URBANDALE
COMMUNITY SCHOOL DISTRICT

Technical Math for College and Career

Learning Requirements & Proficiency Scales

What are grade level learning requirements and how should they be used?

Learning requirements are the student and parent/guardian friendly statement that indicates the knowledge, understanding, and skills students are expected to learn. In addition, educators communicate, post, and share course learning requirements with students and families in order to establish a compelling "why" and "what" within their classroom learning system.

Teachers use the learning requirements to guide their planning and assessment within their classroom. Individual and grade/content teams should use learning requirements daily to inform planning, delivery of instruction, and assessment within the professional learning process and individual actions. Finally, learning requirements were established from course/grade level level standards by assessing each standard's relevance, endurance, appearance on assessments, and leverage. Therefore, these are the learning outcomes that are prioritized for the grade/course and therefore should occupy the most instructional time for both whole group, small group and individual intervention.

What are proficiency scales and how should they be used?

Proficiency scales are a structure that articulates levels of learning that aligns to the learning requirement. Each proficiency scale is unidimensional meaning it outlines the levels of learning related to a single skill, concept, or understanding. There are frequently more than one proficiency scale that aligns and informs the overall level of proficiency for a learning requirement. The fulcrum for the proficiency scale is the score of 3.0 level. When students demonstrate competence at the score of 3.0, we say they are proficient. The score of 2.0 content is necessary for students to be able to achieve proficiency and important for the teacher to instruct directly. The score of 4.0 content is advanced and typically requires students to apply the score of 3.0 content in novel situations that they did not receive direct instruction on in class. Score of 1.0 signifies that a student cannot demonstrate proficiency in any of the content independently, but can do so, at least partially, with aid and cueing. Finally, the score value of 0.0 signifies that even with help, the student cannot demonstrate even partial competence in any of the content the scale articulates.

Teachers should use proficiency scales individually and collectively in the following ways:

- To plan instruction paying specific attention to level 2.0 to identify foundational vocabulary, knowledge, understanding, and skills to execute.
- To communicate levels of proficiency with students so students understand how they go from learning to knowing and doing.
- To assess students during instruction and as a result of instruction.
- To assess students on formative and summative assessments.
- Collectively a grade or content team should use the proficiency scales within a learning requirement in the design of common formative assessments and to assess students proficiency on common formative assessments.

