Transition to Technical Math Unit Rubrics

METT – Trades

Standard	4 - Mastery	3 - Proficient	2 - Basic	1- Below Basic	0 - No Evidence
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., π/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-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.
TM-NS2.D. Manipulate and transform units appropriately when multiplying or dividing quantities. i.e. ft X ft is ft^2, ft per second divided by feet yields seconds	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-C. Work with radicals and integer exponents.	C. Find and correct an error within a problem which includes radical and integer exponents.	C. Solve problems or use formulas within an authentic task which involve radical and integer exponents.	C. Evaluate formulas with radicals and integer exponents.	C. Able to compute with radicals and integer exponents on a calculator.	C. Not yet able to simplify a problem with radical or 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. 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-E. Evaluate square roots of small perfect squares and cube roots of small perfect cubes.	E. Evaluate larger perfect square and cube roots within an authentic task without a calculator.	E. Evaluate small, perfect square and cube roots, within an authentic task without a calculator.	E. Evaluate small, perfect square and cube roots with a calculator	E. Recognize perfect squares and perfect cubes.	E. Not yet able to evaluate perfect square or cube root.

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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-C. Identify types of graphs that best represent a given set of data.	C. Identify pros and cons of different graphs given a set of data from an authentic task.	C. Identify and defend chosen graphical representation of a given set of data from an authentic task.	C. Recognize when specific data is best represented by certain graphs.	C. Identify types of graphs and what they are used for.	C. Not yet able to identify graphs and uses for them.
TM-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.
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. 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. 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.

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TM-G2-D. Represent applied problems by graphing points in the coordinate plane and interpret coordinate values of points in the context of the situation.	D. Create the graph and label axis, scale, coordinates from an authentic task.	D. Graph and interpret meanings of coordinate points from an authentic task with given origin and scale.	D. Graph contextual situation on a coordinate plane with a given labeled axis.	D. Can graph points and give coordinates of points on a graph.	D. Not yet able to recognize coordinates of points or graph points.
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-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
TM-BA3-A. Evaluate expressions, including those that arise from formulas in authentic problems, at specific values for their variables.	A. Explain answers from an authentic task.	A. Evaluate the expression or formula, with correct units, within an authentic task.	A. Evaluate the expression or formula, with correct units.	A. Correctly substitute the numbers into the expression.	A. Not yet able to evaluate an expression.
TM-BA3-B. Reason quantitatively and use units to solve problems as a way to understand problems and to guide the solution of multistep 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.

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TM-NS1-E. Assess the reasonableness of answers using mental computation and estimation and rounding strategies.	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-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-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-C. Work with radicals and integer exponents.	C. Find and correct an error within a problem which includes radical and integer exponents.	C. Solve problems or use formulas within an authentic task which involve radical and integer exponents	C. Evaluate formulas with radicals and integer exponents	C. Able to compute with radicals and integer exponents on a calculator.	C. Not yet able to simplify a problem with radical or integer exponents.
TM-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-G3.A. Use the Pythagorean Theorem to solve for the length of a leg or the hypotenuse of right triangles.	A. Apply Pythagorean Theorem in an authentic task to determine if the measures form an acute, right, or obtuse triangle.	A. Apply Pythagorean Theorem in an authentic task to find the side of a right triangle.	A. Apply the Pythagorean Theorem to find sides of a right triangle.	A. Identify the legs and hypotenuse of a right triangle.	A. Not yet able to apply Pythagorean Theorem to calculate an unknown side of a 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. Prove calculations using a different Trigonometry function or another Triangle Property. (ie Triangle Sum and Pythagorean Theorem).	B. Calculate unknown sides and angles of a right triangles within an authentic task.	B. Calculate unknown sides and angles of a right triangles	B. Can find trigonometry ratios of an acute angle of a triangle with known sides.	B. Not yet able to apply right triangle trigonometry to calculate unknown sides and angles in a right triangle.
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.