Transition to Technical Math Unit Rubrics

METT – Manufacturing

Standard	4 - Mastery	3 - Proficient	2 - Basic	1- Below Basic	0 - No Evidence
TM-NS1.A. Analyze proportional relationships and use them to solve contextualized and mathematical problems.	A. Create equivalent proportions for quantities with an authentic task.	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. Set up a proportion and solve.	A. Set up a single ratio using units.	A. Not yet able to setup a ratio or proportion.
TM-NS1-C. Apply properties of operations to calculate with numbers in any form including signed numbers	C. Find and correct calculation errors, using any real number, within an authentic task.	C. Calculate values for different problems within an authentic task(s) for any real number. Problems must include signed values and a variety of real numbers.	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 an integer.	C. Not yet able to consistently calculate answers for problems using real numbers in an authentic task.
TM-NS1.D. Convert between forms as appropriate.	D. Convert between decimal, common fractions, and percentages using mental math	D. Convert between decimal, common fractions, and percentages within an authentic task.	D. Convert between decimal, common fractions, and percentages.	D. Convert between two forms. (I.e. fraction to decimal only).	D. Not yet able to convert between decimal, common fractions, and percentages.
TM-NS1-E. Assess the reasonableness of answers using mental computation and estimation and rounding strategies.	E. Apply mental math skills to find and correct errors in contextual problems.	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. Recognize reasonable solutions to problem and level of needed precision.	E. Apply basic rules of rounding and estimation using mental math.	E. Not yet able to use mental math skills to determine if an answer is reasonable.
TM-NS1-F. Use rational approximations of irrational numbers to compare the size of irrational numbers and estimate the value of expressions (e.g., $\pi/2$).	F. Apply multiple rational approximations within one task to more precisely estimate values.	F. Apply rational approximations to more precisely estimate values within an authentic task.	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. Determine placement on a number line between consecutive integers.	F. Not yet able to calculate rational approximations.
TM-NS2-A Convert like measurement units within a given measurement system and between systems.	A. Accurately convert units among and between systems and determine which system is more applicable to the given scenario.	A. Convert units within a measurement system and between systems within an authentic task	A. Convert units between measurement systems	A. Convert units within the same measurement system. (ie converting inches to feet, centimeters to meters)	A. Not yet able to convert units between like or unlike systems.
TM-NS2-B Convert among different sized standard and/or metric measurement units and use these conversions in solving authentic multistep problems.	B. Accurately convert units among and between systems and determine which system and/or unit is more applicable to the given scenario.	B. Convert different sized units within a measurement system and between systems within an authentic task	B. Convert different sized units between like systems from an authentic task.	B. Recognize measurement system and measurement units are appropriate to use within an authentic task and can develop a plan for solving.	B. Not yet able to convert different sized units between like or unlike systems within an authentic task.

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TM-NS2-D Manipulate and transform units appropriately when multiplying or dividing quantities.	D. Find and correct a unit error within an authentic task.	D. Manipulate and transform units when multiplying and dividing quantities with units in an authentic task.	D. Manipulate and transform units when multiplying and 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. Not yet able to manipulate and transform units when multiplying or dividing quantities with units.
TM-NS3-A. Evaluate expressions at specific values for their variables. Include expressions that arise from formulas in authentic problems.	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.	A. Evaluate variable expressions containing common integer, decimal, and fractional values found in authentic task. (with and without technology)	A. Evaluate variable expressions with integers, decimals, and fraction values.	A. Evaluate variable expressions with integer values.	A. Not yet able to accurately evaluate an expression for a given value.
TM-NS3-B. Perform arithmetic operations, including those involving whole-number exponents, using order of operations.	B. Find and correct an error with an order of operation problem which includes whole number exponents.	B. Calculate an order of operation problem with an authentic task which involves whole number 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.	B. Use order of operations to simplify an expression.	B. Explain the process using the order of operations to simplify a given expression.	B. Not yet able to apply order of operations.
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. Develop an algebraic expression that demonstrates the transition from exponents to radical solutions within an authentic task.	D. Correctly using the square root and cube root symbols in the solutions to x2 = p and x 3 = p, where p is a positive rational number, within an authentic task.	D. Correctly using the square root and cube root symbols in the solutions to x2 = p and x 3 = p, where p is a positive rational number.	D. Recognize that x is a square root or cube root of p, where p is a positive rational number.	D. Not yet able to use root symbols to represent solutions to equations.
TM-NS3-F. Know that square roots and cubed roots of non-perfect squares and cubes are irrational and understand what irrational numbers are.	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.	F. Estimate the value of a non-perfect square or cube root when solving problems. AND 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.	F. Recognize a value as an estimate (close in value) of a non-perfect square or cube.	F. Estimate roots of non-perfect squares and cubes using a calculator.	F. Not yet able to make a connection between a non-perfect square or cube root and an irrational number.
TM-NS4-D. Make and justify decisions based on data.	D. Critique another person's decision and process used.	D. Explain and justify, using data and information as support, a decision made while solving an authentic task.	D. Make a decision and recite the process used to make a decision when solving an authentic task.	D. Make a decision while solving an authentic task, may be a correct or incorrect decision.	D. Not yet able to make a decision without guided support or examples.
TN-G1.A. Use perimeter, area, and volume formulas to calculate measurements of geometric figures.	A. Determine ideal (optimal) measurements of a figure within an authentic task.	A. Determine measurements of figures using geometric formulas of perimeter, area, and volume within an authentic task.	A. Determine measurements of figures using formulas of perimeter, area, and volume.	A. Identify which formula and units are appropriate for calculating measurements.	A. Not yet able to use formulas to calculate measurements of a figure.

