

21st Century Learning Curriculum Framework

Performance Rubrics for Math

Grade 8

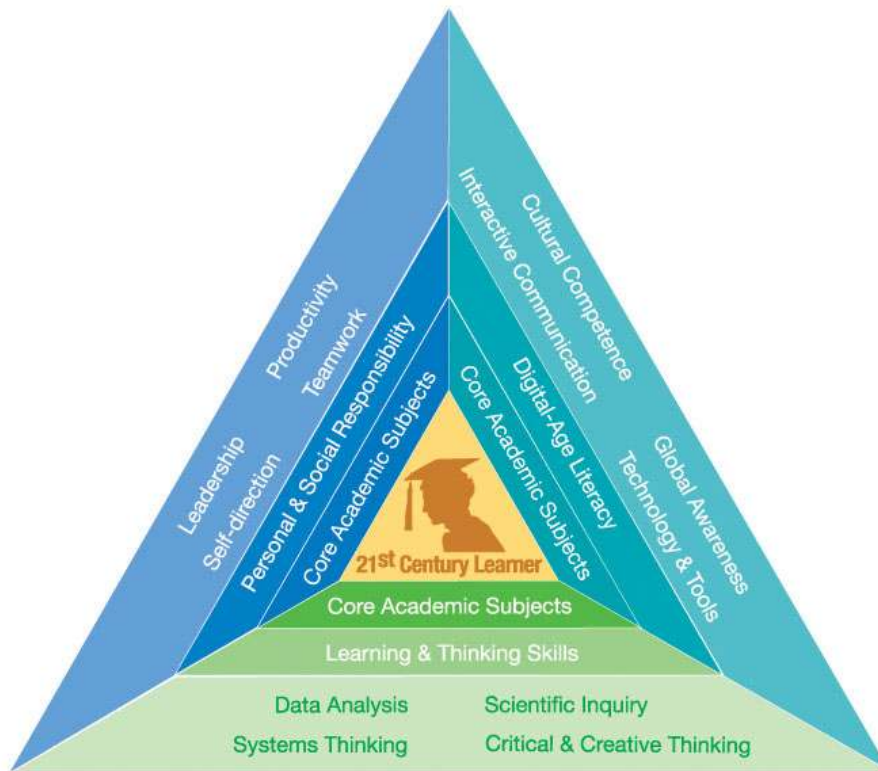


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Introduction

The purpose of this project is to design a system that will: 1) focus instruction across the district on specific areas of knowledge and skill referred to as “measurement topics” and 2) provide a vehicle for teachers to keep track of the progress of individual students on each measurement topic using teacher-designed formal and informal assessments. To these ends a set of K – 8 measurement topics are being designed in a variety of subject areas. Math educators (to date) have identified the following fifteen measurement topics:

Numbers and Operations

- Number Systems
- Numerical Relationships
- Addition and Subtraction
- Multiplication and Division
- Higher Order Operations

Patterns, Algebra & Functions

- Patterns
- Algebraic Concepts

Measurement

- a. Dimensional Measurement
- b. Measurement Systems

Data Analysis

- c. Probability and Discrete Mathematics
- d. Data Organization and Interpretation

Mathematical Processes

- e. Problem Solving
- f. Reasoning and Proof

At each grade, the measurement topics are presented in a rubric format as shown in Figure 1.

Figure 1: Rubric for the Measurement Topic of Data Organization and Interpretation at Grade 3

Data Organization and Interpretation		
Grade 3		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving data organization and interpretation, the student:</p> <ul style="list-style-type: none"> • generates questions and gathers data (categorical and numerical) using appropriate tools (e.g., student decides to survey class to find out how many siblings each student has) and, (required: tally chart, line plot) • constructs appropriate horizontal and vertical bar graphs (with and without graphing software) with correct scale, labels, and titles to display data • formulates and answers questions about data sets displayed in graphs, line plots, and tables (e.g., given a bar graph on favorite pets, student asks “Which type of pet is owned by the most people?”) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ categorical data ○ numerical data ○ line plot ○ table ○ scale ○ horizontal ○ vertical ○ axis • recognizes and recalls the accuracy of basic solutions and information and performs basic processes such as: <ul style="list-style-type: none"> ○ cat, dog, mouse are categorical data; 1,2,3,4 represent numerical data ○ gathering data given the question and appropriate tool ○ filling in the missing information on a graph ○ answering questions about data in a graph <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Figure 1 depicts the third grade rubric for Data Organization and Interpretation. To understand this format, consider level 3.0. It states that while engaged in tasks involving data organization and interpretation, the student:

