Technical Math – Master Rubric

Competency and Indicator	Level 1 – No Evidence	Level 2 – Partially Meets	Level 3 - Approaches	Level 4 - Meets	Level 5 - Exceeds
	Student does not meet prerequisite skills.	Student demonstrates prerequisite skills.	Student demonstrates understanding of simple indicators.	Student demonstrates understanding of complex indicators in an authentic task.	Student demonstrates understanding of indicators that goes beyond expectations.
TM-NS1.A. Analyze proportional relationships and use them to solve contextualized and mathematical problems.	A. Not yet able to set-up a ratio or proportion.	A. Set up a single ratio using units.	A. Set up a proportion and solve.	A. Set-up and solve a proportion as part of an authentic task. Including units when applicable. AND A. Describe the proportional relationship between quantities within an authentic task.	A. Create equivalent proportions for quantities with an authentic task.
TM-NS1.B. Compute unit rates associated with ratios of fractions, decimals, and percent and including ratios of lengths, areas and other quantities measured in like or different units.	B. Not yet able to calculate rates.	B. Calculate unit rates of like units of quantities.	B. Calculate unit rates from like and unlike units of quantities.	B. Calculate unit rates from like and unlike units of quantities given within an authentic task.	B. Find and correct calculation errors within an authentic task.
TM-NS1.C. Apply properties of operations to calculate with numbers in any form	C. Not yet able to consistently calculate answers for problems using real numbers in an authentic task.	C. Calculate values for different problems within an authentic task(s) for an integer.	C. Calculate values for different problems within an authentic task(s) for integer, simple fractions and simple decimal.	C. Calculate values for different problems within an authentic task(s) for any real number. Problems must include signed	C. Find and correct calculation errors, using any real number, within an authentic task.

including signed numbers.				values and a variety of real numbers.	
TM-NS1.D. Convert between forms as appropriate.	D. Not yet able to convert between decimal, common fractions, and percentages.	D. Convert between two forms. (ie fraction to decimal only)	D. Convert between decimal, common fractions, and percentages.	D. Convert between decimal, common fractions, and percentages within an authentic task.	D. Convert between decimal, common fractions, and percentages using mental math.
TM-NS1.E. Assess the reasonableness of answers using mental computation and estimation and rounding strategies.	E. Not yet able to use mental math skills to determine if an answer is reasonable.	E. Apply basic rules of rounding and estimation using mental math.	E. Recognize reasonable solutions to problem and level of needed precision.	E. Mathematically determine and support, using mental math, the reasonableness of an answer to a contextual problem. (Must be able to determine and support reasonable and non-reasonable answers.)	E. Apply mental math skills to find and correct errors in contextual problems.
TM-NS1.F. Use rational approximations of irrational numbers to compare the size of irrational numbers and estimate the value of expressions (e.g., π/2).	F. Not yet able to calculate rational approximations.	F. Determine placement on a number line between consecutive integers.	F. Estimate approximations of irrational numbers and be able to round up to next larger integer to estimate values with in an authentic task.	F. Apply rational approximations to more precisely estimate values within an authentic task.	F. Apply multiple rational approximations within one task to more precisely estimate values.
TM-NS2.A. Convert like measurement units within a given measurement system and between systems.	A. Not yet able to convert units between like or unlike systems.	A. Convert units within the same measurement system. (ie converting inches to feet, centimeters to meters)	A. Convert units between measurement systems.	A. Convert units within a measurement system and between systems within an authentic task.	A. Accurately convert units among and between systems and determine which system is more applicable to the given scenario.
TM-NS2.B. Convert among different sized standard and/or metric measurement units and use these conversions in solving	B. Not yet able to convert different sized units between like or unlike systems within an authentic task.	B. Recognize measurement system and measurement units are appropriate to use within an authentic	B. Convert different sized units between like systems from an authentic task.	B. Convert different sized units within a measurement system and between systems within an authentic task.	B. Accurately convert units among and between systems and determine which system and/or unit is

