June, 2008

Mathematics Alignment Guide

Mason-Lake Tech Prep

Course: Automotive 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		
L1.1.6 Explain the importance of the irrational numbers and in basic right triangle trigonometry, and the importance of Pi because of its role in circle relationships.	x		Students determine displacement using cylinders. Students determine the bore (diameter of the cylinder) and stroke (length of the piston travel).	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated for approximately 3 weeks
L1.2.1 Use mathematical symbols to represent quantitative relationships and situations.		x	1) Students describe the output force vs. the input force of a system using equations. 2) Students use formulas to indirectly measure systems that are outside of the manufactures specifications. 3) Students represent situations using Ohm's Law.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

L1.2.4 Organize and summarize a data set in a table, plot, chart, or spreadsheet; find patterns in a display of data; understand and critique data displays in the media.	x		Students use charts and tables all year. Some examples include: 1) Students interpret charts and tables to determine the manufactures specifications in a given system. 2) Students look at wavelength charts, pulse widths, plots of horsepower vs. power, and graphs of air flow.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
L2.1.2 Calculate fluently with numerical expressions involving exponents; use the rules of exponents; evaluate numerical expressions involving rational and negative exponents; transition easily between roots and exponents.	x		Students perform calculations for determining the volumes of cylinders and the areas of a cross-section of a cylinder.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 3 hours
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		1) Students convert within systems and between systems when using length (inches to feet and inches to metric units), temperature (F to C), electrical (amps to watts), volume (liters to ft^3) etc. 2) Students accurately name units of resulting calculations.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

L2.4.1 Determine what degree of accuracy is reasonable for measurements in a given situation; express accuracy through use of significant digits, error tolerance, or percent of error; describe how errors in measurements are magnified by computation; recognize accumulated error in applied situations.	x		1) Students perform measurements to the 10,000th for tolerances to allow for heat expansion. 2) In wheel alignment, students use error tolerance to determine appropriate limits for specifications. 3) Students use parallelism tolerance appropriately with brake pulsations. 4) Students use error tolerance in measuring camber using inequalities.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
L2.4.2 Describe and explain round-off error, rounding, and truncating.	x		1) Students perform rounding when doing calculations with Pi, when converting measurements, and when taking appropriate measurements for an applied situation. 2) Students truncate values from digital voltmeters in the thousandths place to communicating these values to the tenths place.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
L3.1.1 Distinguish between inductive and deductive reasoning, identifying and providing examples of each.	x		1) Students use deductive reasoning to diagnose automotive performance problems based on customer complaints. 2) Students use inductive reasoning for less-specific case studies on issues related to automotive problems.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

L3.2.2 Use the connectives "not," "and," "or," and "if…, then," in mathematical and everyday settings. Know the truth table of each connective and how to logically negate statements involving these connectives.	x		1) Students use "not, "and", "or", and "if/then" statements when diagnosing automotive problems. 2) Students read trouble codes and use "and", "if/then" or "or" phrases to trouble shoot problems.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
L3.2.3 Use the quantifiers "there exists" and "all" in mathematical and everyday settings and know how to logically negate statements involving them.	x		Students understand that "there exists" applies to only certain cases, whereas "all" exists in every case. For example, "all" front wheel drives have certain characteristics that non-front-wheel drive cars don't have.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
A1.2.3 Solve linear and quadratic equations and inequalities including systems of up to three linear equations with three unknowns. Justify steps in the solution, and apply the quadratic formula appropriately.	x		Students solve equations involving substitution with Ohm's Law, volumes of cylinders, cross-sectional area of cylinders, and conversions of measurements.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
A1.2.8 Solve an equation involving several variables (with numerical or letter coefficients) for a designated variable. Justify steps in the solution.	x		Students solve equations with Ohm's Law, volumes of cylinders, cross-sectional area of cylinders, and conversions of measurements for other variables in the equations and then use substitution to solve for a numerical value.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