- generates questions and gathers data (categorical and numerical) using appropriate tools (e.g., student decides to survey class to find out how many siblings each student has) and, (required: tally chart, and line plot)
- constructs appropriate horizontal and vertical bar graphs (with and without graphing software) with correct scale, labels, and titles to display data
- formulates and answers questions about data sets displayed in graphs, line plots, and tables (e.g., given a bar graph on favorite pets, student asks “Which type of pet is owned by the most people?”)

These level 3.0 statements represent the expected behavior for third grade students regarding the measurement topic of Data Organization and Interpretation. That is, level 3.0 in each rubric represents the “target level” of knowledge for a measurement topic at a given grade level.

Next consider level 2.0. In effect, it states that the student cannot generate questions and gather data but can gather data if given a question and the appropriate tool(s). It also states that the student cannot construct appropriate horizontal and vertical bar graphs with correct scale, labels, and titles to display data but can fill in missing information on a graph. Likewise, the student cannot formulate and answer questions about data sets displayed in graphs, line plots, and tables but can answer questions about data in a given graph. Level 2.0 also indicates that the student understands some basic terminology.

Level 2.0 behaviors are obviously more basic and simpler than the level 3.0 behaviors. That is why they are referred to as the simpler “details and processes” in the rubric. Level 2.5 is between levels 3.0 and 2.0. It indicates that the student can perform the level 2.0 behaviors successfully but is only partially successful at the level 3.0 behaviors. Level 1.5 indicates that the student is partially successful at the level 2.0 behaviors. For example, the student is able to fill in some of the missing information on a graph.

Level 1.0 indicates that without help the student can do virtually nothing by himself. However, with help from the teacher in the form of hints, clues, and suggestions the student has partial success with the level 3.0 and the level 2.0 behaviors. Level 0.5 indicates that with help the student has some success with the level 2.0 behaviors but still has no success with the level 3.0 behaviors. Level 0.0 indicates that the student has no success even with the teacher’s help with both the more complex (i.e. level 3.0) and the simpler behaviors (i.e. level 2.0) for the measurement topic.

Finally, level 4.0 indicates that the student demonstrates all behaviors for level 2.0 and 3.0. In addition the student makes inferences and applications that go beyond what was taught in class. In the case of Data Organization and Interpretation this might mean that the student is able to use appropriate tools to generate questions and gather data as well as being able to analyze what the data says about possible answers to the generated question. Level 3.5 also indicates that the student demonstrates all level 2.0 and 3.0 behaviors. Additionally, the student attempts to do things like analyze what the gathered data says about possible answers

Teachers Designing and Administering Their Own Assessments

The system of rubrics provided in this document is intended to be used by teachers to design, administer, and score their own classroom assessments. There are two basic approaches to designing assessments using these rubrics: 1) designing assessments that include all levels of the rubric and 2) designing assessments that include one level of the rubric only.

Assessments that Include All Levels of the Rubric

To illustrate this approach, assume that a third grade teacher wishes to design an assessment for Data Collection and Interpretation focusing on generating questions and gathering data using appropriate tools. The teacher would make sure she has an item or items that address level 2.0 behavior. From the rubric in Figure 1 we see that level 2.0 behavior involves gathering data given the question and appropriate tool and understanding basic terminology. To assess level 2.0 behavior the teacher might provide students with a question and a tool and ask them to generate as many questions and gather as much data as they can. The teacher might also ask students to describe some basic terms. Successfully answering these questions would indicate that a particular student had obtained level 2.0 status.

To assess level 3.0 compliance, the teacher might provide an investigation topic and ask students to select their own tools and generate questions and gather data independently. Successfully selecting an appropriate tool and using it to generate questions and gather data would indicate that a student had reached level 3.0 status.

Finally, to assess level 4.0 status the teacher would include an item that goes beyond organizing data as qualitative and quantitative. The teacher would ask students to go one step further by analyzing what the data they gathered says about possible answers to the questions they generated. A student who could answer this analysis question, along with successful completion of the level 3.0 and the level 2.0 tasks would be assigned level 4.0.