		task and can develop a plan for solving.			more applicable to the given scenario.
TM-NS2.C. Use ratio reasoning (dimensional analysis) to convert measurement units including, but not limited to, distances and rates.	C. Not yet able to convert measurement units within a ratio.	C. Recognize which ratio must be used to convert to measurement.	C. Apply dimensional analysis to convert a measurement	C. Apply dimensional analysis to convert units, including distance and rates, within an authentic task.	C. FInd and correct an error within an authentic task. C. Apply multiple ratios to solve an authentic task.
TM-NS2.D. Manipulate and transform units appropriately when multiplying or dividing quantities. **ie ft X ft is ft^2, ft per second divided by feet yields seconds**	D. Not yet able to manipulate and transform units when multiplying or dividing quantities with units.	D. Recognize which units must be used when multiplying or dividing quantities with units with initial units and ending units.	D. Manipulate and transform units when multiplying and dividing quantities with units.	D. Manipulate and transform units when multiplying and dividing quantities with units in an authentic task.	D. Find and correct a unit error within an authentic task.
TM-NS3.A. Evaluate expressions at specific values for their variables. Include expressions that arise from formulas in authentic problems.	A. Not yet able to accurately evaluate an expression for a given value.	A. Evaluate variable expressions with integer values.	A. Evaluate variable expressions with integers, decimals, and fraction values.	A. Evaluate variable expressions containing common integer, decimal, and fractional values found in authentic task. (with and without technology)	A. Explain how the values of the variable(s) effect with each other and how changes can affect the final value in an authentic task.
TM-NS3.B. Perform arithmetic operations, including those involving whole-number exponents,	B. Not yet able to apply order of operations.	B. Explain the process using the order of operations to simplify a given expression.	B. Use order of operations to simplify an expression.	B. Calculate an order of operation problem with an authentic task which involves whole number	B. Find and correct an error with an order of operation problem which includes whole number exponents.

				exponents. (with and without technology) AND B. Explain the process used to calculate and order of operation problem within an authentic task which includes whole number exponents.	
TM-NS3.C. Work with radicals and integer exponents.	C. Not yet able to simplify a problem with radical or integer exponents.	C. Able to compute with radicals and integer exponents on a calculator.	C. Evaluate formulas with radicals and integer exponents.	C. Solve problems or use formulas within an authentic task which involve radical and integer exponents.	C. Find and correct an error within a problem which includes radical and integer exponents.
TM-NS3.D. Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number.	D. Not yet able to use root symbols to represent solutions to equations.	D. Recognize that x is a square root or cube root of p, where p is a positive rational number	D. Correctly using the square root and cube root symbols in the solutions to $x^2 = p$ and $x^3 = p$, where p is a positive rational number	D. Correctly using the square root and cube root symbols in the solutions to $x^2 = p$ and $x^3 = p$, where p is a positive rational number, within an authentic task.	D. Develop an algebraic expression that demonstrates the transition from exponents to radical solutions within an authentic task
TM-NS3.E. Evaluate square roots of small (1-12) perfect squares and cube roots of small(1-5) perfect cubes.	E. Not yet able to evaluate perfect square or cube root.	E. Recognize perfect squares and perfect cubes.	E. Evaluate small, perfect square and cube roots with a calculator.	E. Evaluate small, perfect square and cube roots, within an authentic task without a calculator.	E. Evaluate larger perfect square and cube roots within an authentic task without a calculator.
TM-NS3.F. Know that square roots and cubed roots of non-perfect squares and cubes are irrational and understand what	F. Not yet able to make a connection between a non-perfect square or cube root and an irrational number.	F. Estimate roots of non-perfect squares and cubes using a calculator.	F. Recognize a value as an estimate (close in value) of a non-perfect square or cube.	F. Estimate the value of a non-perfect square or cube root when solving problems. AND	F. Estimate values of a non-perfect square or cube root without technology and determine how to use

