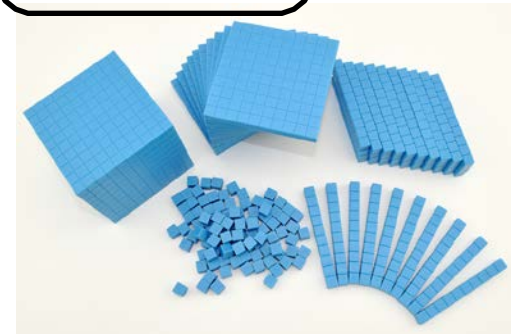



*Counting Up:* a subtraction counting strategy in which a student counts up from one part to the whole in order to find the missing part. Example: 9 – 6 = ? The student would count starting at 6, saying "7, 8, 9" determining that, by counting up three numbers, the missing part of the number sentence is '3'.
*Counting Back:* a subtraction counting strategy in which a student counts back from the total in order to find the missing part. Example: 9 – 6 = ? The student would count starting at 9, saying "8, 7, 6" determining that, by counting back three numbers, the missing part of the number sentence is '3'.

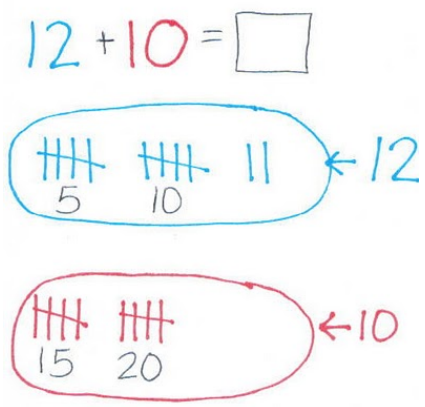


*Visual representations of numerals:* concrete materials or pictures that represent specific numerals, showing the quantity represented by those numerals. Examples:





Part II




**Instructional Connections outside the Focus Cluster**

*cardinality:* is the understanding that when counting a set, the last number counted represents the total number of objects in the set.

Example:


This is a set of 3 stars.

*Invented, flexible algorithms:* algorithmic thinking that includes strategies such as the use of expanded form, partial sums, move some to make tens, using nicer numbers and compensating, etc. rather than relying on the standard algorithm.
Resources:

Free Resources:
http://wps.ablongman.com/ab_vandewalle_math_6/0,12312,3547876-,00.html Reproducible blackline masters
http://lrt.ednet.ns.ca/PD/BLM_Ess11/table_of_contents.htm mathematics blackline masters
http://yourtherapysource.com/freestuff.html Simple activities to encourage physical activity in the classroom
http://www.mathsolutions.com/index.cfm?page=wp9&crid=56 Free lesson plan ideas for different grade levels
http://digiblock.com/ Lesson plans for using Digi-Blocks
http://sci.tamucc.edu/~eyoung/literature.html links to mathematics-related children's literature
http://www.nctm.org/ National Council of Teachers of Mathematics
www.k-5mathteachingresources.com Extensive collection of free resources, math games, and hands-on math activities aligned with the Common Core State Standards for Mathematics
http://elementarymath.cmswiki.wikispaces.net/Standards+for+Mathematical+Practice Common Core Mathematical Practices in Spanish
http://mathwire.com/ Mathematics games, activities, and resources for different grade levels
http://www.pbs.org/teachers/math/ interactive online and offline lesson plans to engage students. Database is searchable by grade level and content
http://www.k8accesscenter.org/training_resources/MathWebResources.asp valuable resource including a large annotated list of free web-based math tools and activities.
http://www.cast.org/udl/index.html Universal Design for Learning
http://engageny.org/wp-content/uploads/2012/05/Shifts-for-Students-and-Parents.pdf Information for parents and students about the Shifts associated with the CCSS.
http://havefunteaching.com/ Various resources, including tools such as sets of Common Core Standards posters.
http://michellef.essdack.org/links Numerous mathematics links.
http://illustrativemathematics.org/ Tasks that align with the MD CCSS.
http://www.aimsedu.org/Puzzle/categories/topological.html Puzzles to challenge students of various ages.
http://www.insidemathematics.org/index.php/home Mathematics resources for teachers.
http://www.fotosearch.com/photos-images/order-pad.html. A link to a host of pictures of restaurant items and workers
http://www.fuelthebrain.com/Game/play.php?ID=1 – Interactive website with 'Ace of Numbers' game

http://schools.nyc.gov/documents/teachandlearn/ss/census/Grade_1_GT_Curriculum_Edit_09_1_final.pdf Gifted and talented resource from NYC
http://www.nctm.org/standards/mathcommoncore/ Math Common Core Coalition
http://www.ccsstoolbox.org/. Common Core State Standards toolbox.
http://www.parcconline.org/ PARCC Resources
http://illuminations.nctm.org/ActivityDetail.aspx?ID=26 and http://illuminations.nctm.org/ActivityDetail.aspx?id=33 equality
**http://nrich.maths.org/2197** Secret codes

Math Related Literature:

Afromsky, Ryan. I Have a Restaurant
Notes: Readers are take on a tour of a restaurant by the owner, Ryan. Students learn learning everything that goes on in a restaurant, from the time the restaurant opens and gets ready to serve its customers, to taking a person s order and preparing it, to when the food arrives.

Derubertis, Barbara. A Collection for Kate.
Notes: Kate participates in Collection Week at school. The focus of this book is on addition: the meaning of addition; counting on to add; using doubles; fact families; mental math strategies; estimating sums; three and four addends; and regrouping.

London, Jonathan. Froggy Eats Out.
Notes: Froggy dines at a fancy restaurant with his parents, but has a difficult time behaving properly.

Marsico, Katie. Good Manners in a Restaurant (Good Manners Matter!)
Notes: Students learn which behaviors to use and which to avoid to make eating in a restaurant enjoyable for everyone.

Moss, Marissa. *Mel's Diner*.
Notes: The main character Mabel enjoys helping her father and mother run their diner.

Murphy, Stuart J. Animals on Board
Notes: Students can join in as trucker Jill and her dog add up the animals zooming by.

Snyder, Laurel. Inside the Slidy Diner.
Notes: The main character, Edie, helps readers avoid the wigglepedes and steer clear of the pumpkin asparagus pie with crunchy-bit topping (nobody knows what the crunchy bits are).

Suess, Dr. Oh the Places You'll Go.
Notes: This book contains humorous verse and illustrations of a child as he sets off into the world to see what life will bring him, encountering all sorts of crazy adventures along the way.

Walters, Alice. L. Fanny at Chez Panisse: A Child's Restaurant Adventures with 46 Recipes.
Notes: Chez Panisse is a restaurant in Berkeley, California, run by Alice Waters and her large group of friends. Her daughter Fanny's stories of this busy place are a friendly and funny introduction to the delights of real restaurant life in the words of a seven-year-old.

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