Grading for Learning Implementation Expectations

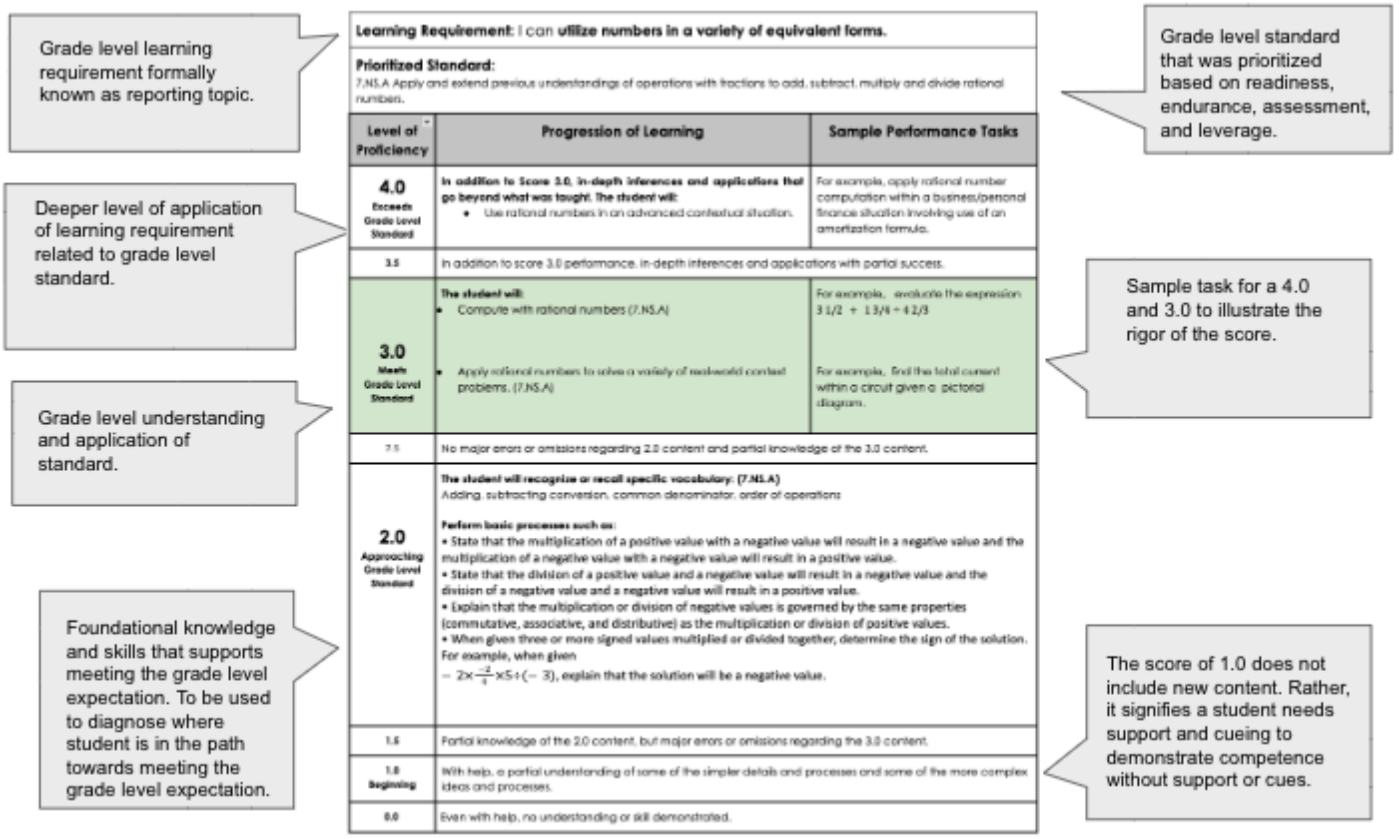
How are learning requirements and proficiency scales used to determine course/content area scores or grades?

A score (end of course level of proficiency) for a learning requirement is determined by using a body of evidence. Best practice is to provide multiple opportunities for students to demonstrate their knowledge, understandings, and execution skills. Evidence can be collected through observations, presentations, projects, interviews, written expressions, quick checks and/or tests. The evidence opportunity is tiered 2.0-4.0 in order to allow the student to demonstrate their full level of proficiency. For efficiency purposes, teachers should first focus on grade level or the 3.0 level of proficiency to determine if the student is proficient, and if they are not, then review the evidence for level 2.0 or 4.0. The last piece of evidence should hold the most weight when making a decision about a student's level of proficiency.

In the example below, the student has received scores for multiple pieces of evidence connected to one learning requirement. Since the evidence shows learning progress over time, the scores are not averaged. The last piece of evidence holds the most weight in determining the overall learning requirement proficiency because it is the most recent evidence of student learning.

Evidence	Score	Learning Requirement	Level of Proficiency
Performance Task	2.0	I can identify and evaluate geometric properties in mathematical problem solving.	3.0
Mid-Unit Check	2.5		
End-of-Unit Assessment	3.0		

