

(CTE) MATHEMATICS IN AUTOMOTIVE

Math IV

Unit Pacing Guide

Rational and Purpose:

Professional math IV is provided to enhance mathematics in high school and provide students with the math skills necessary for the current job market and/or prepare students for college entry. Curriculum that is contained within Career Technology Education (CTE) provides enhanced mathematics instruction that makes mathematics more explicit in a meaningful context and helps reinforce students' mathematics understanding both in and out of context.

Guidelines:

All objectives must be mastered at or above a 70% efficiency level in order to receive 1 Math credit. The content/objectives to be completed in four (4) semesters are listed below in each trade specific program. Since each program contains differing content at various stages, an independent content/objective list will be constructed for each curriculum in every course. Once a designated semester worth of content/objectives (which are listed in the following table) are accomplished, .25 credits will be earned per semester for a total of 1 math credit at the end of 2 years. Failure to complete the required semester content/objectives may result in the student being removed from the Professional Math IV program.

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
Unit Title: (Pre-knowledge) Review of all mathematic objectives for mastery to be a success in the Welding program of study							
Core Concept: Addition and subtraction of whole numbers, multiplication and division of whole numbers, mathematical operation of addition and subtraction of decimal fractions, mathematical operation of multiplication and division of decimal fractions, addition and subtraction of fractions, multiplication and division of fractions, changing common fractions to decimal fractions, changing decimal fractions to common fractions.							
Addition and subtraction of whole numbers	1 st quarter 1 week	After completing this unit the Student will be able to calculate whole numbers through the mathematical processes of addition, subtraction,	MA1, G, 1.10 CLEs N-1B, N-1C, M-2D	Whole numbers Real numbers Natural numbers Numbers Addend, Sum Minuend Subtrahend Difference	Worksheets of addition and subtraction problems	Paper and pencil problems and software demonstrational activities	Test of at least 10 problems in each operation to demonstrate mastery

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Multiplication and division of whole numbers	1 st quarter 1 week	After completing this unit the Student will be able to calculate whole numbers through the mathematical processes of multiplication and division.	MA1, G, 1.10 CLEs N-1B, N-1C, M-2D	Whole numbers Real numbers Natural numbers Rational numbers, Multiplicand Multiplier Product factor, Quotient divisor, Dividend	Worksheets of multiplication and division problems	Paper and pencil problems and software demonstrational activities	Test of at least 10 problems in each operation to demonstrate mastery
Reducing proper and improper fractions	1 st quarter 1 week	After completing this unit the student will be able to add & subtract proper and improper fractions	MA1 G, 3.3, 3.4 CLEs N-1B, N-1C, N-2D, N-3E	Prime numbers Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction.	Test of at least 10 problems in each operation to demonstrate mastery
Add fractions With like denominators and reducing to lowest terms	1 st quarter 1 week	After completing this unit the student will be able to add rational numbers with like denominators and reduce them to lowest terms	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C, N-2D, N-3D,	Prime numbers Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Add fractions with unlike denominators	1 st quarter 1 week	After completing this unit the student will be able to add rational numbers with unlike denominators	MA 1, MA 5 G 3.3, 1.6, 3.4 CLEs N-1C, N-2D, N-3D, N-	Prime numbers Greatest common factor, Least common	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational	Test of at least 10 problems in each operation to demonstrate

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			3E	multiple, Rational expression, Numerator Denominator Reciprocal Equivalent		activities. Peer grouping for additional support and interaction	mastery
Add fractions With unlike denominators When neither is lowest common denominator	1 st quarter 1 week	After completing this unit the student will be able to add rational numbers with unlike denominators when neither is lowest.	MA 1, MA 5 G 3.3, 1.6, 1.10, 3.4 CLEs N-1B, N-1C, N-2D, N-3D, N-3E	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Add mixed numbers with like denominators	1 st quarter 1 week	After completing this unit the student will be able to add mixed numbers with like denominators.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C, N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Add mixed numbers with unlike denominators	1 st quarter 1 week	After completing this unit the student will be able to add mixed numbers with rational numbers when neither rational number has a common denominator.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C, N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery

