

PATTERNS AND FUNCTIONS

3-5 ASSESSMENT

How will I determine my student's needs and how will I know which activities are appropriate for addressing those needs?

Two tools are available to help you determine the needs of your student: Assessments and Teacher Inventories.

Assessments are provided for each grade band within a content strand, for example, there is a K-2 Number & Operation Assessment, a 3-5 Number & Operation Assessment, etc. They can be used each time you begin a new content strand or change grade bands within a strand. Assessments are designed to help you target your student's areas of conceptual strengths and difficulties. Each question on the Assessment addresses one or more mathematical concepts and is correlated to one or more activities in the unit. Begin by using the grade band Assessment that corresponds to your student's current grade level. Have available the Assessment for the grade band below the one you are administering and for the grade band above. If the student quickly and easily answers all of the questions on the Assessment, move up to the next level. If the student has difficulty with several of the questions on the Assessment, begin by simplifying the question, if possible. For example, if the question asks students to *use a calculator to find whole numbers that divide evenly into 156*, the question could be simplified by asking students to do the same for the number 56, or simpler still, 16. If your student struggles with most of the questions, move down a grade band level.

When possible, also seek the assistance of your student's classroom teacher in assessing the student's current needs. The Teacher Inventory, to be completed by the student's classroom teacher, provides another lens for determining your student's areas of difficulty. For each mathematical strand, there is a K-5 Teacher Inventory that covers the K-2 unit and the 3-5 unit for that mathematical strand, and a 6-8 Teacher Inventory. These inventories contain a list of concepts associated with the mathematical strand, and next to each concept is a place for the teacher to give information regarding the student's mastery of those concepts. For your reference, there is a column in the Teacher Inventory that lists the activities within the grade band where each concept is practiced.

Using the information you have gathered from the Assessment, and information from the Teacher Inventory (if available), create an informal mentoring plan for the up-coming weeks. Determine which activities you will use and approximately how much time you will allocate to each activity, but remember, be flexible!

Patterns and Functions

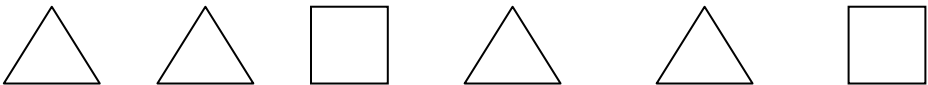
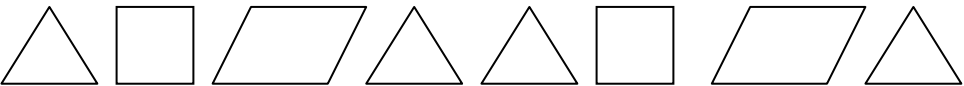
3-5 Assessment

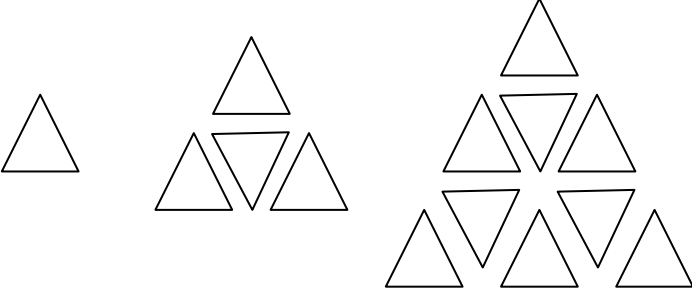
The questions below are designed to help you assess your student's current needs. During the first mentoring session, spend some time working through the questions. After each question, determine whether the student seems to have a good understanding of the concept or whether he or she would benefit from additional help. Keep in mind that the student may be able to complete some of the questions on the Assessment, but he or she may still need work in that area—watch to see how long it takes students to do a task or whether he or she does the task with ease. Based on your determination, circle *yes* or *no* in the *Understands the Concept* column. Each question indicates one or more activities in the unit that can be used to explore and develop the mathematical concepts listed if you feel that students have not yet mastered them.

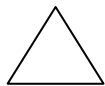
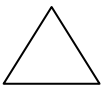
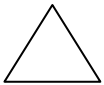
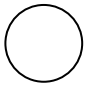
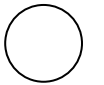
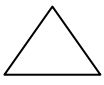
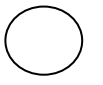

For the activities below, you will need:

Shapes cut out from: Student Page 1: Shape Pieces

Student Page 7: Blank 100's Chart

	Understands the concept
<p>1. Build a few patterns with shape pieces cut out from a copy of Student Page 1: Shape Pieces or with other commonly found materials (e.g. paperclips, pennies, etc.). For each pattern, have students describe the pattern. Ask: <i>What part of the pattern repeats? Can you build the next term of the pattern?</i></p> <p>Pattern 1:</p>  <p>Pattern 2:</p>  <p>Mathematical concepts: repeating patterns, rules for patterns Concepts explored in Activities 1 and 3</p>	<p>Yes No</p>