The Anatomy of the Proficiency Scale



Proficiency scales are designed to provide clarity to what is grade level and the knowledge, understanding, and skills necessary to meet grade level or 3.0. The score of 3.0 and 4.0 includes a focus statement that the teacher uses to know what to look for when assessing the piece of evidence. The Sample Performance Task provides an example of how that statement might manifest or show up. The Sample Performance Task could be used as an example to understand the rigor of grade level and the deeper level performance. The score of 4.0 is at a level with the content that requires students to make inferences and applications that go beyond what the teacher directly addresses in class. The score of 2.0 contains a list of vocabulary terms and details that students should know to be able to demonstrate competence at the score of 3.0 level. The contents of level 2.0 should be used by teams to plan instruction that includes the vocabulary and content listed within it. If less than 80% of students are scoring a 2.0 or less on the content within a proficiency scale or reporting topic the teacher and/or team should provide whole class reteaching using what is outlined in 2.0. In addition, if a student has not reached a level of proficiency of a 3.0 the teacher and/or team should use the knowledge, understandings, and skills within the 2.0 to diagnose the need and match an supplemental intervention during the intervention block to support the student in reaching proficiency.

Grade 8 Science Learning Requirements & Proficiency Scales

Units	Learning Requirements
Unit 1	I can utilize numbers in a variety of equivalent forms.
Unit 2	I can compute integers, fractions and decimals in real world situations.
Unit 3	I can compare measurements using the Metric and English systems.
Unit 4	I can determine the degree of accuracy and precision required in various situations.
Unit 5	I can identify and evaluate geometric properties in mathematical problem solving.
Unit 6	I can evaluate data.

Learning Requirement: I can **utilize numbers in a variety of equivalent forms.**

Prioritized Standard:
7.NS.A Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.

Level of Proficiency	Progression of Learning	Sample Performance Tasks
4.0 **Exceeds Grade Level Standard**	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught. The student will:** • Use rational numbers in an advanced contextual situation.	For example, apply rational number computation within a business/personal finance situation involving use of an amortization formula.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.	
3.0 **Meets Grade Level Standard**	**The student will:** • Compute with rational numbers (7.NS.A) • Apply rational numbers to solve a variety of real-world context problems. (7.NS.A)	For example, evaluate the expression $3\,1/2 + 1\,3/4 \div 4\,2/3$ For example, find the total current within a circuit given a pictorial diagram.
2.5	No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content.	
2.0 **Approaching Grade Level Standard**	**The student will recognize or recall specific vocabulary:** Adding, subtracting conversion, common denominator, order of operations **Perform basic processes such as: (7.NS.A)** • State that the multiplication of a positive value with a negative value will result in a negative value and the multiplication of a negative value with a negative value will result in a positive value. • State that the division of a positive value and a negative value will result in a negative value and the division of a negative value and a negative value will result in a positive value. • Explain that the multiplication or division of negative values is governed by the same properties (commutative, associative, and distributive) as the multiplication or division of positive values. • When given three or more signed values multiplied or divided together, determine the sign of the solution. For example, when given $-2\times\frac{-2}{4}\times5\div(-3)$, explain that the solution will be a negative value.	
1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding the 3.0 content.	
1.0 **Beginning**	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
0.0	Even with help, no understanding or skill demonstrated.	

Learning Requirement: I can **compute integers, fractions and decimals in real world situations.**

Prioritized Standard:

7.NS.A Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.
8.EE.A.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than another.
8.EE.A.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used, Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities.

Level of Proficiency	Progression of Learning	Sample Performance Tasks
4.0 **Exceeds Grade Level Standard**	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught. The student will:** • Engage in advanced real-world tasks and scientific notation.	For example, a carpenter is working on a project that requires cutting a piece of wood that is 3,500,000 millimeters long. The carpenter's saw cuts at a speed of 0.000005 kilometers per second. How long will it take the carpenter to cut the piece of wood in scientific notation?
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.	
3.0 **Meets Grade Level Standard**	**The student will:** • Add, subtract, multiply and divide with signed numbers. (7.NS.A) • Use scientific notation to express very large or very small quantities in context. (8.EE.A.3) • Perform operations with numbers expressed in scientific notation. (8.EE.A.4)	For example, evaluate $\frac{1}{-2} \times (-40) \div (-4) \times \frac{-2}{5}$). For example, express the diameter of the Earth ($10,000,000$ meters) as 1×10^{7} meters. For example, multiply 6×10^{13} by 9×10^{-19}.
2.5	No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content.	
2.0 **Approaching Grade Level Standard**	**The student will recognize or recall specific vocabulary: (7.RP.A.1)** Adding, subtracting conversion, common denominator, order of operations **Perform basic processes such as:** • State that the multiplication of a positive value with a negative value will result in a negative value and the multiplication of a negative value with a negative value will result in a positive value. • State that the division of a positive value and a negative value will result in a negative value and the division of a negative value and a negative value will result in a positive value. • Explain that the multiplication or division of negative values is governed by the same properties (commutative, associative, and distributive) as the multiplication or division of positive values. • When given three or more signed values multiplied or divided together, determine the sign of the solution. For example, when given	