A1.2.9 Know common formulas and apply appropriately in contextual situations.		x	Students solve equations involving substitution with Ohm's Law, volumes of cylinders, cross-sectional area of cylinders, and conversions of measurements.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
G1.1.2 Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.	x		Students determine appropriate tow setting based on measurements for parallelism.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
G1.4.1 Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.	x		Students use parallelogram linkage to determine pivot angles based on the off-set angles (over-center angles).	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 15 hours
G1.8.1 Solve multistep problems involving surface area and volume of pyramids, prisms, cones, cylinders, hemispheres, and spheres.	x		Students determine volumes of cylinders for brakes cylinders, master cylinders, accumulators and calipers.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 7 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 visualize and identify cut-aways of 3-D figures and apply appropriately to an automotive setting. Students need to read 2-D exploded views and apply to procedures in the lab.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
G2.2.2 Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.	x		Students identify and sketch cross-sections of 3-D cut-aways; particularly in belts and tire construction.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
G3.1.1 Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.	x		Students perform rotations to determine radial and lateral run-out and warp on a shaft.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
G3.2.1 Know the definition of dilation and find the image of a figure under a given dilation.	x		Students understand how tires are dilated based on the centrifugal force of the spin. Students understand how temperature effects dilation of piston rings, valve stems, and valve clearance.	x	x	Students demonstrate proficiency in the lab setting.	Approximately 2 hours

S1.1.1 Construct and interpret dot plots, histograms, relative frequency histograms, bar graphs, basic control charts, and box plots with appropriate labels and scales; determine which kinds of plots are appropriate for different types of data; compare data sets and interpret differences based on graphs and summary statistics.	x		Students interpret bar graphs such as pulse widths, temperature relationship to battery performance, switch patterns.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 15 hours
S1.2.1 Calculate and interpret measures of center including: mean, median, and mode; explain uses, advantages and disadvantages of each measure given a particular set of data and its context.	x		Students calculate and interpret mean, median, and mode for miles per gallon on different cars.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 2 hours
*S3.1.4 Design simple experiments or investigations to collect data to answer questions of interest; interpret and present results.		x	When diagnosing automotive problems, students have to collect data, experiment with possible fixes, find solutions, and present results.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

ACT Standards							
Perform one-operation computation with whole numbers and decimals (Range 13 – 15)		x	The student add, subtract, multiply, and divide numbers to arrive at a comparison with the manufactures specification.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Solve problems in one or two steps using whole numbers (Range 13 – 15)		x	The student add, subtract, multiply, and divide numbers in multiple steps to compare results with the manufactures specification. Students determine the amount of change needed to adjust a component.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Perform common conversions (e.g., inches to feet or hours to minutes) (Range 13 – 15)		x	Students convert within systems and between systems when using length (inches to feet and inches to metric units), temperature (F to C), electrical (amps to watts), volume (liters to ft^3) etc.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Calculate the average of a list of positive whole numbers (Range 13 – 15)		x	Students determine the condition of an engine for an average of cylinders.		x	Students demonstrate proficiency and on a NATEF written assessment.	Approximately 2 hours

Recognize equivalent fractions and fractions in lowest terms (Range 13 – 15)		x	Students recognize equivalent fractions when they check tire conditions and size (tires are measured in 1/32"). Students need to put fractions in lowest terms for measurements.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Solve routine one-step arithmetic problems (using whole numbers, fractions, and decimals) such as single-step percent (Range 16 – 19)		x	Students solve routine one-step problems. Some examples include aspect ratio (height to width ratio), variance of percents, percents with gear ratios, etc.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 30 hours
Solve some routine two-step arithmetic problems (Range 16 – 19)		x	Students solve multi-step equations in various problems. For example, for compression ratios and with Ohm's Law. (First, they find total resistance through calculations and then they use that to determine the amperage.)	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Calculate the average of a list of numbers (Range 16 – 19)		x	Students determine the condition of an engine for an average of cylinders.		x	Students demonstrate proficiency and on a NATEF written assessment.	Approximately 2 hours

Read tables and graphs (Range 16 – 19)		x	Students use charts and tables all year. Some examples include: 1) Students interpret charts and tables to determine the manufactures specifications in a given system. 2) Students look at wavelength charts, pulse widths, plots of horsepower vs. power, and graphs of air flow.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Perform computations on data from tables and graphs (Range 16 – 19)		x	Students calculate btu's after reading information from tables and graphs.		x	Students demonstrate proficiency through a NATEF written assessment.	Approximately 3 hours
Identify a digit's place value (Range 16 – 19)		x	Students understand and read place value for oil clearances, for voltage measurements, and when measuring machining surfaces.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Locate points on the number line and in the first quadrant (Range 16 – 19)	x		Students locate measurements on gauges, dials and a torque wrench.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Exhibit some knowledge of the angles associated with parallel lines (Range 16 – 19)		x	Students identify angles associated with thrust angles and toe.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