The example above involves a “paper/pencil” test assigned to the entire class. The third grade rubric for Data Organization and Interpretation can just as easily be used with individual students. For example, the teacher might call a particular student up to her desk while other students are working independently. The teacher would provide the student with an appropriate tool and a question and ask him or her to gather data. The teacher would then provide the student with a broad topic and ask him or her what questions he or she can generate about it, what data appropriate to those questions can be gathered, and what tools he or she would use for investigation. Last, the teacher would ask the student to analyze what he or she has found and discuss what the data might reveal about possible answers to the generated questions. The student’s performance on each of these three interactions would determine the student’s score for this assessment. In short, the rubrics can be used by classroom teachers to design, administer, and score a variety of types of classroom assessments for the measurement topics.

Assessments that Include One Level of the Rubric Only

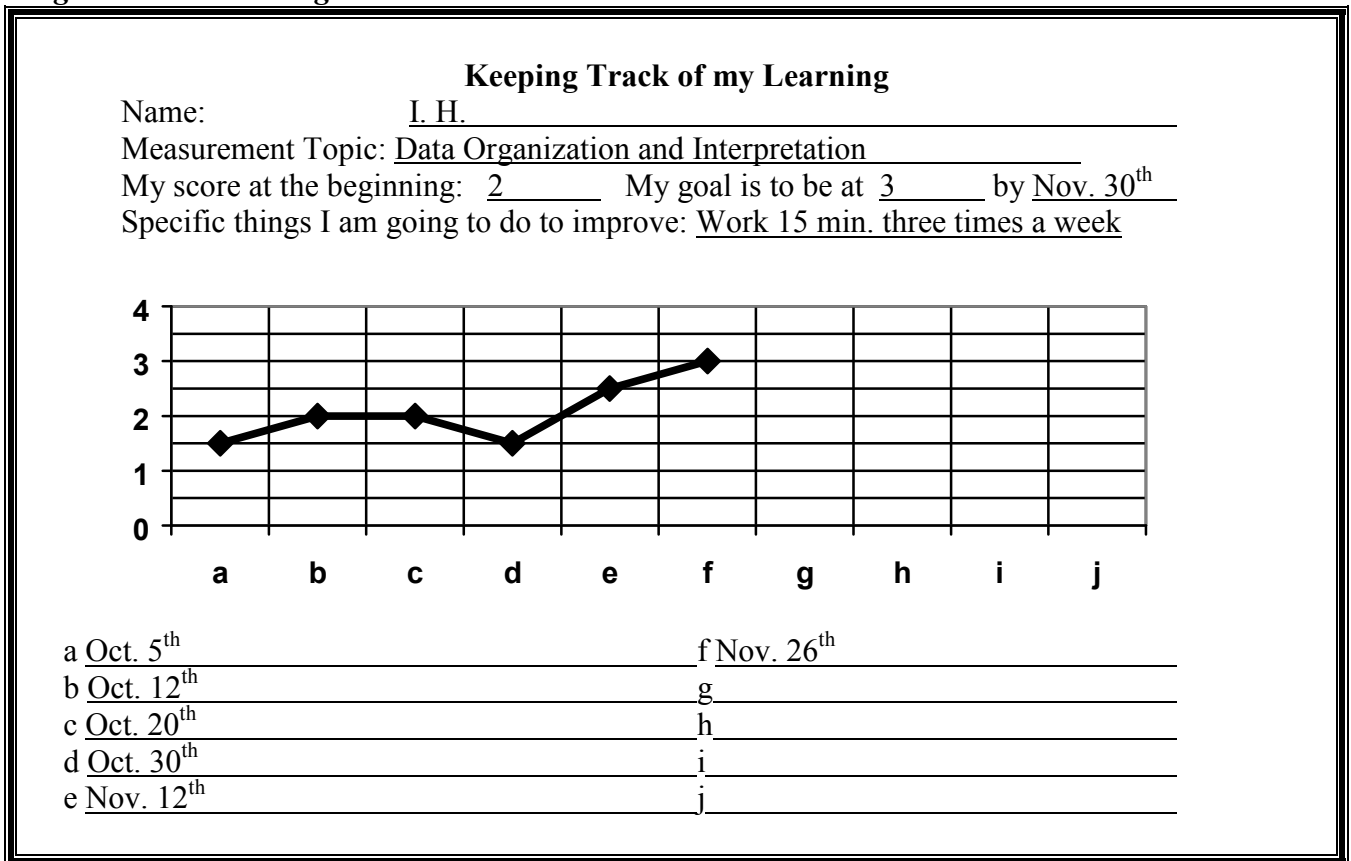
Some teachers prefer to design and administer assessments that address one level of the rubric only. For example at the beginning of a unit, assessments include items and tasks for level 2.0 only. In this case the first assessments in a unit would focus on gathering data when given a question and an appropriate tool, understanding basic terminology, filling in missing information on a given graph, and answering questions about data in a graph. Once students had demonstrated competence in this level 2.0 content, the teacher would focus on level 3.0 content and so on.