	$-2\times\frac{-2}{4}\times5\div(-3)$, explain that the solution will be a negative value. **The student will recognize or recall specific vocabulary:** Scientific notation, regular notation, exponent, power of ten, power, base **Perform basic processes such as: (8.EE.A.3)(8.EE.A.4)** • Convert numbers from scientific notation to regular notation and from regular notation to scientific notation. • Explain that when a number is multiplied by a positive power of 10 the decimal point is moved to the right the number of places expressed by the exponent and when it is multiplied by a negative power of 10 the decimal point is moved to the left the number of places expressed by the exponent. • Explain that zeros are written in decimal places that do not contain other digits when multiplying a number by a power of 10. • Give examples of very small measurements that are best expressed using scientific notation. For example, the size of a water molecule (2.5×10^{-10} meters), the width of a printed period (6×10^{-4} meters), the size of a bacteria cell (2.1×10^{-6} meters), or the volume of a red blood cell (9×10^{-14} liters). • Give examples of very large measurements that are best expressed using scientific notation. For example, the population of the United States (3.1×10^{8} people), the population of the world (6.9×10^{9} people), Avogadro's Number (6.022×10^{23} atoms), the amount of water that flows over Niagara Falls every minute (2.8×10^{9} cubic centimeters), the distance from the sun to Earth (1.5×10^{11} meters), the speed of light (3×10^{8} meters/second), the height of Mt. Everest (2.0920×10^{4} feet), or the diameter of the Earth (1×10^{7} meters). • Apply the associative and commutative properties to rearrange and regroup expressions containing numbers expressed in scientific notation. • Use properties of exponents to multiply or divide powers of 10.
1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding the 3.0 content.
1.0 Beginning	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.
0.0	Even with help, no understanding or skill demonstrated.

Learning Requirement: I can **compare measurements using the Metric and English systems.**

Prioritized Standard:

HSN.Q.A.1 Use units as a way to understand problems and guide the solutions of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
HSN.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.

Level of Proficiency	Progression of Learning	Sample Performance Tasks
4.0 **Exceeds Grade Level Standard**	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught. The student will:** • Solve an advanced real-world math scenario using conversions.	For example, a swimming pool has dimensions of 25 meters in length, 10 meters in width, and 2 meters in depth. If the pool is filled with water at a rate of 5 liters per second, how long will it take to fill the pool completely? (1 cubic meter = 1000 liters)
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.	
3.0 **Meets Grade Level Standard**	**The student will:** • Convert within and between Metric and English systems (HSN.Q.A.1)(HSN.Q.A.2)	For example, determine how many kg equals 180 pounds.
2.5	No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content.	
2.0 **Approaching Grade Level Standard**	**The student will recognize or recall specific vocabulary:** Units, cancel out, measurement, conversion, equivalent units **Perform basic processes such as: (HSN.Q.A.1)(HSN.Q.A.2)** • Explain that measurement units can be viewed as algebraic objects (variables) in an expression. • Explain that measurement units will cancel out when they appear in both the numerator and denominator of an expression. For example, $\frac{12\ feet}{1\ second} \times 60\ seconds = \frac{12\ feet}{1\ second} \times 60\ seconds = 12\ feet \times 60 = 720\ feet.$ • Identify the units used to give information in a real-world problem. For example, if a rabbit is crossing a 9 -foot-wide road at a rate of 12 feet per second and a truck is 50 feet away and driving toward the rabbit at a rate of 100 feet per second, then speed is given in *feet per second* and distance traveled is given in *feet*. • Rearrange algebraic formulas to solve for a specific unit. For example, the distance formula $d = rt$ can be stated as $\frac{d}{t} = r$ to solve for the rate. • Convert measurements to like units before evaluating an expression. For example, convert miles to yards before trying to determine how many laps around a field with a perimeter of 300 yards are required to run at least 2 miles.	
1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding the 3.0 content.	
1.0 Beginning	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	

