Teacher Guide to Clarification

Instructional Math Materials

**2.OA.2**

**Add and subtract within 20**

2.OA.2 Fluently, add and subtract within 20 using mental strategies. By the end of grade 2, know from memory all sums of two one-digit numbers. 2 See standard 1.OA.6 for a list of mental strategies

**Fluently add and subtract within 20 mentally**

**2.OA.2** mentions the word fluently when students are adding and subtracting numbers within 20. Fluency means accuracy (correct answer), efficiency (within 4-5 seconds), and flexibility (using strategies such as making 10 or breaking apart numbers). Research indicates that teachers’ can best support students’ memorization of sums and differences through varied experiences making

10, breaking numbers apart and working on mental strategies, rather than repetitive timed tests.

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This is a great definition of how fluency can look in the CC math classroom

This standard builds upon the mental math strategies in Grade 1

(Below are 4 strategies named in standard 1.OA.6)

**Example: 9 + 5= \_\_**

Student 1

**Counting On**

I started at 9 and then counted 5 more. I landed on 14.

Student 2

**Decomposing a Number Leading to a Ten**

I know that 9 and 1 is 10, so I broke 5 into 1 and 4. 9 plus

1 is 10. Then I have to add 4 more, which gets me

to 14.

**Example: 13 - 9 = \_\_**

Student 1

**Using the Relationship between Addition and Subtraction:**

I know that 9 plus 4 equals 13. So, 13 minus 9 equals 4.

Student 2

**Creating an easier problem using compatible numbers:**

Instead of 13 minus 9. I added 1 to each of the numbers to make the problem 14 minus 10.

I know the answer is 4. So 13 minus 9 is also 4.

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Daily Discussions is a great way to practice these strategies and to utilize Math Practice 3 – *Construct viable arguments and critique the reasoning of others.*

Check out how a third grade class adds mentally. 2nd graders would use numbers within 20.

<https://www.teachingchannel.org/videos/third-grade-mental-math>

The deep extended experiences students have with addition and subtraction in Kindergarten and Grade 1 culminate in Grade 2 with students becoming fluent in single-digit additions and the related subtractions using **the mental Level 2 and 3 strategies as needed.2.OA.2**

Common Core Standards Writing Team. (2013, September 19). *Progressions for the Common
 Core State Standards in Mathematics(draft). K-5 Counting and Cardinality and
 Operations and Algebraic Thinking.* Tucson, AZ: Institute for Mathematics and
 Educations, University of Arizona.

For some definitions of Level 2 problem solving refer to pg. 37 of the KCC –OS Progression Document.

Level 2. Counting On.

*Embed an addend within the total (the addend is perceived simultaneously as an addend and as part of the total). Count this total but abbreviate the counting by omitting the count of this addend; instead, begin with the number word of this addend. Some method of keeping track (fingers, objects, mentally imaged objects, body motions, other count words) is used to monitor the count.*

*For addition, the count is stopped when the amount of the remaining addend has been counted. The last number word is the total. For subtraction, the count is stopped when the total occurs in the count. The tracking method indicates the difference (seen as an unknown addend).*

Counting on can be used to find the total or to find an addend. These look the same to an observer. The difference is what is monitored: the total or the known addend. Some students count down to solve subtraction problems, but this method is less accurate and more difficult than counting on. Counting on is not a rote method. It requires several connections between cardinal and counting meanings of the number words and extended experience with Level 1 methods in Kindergarten.

Adding (e. g., 8 + 6 = ? ) uses counting on to find a total: One counts on from the first addend (or the larger number is taken as the first addend). Counting on is monitored so that it stops when the second addend has been counted on. The last number word is the total.

Finding an unknown addend (e.g., 8 + ? = 14): One counts on from the known addend. The keeping track method is monitored so that counting on stops when the known total has been reached. The keeping track method tells the unknown addend.

Subtracting (14 - 8 = ?): One thinks of subtracting

as finding the unknown addend, as 8 + ? =14 and uses counting on to find an unknown addend (as above).

The problems in Table 2 which are solved by Level 1 methods in

Kindergarten can also be solved using Level 2 methods: counting on to find the total (adding) or counting on to find the unknown addend (subtracting).

The middle difficulty (lightly shaded) problem types in Table 2 for Grade 1 are directly accessible with the embedded thinking of Level 2 methods and can be solved by counting on.

Finding an unknown addend (e.g., 8 + ? = 14) is used for Add To/Change Unknown, Put Together/Take Apart/Addend Unknown, and Compare/Difference Unknown. It is also used for Take From/Change Unknown (14 - ? = 8) after a student has decomposed the total into two addends, which means they can represent the situation as 14 - 8 = ?.

Adding or subtracting by counting on is used by some students for each of the kinds of Compare problems (see the equations in Table 2). Grade 1 students do not necessarily master the Compare Bigger Unknown or Smaller Unknown problems with the misleading language in the bottom row of Table 2.

Solving an equation such as 6 + 8 = ? by counting on from 8 relies on the understanding that 8 + 6 gives the same total, an implicit use of the commutative property without the accompanying written representation 6 + 8 = 8 + 6.