<p>2. Have students create two different repeating patterns. For each pattern, ask students to describe the pattern, identify the part of the pattern that repeats, and determine what the next element of the pattern would be.</p> <p>Mathematical concepts: repeating patterns, cores of patterns, pattern rules Concepts explored in Activities 1 and 3</p>	<p>Yes No</p>
<p>3. Build or sketch the following growing pattern:</p>  <p>Have students describe the pattern. Ask: <i>How does this pattern change from one term to the next? Can you sketch the next term in the pattern? Describe the pattern using numbers. How many triangles are in each picture? What is the number for the fifth term in the pattern? Using squares, build a similar growing pattern.</i></p> <p>Mathematical concepts: growing and shrinking patterns Concepts explored in Activity 1</p>	<p>Yes No</p>
<p>4. Play “Guess My Rule.” Tell students you have a rule in mind. Start with a +3 rule, but do not tell students the rule. Ask students to give you a number (say, 5), apply the rule (+3) in your head, and tell students the result (8). Have students continue to give you numbers. Apply the rule in your head and give students the results until students are able to guess the rule.</p> <p>Try a few more rules, such as +5, -2, or x2.</p> <p>Give students the opportunity to be the rule-maker. Have them think of a rule and write it on a scrap of paper. They should not show you the rule. As you call out numbers, the students apply the rule and tell you the resulting number until you are able to guess the rule.</p> <p>Mathematical concepts: input/output rules for functional relationships, basic number skills Concepts explored in Activity 2, 4, 5, 7</p>	<p>Yes No</p>
<p>5. Give students a copy of Student Page 7: Blank 100’s Chart. Write a 1 in the</p>	

<p>top left hand box on the chart. Ask students what would go in the box to the right of the 1 and what would go in the box below the 1. Continue to point at different spots, moving both vertically and horizontally, and for each spot that you point at, ask:</p> <ul style="list-style-type: none"> • <i>What number would go in this box?</i> • <i>How do you know?</i> <p>When students have finished filling in the 0-99 chart, ask them to look for patterns in the numbers on the chart. You can ask questions such as:</p> <ul style="list-style-type: none"> • <i>What do you notice about all of the numbers in any one column?</i> • <i>What do you notice about all of the numbers in any one row?</i> • <i>What happens if you go down one row and over two columns to the right?</i> • <i>What happens if you go up two rows?</i> • <i>What happens if you move left three columns?</i> • <i>If you look at the numbers along a diagonal do you notice any pattern?</i>[one diagonal goes up by 9's, the other diagonal goes up by 11's] • <i>Do you see the same pattern in the numbers along a different diagonal?</i> <p>Mathematical concepts: patterns on a number lattice, visual and numeric patterns, properties of numbers Concepts explored in Activities 3, 4, 5</p>	<p>Yes No</p>
<p>6. Draw a triangle, a square, and a circle. Explain that you are going to make up some problems using these shapes. Students will need to replace the shapes with numbers that will make the number sentences true. For any given problem, whatever number is used in one type of shape must always be used in that shape. For example if 3 is placed in the triangle, 3 must be placed in every other triangle in that problem (note: it is legal to use the same number in different shapes, i.e. 3 could be placed in both the square and the circle, as long as it is placed in every square and every circle). For each problem below, ask students to find one or more possible solutions:</p> <p>  +  = 6 (only solution: 3 + 3) </p> <p>  +  +  = 6 (possible solutions: 2 + 2 + 2 = 6 4 + 1 + 1 = 6 6 + 0 = 6) </p> <p>  +  +  = 6 (possible solutions: 2 + 2 + 2 = 6 1 + 2 + 3 = 6 0 + 2 + 4 = 6 ...) </p> <p>Mathematical concepts: Variables as tools for representing unknowns Concepts explored in Activities 6 and 7</p>	<p>Yes No</p>

Teacher Inventory: Patterns and Functions (Grades K-5)

(Have your student's teacher fill out this page, if possible)

Concept		Teacher Rating: Has the student mastered the concept? (circle yes, no, or unknown for each concept)	Grades K-2 Patterns and Functions Activities where the concept is explored:	Grades 3-5 Patterns and Functions Activities where the concept is explored:
One-Dimensional Repeating Patterns	Extension and creation of repeating patterns	Yes No Unknown	1, 2	
	Repeating cores	Yes No Unknown	1, 2	
	Regularities in shapes, designs, events, numbers	Yes No Unknown	1, 2	
	Pattern families	Yes No Unknown	2	
	Alphabetic representation	Yes No Unknown	2	
Two-dimensional Repeating Patterns	Extension and creation of two-dimensional repeating patterns	Yes No Unknown	3, 5, 7	
	Grid patterns with shapes and colors	Yes No Unknown	3	
	Visual patterns	Yes No Unknown	3, 4, 5	
	Number patterns on 0-99 chart	Yes No Unknown	5	3
	Relationship between visual and number patterns	Yes No Unknown	5, 7	3
	Rules for patterns	Yes No Unknown	5, 7	3
Growing and Shrinking Patterns	Creation and extension of growing and shrinking patterns	Yes No Unknown	4	1
	Rules for growing and shrinking patterns	Yes No Unknown		1
	Tables to represent and record data about patterns	Yes No Unknown		1, 2
Functions, Operations, and Variables	Symbolic representations of operations on numbers	Yes No Unknown	6	4, 5, 7
	Patterns of relationships between numbers	Yes No Unknown	6	7
	Equivalence, commutativity, and inverse relationships	Yes No Unknown		4, 5, 7
	Variables	Yes No Unknown	8	4, 5, 6
	Tables for representing and recording patterns	Yes No Unknown		1, 2

	Input/output rules for functional relationships	Yes	No		2
	Use of range of problem-solving strategies	Yes	No		7
		Unknown			
		Unknown			

Additional Comments:

Mentoring Plan

Based on your assessment of your student's needs, and their teacher's inventory (if available), check the 3-5 Patterns and Functions activities on which you will concentrate the most time in the coming weeks:

- Activity 1: Patterns and Rules
- Activity 2: Function Machines
- Activity 3: Patterns on a Lattice
- Activity 4: Paths
- Activity 5: Equivalent Paths
- Activity 6: Shape Holders
- Activity 7: Number Puzzles