0.0	Even with help, no understanding or skill demonstrated.

Learning Requirement: I can **determine the degree of accuracy and precision required in various situations.**

Prioritized Standard:

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.

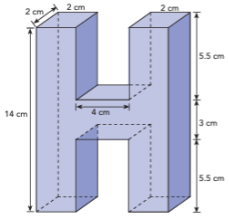
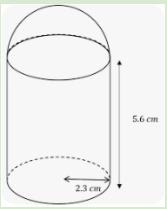
Level of Proficiency	Progression of Learning	Sample Performance Tasks
4.0 **Exceeds Grade Level Standard**	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught. The student will:** • Apply concepts to complex real-world situations.	For example, a website lists the heights of skyscrapers to the nearest foot. Determine the least and greatest possible height of them.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.	
3.0 **Meets Grade Level Standard**	**The student will:** • Accurately read the measurement shown on a variety of tools. (HSN.Q.A.3) • Determine the precision and greatest possible error of a measurement. (HSN.Q.A.3)	For example, accurately read the measurement on a vernier caliper. For example, find the precision and greatest possible error of 6.13 mm.
2.5	No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content.	
2.0 **Approaching Grade Level Standard**	**The student will recognize or recall specific vocabulary:** Accuracy of a measurement, exact number, approximate number **Perform basic processes such as: (HSN.Q.A.3)** • Reading a ruler • Identify equal measures • Understand metric and English units • Identify a variety of measurement tools	
1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding the 3.0 content.	
1.0 **Beginning**	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.	
0.0	Even with help, no understanding or skill demonstrated.	

Learning Requirement: I can **identify and evaluate geometric properties in mathematical problem solving.**

Prioritized Standard:

HSG.SRT.C.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.
HSG.GMD.A.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.
HSG.MG.A.1 Use geometric shapes, their measures and their properties to describe objects.

Supporting Standards: HSG.CO.D.12

Level of Proficiency	Progression of Learning	Sample Performance Tasks
4.0 **Exceeds Grade Level Standard**	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught. The student will:** • Use volume in an advanced application problem	For example, find the volume of the following shape: 
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.	
3.0 **Meets Grade Level Standard**	**The student will:** • Use formulas to determine the components of two-dimensional figures. (HSG.SRT.C.8)(HSG.MG.A.1) • Use formulas of cylinders, pyramids, cones and spheres to solve problems. (HSG.GMD.A.3)(HSG.MG.A.1)	For example, find the missing side length of a right triangle with one side measuring 25cm and the hypotenuse measuring 35cm. For example, find the volume of the following shape: 
2.5	No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content.	
2.0 **Approaching Grade Level Standard**	**The student will recognize or recall specific vocabulary:** Leg, hypotenuse, square of a number, equality, triangle, right angle **Perform basic processes such as: (HSG.SRT.C.8)(HSG.MG.A.1)** • Identify the components of right triangles (right angle, legs, hypotenuse). • Explain that the Pythagorean Theorem ($a^2 + b^2 = c^2$) states that the square of the hypotenuse of a right triangle is equal to the sum of the squares of its legs. • Identify the components of the Pythagorean Theorem (legs a and b, and hypotenuse c). • Solve algebraic equations for a given variable.	

