

ASSESSING MATH CONCEPTS

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Assessment Four

NUMBER
ARRANGEMENTS

THE ASSESSMENTS: How Do We Know They're Learning?

This continuum of assessments follows the stages of children's development of the Critical Learning Phases for the core concepts for numbers to 100. The assessments pinpoint what children know and still need to learn and can be used to document children's growth over time.

Teachers can be misled into thinking that children are making the progress necessary to move on to more complex ideas when they get right answers without understanding the underlying mathematics. Therefore, these assessments are designed to yield more information than whether the children can "get it right or wrong." They determine not only their ability to get right answers but identify the actual mathematics the children know as well.

What young children know and understand can never be fully determined through paper and pencil tasks. Teachers can get much more complete and useful information if they watch and interact with the children while they are doing mathematical tasks. How the children respond indicates what Critical Learning Phase they have reached and reveals their level of understanding. Indicators that describe the range of responses and identify children's instructional needs are listed on each of the assessment forms and explained in detail in each book in the series.

Overview of the Assessments

The assessment described in this book is one of a set of 9. The following charts describe the concepts that are assessed in each book in the series and will help teachers see where the assessment they are using fits into the development of number concepts as a whole.

Topic	Assessments	Focus Questions	Range
Counting	Concept 1: <i>Counting Objects</i> Student Interview: "Counting Objects" Assessing at Work: "Counting Collections"	Counting • Can the children use counting confidently and accurately to find out how many? • Can they count out a particular amount? One More/One Less • Do they know one more and one less without counting?	Task 1: Counting an unorganized group of objects - from 1 or 2 objects to 32 objects Task 2: Counting out from 5 to 18 objects Task 3: Telling 1 more and 1 less within the range of numbers from 3 to 22 Extension: Telling 1 more and 1 less over the decades and beyond 100

Topic	Assessments	Focus Questions	Range
Number Relationships	Concept 2: <i>Beginning Number Relationships</i> Student Interview: "Changing Numbers" Assessing at Work: "Fix It"	• Can the children use the relationships between numbers to add or take away the appropriate group of objects to change one number into another? • Do they know particular relationships between numbers?	From adding 3 objects to 2 objects to form a group of 5, to knowing how many to add to 11 to make 15
	Concept 3: <i>Comparing Numbers</i> Student Interview: "More/Less Trains" Assessing at Work: "Comparing Yarn" and "Comparing Collections"	• Can the children use what they know about one quantity to determine another? • Can they tell how many more or less one number is than another?	From using one train to determine the length of the other, to determining how many more or less one quantity is than another Settings: Comparing two trains up to 11 cubes long with differences from 1 to 3; Comparing parts of a train (6, 4); Comparing two piles with differences of 3 (6 and 9, 9 and 12)

Topic	Assessments	Focus Questions	Range
Addition and Subtraction to 20	Concept 4: <i>Identifying and Combining Parts</i> Student Interview: "Number Arrangements" Assessing at Work: "Sorting Arrangement Cards"	• Can the children recognize small groups without counting? • Can they recognize and describe the parts of numbers in arrangements?	Instant recognition of the parts of numbers from 3 to 6 Recognizing and combining parts of numbers to 10
	Concept 5: <i>Number Combinations</i> Student Interview: "Combination Trains" Assessing at Work: "Number Combination Cards"	• Can they use what they know about one combination to figure out a related combination? • Can they combine parts to 10 without counting? • Can they combine parts to 20 without counting?	Combining related combinations from 2+1 to 8+8
	Concept 6: <i>Decomposing Numbers to 10</i> Student Interview: "Hiding Assessment" Assessing at Work: "Grab Bag Subtraction"	• Can they tell the missing part of a number (subtracting) without having to figure it out?	Identifying the missing parts of numbers from 3 to 10
	Concept 7: <i>One Ten and Some More</i> Student Interview: "Ten Frames" Part One: Combining Part Two: Taking Away Assessing at Work: "Can You Make a Ten?" "Can You Break Up a Ten?"	• Can they tell how many are needed to make the next ten? • Can they combine 2 single digit numbers to form a ten and leftovers? • Can they subtract a single digit number from a teen number by breaking up a ten?	Addition: From adding 10+8 to 8+7 Extension: 18+7 Subtraction: From subtracting 17-7 to 13-7 Extension: 23-7

