

Place Value and Computational Strategies with Larger Numbers



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Online Resources

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Introduction to Math Navigator

Dear Parent/Guardian,

_____ has been selected to participate in Math Navigator! Math Navigator is one of the ways that our school is working to help all students succeed in mathematics. The program gives students the additional time and instruction they need to improve their performance in this important subject.

Your child will be participating in the *Place Value and Computational Strategies with Larger Numbers* module. The main goal of this module is to help students add and subtract to 1,000 flexibly, efficiently, and accurately. Students will use place value understanding, number sense, and properties of operations as they consider, test, develop, and explain strategies for computation. Students will explore general methods of adding or subtracting in preparation for learning standard algorithms. Students will record their thinking about computations in writing, and explain why strategies work. Students will learn to round numbers and develop estimation strategies, then use estimation to anticipate the result of a computation and to judge whether the result arrived at is reasonable. Students will also extend their understanding of place value and properties of operations as they make sense of multiplying by multiples of 10 (for example, 4×60 or 8×70).

There are a variety of materials students will use with this module: one of them is a set of Study Cards. These cards include mathematical ideas for students to master, game cards, and blank cards that students can customize with concepts that they need to work on. Students are encouraged to use these cards during the lessons, as well as during free time and at home. Please encourage your child to share them with you.

The more enthusiastic you can be about Math Navigator, the more it will help your child. Ask questions each day about what your child learned and how the Math Navigator class was different from your child's regular math class. It is important for you to acknowledge what your child has accomplished both on a day-to-day basis and after completing the Math Navigator module.

We are excited about using Math Navigator with students. Learn more about this special program and how it works by reading the short description that follows. If you have any questions about the program, please do not hesitate to contact us here at school.

How Math Navigator Works

Structure of a Module

Each module contains 20 days of 30- or 45-minute lessons, including a pre-test and post-test. During the 20 days, students have two or three checkpoint lessons that assess their understanding of the concepts in the module.

Frequent Skills Practice

Most lessons include a Show Me session in which students practice and reinforce skills. It is also a time for students to learn strategies and techniques that make computation easier.

Emphasis on Understanding

The lessons are carefully designed to uncover mistakes that result from students misunderstanding something. We call such mistakes *misconceptions*. Misconceptions need to be corrected because they can interfere with new learning. Math Navigator modules do not attempt to reteach everything that students have learned about a topic. Instead, they help students understand the mathematics of the procedures and concepts that they have already learned so that they can correct the misconceptions that are getting in the way of their progress.

Learning to Think Mathematically

Lessons are structured to teach students to think like mathematicians. Students will learn how to ask themselves questions before beginning a problem; to use diagrams, tables, and other methods of representing problems; and to estimate as a way of determining whether their answers are reasonable. Most importantly, they will come to see that mistakes are opportunities for learning, rather than something to hide.

Misconceptions and Errors

AT1	Does not recognize a pattern including a number pattern
F21	Does not understand the concept of equivalence
G3	Rounds incorrectly
G5	Misapplies the rule for rounding up and changes the digit in the designated place while leaving the digits in smaller places as they are
O16	Does not recognize or misapplies the associative property
O17	Estimates incorrectly
O22	Fails to link addition and subtraction as inverse operations
O23	Is unable to transfer between different representations of operations
O24	Does not recognize or misapplies the distributive property
O33	Subtracts the smaller number from the larger one
PV3	Ignores place value and treats each number as a separate number
PV12	Does not understand the relative sizes of digits in place-value notation

AT1 Does not recognize a pattern including a number pattern

example	$39 - 24 = 40 - 25$
	$38 - 23 = 40 - 25$
	$37 - \underline{13} = 40 - 25$

F21 Does not understand the concept of equivalence

The student does not understand that adding an amount and then subtracting that amount (or vice versa) give the same result.

example Finish this student's work.

$$37 + 45 = ?$$

$$(37 + 3) + 45 \rightarrow 40 + 45 \rightarrow 85$$
G3 Rounds incorrectly

example Round 243 to the nearest 10.

240

Round 356 to the nearest 100.

300

G5 Misapplies the rule for rounding up and changes the digit in the designated place while leaving the digits in smaller places as they are

example Round 367 to the nearest 100.

467

Round 367 to the nearest 50.

357

O16 Does not recognize or misapplies the associative property

The student fails to find an easier way to add because he fails to recognize that the order in which numbers are added can be changed without affecting the result. The student labors to find the total.

The student fails to make sense of multiplying tens because he fails to recognize that the order in which numbers are multiplied does not affect the result.

example

$35 + 42 + 15 = ?$

$35 + 40 \rightarrow 75 + 2 \rightarrow 77 + 10 \rightarrow 87 + 5 \rightarrow 92$

Josh's teacher has 3 boxes of pencils. Each box has 6 bunches of 10 pencils. How many pencils are there in all?

Finish these two equations for this problem:

$3 \times \underline{60} = \underline{180}$

$\underline{\quad} \times 10 = \underline{180}$

O17 Estimates incorrectly

The student fails to check the place value of the leading digit, or the student spends as much time finding a close estimate as it would take to find the exact result.

example

Estimate the total of $356 + 48$.