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		1) Students figure tax added in billing procedures. 2) Students compare compression ratios with octane ratings to determine and anti-knock index. 3) Students use air/fuel ratios to determine ideal compliance.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Translate from one representation of data to another (e.g., a bar graph to a circle graph) (Range 20 – 23)		x	1) Students use data from a bar graph to incorporate information on compliance. 2) Students translated from a bar graph to a circle graph when doing wheel alignment.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Exhibit knowledge of simple counting techniques (Range 20 – 23)		x	Students determine the likelihood of brake pulsation based on the parallelism of the brake rotor or the out-of-roundness of a brake drum.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Exhibit knowledge of elementary number concepts including rounding, the ordering of decimals, pattern identification (Range 20 – 23)		x	1) Students perform rounding when doing calculations with Pi, when converting measurements, and when taking appropriate measurements for an applied situation. 2) Students do ordering of decimals when arranging bold sizes. 3) Students identify patterns when performing cylinder head tightening sequences and when performing tightening sequence of lug nuts.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Perform straightforward word-to-symbol translations (Range 20 – 23)		x	Students translate volt, amp, and resistance verbal descriptions into mathematics symbols and equations and solve.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into the 200 hours required for electrical
Exhibit knowledge of slope (Range 20 – 23)		x	Students correlate coefficient of static friction to cars sliding down a hill. Students look at what slope the vehicle will begin to slide.		x	Students demonstrate proficiency on an in-class activity.	One class period

Find the measure of an angle using properties of parallel lines (Range 20 – 23)		x	Students identify angles associated with thrust angles and toe.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Exhibit knowledge of basic angle properties and special sums of angle measures (e.g., 90°, 180°, and 360°) (Range 20 – 23)	x		Students calculate steering wheel ratios (using 360 degrees).	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 1 week
Solve multi-step arithmetic problems that involve planning or converting units of measure (e.g., feet per second to miles per hour) (Range 24 – 27)		x	1) Students convert inch-pounds to foot-pounds and vice-versa. 2) Students convert from psi to kpa and vice versa.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 2 hours
Manipulate data from tables and graphs (Range 24 – 27)		x	Students calculate Btu's after reading information from tables and graphs.		x	Students demonstrate proficiency through a NATEF written assessment.	Approximately 3 hours
Order fractions (Range 24 – 27)		x	Students recognize the order of fractions to determine the safety of a treat depth.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Solve word problems containing several rates, proportions, or percentages (Range 28 – 32)		x	1) Students figure tax added in billing procedures. 2) Students compare compression ratios with octane ratings to determine and anti-knock index. 3) Students use air/fuel ratios to determine ideal compliance.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Interpret and use information from figures, tables, and graphs (Range 28 – 32)		x	Students use charts and tables all year. Some examples include: 1) Students interpret charts and tables to determine the manufactures specifications in a given system. 2) Students look at wavelength charts, pulse widths, plots of horsepower vs. power, and graphs of air flow.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Use relationships involving area, perimeter, and volume of geometric figures to compute another measure (Range 28 – 32)	x		Students compare maximum volume of a cylinder to minimum volume of a cylinder to get a compression ratio.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 10 hours

