June, 2008

Mathematics Alignment Guide

Mason-Lake Tech Prep

Course: Welding Technology

*** *Note: If a standard is covered partially, then the part that is covered is underlined.*

High School Content Expectations						
Standard	Level of Coverage		Activities Linked to this Standard	Assessment Method		Assessment Correlation	Approximate Time Spent on the Standard
	Partial	Complete		Performance Based	Written		
L2.3.1 Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.	x		Students encounter conversions in multiple fashions such as: 1) converting within the English unit of measure including whole numbers, decimals, and fractional units, 2) students explain how arithmetic operations may affect the units when setting machines for proper voltage, amperage, and grounding. Students need to account for rod size and travel speed/rod angle when determining the proper settings, 3) students carry units through calculations correctly when working between rod diameter, volts, amps, and watts.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 30 minutes daily

L2.4.2 Describe and explain round-off error, rounding, and truncating.	x		Students apply knowledge of rounding and need to be able to use rounding to find appropriate final product sizes. Typically, students round to the nearest quarter inch and typically they need to round down due to the size of the weld.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
L2.4.3 Know the meaning of and interpret statistical significance, margin of error, and confidence level.	x		Students use margin or error to keep their products within AWS standards. When working with the allowable margin or error, students use confidence intervals to determine the worthiness of a produce.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 60 hours during the 1st marking period
G1.1.1 Solve multi-step problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.	x		Students use mathematical relationships of complementary angles and knowledge of right angles for travel angle vs. work angle for every weld that students perform.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

G1.1.3 Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.	x		Students use their knowledge that the intersection of the diagonals of a rectangle determines the midpoint of the segments. Students create an inscribed circle to the rectangle using the center found by the intersection of the diagonals.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 1 week
G1.1.4 Given a line and a point, construct a line through the point that is parallel to the original line using straightedge and compass; given a line and a point, construct a line through the point that is perpendicular to the original line; justify the steps of the constructions.	x		When doing oxy-fuel cutting, students construct parallel and perpendiculars of lines through points to create a rectangular piece.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 3 class periods; minimum of 6 hours

G1.6.4 Know and use properties of arcs and sectors, and find lengths of arcs and areas of sectors.	x		Students use properties of arc length to determine the appropriate distance from the work that the electrode should be for a accurate sized weld.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
G 1.4.1 Solve multi-step problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.	x		Students use properties of rectangles based on angle measure, side length, and diagonal length to create a true rectangle and distinguish the rectangle from a parallelogram.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 3 class periods; minimum of 6 hours
G2.2.1 Identify or sketch a possible three-dimensional figure, given two-dimensional views. Create a two-dimensional representation of a three-dimensional figure.	x		Students use two-dimensional blueprints to construct three-dimensional figure.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

ACT Standards							
Perform one-operation computation with whole numbers and decimals (Range 13 – 15)		x	Students demonstrate proficiency with one-operation computations when welding pieces together to get a total length and then subdividing the total length into quarters. Students do mental calculations when working with error tolerance in order to meet the standards of acceptability.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Solve problems in one or two steps using whole numbers (Range 13 – 15)		x	Students distinguish the process necessary (soldering, brazing, or braze welding) and make temperature comparisons based on the appropriate application (mental calculation – one step). Students may perform multi-step calculations when creating a final product.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 1 week
Perform common conversions (e.g., inches to feet or hours to minutes) (Range 13 – 15)		x	Students encounter conversions in multiple fashions such as: 1) converting within the English unit of measure including whole numbers, decimals, and fractional units, 2) students carry units through calculations correctly when working between rod diameter, volts, amps, and watts.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 30 minutes daily

Perform a single computation using information from a table or chart (Range 13 – 15)		x	Using a table, students get equivalent values for amperage, rate, and rod size. From that, students calculate travel speed, rod angle, and arc gap.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Recognize equivalent fractions and fractions in lowest terms (Range 13 – 15)		x	While measuring, students use 32nds, 8ths, 4ths, and halves. Students need to put fractions from measurements in lowest terms and recognize when two fractions are equivalent.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately 1/3 of the school year
Estimate or calculate the length of a line segment based on other lengths given on a geometric figure (Range 13 – 15)		x	Reading 2-D blueprints or diagrams, students need to determine the total length and width of various dimensions of an end product based on the lengths of the individual components.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Weekly

Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent (Range 16 – 19)		x	Students demonstrate proficiency with one-operation computations when welding pieces together to get a total length and then subdividing the total length into quarters. Students do mental calculations when working with error tolerance in order to meet the standards of acceptability.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Solve some routine two-step arithmetic problems (Range 16 – 19)		x	Students perform multi-step calculations to determine correct bead height and width dependent upon rod angle, speed and gap.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Read tables and graphs (Range 16 – 19)		x	In order to meet the AWS specifications, students need to read tables and graphs. Students use information from tables and graphs to properly determine amperage, rate, travel speed, and rod size for a given project.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

Perform computations on data from tables and graphs (Range 16 – 19)		x	In order to meet the AWS specifications, students need to read tables and graphs. Students use information from tables and graphs to properly determine amperage, rate, travel speed, and rod size for a given project. Students make calculations for proper weld bead, width, and height.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Solve routine two-step or three-step arithmetic problems involving concepts such as rate and proportion, tax added, percentage off, and computing with a given average (Range 20 – 23)	x		Students determine the feed rate of a weld. Students use proportional thinking when figuring the relationship between the wire size and the a amperage needed.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately ¼ of a year

Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification, absolute value, primes, and greatest common factor (Range 20 – 23)	x		Students apply knowledge of rounding and need to be able to use rounding to find appropriate final product sizes. Typically, students round to the nearest quarter inch and typically they need to round down due to the size of the weld.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°) (Range 20 – 23)	x		Students use mathematical relationships of complementary angles and knowledge of right angles for travel angle vs. work angle for every weld that students perform.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Manipulate data from tables and graphs (Range 24 – 27)		x	In order to meet the AWS specifications, students need to read tables and graphs. Students use information from tables and graphs to properly determine amperage, rate, travel speed, and rod size for a given project. Students make calculations for proper weld bead, width, and height.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

Find the midpoint of a line segment (Range 24 – 27)		x	Students use their knowledge that the intersection of the diagonals of a rectangle determines the midpoint of the segments. Students create an inscribed circle to the rectangle using the center found by the intersection of the diagonals.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards, (performance-based assessments) 2) written tests.	Approximately 1 week
Interpret and use information from figures, tables, and graphs (Range 28 – 32)		x	Using a table, students get equivalent values for amperage, rate, and rod size. From that, students calculate travel speed, rod angle, and arc gap. Students interpret the data from the figure, table, and/or graph based on the practicality of the real-world setting.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Solve complex arithmetic problems involving percent of increase or decrease and problems requiring integration of several concepts from pre-algebra and/or pre-geometry (e.g., using several ratios in geometry settings) (Range 33 – 36)	x		Students read 2-D blueprints and interpret the information to do calculations necessary for GMAW direct correlation of amperage, wire feed speed, voltage, wire size, and gas composition.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately ½ of one marking period; 45 hours

Analyze and draw conclusions based on information from figures, tables, and graphs (Range 33 – 36)		x	Students analyze project information from tables to determine the correct size steel, amperage, rod angle, travel speed to meet minimum AWS standards.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Solve problems integrating multiple algebraic and/or geometric concepts (Range 33 – 36)		x	Students read 2-D blueprints and interpret the information to do calculations necessary for GMAW direct correlation of amperage, wire feed speed, voltage, wire size, and gas composition.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Approximately ½ of one marking period; 45 hours
Draw conclusions based on a set of conditions (Range 33 – 36)		x	Students determine weld bead size and penetration directly according to AWS standards. Students interpret information from charts and graphs and apply this information based on their real world applications and outcomes for the project.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily lab exercises

Solve multi-step geometry problems that involve integrating concepts, planning, visualization, and/or making connections with other content areas (Range 33 – 36)		x	Students integrate geometric 2-dimensional representations with arithmetic calculations to visualize a product that they will create by welding.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

WorkKeys Standards							
Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers (Level 3)		x	Students demonstrate proficiency with one-operation computations when welding pieces together to get a total length and then subdividing the total length into quarters. Students do mental calculations when working with error tolerance in order to meet the standards of acceptability.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Change numbers from one form to another using whole numbers, fractions, decimals, or percentages (Level 3)	x		When perform conversions within the English unit of measure, students change the form of numbers between whole numbers, decimals, and fractions based on the appropriateness of the number in the real world context.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

Solve problems that require one or two operations (Level 4)		x	Students distinguish the process necessary (soldering, brazing, or braze welding) and make temperature comparisons based on the appropriate application (mental calculation – one step). Students may perform multi-step calculations when creating a final product.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals (Level 4)	x		Students mentally and mechanically calculate feed rates for mechanical cutting. Students use proportional thinking when comparing size with amperage, rod angle with travel speed, and arc gap with type of joint to be welded.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Add commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%) (Level 4)	x		While measuring, students use 32nds, 8ths, 4ths, and halves. Students may convert from a fraction to a decimal after taking measurements. Students typically add these fractions or decimals to ensure they are staying within the error tolerance of the project.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

Add up to three fractions that share a common denominator (Level 4)	x (for halves, 4ths, 8ths, and 32nds only)		While measuring, students use 32nds, 8ths, 4ths, and halves. Students typically add these fractions to ensure they are staying within the error tolerance of the project. Often, this may require the addition of three or more fractions with or without a common denominator.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Put the information in the right order before performing calculations (Level 4)		x	Students determine rod size before adjusting amperage. Then students determine the proper joint to use the proper angle and arc gap.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily

Decide what information, calculations, or unit conversions to use to solve the problem (Level 5)		x	Students determine rod size and type before adjusting amperage. Then students determine the proper joint to use the proper angle and arc gap. In certain situations, students must follow the AWS specifications (rather than determining their own specifications) and must adjust the procedure to meet the standards. Depending on how the measurements are taken, students may have to do conversions within the English unit of measure.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments), 2) written tests.	Daily
Use fractions, negative numbers, ratios, percentages, or mixed numbers (Level 6)	x		Students use fractions and mixed numbers in measurements, error tolerances, and conversions. Students use ratios when comparing iron content and/or chromium content to determine ductility of metals.	x	x	Students demonstrate proficiency on: 1)American Welding Society standards (performance-based assessments) 2) written tests.	Daily for measurements, error tolerances, and conversions. Approximately one week for metal ratios.

Find mistakes in questions that belong at Levels 3, 4, and 5 (Level 6)		x	Students use the mathematical concepts expected in level 3, 4, and 5 to self-assess their work before submission to the instructor.	x		Students demonstrate proficiency on American Welding Society standards (performance-based assessments).	Daily

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