800

Estimate: $692 - 397$

290

O22 Fails to link addition and subtraction as inverse operations

The student does not use the adding up strategy (“think addition”) to make subtraction problems easier to solve. She does not view subtraction problems as missing addend problems. She may count down, making the common error of counting the starting number as the first subtraction.

example

$73 - 48 = ?$

I counted down 40 by tens: 73, 63, 53, 43.
 Then I counted down 8: 43, 42, 41, 40, 39, 38, 37, 36.
 The answer is 36.

O23 Is unable to transfer between different representations of operations

The student has problems reading or creating different representations of addition or subtraction.

example

Use an open number line diagram to show this strategy for solving $65 - 19$:

“I gave the problem 1 so I could subtract 20 from 65. I took away the tens in 20: 65 ... 55, 45. Then I added 1 back because I took away 1 too many.”

O24 Does not recognize or misapplies the distributive property

The student does not recognize that multiplication can be made easier by breaking a number into parts and multiplying each part. The student labors to find the product and to understand multiplication of tens.

example

$17 \times 10 = ?$

*I wrote 17 tens, and then I counted by 10s.
The answer is 170.*

10 10 10 10 10 10 10 10 10 10
10 10 10 10 10 10 10

O33 Subtracts the smaller number from the larger one

example

$$\begin{array}{r} 749 \\ - 675 \\ \hline 134 \end{array}$$

PV3 Ignores place value and treats each number as a separate number

example

$$\begin{array}{r} 645 \\ + 362 \\ \hline 9,107 \end{array}$$

PV12 Does not understand the relative sizes of digits in place-value notation

The student fails to view two-digit and three-digit numbers using base-ten units flexibly (as 10 times, 100 times). He fails to understand 207 as 20 tens and 7 ones, or to understand 150 as 15 tens.

 example	150 is the same as how many tens? <u>5</u>
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Class Profile Instructions

About the Class Profile

Completing an analysis of student work gives you a clear picture of the strategies an individual student is applying to a particular problem or topic in mathematics. Such an analysis is even more powerful when it is applied to the Math Navigator class as a whole.

The Class Profile gives you both. By reading the Class Profile across a row, you can see where each student stands at any point in time. Reading down the columns allows you to see the strengths and needs of the entire class at a glance. By reviewing the Class Profile, you will be able to make decisions that target appropriate instruction to individuals, small groups, and the whole Math Navigator class.

The first pages of the Class Profile provide assessment items related to the content of the module. The last page is based on the mathematical practices from the Common Core State Standards for Mathematics.¹ On this page, record evidence of students using these practices.

Recording Data on the Class Profile

When you see—either through discussion, analysis of student work, or direct observation—that a student understands a concept, still has a misconception, or engages in a mathematical practice, make a note on your Class Profile. As the student's understanding increases, update the Class Profile.

Using the Class Profile

Review the Class Profile periodically during the lesson to help you decide which topics would be most beneficial for your students to focus on during the class discussion. Address topics that most of the students in the Math Navigator group need to learn during the show me, work time, or probing for understanding parts of the lesson. Address topics that only some students are struggling with during partner work or in conferences. If only one or two students need help with a topic, address the topic in an individual conference.

Give a copy of the completed Class Profile to each student's classroom teacher at the end of the module.

¹Common Core State Standards Initiative. 2010. "Common Core State Standards for Mathematics": 6–8. Accessed July 1, 2011. http://www.corestandards.org/assets/CCSSI_Math%20Standards.pdf.

CLASS PROFILE (1 OF 2)

Concepts and Procedures	
1	<p>Student Name</p> <p>C1: Rounds whole numbers to the nearest 10 or 100 using place value understanding</p> <p>P1: Fluently adds within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction</p> <p>P2: Fluently subtracts within 1,000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction</p> <p>P3: Multiplies one-digit whole numbers by multiples of 10 in the range 10–90 (e.g., 9×80, 5×60) using strategies based on place value and properties of operations</p> <p>P4: Uses a written method to represent a computation</p> <p>Observed Errors</p>
2	
3	
4	
5	
6	
7	
8	
9	
10	

CLASS PROFILE (2 OF 2)

Mathematical Practice Standards	
<p>MP1: Make sense of problems and persevere in solving them.</p> <p>MP2: Reason abstractly and quantitatively.</p> <p>MP3: Construct viable arguments and critique the reasoning of others.</p> <p>MP4: Model with mathematics.</p>	<p>MP5: Use appropriate tools strategically.</p> <p>MP6: Attend to precision.</p> <p>MP7: Look for and make use of structure.</p> <p>MP8: Look for and express regularity in repeated reasoning.</p>
Student Name	Observations
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	



A Complete Solution to a Math Story

includes all of the following ...



A written estimate



All work that you do



An equation (even if you solved it using column form)



A diagram, number line, table, or other representation



The answer to the question in a complete sentence



What to Do If You Get Stuck



Look at past work times



Look at the charts that are posted



Model the problem using counters or other materials



Sketch a diagram or other representation



Change the numbers to make the problem simpler



Write what you do know



Write down questions to ask later



Check other resources