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				Reciprocal Equivalent			
Subtracting fractions with like denominators	2nd quarter 1 week	After completing this unit the student will be able to subtract rational numbers with like denominators.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C,N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Subtracting fractions with unlike denominators	2 nd quarter 1 week	After completing this unit the student will be able to subtract rational numbers with unlike denominators.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C,N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Subtracting mixed numbers and reducing answers to lowest terms	2 nd quarter 1 week	After completing this unit the student will be able to subtract mixed numbers and reduce their answers to lowest terms.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C,N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Subtracting fractions when borrowing is	2 nd quarter 1 week	After completing this unit the student will be able to subtract rational numbers when borrowing is	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-	Prime numbers, Greatest common factor,	Hardcopy worksheets, video, internet and other	Paper and pencil problems and software	Test of at least 10 problems in each operation to

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necessary		necessary.	1C,N- 2D, N-3D,	Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	electronic sources	demonstrational activities. Peer grouping for additional support and interaction	demonstrate mastery
Multiplying fractions	2 nd quarter 1 week	After completing this unit the student will be able to multiply rational numbers.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C,N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Multiplying fractions and whole numbers	2 nd quarter 1 week	After completing this unit the student will be able to multiply rational numbers and whole numbers.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C,N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Dividing fractions	2 nd quarter 1 week	After completing this unit the student will be able to divide rational numbers.	MA 1, MA 5 G 1.6, 1.10, 3.4 CLEs N-1B, N-1C,N- 2D, N-3D,	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery

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				Denominator Reciprocal Equivalent			
Changing common fractions to decimal fractions and decimal fractions to common fractions	2 nd quarter 1 weeks	After completing this unit the student will be able to Change common fractions to decimal fractions and decimal fractions to common fractions.	MA 1, MA 5 G 3.3, 1.6, 1.10, 3.4 CLEs N-1B, N-1C, M-2D, M-3D, M-3E	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery
Addition, subtraction, multiplication and divisions of decimals to recognize and collect data from Tables and Charts and use this data to perform more advanced Calculations.	2 nd quarter 1 week	After completing this unit the student will be able to add, subtract, multiply and divide decimal fractions.	MA 1, MA 5 G 3.3, 1.6, 1.10, 3.4 CLEs N-1B, N-1C, M-2D, M-3D, M-3E	Prime numbers, Greatest common factor, Least common multiple, Rational expression, Numerator Denominator Reciprocal Equivalent	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer grouping for additional support and interaction	Test of at least 10 problems in each operation to demonstrate mastery

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<p>Unit Title: (Current Knowledge) Module # I Angles, Degrees, Adding and Subtracting angular measurements</p> <p>Core Concepts: Students will learn: How to use a protractor; Convert degrees into minutes and seconds; Estimate angle sizes; Add and Subtract angular measurements; Calculate diameter, radius, area, and circumference; How to figure arc length; The metric system; The value of integers; signed numbers; and absolute values.</p>							
<p>Comp. # 1</p> <p>To discover the principles of contextual angle measurements, adding and subtracting angles, and convert degrees into minutes and seconds</p>	3 rd quarter 2 weeks	After completing this unit the student will be able to interpret, evaluate and understand how different angles are measured, added and subtracted from each other, and be able to convert degrees into minutes and seconds.	MA 1, MA 2, MA 4, MA 5 G 1.6, 1.10, 4.8 CLEs N-3D, N-3E, G-1A, G 4B, M-1B, M-2Dc	Protractor Angles Degrees Minutes Seconds (Fractional Degree) Numerator Denominator Vertex Side (Center Mark)	Dividers/compass Protractors Rulers Meter sticks Yard sticks Drafting ruler Angle finder	Classroom demonstration of how to use various measuring devices Lecture on how to interpret angle measurements The students will be given written assignments to demonstrate their knowledge of how to measure angles and make angle measurement conversions.	Students will be asked to walk around the shop and identify numerous measurement devices used in the automotive industry. There will be a written test to demonstrate student's ability to measure accurately.
<p>Comp. # 2</p> <p>To analyze and investigate the theory of Geometry by learning how to calculate diameter, radius, area, arc length and</p>	3 rd quarter 1 week	After completing this unit the student will be able to apply formulas to find the circumference, area of a circle, arc length, and the volume of a cylinder. Calculate the diameter, radius, area, and circumference of tires and cylinders. Determine cylinder volume and total engine displacement.	MA 1, MA 2, MA 5, G-1.10, 3.4. CLEs G-1A, G-4A	Radius Diameter Circumference Pie Arc length Base Bore diameter Cubic Chain Sprocket Curve	Physical examples of a piston, cylinder and a sprocket. Compass Rulers Calculators. Pencils Paper	Classroom lecture Practice problems done in class Student participation of working problems in class with class discussion.	Test utilizing practical problems that demonstrates the student's knowledge of how to calculate Circumference, area, volume, and arc length.