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**Coherence and Connections: Need to Know**

|  |  |  |
| --- | --- | --- |
| Below Grade Level | At Grade Level | Above Grade Level |
| 1.OA.6 | **2.OA.2**2.NBT.5 | none |

Fluency Standard

So fluency in adding and subtracting single-digit numbers has progressed from numbers within 5 in Kindergarten to within 10 in Grade 1 to within 20 in Grade 2. The methods have also become more advanced. The word *fluent* is used in the Standards to mean “fast and accurate.” Fluency in each grade involves a mixture of just knowing some answers, knowing some answers from patterns (e.g., “adding 0 yields the same number”), and knowing some answers from the use of strategies. It is important to push sensitively and encouragingly toward fluency of the designated numbers at each grade level, recognizing that fluency will be a mixture of these kinds of thinking which may differ across students. The extensive work relating addition and subtraction means that subtraction can frequently be solved by thinking of the related addition, especially for smaller numbers. It is also important that these patterns, strategies and decompositions still be available in Grade 3 for use in multiplying and dividing and in distinguishing adding and subtracting from multiplying and dividing. So the important press toward fluency should also allow students to fall back on earlier strategies when needed. By the end of the K–2 grade span, students have sufficient experience with addition and subtraction to know single-digit sums from memory;2.OA.2

as should be clear from the foregoing, this is not a matter of instilling facts divorced from their meanings, but rather as an outcome of a multi-year process that heavily involves the interplay of practice and reasoning.

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This cluster is connected to the Second Grade Critical Area of Focus #2, **Building fluency with addition and subtraction**.

This cluster is connected to *Represent and solve problems involving addition and subtraction* and *Add and subtract within 20* in Grade 1, and to *Use place value understanding and properties of* *operations to add and subtract* in Grade 2.

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When teaching these mental math strategies the approach the teacher takes is just as important. A recommendation is to let students solve the problem in any way that works for them, and then elaborate on how they solved the problem. Given the problem 13 + 5 students can solve the problem a few different ways. It is up to the teacher to recognize how they solved it and then identify that strategy to the other students. This promotes student-discovery learning. The teacher then truly becomes a facilitator of learning.

**In this grade level, the conceptual understanding is being developed. In grade 3, students will learn the standard algorithm with regrouping.**

This standard is strongly connected to all the standards in this domain. It focuses on students being able to fluently add and subtract numbers to 20. Adding and subtracting fluently refers to knowledge of procedures, knowledge of when and how to use them appropriately, and skill in performing them flexibly, accurately, and efficiently.

Mental strategies help students make sense of number relationships as they are adding and subtracting within 20. The ability to calculate mentally with efficiency is very important for all students. Mental strategies may include the following:

* Counting on
* Making tens (9 + 7 = 10 + 6)
* Decomposing a number leading to a ten ( 14 – 6 = 14 – 4 – 2 = 10 – 2 = 8)
* Fact families (8 + 5 = 13 is the same as 13 - 8 = 5)
* Doubles
* Doubles plus one (7 + 8 = 7 + 7 + 1)

The use of objects, diagrams, or interactive whiteboards, and various strategies will help students develop fluency.

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**Example of Major Within-Grade Dependencies**

Knowing single-digit sums from memory (2.OA.B.2) is the basis for adding and subtracting multi-digit numbers fluently and efficiently in general (cluster 2.NBT.B).

**Examples of Opportunities for Connections among Standards, Clusters or Domains**

Students’ work with addition and subtraction word problems (2.OA.A.1) can be coordinated with their growing skill in multi-digit addition and subtraction (2.OA.B.2, cluster 2.NBT.B).

*PARCC Draft Model Content Frameworks: Mathematics Grades K-2* (2013, December).
 Retrieved May 10, 2014, from <http://parcconline.org/sites/parcc/files/PARCCMCFMathematicsNovember2012V3_FINAL_0.pdf>

**Classroom Resource**

This power point will give the teacher addition and subtraction problems that allow students to solve in multiple ways and to utilize their mental math strategies. Sample answer are in the notes of the ppt., however, students may use a variety of ways to solve.

**HOT Questions**

1. Jean solved the addition problem below. Can you think of another way to solve it?

**Additional Resources**

7 + 8 = 15

Jean: I know that 7 + 7 equals 14 and one more from the 8 makes 15

2. True or False – explain how you know

9 + 6 = 10 + 5

3. Solve 13 – 8 two different ways. Be prepared to share your strategy with a partner.

Card game that allows students to add or subtract numbers in order to get close to 20.

<http://www.insidemathematics.org/problems-of-the-month/pom-gotyournumber.pdf>

Howard County Wiki

[https://grade2commoncoremath.wikispaces.hcpss.org/Assessing+2.OA.2](https://grade2commoncoremath.wikispaces.hcpss.org/Assessing%2B2.OA.2)

K-5 teaching resources – scroll down to 2.OA.2 – many activities, good center ideas

<http://www.k-5mathteachingresources.com/2nd-grade-number-activities.html>

North Carolina Wiki

[http://commoncoretasks.ncdpi.wikispaces.net/2.OA.2+Tasks](http://commoncoretasks.ncdpi.wikispaces.net/2.OA.2%2BTasks)

Illustrative Math

<https://www.illustrativemathematics.org/2>