

PATTERNS AND FUNCTIONS
6-8 ASSESSMENT:

Assessment
Teacher Inventory
Mentor Planning Guide

PATTERNS AND FUNCTIONS

6-8 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

6-8 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 the student 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 the student has not yet mastered them.

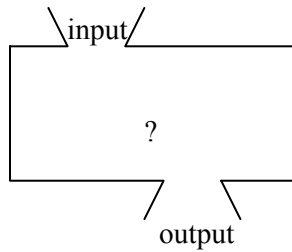
For the activities below, you will need:

Cards for making number cards in question one

Paper for drawing pictures for the student

	Understands the concept
<p>1. Write these numbers on cards: <i>Set #1: 1, 2, 3, 4</i> <i>Set #2: 3, 4, 5, 8</i></p> <p>On another set of cards write these symbols: +, −, ×, ÷, ()</p> <ul style="list-style-type: none"> • Show the student the cards in Set #1 and the operation cards. Present the challenge: <i>Using the numbers and operations on these cards, write a number sentence that has a value of 10. You must use each number card once, but you can use any of the operation cards you need as many times as you like. When you have come up with one possible number sentence that equals 10, try to think of three more number sentences, each different, that are all equal to 10 as well. [Examples of number sentences that the student might come up with include: $1 + 2 + 3 + 4 = 10$ or $(1 \times 2 \times 3) + 4 = 10$ or $(3 \times 4) - (2 \times 1) = 10$]</i> • Now, show the student the cards in Set #2. Tell students: <i>Show me a number sentence that equals the largest value possible, using each number card once, and any of the operation cards as many times as you like. Now show me a number sentence that makes the value the closest to 0 possible. Explain the strategies that you used to make the largest value and the value closest to 0.</i> <p>Mathematical concepts: order of operations; addition, subtraction, multiplication and division; writing numeric expressions; evaluating numeric expressions; commutative property of addition and multiplication Concepts explored in Activities 1, 2</p>	<p>Yes No</p>
<p>2. Draw the chart and function machine, pictured below, on a separate piece of paper.</p>	

Input	Output
3	9
5	15



Yes No

Tell the student: *This is a mystery machine. If you put a number into the top of the mystery machine, the machine does something to that number to change it, and then spits a new number out of the bottom of the machine. The rule that the mystery machine follows is always the same. This table shows some numbers in the left-hand column that were put into this machine (the inputs), and then in the right-hand column it shows what number came out of the machine (the outputs). Your job is to figure out what the rule is for this mystery machine.*

Have the student write numbers in the left column of the chart and you fill in the corresponding numbers in the right column (the number in the right column is 3 times the number in the left column). When the student thinks that he or she can predict what numbers you will write in the right column when he or she writes numbers in the left column, move on to the questions below.

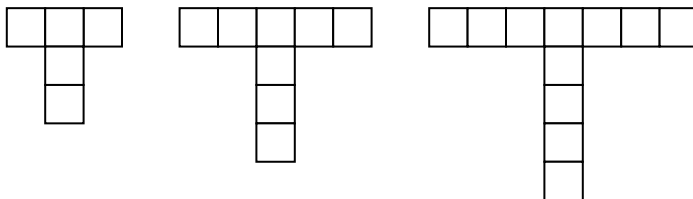
Ask the student:

- Describe any patterns you notice in the numbers in the table.
- How does the number in the right column relate to the number in the left column? [It is 3 times as big]
- What is the rule inside this mystery machine? [Multiply by 3]
- Can you fill in the table to show what the output would be if the input was 10? [10, 30]
- Try to fill in some other pairs of inputs and output.
- If 60 is the output, what was the input? How about if 75 was the output? If 100 was the output?

Mathematical concepts: identifying number patterns; describing number patterns; determining the next element in a number pattern; using input/output tables to represent functions

Concepts explored in Activities 3 and 4

3. Draw this picture on a separate sheet of paper for the student:



Yes No

Label the first one "T #1", the next one "T #2", and the third one "T #3".

Explain to students: *These are called "Growing T's"*. Have the student make a 2-column table that shows the number of the T in the left column and the number of squares needed to build the T in the right column.

Ask the student:

- *How many squares would be needed to build a the #4 T? The #5 T? The #10 T? Fill in these values in the table.*
- *How does each T change from the one before it?*
- *What is the pattern for the number of squares needed to build each successive T?*

Mathematical concepts: identifying visual patterns; describing visual patterns; determining the next element in a visual pattern; using input/output tables to represent visual patterns; using input/output tables to represent linear relationships
Concepts explored in Activities 5 and 6

4. Have the student try to figure out what the shape equals in each of the four equations below. The shape in each equation equals the same number each time that it appears in the equation.

$$\text{⚡} + 5 = \text{⚡} + \text{⚡} + 1$$

$$\square \times 3 = \square + 10$$

$$\triangle - 6 = 16 - \triangle$$

Mathematical concepts: transforming equations; solving single-variable equations
Concepts explored in Activities 7

Yes No

Teacher Inventory: Patterns and Functions (Grades 6-8)

Concept		Teacher Rating: Has the student mastered the concept? (circle yes, no, or unknown for each topic)	Grades 6-8 Activities where the concept is explored:
Numbers	Order of operations	Yes No Unknown	1, 2
	Addition, subtraction, multiplication, and division	Yes No Unknown	1, 2
	Evaluating numeric expressions	Yes No Unknown	1, 2
	Writing numeric expressions	Yes No Unknown	1, 2
	Commutative property of addition	Yes No Unknown	1, 2
Patterns	Number patterns	Yes No Unknown	1, 2, 4, 6
	Visual patterns	Yes No Unknown	5, 6
	Describing pattern generation	Yes No Unknown	4, 5, 6
	Determining next element in pattern	Yes No Unknown	3, 4, 5, 6
	Rules to describe patterns	Yes No Unknown	4, 5, 6
General Algebra	Input-Output tables	Yes No Unknown	4, 5, 6
	Understanding variables in expressions	Yes No Unknown	7
	Transforming equations/finding equivalent functions	Yes No Unknown	3, 4, 7
	Solving single-variable equations	Yes No Unknown	7, 8
Linear Functions and Ways to Represent Linear Functions	Linear Relationships	Yes No Unknown	3, 4, 5, 6
	Input/output nature of linear functions	Yes No Unknown	3, 4, 5, 6
	Function machines	Yes No Unknown	3, 4
	Verbal descriptions of linear relationships	Yes No Unknown	5, 6

Additional Comments:

Mentoring Plan

Based on your assessment of your student's needs, and their teacher's assessment (if available), check the 6-8 Patterns and Functions activities on which you will concentrate the most time in the coming weeks:

- Activity 1: Target Numbers
- Activity 2: Four 4s
- Activity 3: Function Machines
- Activity 4: Mystery Machines
- Activity 5: Growing Patterns
- Activity 6: Toothpick Patterns
- Activity 7: Balancing Equations
- Activity 8: Equation Bingo