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the circumference of a circle.				Cylinder Piston		Work sheets	
Comp. # 3 To study the metric system units of measure and be able to accomplish conversions between metric and standard English forms	3 rd quarter 2 weeks	After completing this unit the student will be able to convert standard English measurements to the International System of Units (metric) and metric measurements to standard English form and be able to identify and write the correct metric and English abbreviations.	MA-1, G-1.8, 1.10. CLEs N-1C, M-2D.	Metric System Units of Measure Joule (J) Pascal (Pa) Watt (W) Ampere (A) Liter (L) Meter (m) Gram (g) Mega (M) Kilo (k) Centi (c) Millimeter (mm) Micro (μ)	Worksheets which contain conversion problems. Chart of metric prefixes. Chart of metric units for the automotive trades. Metric conversion charts. Weights and measurement charts. Chart of Metric-Customary Equivalents	Short lecture using and explaining the metric system Review of how to find and calculate a conversion factor. Worksheets handed out for guided practice.	The students will be asked to measure several objects using a standard and metric measuring device to formulate their own conversion factor They will then be given a written test
Comp. # 4 To study integers, signed numbers and absolute values and apply this knowledge in reference to engine coolants and alignment adjustments.	3 rd quarter 2 weeks	After completing this unit the student will be able to calculate positive and negative whole numbers, fractions, and decimals. Understand the meaning of absolute values. Determine engine coolant temperature in Fahrenheit and Centigrade. Comprehend alignment adjustment values.	MA-1, MA-5. G-1.8, 1.10, G-3.4, G-2.3, G-2.7. CLEs N-1A, 1B, 3D.	Negative angle Positive angle Signed numbers Improper fractions Proper fractions Fahrenheit Centigrade Included angle Positive camber Steering axis of inclination Negative camber Toe angle Rod adjusting sleeves	A physical model of a replicated working front end of a car. Work sheets Front end alignment video. Front end alignment drawings	Short lecture. Mathematical problems to demonstrate a working knowledge of signed numbers.	Paper and pencil test to demonstrate mastery of Module # 1, Competency 4 objectives.

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<p>Unit Title: (Current Knowledge) Module # II Ratios, Proportions and Percentages</p> <p>Core Concepts: Students will investigate: The difference between ratios and rates and be able to simplify a ratio; Set up and solve proportions and know the difference between direct and indirect proportions; Convert decimals and fractions to percentages; Solve problems using percentages; Understand gears, fluids, and engine compression ratios; Calculate repair costs, interest, discounts, payments, business profit/loss, employee commissions, and tax.</p>							
<p>Comp. # 1</p> <p>To examine the difference between ratios and rates, solve associated problems, and simplify ratios.</p>	4 th quarter 2 weeks	After completing this unit the student will be able to simplify a ratio and explain the difference between a ratio and a rate.	MA-1, G-1.10. CLEs N-1B, 3D, 3E, A-4.A.	Ratio Fraction Simplify Percentage Decimal equivalent Decimal fraction Whole number Rate Lowest terms	Pencil Paper Physical models that represent pieces or parts of a whole	The students will give examples of ratios and proportions they use in their everyday life Hand out worksheets that demonstrate the use of ratios and proportions	Paper and pencil test to show mastery of how to simplify a ratio and set up two ratios as a proportion to solve for X.
<p>Comp. # 2</p> <p>The study of how to set up and solve proportions and define and calculate direct and indirect proportions</p>	4 th quarter 2 weeks	After completing this unit the student will be able to set up and solve proportions and be able to explain the difference between direct and indirect proportions.	MA-1, G-1.10. CLEs N-1B, 3D, 3E, A- 2C.	Proportions Direct Indirect Engine Speed Drive-axle speed Gears Meshed Diameter Pulleys	Real life gears and pulleys from an automobile Physical gears and pulleys from other kinds of equipment.	The instructor will set up two ratios, one on each side of an equal sign, to demonstrate a proportion to solve for X. Hand out worksheets that demonstrate the use of ratios and proportions	Paper and pencil quiz
<p>Comp. # 3</p> <p>To convert decimals and</p>	4 th quarter 2 weeks	After completing this unit the student will be able to understand ratios as they relate to fluids, gears and engine compression. The student will also	MA 1, MA 5 G 3.3, 1.6, 1.10, 3.4 CLEs N-1B, N-	Decimal fractions Ratios Revolutions per	Pulleys and Gears taken from various model vehicles	Short in class lecture In class math	The students will be asked to design a radiator and calculate a safe mixture for proper