In this system students are assessed only on what has been or is being addressed in class at a particular moment in time. Typically students are more familiar and more comfortable with this approach. However, this system doesn’t provide students with the picture of where the unit is going and what will be expected of them by the end of the unit.

Students Keeping Track of Their Own Progress

One of the simplest and most powerful uses of the measurement topics is to provide students with venues for keeping track of their own progress. To demonstrate, consider Figure 2, depicting a specific student's scores on the measurement topic of Data Organization and Interpretation.

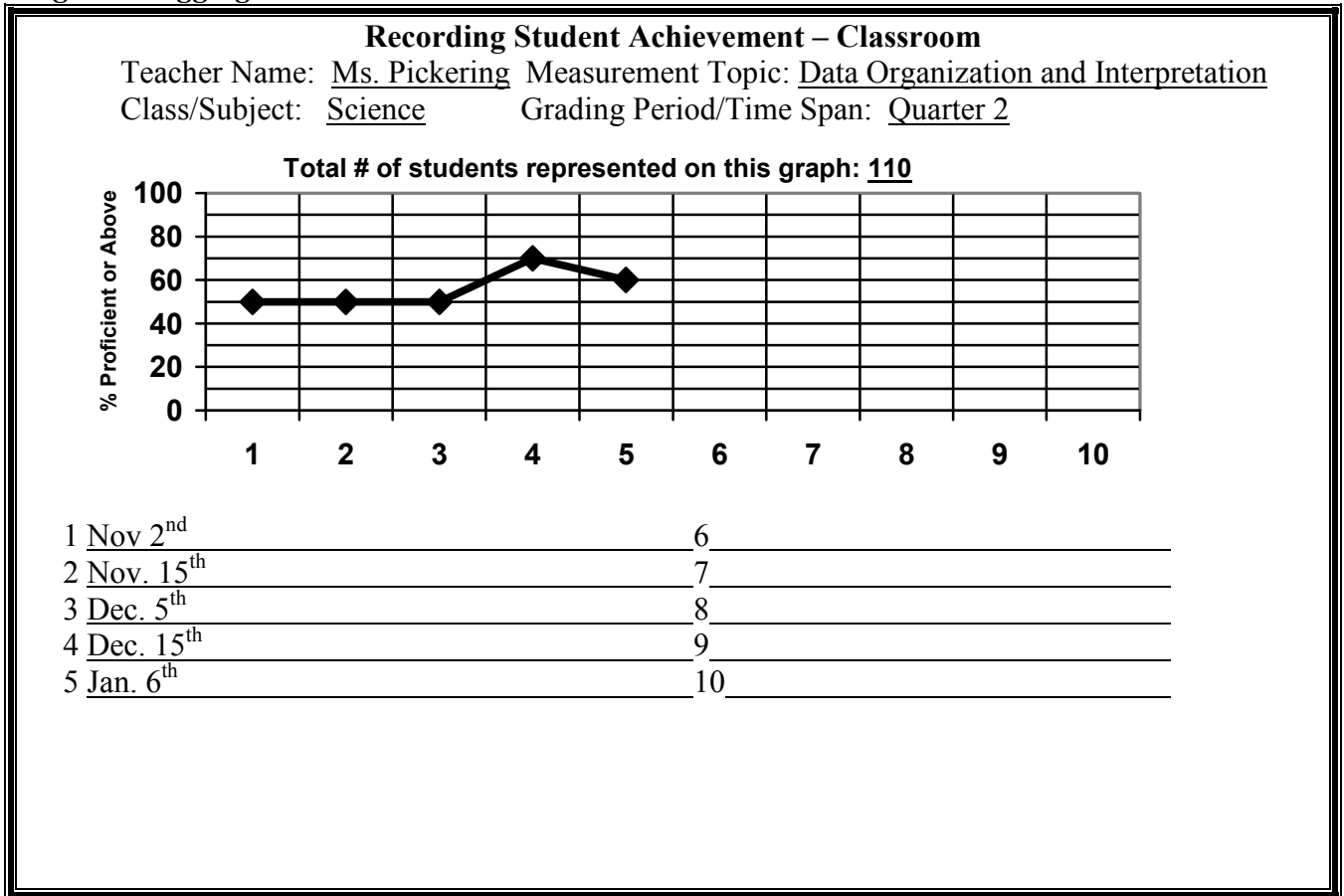
Figure 2: Student Progress Chart



In this example, six scores have been recorded by the student presumably generated from six formal or informal assessments constructed by the teacher. The first assessment was on October 5, the next was on October 12 and so on. Each student in the class would begin with a blank form similar to the one filled in as an example above. After each assessment scored by the teacher each student would record his or her score on their individual progress chart. This not only provides students with a visual representation of their progress but invites discussions between teacher and students about areas of strength and weakness along with strategies for improvement as well. It also provides students with opportunities to set personal goals as to their knowledge gain over a grading period.

The data from individual progress charts can also be aggregated to obtain a snapshot of the progress for an entire class or set of classes. To illustrate, consider the example shown in Figure 3.

Figure 3: Aggregated Student Data



This figure depicts scores from a number of classes that involve 110 total students. It shows how many students are above a specific “performance standard.” For example, if the school or district has established that it wishes all students to achieve a rubric score of at least 2.0 on the rubric for a particular measurement topic, then the score of 2.0 is the performance standard for that particular topic. For the measurement topic of Data Organization and Interpretation 50 percent of the students were at or above the performance standard on November 2 as they were for the next two assessments. However, by December 15, 70 percent of students were at the performance standard or above.