Topic	Assessments	Focus Questions	Range
Place Value: Number Composition and Decomposition to 100	Concept 8: <i>Numbers as Tens and Ones</i> Student Interview: "Grouping Tens" Part One: Organizing into Tens Part Two: Conservation and Counting Groups Assessing at Work: "Measuring Shapes"	• Can they tell the total amount of a group of objects if they know the number of tens and ones? • Can they add ten more without counting? • Can they take ten away without counting?	Task 1: From determining how many in 3 groups of 10 and 4 ones by counting by ones, to knowing 10 more and 10 less without counting Extension: From determining 20 more and 20 less by counting, to knowing without counting Knowing what 7 tens and 12 ones total Task 2: From not understanding counting by 2s and 5s to counting by 2s and 5s with ease
	Concept 9: <i>Combining and Separating Tens and Ones</i> Student Interview: "Two-Digit Addition and Subtraction" Part One: Adding up Tens Part Two: Breaking up Tens Assessing at Work: "Tens and Ones Grid Shapes"	• Can they combine quantities by forming new tens when necessary? • Can they subtract from groups of tens and ones efficiently using relationships?	Part One: From solving two-digit addition problems by counting all, to solving problems by combining numbers into tens and ones using their knowledge of the parts of numbers Part Two: From solving two-digit subtraction problems by counting all, to solving problems by breaking numbers apart and recombining them using their knowledge of parts of numbers

Assessment Guidelines

There are two ways that information about the child's level of understanding and competence with concepts is gathered; 1) through student interviews and, 2) through assessing children while they are at work.

The Student Interview

The student interviews help teachers become familiar with the stages through which children move as they develop particular concepts. The assessments identify a range of instructional needs and can be repeated over time to document children's growth. They are designed to take a short amount of time while giving the teacher a great deal of information about each child.

Assessing Children at Work

Teachers will benefit greatly from the data gathered from individual interviews as it helps them know what to look for when they watch their students at work. The student interview gives teachers the information and insights into their children's thinking so they can focus right away on how the child approaches a task and can easily interpret what they see. They are then able to respond immediately with appropriate support and challenges. What they observe then adds to the information gained from the interview, making their observations much more productive than they would otherwise be.

Taking Time for the Assessments

It is vitally important that teachers devote the time it takes to assessing the instructional needs of their students. The data gathered through the student interviews is focused on foundational understandings that cannot be obtained in any other way and supplies the information necessary for teachers to provide the most focused and appropriate instruction possible. The assessments have been carefully designed to yield a great deal of information in the least amount of time.

It is reassuring to those who are giving the assessments for the first time to know that the time devoted to doing the assessments will lessen with familiarity with the assessments. Once teachers become familiar with the assessments, they will be able to find where the children are on a continuum of learning and will see it is not always necessary to go through the whole assessment with each child. The assessment is complete as soon as the teacher has reached the point in the assessment that identifies the edge of the child's understanding.

The power inherent in these assessments is that they are simple to administer but what can be learned from them is complex. The explanation of each assessment and description of what can be learned can take many pages but the actual assessment can be done quickly and efficiently.

Teachers have found many different ways to accommodate their need to work with individual students. Sometimes they assess while the other children explore math materials, do quiet work such as reading or drawing, or have an assistant or parent helper read to them. Once the teacher

has found a way to get this valuable information about each child, he or she sees that nothing else they might provide for the class is more important to the instructional program as a whole than gathering the information they need to provide appropriate instruction for their students.

Using the Assessment Forms

The assessment forms have been carefully crafted to help teachers pinpoint exactly where a child is on a continuum of understanding. The indicators are included on the form to help teachers know exactly what they are looking for and to minimize the amount of writing that will be necessary. Using the form may seem cumbersome at first, but with practice, teachers will become familiar with what they are looking for, the pattern of responses, and the layout of the form itself. Resist the temptation not to use the form, as that will just delay becoming familiar with the format and will make the assessment process less focused and clear.

Getting Authentic Information from the Student Interview

The essential value of the student interview is the insight teachers can get into the child's thinking, so it is important that the setting be conducive to getting authentic responses from the children. To ensure that the interview yields the most valid information possible, it is important for teachers not to give the children support to do the tasks. The teacher's attitude needs to be one of respectful listening and acceptance of wherever the children are in their understanding of mathematics. The interview should be considered an opportunity to gather information without judgment, and it is important that teachers not make evaluative comments, including praise. The information obtained will then allow teachers to provide their students with appropriate instruction.