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fractions to percents, solve problems using percents, and understand gear, fluid, and engine compression ratios		be able to convert decimals and fractions to percentages, convert percentages to fractions and decimals, and solve problems utilizing percentages.	1C, M-2D, M-3D, M-3E	minute Camshaft Ring gear Gears Messed Drive-shaft Axle Bottom dead center (BDC) Top dead center (TDC) Camshaft Crankshaft	Transmission and axle Piston and cylinder	problems illustrating fluid, gear and engine compression ratios, percent to decimal conversions, percent to fraction conversions, and IS/OF = % / 100 problems.	winterization Or Take an existing rear axle ratio and change it mathematically so it will get better gas mileage because of changes made Or Design a cylinder with its piston and calculate a compression ratio using Volume, (BDC) and (TDC) (Explain and prove your results in a presentation using visual aids such as Power Point)
Comp. # 4 To calculate repair costs, discounts, interest payments, profit/loss, commissions, and tax payments	4 th quarter 3 weeks	After completing this unit the student will be able to calculate repair costs, discounts, payment amounts, interest, business profit/loss, employee commissions, and tax payments	MA 1, MA 6, G- 1.8, 1.10, G-2.1, 2.3, G-3.4, 3.8, G-4.6. CLEs N-1B, N-3D, D-1C.	Discount Reduction Repair costs Profit / Loss Commission Tax Interest rate Income Profit margin Payments Principal Annually Compounding Accumulated amount	Appropriate interest and payment charts Compounding interest and other necessary formulas All necessary forms to fill out from auto-tech curriculum	Lecture concerning all mathematical skills needed to complete Module II, Comp # 4 objectives Fill out appropriate forms and worksheets in class Complete math problem worksheets	Paper and Pencil Test Complete a payment schedule

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<p>Unit Title: (Current Knowledge) Module # III Engine efficiency, engine systems, automobile electrical system, and chassis.</p> <p>Core Concepts: Student will be able to: Calculate the volume of a cylinder; Calculate engine valve timing and compression ratio; Utilize formulas for HP, torque, cubic inch displacement, air capacity, volume efficiency, fluid capacity and volumetric efficiency; Know the relationship between voltage, current and resistance using Ohm's Law; describe battery ratings, and determine proper wire sizes; The student will also determine transmission gear ratios, torque, force, and pressure.</p>							
<p>Comp. # 1</p> <p>To study the volume of a cylinder, engine specification, compression ratio, valve timing, intro to torque and horsepower</p>	5 th quarter 2 weeks	After completing this unit the student will be able to calculate the volume of a cylinder and engine compression ratio, make engine measurements and interoperate related specifications, determine engine valve timing, and become familiar with engine torque and horsepower.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C, M-2C, M-2D	Cylinder bore Engine compression ratio Valve timing Torque Horsepower Camshaft Crankshaft Out-of-round Taper-thrust side Valve stem	Graphs Charts Media examples Pictorial illustrations List of Formulas	Show media examples of moving engine parts Lecture showing how to use appropriate formulas Math worksheet problems	Written test over each specific math topic illustrated in Module #III, Comp # 1 1. Vol. of a cylinder 2. Engine Spec. 3. Comp. Ratio 4. Valve timing 5. Torque/ Horsepower
<p>Comp. # 2</p> <p>To study formulas for hp loss, torque, in³ displacement, theoretic air capacity, volume efficiency, engine fluid capacity and volumetric efficiency</p>	5 th quarter 2 weeks	After completing this unit the student will be able to determine engine fluid capacity, use formulas for volume efficiency, air capacity, cubic inch displacement, torque, and horsepower loss relative to elevation (.03) per 1000 ft., and calculate engine volumetric efficiency,	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C, M-2C, M-2D	Horsepower loss Torque Cubic-inch displacement Air capacity Volume efficiency Engine fluid capacity Volumetric efficiency	List of applicable formulas Calculator Worksheets with examples. Internet resources. Video supplements	Show video Lecture defining terminologies and explaining how to set up and use formulas. Worksheets demonstrating problems to be solved for guided practice for proficiency	Students will be given a test to measure competencies in reference to objectives