This type of aggregated data provides teachers and administrators with a snapshot of the progress of entire grade levels or an entire school. Such aggregated data can be the basis for identifying future instructional emphases for teams of teachers. If the aggregated data indicates that an insufficient percentage of students in a particular grade level are at or above the designated performance standard, then the teachers at that grade level might mount a concerted joint effort to enhance student progress for the measurement topic.

As the Basis for Grading

Measurement topics can be used as the basis for classroom grading. To illustrate, consider a third grade teacher who is attempting to keep track of students' performance on four measurement topics in math within a given quarter:

- Number Systems
- Numerical Relationships
- Addition and Subtraction
- Multiplication and Division

She would utilize four rubrics for those measurement topics each modeled after the rubric template in Figure 1.

Over a nine-week period of time (let's say), the teacher would administer a number of assessments on these measurement topics. Certainly, some of these would be explicit quizzes and tests. However, some forms of assessment could be quite informal in nature, such as an interaction the teacher has with a specific student.

A useful convention that can be employed with the rubrics for measurement topics is that assessments that address more than one measurement topic can be readily designed and scored. For example, a teacher might construct a test that addresses the measurement topics of Number Systems, Numerical Relationships, and Addition and Subtraction. Using three rubrics, the teacher would assign three scores to each student's test paper focusing on different items to assign each rubric score.

By designing assessments that address more than one measurement topic the teacher would accrue a number of rubric scores for each student on each measurement topic as shown in the following example.

Figure 4: Rubric Scores for a Student on Four Math Measurement Topics

Assessment #	Number Systems	Numerical Relationships	Addition and Subtraction	Multiplication and Division
1	1.5	2.0		1.0
2		2.5	2.0	1.0
3	2.0	3.0		2.5
4	1.5		3.0	
5	3.0	2.5		2.5
6	2.5		2.5	
7		3.0		2.5
8	3.0		3.0	
9		3.5	3.5	
10	3.0	3.0	4.0	3.5

Figure 4 contains the scores for a single student on four measurement topics. In all, the teacher has used ten different assessments to gather the information on this student. The first assessment addressed the measurement topics of Number Systems, Numerical Relationships, and Multiplication

and Division. The second assessment addressed Numerical Relationships, Addition and Subtraction, and Multiplication and Division and so on.