	The student will recognize or recall specific vocabulary: base, height, radius, slant height, capacity **Perform basic processes such as: (HSG.GMD.A.3)(HSG.MG.A.1)** • Identify cones, cylinders, spheres and pyramids • State that the volume of a cone is equal to one-third the area of the base times the height ($V = \frac{1}{3}Bh$, in which B is the area of the base). • State that the area of a circle is equal to pi times the radius squared ($A = \pi r^2$). • State that the volume of a cylinder is equal to the area of the base times the height ($V = B \times h$, in which B is the area of the base). • Explain that the volume of a sphere is calculated as four-thirds pi times the radius cubed ($V = \frac{4}{3}\pi r^3$). • State that the volume of a pyramid is equal to the one third the area of the base times the height ($V = \frac{1}{3}Bh$, in which B is the area of the base).
1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding the 3.0 content.
1.0 Beginning	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.
0.0	Even with help, no understanding or skill demonstrated.

Learning Requirement: I can **evaluate data.**

Prioritized Standard:

HSS.ID.A.2 Use statistics appropriate to the shape of the data distribution to compare center (mean, median) and spread (interquartile range, standard deviation) of two or more different data sets.
HSS.ID.A.3 Interpret differences in shape, center and spread in the context of the data sets, accounting for possible effects of extreme data points.

Level of Proficiency	Progression of Learning	Sample Performance Tasks
4.0 **Exceeds Grade Level Standard**	**In addition to Score 3.0, in-depth inferences and applications that go beyond what was taught. The student will:** • Investigate the procedures used in a statistical study to draw conclusions about the validity of its results compared to another statistical study on the same topic.	For example, decide if the methods used in one study to select and survey a sample group were more or less appropriate for the conclusions drawn from the results than the methods used in another study.
3.5	In addition to score 3.0 performance, in-depth inferences and applications with partial success.	
3.0 **Meets Grade Level Standard**	**The student will:** • Interpret data from a variety of representations. (HSS.ID.A.2) • Create tables and graphs from data sets. (HSS.ID.A.3)	For example, given a bar graph representing life expectancies of different countries, determine which country has the longest life expectancy. For example, given a data set, create a histogram to represent it.
2.5	No major errors or omissions regarding 2.0 content and partial knowledge of the 3.0 content.	
2.0 **Approaching Grade Level Standard**	**The student will recognize or recall specific vocabulary:** (HSS.ID.A.2)(HSS.ID.A.3) **Perform basic processes such as:** • State that an outlier is a data point which falls more than 1.5 times the interquartile range above the third quartile or below the first quartile. For example, determine that a data point of 98 is an outlier for a data set with a median of 32 and an interquartile range of 25. • Select the appropriate measures of center and spread to describe a data set in the presence or absence of outliers. For example, in the presence of outliers choose to use the median and interquartile range to compare two data sets since the outlier will inflate or deflate the mean, and when data are clustered together without outliers choose to use the mean and standard deviation to compare two data sets. • Identify data sets that are skewed to the left or right. For example, describe a data set with an upper extreme value of 98, a lower extreme value of 13, a median of 32, and an interquartile range of 25 to be skewed right. • Compare two data sets using mean and standard deviation. For example, state that one data set has a smaller standard deviation and a larger mean so the data is more compact around a larger mean compared to a different data set that is more spread out due to a larger standard deviation around a smaller mean. • Compare two data sets using median and interquartile range. For example, state that one data set has a larger median with data that is more compact because the interquartile range is smaller compared to a different data set that is more spread out, because it has a larger interquartile range about a smaller median.	
1.5	Partial knowledge of the 2.0 content, but major errors or omissions regarding the 3.0 content.	

1.0 Beginning	With help, a partial understanding of some of the simpler details and processes and some of the more complex ideas and processes.
0.0	Even with help, no understanding or skill demonstrated.