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., comparing percentages or averages, using several ratios, and finding ratios in geometry settings) (Range 33 – 36)	x		Students read electrical diagrams, determine total resistance based on parallel and series circuits, and compute voltage or amperage.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into the 200 hours required for electrical
Analyze and draw conclusions based on information from figures, tables, and Graphs (Range 33 – 36)		x	Students use charts and tables all year. Some examples include: 1) Students can interpret charts and tables to determine the manufactures specifications in a given system. 2) Students look at wavelength charts, pulse widths, plots of horsepower vs. power, and graphs of air flow. 3) Students analyze and draw conclusions based on diagnostic flowcharts.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Solve problems integrating multiple algebraic and/or geometric concepts (Range 33 – 36)	x		Students read electrical diagrams, determine total resistance based on parallel and series circuits, and compute voltage or amperage.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into the 200 hours required for electrical
Draw conclusions based on a set of conditions (Range 33 – 36)		x	Students are given a series of conditions that describe problems with vehicle performance and students diagnose solutions.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Use relationships among angles, arcs, and distances in a circle (Range 33 – 36)	x		Students use included angles to determine the turning radius to avoid scrubbing.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Work Keys Standards							
Solve problems that require a single type of mathematics operation (addition, subtraction, multiplication, and division) using whole numbers (Level 3)		x	The student add, subtract, multiply, and divide numbers to arrive at a comparison with the manufactures specification.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Add or subtract negative numbers (Level 3)		x	Students add and subtract negative numbers when maintaining ranges for error tolerance.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Change numbers from one form to another using whole numbers, fractions, decimals, or percentages (Level 3)		x	Students change numbers from one form to another when doing measurements and conversions. Students convert from fractions to percents for engine performance.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Convert simple money and time units (e.g., hours to minutes) (Level 3)		x	Students convert money and time units for calculating labor rates.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Solve problems that require one or two operations (Level 4)		x	The student add, subtract, multiply, and divide numbers in multiple steps to compare results with the manufactures specification. Students determine the amount of change needed to adjust a component.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Calculate averages, simple ratios, simple proportions, or rates using whole numbers and decimals (Level 4)	x		Students do calculations with simple rates, ratios, and proportions when performing compression ratios, air-fuel ratios, and aspect ratio of tires.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Add commonly known fractions, decimals, or percentages (e.g., 1/2, .75, 25%) (Level 4)		x	1) Students add decimals when finding total toe reading. 2) Students add or subtract percentages when doing temperature compensations.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Multiply a mixed number by a whole number or decimal (Level 4)		x	Students multiply mixed numbers, whole numbers, and decimals when using Ohm's Law.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into the 200 hours required for electrical
Put the information in the right order before performing calculations (Level 4)		x	Students look at electrical diagrams and determining the correct process for calculating the total resistance of parallel and series circuits.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into the 200 hours required for electrical

Decide what information, calculations, or unit conversions to use to solve the problem (Level 5)		x	Students gathering information from tables or charts, perform necessary calculations including necessary conversations, and solve problems based on conditions.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Look up a formula and perform single-step conversions within or between systems of measurement (Level 5)		x	Students convert within systems and between systems when using length (inches to feet and inches to metric units), temperature (˚F to ˚C), electrical (amps to watts), volume (liters to ft^3) etc.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Find the best deal using one- and two-step calculations and then comparing results (Level 5)		x	Students find the best deal when performing a price quote based on individual aspects of the quote.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Use fractions, negative numbers, ratios, percentages, or mixed numbers (Level 6)	x		Students do calculations with simple rates, ratios, and proportions when performing compression ratios, air-fuel ratios, and aspect ratio of tires. Students use cranking power/temperature relationships to determine percentage of battery performance.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Use two formulas to change from one unit to another within the same system of measurement (Level 6)		x	Students convert inches to feet and feet to yards for reaction time and distance traveled.		x	Students demonstrate proficiency on in-class assignments.	Approximately 2 hours
Use two formulas to change from one unit in one system of measurement to a unit in another system of measurement (Level 6)		x	1) Students convert inch-pounds to foot-pounds and vice-versa. 2) Students convert from psi to kpa and vice versa.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 2 hours
Calculate multiple rates (Level 6)		x	Students do many different types of multiple ratio conversions such as conversions between miles per hour and kilometers per hour.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Convert between systems of measurement that involve fractions, mixed numbers, decimals, and/or percentages (Level 7)		x	Students do many different types of multiple ratio conversions such as conversions between miles per hour and kilometers per hour.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year
Calculate multiple areas and volumes of spheres, cylinders, or cones (Level 7)	x		Students calculate volumes of cylinders with compression ratios.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Incorporated into units at various aspects of the course throughout the school year

Set up and manipulate complex ratios or proportions (Level 7)		x	1) Students calculate and use gear ratio. 2) Students analyze exhaust gas emissions and compare ppm ratios to acceptable levels of environmental safety.	x	x	Students demonstrate proficiency in the lab setting, through a diagnostic, on a NATEF task, and on a NATEF written assessment.	Approximately 25 hours

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