To construct an overall grade for a given 9 week period of time (let's say), the final scores on each measurement topic would be averaged in some weighted or un-weighted fashion. A weighted or un-weighted average could be readily transformed into traditional A, B, C, D and F grades if the school or district so desires. Figure 5 provides a sample of a possible grading scheme.

Figure 5: Conversion Scale to Traditional Grade

Average Rubric Score	Traditional Grade	Average Rubric Score	Traditional Grade
3.63-4.00	A	2.25-2.49	C
3.26-3.62	A-	2.00-2.24	C-
3.09-3.25	B+	1.84-1.99	D+
2.92-3.08	B	1.67-1.83	D
2.76-2.91	B-	1.50-1.66	D-
2.50-2.75	C+	.00-1.49	F

Using final scores, any number of measurement topics addressed within a grading period can be combined to form an overall grade based on the traditional A,B,C,D,F scale. Of course, this is an example only. The school district or individual schools might design a system that best reflects their needs and values.

The next section of this document contains the rubrics for each of the fourteen measurement topics at each grade level. Figure 6 provides an overview of the grade levels addressed by each of the fourteen measurement topics.

Number and Operations

Number Systems

Number Systems		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	While engaged in grade appropriate tasks involving number systems, the student:	
	<ul style="list-style-type: none"> • classifies real numbers • orders real numbers (required: number lines and lists) The student exhibits no major errors or omissions.	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	There are no major errors or omissions regarding the simpler details and processes as the student:	
	<ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ irrational numbers ○ real number ○ rational numbers • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ a rational number can be written as a simple fraction ○ given the numbers (-5, 12, 2/3, .33, -35) the correct order is (-35, -5, .33, 2/3, 12) However, the student exhibits major errors or omissions regarding the more complex ideas and processes.	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Numerical Relationships

Numerical Relationships		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving numerical relationships, the student:</p> <ul style="list-style-type: none"> • uses opposites, reciprocals, and equivalent forms to evaluate and solve problems • converts numbers in standard notation to scientific notation and scientific notation to standard notation (required: using negative exponents) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ scientific notation • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ $5/4$ is the reciprocal of $4/5$ ○ standard notation = 5,000 and scientific notation = 5×10^3 <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Addition and Subtraction

Addition and Subtraction		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	While engaged in grade appropriate tasks involving addition and subtraction, the student:	
		<ul style="list-style-type: none"> • adds and subtracts rational numbers The student exhibits no major errors or omissions.
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	There are no major errors or omissions regarding the simpler details and processes as the student:	
		<ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ rational number • performs basic processes such as: <ul style="list-style-type: none"> ○ adding and subtracting rational numbers using manipulatives/concrete models However, the student exhibits major errors or omissions regarding the more complex ideas and processes.
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Multiplication and Division

Multiplication and Division	
Grade 8	
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.
	Level 3.5 In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving multiplication and division, the student:</p> <ul style="list-style-type: none"> • multiplies and divides rational numbers (required: including estimation) • describes the effect of multiplying and dividing by rational numbers (required: zero, numbers between zero and one and numbers less than zero). <p>The student exhibits no major errors or omissions.</p>
	Level 2.5 No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ rational number • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ $25/80 \div 10/25 = 25/80 \times 25/10 = 625/800 = 25/32$ ○ $-2 \times -2 = 4$ <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>
	Level 1.5 Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.
	Level 0.5 With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.

Higher Order Operations

Higher Order Operations		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving higher order operations, the student:</p> <ul style="list-style-type: none"> • simplifies numerical expressions using the order of operations (required: cube roots and grouping symbols --- e.g., $\left\{3 + \left[4 - \left(2 + \sqrt{21+4}\right)\right] - 6^2\right\}$). • evaluates expressions with integer exponents • approximates the value of non-perfect squares • solves problems that involve absolute value <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ order of operations ○ integer exponent • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ $5 + (2 \times 3 + 6)^3 = 5 + (12)^3 = 5 + 1,728 = 1,733$ ○ $2^2 = 2 \times 2 = 4$ and $2^3 = 2 \times 2 \times 2 = 8$ ○ $\sqrt{81} = 9$ ○ the absolute value of 5 is 5 and the absolute value of -5 is 5 <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Patterns, Algebra, and Functions