					the value in context of the authentic task.
irrational numbers are.				F. Determine when an answer in an authentic task will be an irrational number. Can describe how accuracy is impacted by the use of irrational numbers.	
TM-NS4.A. Draw conclusions and justify those conclusions from graphics such as order forms, bar charts, pie charts, diagrams, flow charts, maps, and dashboards.	A. Not yet able to make conclusions from different types of visual representation of data.	A. Can identify what the parts of the graph represent of various representations. (such as horizontal and vertical axis)	A. Can estimate values to make conclusions from a variety of visual representations.	A. Make and justify conclusions made from different types of visual representations of data within an authentic task.	A. Justify a different conclusion, based on the same data sets, within an authentic task.
TM-NS4.B. Identify and interpret trends, patterns, and relationships from graphs and charts.	B. Not yet able to interpret trends, patterns or relationships from graphs and charts.	B. Identify differences, general characteristics, or trends of graphs. (ie such as size of value or increasing vs. decreasing)	B. Can compare and state differences, general characteristics, or trends of graphs	B. Identify and interpret trends, patterns, and relationships from graphs and charts in an authentic situation.	B. Use trends to make predictions based on the identification and interpretation of trends and patterns in an authentic task.
TM-NS4.C. Identify types of graphs that best represent a given set of data.	C. Not yet able to identify graphs and uses for them.	C. Identify types of graphs and what they are used for.	C. Recognize when specific data is best represented by certain graphs	C. Identify and defend chosen graphical representation of a given set of data from an authentic task.	C. Identify pros and cons of different graphs given a set of data from an authentic task.
TM-NS4.D. Make and justify decisions based on data.	D. Not yet able to make a decision without guided support or examples.	D. Make a decision while solving an authentic task, may be a correct or incorrect decision.	D. Make a decision and recite the process used to make a decision when solving an authentic task.	D. Explain and justify, using data and information as support, a decision made while solving an authentic task.	D. Critique another person's decision and process used.
TN-G1.A. Use perimeter, area, and volume formulas to calculate	A. Not yet able to use formulas to calculate measurements of a figure.	A. Identify which formula and units are appropriate for	A. Determine measurements of figures using formulas	A. Determine measurements of figures using geometric formulas of perimeter,	A. Determine ideal (optimal) measurements of a

		calculating measurements.	of perimeter, area, and volume.	area, and volume within an authentic task.	figure within an authentic task.
measurements of geometric figures.					
TM-G2.A. Use facts about supplementary, complementary, vertical, adjacent, corresponding, alternate interior, and alternate exterior angles to solve for an unknown angle.	A. Not yet able to apply angle properties to determine unknown angle measures within an authentic figure.	A. Recognize supplementary, complementary, vertical, adjacent, and corresponding angles on authentic figure.	A. Apply angle properties, such as vertical angles are congruent, to calculate unknown angle values.	A. Determine unknown angle measures within an authentic task applying angle properties.	A. Explain the properties being used to solve for missing angle measures in an authentic task.
TM-G2.B. Accurately measure parts of geometric figures such as sides, perimeter, circumference, diagonals, diameter, and angles using the correct measurement tool.	B. Not yet able to correctly use a measurement tool to find the measure of geometric figures.	B. Recognize which measuring instrument and units are appropriate.	B. Measure and write the measurement of figures on paper.	B. Measure and write the measurement of part(s) of real world geometric figures using correct tool.	B. Measure and write the measurement of part(s) of real world geometric compound figures using correct tool.
TM-G2.C. Solve problems involving scale drawings of geometric figures including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.	C. Not yet able to apply scale drawings to compute actual measurements.	C. Identify given scale and convert length to actual units.	C. Create a drawing using a given scale. (Can be a simple object from classroom or can use technology if school has access.)	C. Reproduce a scale drawing applying a different scale. AND C. Solve a variety of problems involving scale drawings within an authentic task.	C. Adjust measurements within a scale drawing to give different options to an authentic task.
TM-G2.D. Represent applied problems by graphing points in the coordinate plane and interpret coordinate	D. Not yet able to recognize coordinates of points or graph points	D. Can graph points and give coordinates of points on a graph.	D. Graph contextual situation on a coordinate plane with a given labeled axis.	D. Graph and interpret meanings of coordinate points from an authentic task with given origin and scale.	D. Create the graph and label axis, scale, coordinates from an authentic task.