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TM-G2-A. Use facts about supplementary, complementary, vertical, adjacent, corresponding, alternate interior, and alternate exterior angles to solve for an unknown angle.	A. Explain the properties being used to solve for missing angle measures in an authentic task.	A. Determine unknown angle measures within an authentic task applying angle properties.	A. Apply angle properties, such as vertical angles are congruent, to calculate unknown angle values.	A. Recognize supplementary, complementary, vertical, adjacent, and corresponding angles on authentic figure.	A. Not yet able to apply angle properties to determine unknown angle measures within an authentic figure.
TM-G2.B. Accurately measure parts of geometric figures such as sides, perimeter, circumference, diagonals, diameter, and angles using the correct measurement tool.	B. Measure and write the measurement of part(s) of real world geometric compound figures using correct tool.	B. Measure and write the measurement of part(s) of real world geometric figures using correct tool.	B. Measure and write the measurement of figures on paper.	B. Recognize which measuring instrument and units are appropriate.	B. Not yet able to correctly use a measurement tool to find the measure of geometric figures.
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. Adjust measurements within a scale drawing to give different options to an authentic task	C. Reproduce a scale drawing applying a different scale. AND C. Solve a variety of problems involving scale drawings within an authentic task.	C. Create a drawing using a given scale. (Can be a simple object from classroom or can use technology if school has access.)	C. Identify given scale and convert length to actual units.	C. Not yet able to apply scale drawings to compute actual measurements.
TM-BA1-A. Use properties of operations to generate equivalent expressions.	A. Describe properties and operations to create equivalent expressions within an authentic task.	A. Apply properties of operations to create equivalent expressions within an authentic task.	A. Show that two expressions are equivalent.	A. Identify equivalent expressions.	A. Not yet able to create equivalent expressions.
TM-BA1-B. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	B. Find and correct an error when adding, subtracting, factoring and expanding a linear expression within an authentic task.	B. Add, subtract, factor, and expand linear expressions with rational coefficients within an authentic task.	B. Able to add, subtract, and factor linear expressions with rational numbers.	B. Able to add, subtract, factor linear expressions with integers.	B. Not yet able to apply properties of operations with expressions containing rational coefficients.
TM-BA1-C. Solve linear equations and inequalities in one variable.	C. Find and correct solution errors and/or interpretation errors of equations or inequalities within an authentic task.	C. Solve and interpret solution of linear equations and inequalities, in one variable, within an authentic task.	C. Solve multi-step equations and inequalities.	C. Solve two-step equation and inequality.	C. Not yet able to solve single variable equations and inequalities.
TM-BA2.A. Use variables to represent two quantities involving geometric figures that change in relationship to one another.	A. Predict the impact of change on one variable as it relates to the second variable, using an authentic task.	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. Evaluate the geometric relationship with different values in the two quantities and note changes in one quantity when the other is changed.	A. Define quantities needed given a geometric formula.	A. Not yet able to represent two quantities of a figure as variables.

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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. Describe the relationship, using explicit terms, values, or units, of the two variables in an authentic task.	B. Write and define an equation that represents an authentic task having an independent and dependent variable.	B. Write an equation for one variable in terms of another.	B. Identify the dependent and independent variables in an equation.	B. Not yet able to write an equation with an independent and dependent variable that represents an authentic task.
TM-BA2-C. Rearrange formulas to highlight a quantity of interest using the same reasoning as in solving equations.	C. Explain effects to the formula as changes to a variable happen within an authentic task.	C. Solve and interpret a formula (literal equation) within an authentic task.	C. Solve multi-step literal equations.	C. Solve 1 or 2 step literal equations.	C. Not yet able to solve a literal equation.
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. Explain and defend a multi-step solution within an authentic task using quantitative reasoning.	B. Apply quantitative reasoning when solving a multi-step problem within an authentic task.	B. Apply quantitative reasoning when solving a simple task.	B. Compare different quantities based on units to decide steps for solving a problem.	B. Not yet able to apply units to reason quantitatively about a problem.
TM-BA3-C. Choose and interpret units consistently in formulas.	C. Justify final unit measure selection.	C. Interpret units of measure in a formula within an authentic task.	C. Recognize different unit measures within a problem and convert correctly.	C. Determine appropriate units for final answers.	C. Not yet able to choose units of measure in formulas.
TM-BA3-D. Apply appropriate formulas to solve applications.	D. Apply and explain formulas used to solve problems in an authentic task.	D. Select and apply appropriate formulas to solve problems in an authentic task.	D. Select the appropriate formula to solve an authentic task.	D. Determine correct formula for an authentic task when given options.	D. Not yet able to apply formulas within an authentic task.