Patterns

Patterns		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving patterns, the student:</p> <ul style="list-style-type: none"> • uses slope concepts to generate and graph linear functions (required: slope-intercept form, point-slope form, midpoint, and distance formula) • given a table of values, equation, or graph, generates the other two • graphs a non-linear function (required: exponential and quadratic) • analyzes graphs to determine if they represent functions <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ slope-intercept form ○ point-slope form ○ midpoint and distance formula ○ non-linear function ○ exponential ○ quadratic • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ identifying slope-intercept form, point-slope form, and midpoint and distance formulas ○ identifying correct examples of equivalent tables of values, equations, and graphs ○ identifying exponential and quadratic non-linear functions ○ identifying accurate statements about the relationship between graphs and functions <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Algebraic Concepts

Algebraic Concepts		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving algebraic concepts, the student:</p> <ul style="list-style-type: none"> • translates and solves multi-step equations using real numbers when given a word phrase (e.g., two less than the product of 5 and a number is -14 is translated to $5x - 2 = -14$) • evaluates expressions using two variables ($a + b$, given $a = -3.3$ and $b = 7$) (required: real numbers) • solves and graphs linear multi-step equations <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ real number ○ variable • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ translating and solving basic word problems ○ identifying accurate translations of word phrases into numerical equations ○ evaluating basic expressions ○ graphing basic equations <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Geometry

Figures

Figures		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving geometric figures, the student:</p> <ul style="list-style-type: none"> • builds nets of three-dimensional figures • determines parallel and perpendicular lines by their slope • uses coordinate geometry to represent the properties of geometric shapes • predicts the results of combining, subdividing, and changing shapes of plane figures and solids (e.g., paper folding, tiling, and rearranging cut up pieces) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ net ○ parallel lines ○ perpendicular ○ combining, subdividing • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ identifying basic construction process for a three dimensional figure ○ determining approximations of parallel and perpendicular lines ○ identifying the properties of geometric shapes ○ identifying reasonable predictions of the results of combining, subdividing, and changing shapes of plane figures and solids <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Transformations

Transformations		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving geometric transformations, the student:</p> <ul style="list-style-type: none"> • determines whether a given pair of figures on a coordinate plane represents a translation, reflection, rotation and/or dilation • performs a transformation to determine the ordered pair of the image (e.g., translate right 4-units and down 2-units and identify new ordered pairs) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ translation ○ reflection ○ rotation ○ dilation • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ identifying a translation, reflection, rotation, dilation ○ identifying the ordered pair of an image <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Measurement

Dimensional Measurement

Dimensional Measurement		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving dimensional measurement, the student:</p> <ul style="list-style-type: none"> • calculates surface area and volume of cones and pyramids • describes the change in volume as a ratio when one or more dimensions are altered • calculates the missing dimension given the volume, area, or perimeter of a figure • calculates the area of a sector (required: 180° arcs and 90° arcs) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ cone ○ pyramid ○ volume ○ ratio ○ sector • recognizes or recalls the accuracy of basic solutions and information such as: <ul style="list-style-type: none"> ○ $SA = B + n(1/2sl)$ is the formula for the surface area of a pyramid and $\pi^2 + \pi rs$ is the formula for the surface are of a cone ○ altered dimensions mean a change in volume ○ identifying the correct solution to a problem with a missing dimension ○ identifying the correct calculation of the area of a sector <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Measurement Systems

Measurement Systems		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving practical applications of measurement, the student:</p> <ul style="list-style-type: none"> • converts capacity and mass between U.S. customary and metric when given the conversion ratios • performs dimensional conversions that involve multiple conversion factors (e.g., square inches and square feet) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ capacity ○ mass • performs basic processes such as: <ul style="list-style-type: none"> ○ making basic conversions between U.S. customary and metric systems ○ performing basic conversions with simple conversion factors <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Data Analysis