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<p>Comp. # 3</p> <p>To study the relationship between voltage, current and resistance utilizing Ohms law, describe battery ratings, and determine proper wire size as well as range and domain using an oscilloscope. Graph Theory</p>	5 th quarter 2 weeks	After completing this unit the student will be able to explain the difference between voltage, current, and resistance, use ohm's law to calculate voltage, current, and resistance, describe battery ratings, determine proper wire size and length according to current flow, and use circuit voltage drops to determine circuit resistance. The student will also understand the difference between range and domain utilizing graphs illustrated by the use of an oscilloscope.	MA-1, MA-2, MA-5. G-1.6, 3.3, 3.5. CLEs N-1A, 1C, 3D, 3E, M-2D, D-1C.	Volts Ohms Current Resistance Watts Gauge of wire Voltage drop Oscilloscope Range Domain Amplitude Time Wave patterns	Volt/Ohm meters Test circuits Worksheets Board examples Wire gauge chart	Introduce Ohm's power wheel Test a series and parallel circuit set up for the students with a volt/ohm meter Take measurements acquired from volt/ohm meter and apply Ohm's law to them to see if they are correct Assign worksheets	Students will be given a test that will demonstrate their knowledge of Ohm's Law Wire gauge size Voltage drops
<p>Comp. # 4</p> <p>To determine transmission gear ratios, torque, force and pressure, Describe the difference between speed and torque. Explain relationships between engine speed, transmission ratio, drive axle ratio, and tire diameter in reference to vehicle speed</p>	5 th quarter 3 weeks	After completing this unit the student will be able to determine total torque of an entire driveline, gear ratios of planetary gear sets, and transmission gear ratios for external gears. They will also be able to calculate torque, force, pressure, gear ratio, and know the difference between engine speed, transmission ratio drive axle ratio, and tire diameter in reference to vehicle speed.	MA-1, MA-2, MA-5, G- 1.8, 1-10, G-2.3, G-3.4. CLEs N-1B, 3D, 3E, G-1A, 4B, M-1B, 2D.	Transmission gear ratios Torque Force Pressure Speed Drive axel ratio Tire diameter Pound-feet Pound-inches	List of formulas Media examples of pistons, gears, Planetary gear, Clutch master cylinder, and more gear ratio examples Chart of gear ratios	The students will be exposed to media or paper pictures representing items for application of formulas The instructor will apply formulas to pictorial examples and show the students how to plug appropriate data from picture into formula Instructor and students will work together on hand outs	Students will be given a paper and pencil assessment to test for mastery of concepts concerning the automobile drive train