values of points in the context of the situation.					
TM-G3.A. Use the Pythagorean Theorem to solve for the length of a leg or the hypotenuse of right triangles.	A. Not yet able to apply Pythagorean Theorem to calculate an unknown side of a triangle.	A. Identify the legs and hypotenuse of a right triangle.	A. Apply the Pythagorean Theorem to find sides of a right triangle.	A. Apply Pythagorean Theorem in an authentic task to find the side of a right triangle.	A. Apply Pythagorean Theorem in an authentic task to determine if the measures form an acute, right, or obtuse triangle.
TM-G3.B. Use right triangle ratios (sine, cosine, tangent, and their inverses) to solve for unknown sides and angles in right triangles.	B. Not yet able to apply right triangle trigonometry to calculate unknown sides and angles in a right triangle.	B. Can find trigonometry ratios of an acute angle of a triangle with known sides.	B. Calculate unknown sides and angles of a right triangles.	B. Calculate unknown sides and angles of a right triangles within an authentic task.	B. Prove calculations using a different Trigonometry function or another Triangle Property. (ie Triangle Sum and Pythagorean Theorem)
TM-BA1.A. Use properties of operations to generate equivalent expressions.	A. Not yet able to create equivalent expressions.	A. Identify equivalent expressions.	A. Show that two expressions are equivalent.	A. Apply properties of operations to create equivalent expressions within an authentic task.	A. Describe properties and operations to create equivalent expressions within an authentic task.
TM-BA1.B. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	B. Not yet able to apply properties of operations with expressions containing rational coefficients.	B. Able to add, subtract, factor linear expressions with integers.	B. Able to add, subtract, and factor linear expressions with rational numbers.	B. Add, subtract, factor, and expand linear expressions with rational coefficients within an authentic task.	B. Find and correct an error when adding, subtracting, factoring and expanding a linear expression within an authentic task.
TM-BA1.C. Solve linear equations and inequalities in one variable.	C. Not yet able to solve single variable equations and inequalities.	C. Solve two-step equation and inequality.	C. Solve multi-step equations and inequalities.	C. Solve and interpret solution of linear equations and inequalities, in one	C. Find and correct solution errors and/or interpretation errors of equations or

				variable, within an authentic task.	inequalities within an authentic task.
TM-BA1.D. Use linear equations to model authentic contexts.	D. Not yet able to model an authentic task with a linear equation.	D. Define variable and restate known values from an authentic task.	D. Model an authentic task with a linear equation, may be incorrect.	D. Model an authentic task with linear equations. Defining variable(s) and solution meaning within context of the task.	D. Model, solve, and interpret solution(s) of linear equations within an authentic task.
TM-BA2.A. Use variables to represent two quantities involving geometric figures that change in relationship to one another.	A. Not yet able to represent two quantities of a figure as variables.	A. Define quantities needed given a geometric formula.	A. Evaluate the geometric relationship with different values in the two quantities and note changes in one quantity when the other is changed.	A. Define and use variables that represent quantities of geometric figures within an authentic task. AND A. Describe the relationship of two quantities within a geometric figure and how they change in relationship to each other.	A. Predict the impact of change on one variable as it relates to the second variable, using an authentic task.
TM-BA2.B. Write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable.	B. Not yet able to write an equation with an independent and dependent variable that represents an authentic task.	B. Identify the dependent and independent variables in an equation.	B. Write an equation for one variable in terms of another.	B. Write and define an equation that represents an authentic task having an independent and dependent variable.	B. Describe the relationship, using explicit terms, values, or units, of the two variables in an authentic task.
TM-BA2.C. Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.	C. Not yet able to solve a literal equation.	C. Solve 1 or 2 step literal equations.	C. Solve multi-step literal equations.	C. Solve and interpret a formula (literal equation) within an authentic task.	C. Explain effects to the formula as changes to a variable happen within an authentic task.

TM-BA3.A. Evaluate expressions, including those that arise from formulas in authentic problems, at specific values for their variables.	A. Not yet able to evaluate an expression.	A. Correctly substitute the numbers into the expression.	A. Evaluate the expression or formula, with correct units.	A. Evaluate the expression or formula, with correct units, within an authentic task.	A. Explain answers from an authentic task.
TM-BA3.B. Reason quantitatively and use units to solve problems as a way to understand problems and to guide the solution of multi-step problems.	B. Not yet able to apply units to reason quantitatively about a problem.	B. Compare different quantities based on units to decide steps for solving a problem.	B. Apply quantitative reasoning when solving a simple task.	B. Apply quantitative reasoning when solving a multi-step problem within an authentic task.	B. Explain and defend a multi-step solution within an authentic task using quantitative reasoning.
TM-BA3.C. Choose and interpret units consistently in formulas.	C. Not yet able to choose units of measure in formulas.	C. Determine appropriate units for final answers.	C. Recognize different unit measures within a problem and convert correctly.	C. Interpret units of measure in a formula within an authentic task.	C. Justify final unit measure selection.
TM-BA3.D. Apply appropriate formulas to solve applications.	D. Not yet able to apply formulas within an authentic task.	D. Determine correct formula for an authentic task when given options.	D. Select the appropriate formula to solve an authentic task.	D. Select and apply appropriate formulas to solve problems in an authentic task.	D. Apply and explain formulas used to solve problems in an authentic task.