Probability and Discrete Mathematics

Probability and Discrete Mathematics		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving probability, the student:</p> <ul style="list-style-type: none"> • determines the probability of the complement of an event (e.g., heads is the complement of tails) • determines the probability that a specific event will occur in a multi-stage probability experiment (e.g., if I roll a die and flip a coin, then the probability is $\frac{1}{2} \cdot \frac{1}{6} = \frac{1}{12}$) • determines the number of outcomes of an event using combinations • analyzes contextual situations to determine whether to use combinations, permutations, or the Fundamental Counting Principle <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ mutually exclusive ○ Fundamental Counting Principle • recognizes or recalls the accuracy of basic solutions and information and performs basic processes such as: <ul style="list-style-type: none"> ○ identifying accurate statements about probability and its relationship to the complement of an event ○ determining probability in basic situations ○ identifying valid outcomes of an event given different combinations ○ identifying combinations, permutations, and the Fundamental Counting Principle <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Data Organization and Interpretation

Data Organization and Interpretation		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving data organization and interpretation, the student:</p> <ul style="list-style-type: none"> • selects methods for collecting and organizing data (e.g., tables, charts, and sampling techniques) • determines correlations and line of best fit in a two-variable set of data (e.g., scatter plot) • evaluates the effects of sample size, sample choice, incorrect, missing, or additional data, bias, and misleading graphical representations • analyzes data using graphical representations, spreadsheets, graphing calculators, and statistics software (required: box and whisker plot and circle graphs) <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ correlation ○ line of best fit ○ sample size ○ box and whisker plot • recognizes or recalls the accuracy of basic solutions and information and performs basic processes such as: <ul style="list-style-type: none"> ○ using a given method to collect and organize basic data ○ identifying accurate statements about correlations and line of best fit in a two-variable set of data ○ identifying examples of sample size, sample choice, incorrect, missing, or additional data, bias, and misleading graphical representations ○ analyzing data using basic techniques <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Mathematical Processes

Problem Solving

Problem Solving		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks involving problem solving (defining the problem, constructing and verifying solutions, applying strategies), the student:</p> <ul style="list-style-type: none"> • formulates problems from a variety of mathematical situations (required: rates and percent change) • selects and applies appropriate specific strategies (required: model using a flow chart, construct an equation, vertex-edged graphs/networks, and Pythagorean Theorem) and tools (e.g., rulers, protractors, manipulatives, graphing calculators, and technology) to construct a solution • solves and checks the solution of multi-step problems <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ rates ○ percent change ○ flow chart ○ vertex-edge graph ○ Pythagorean Theorem • recognizes or recalls the accuracy of basic solutions and information and performs basic processes such as: <ul style="list-style-type: none"> ○ identifying examples of problems within basic mathematical situations ○ using given strategies and tools to solve basic problems ○ identifying the correct solution to a multi-step problem <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	

Reasoning and Proof

Reasoning and Proof		
Grade 8		
Level 4.0	In addition to Level 3.0, in-depth inferences and applications that go beyond what was taught.	
	Level 3.5	In addition to Level 3.0 performance, in-depth inferences and applications with partial success.
Level 3.0	<p>While engaged in grade appropriate tasks that involve reasoning and proof, the student:</p> <ul style="list-style-type: none"> • applies inductive and deductive reasoning in making and supporting mathematical conjectures (required: if – then statements) • verifies and explains an argument, using appropriate mathematical ideas and language • uses counterexamples to refute incorrect statements <p>The student exhibits no major errors or omissions.</p>	
	Level 2.5	No major errors or omissions regarding the simpler details and process and partial knowledge of the more complex ideas and processes.
Level 2.0	<p>There are no major errors or omissions regarding the simpler details and processes as the student:</p> <ul style="list-style-type: none"> • recognizes or recalls specific terminology such as: <ul style="list-style-type: none"> ○ conjecture ○ counterexample • recognizes or recalls the accuracy of basic solutions and information and performs basic processes such as: <ul style="list-style-type: none"> ○ identifying examples of inductive and deductive reasoning ○ verifying and explaining a given argument using basic mathematical language ○ identifying counterexamples <p>However, the student exhibits major errors or omissions regarding the more complex ideas and processes.</p>	
	Level 1.5	Partial knowledge of the simpler details and processes but major errors or omissions regarding the more complex ideas and procedures.
Level 1.0	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
	Level 0.5	With help, a partial understanding of some of the simpler details and processes but not the more complex ideas and processes.
Level 0.0	Even with help, no understanding or skill demonstrated.	