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<p>Unit Title: (Current Knowledge) Module # IV The automobile chassis, measurement equipment and tools, and repair orders.</p> <p>Core Concepts: The Student will be able to do all calculations in relation to an automobile chassis, read, use, and operate measurement tools such as digital and analog meters, and complete repair orders.</p>							
<p>Comp. # 1</p> <p>To study volume in a cylinder, determine hydraulic force, steering and suspension, brake operation & worn components, weight transfer, and alignment adjustment angles</p>	6 th quarter 2 weeks	After completing this unit the student will be able to read and understand alignment adjustment angles and all other aspects of steering and suspension, use brake specifications to determine serviceability of worn brake components, describe chassis dynamics of weight transfer, explain the hydraulic relationship between pressure, area, and force in the operation of brakes, and calculate the area and volume of a circle and cylinder to determine hydraulic force.	MA 1, MA 2, MA 5. G-1.8, 1.10, 2.3, 2.7, 3.4. CLEs N-1B, 3D, G-1A, 1B, 3C, 4B.	Cylinders Hydraulic force Angular relationships Alignment angles Weight transfer Brake specifications Piston Negative caster Positive caster True vertical Negative camber Positive camber Toe-in	Calculator Front end of a car exposed to see internal components Master cylinder Brake rotors and disks Micrometer	Class lecture Introduce the lesson by showing a shop example of an exposed steering and suspension take from an automobile Measure several worn brake rotors with micrometer to check for serviceability Paper and pencil Problems to work	Test containing problems similar to the ones worked in class.
<p>Comp. # 2</p> <p>Learn how to read digital meters, scale measurements, and analog meters</p>	6 th quarter 2 weeks	After completing this unit the student will be able to recognize and read digital and analog multimeters and use other measurement tools such as a ruler, test meters, dial indicators and micrometers.	MA1, MA 5. G-1.2, 1.4, 1.10, 2.7. \CLEs N-1A, 3-D, M-2D.	Analog meter Digital meter Unit symbols Scale measurement Parallax error Ohmmeter	Analog meter Digital meter Circuits to test Piston Rocker arm Valve Random measuring	Use an analog and digital multimeter to measure voltage, current, and resistance in a provided automotive circuit Measure provided lines and objects with rulers of	A test will be given that requires the students to make measurements on a provided circuit with their digital and analog meters and log the correct measurement on a

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					devices	differing scales	document provided The students will be given a test to measure an assortment of objects with variously scaled rulers and log these measurements in a table
<p>Comp. # 3</p> <p>Learn how to read dial indicators, micrometers, and identify proper thread sizes</p>	6 th quarter 2 weeks	After completing this unit the student will be able to use a dial indicator to measure movement and specification compliance, be able to read and use micrometers to determine specification compliances, and describe the various thread sizes.	MA-1, MA-6, G-1.8, 1.10, 2.7, 3.4, 4.6. CLEs N-1B, N-3D, M-2D, D-1C.	Shaft end play Gear back lash Brake disc run out Clockwise Counter clock wise Complete revolutions Millimeters Thousandths Hundredths Fractional sizes Decimal equivalents	<p>An assortment of dial indicators</p> <p>An assortment of inside and outside micrometers</p> <p>An assortment of charts that demonstrate numbers and letter sizes of drills with decimal equivalents</p>	<p>The students will be given a demonstration on how to use and read various dial indicators</p> <p>The same will be done using inside and outside micrometers</p> <p>The students will be given several objects that demonstrate various thread sizes and asked to identify the threads and their fraction and decimal equivalent sizes</p>	<p>An assessment will be given that requires the student to correctly interpret dial indicator measurements such as valve deflection, bearing endplay, crankshaft endplay and camshaft runout.</p> <p>An assessment will be given for student to determine the correct reading on an assortment of micrometer sleeve and thimbles</p> <p>A test will be given that requires students</p>

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
							to record the drill size of a given thread size.
<u>Comp. # 4</u> To complete repair orders	6 th quarter 3 weeks	After completing this unit the student will be able to apply addition and multiplication of decimals, apply percentages in a business scenario, complete a repair order, and determine labor/time cost, overhead, and profit/loss amounts.	MA 1, MA 6, G- 1.8, 1.10, G-2.1, 2.3, G-3.4, 3.8, G-4.6. CLEs N-1B, N-3D, D-1C.	Part no. Operation no. Accessories Total Tax Percentage rate Tenths of an hour Minutes/hour	Several examples of repair orders to fill out and the appropriate resources in which to extract information from to properly fill out order.	Program and Math instructors will help students fill out several repair orders on line and in hardcopy form.	Students will have to fill out a repair order on their own.

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
<p>Unit Title: (Post Knowledge) Higher education/career prep project</p>							
<p>Core Concept: To unite in a project with at least one other program to utilize mathematical concepts learned in previous mathematics curriculum to provide evidential proof of mastery.</p>							
<p>To conduct a project designed and prepared by a joint effort between Program Instructor and Math instructor to demonstrate mastery of previously learned competencies and to demonstrate mastery of applicable Concepts of mathematics.</p>	<p>4th Semester</p>	<p>After completing this unit the student will be able to unite with fellow students to complete a real world situational workplace endeavor or task.</p>	<p>MA 1, MA 2, MA 3, MA 4, MA 5. G 1.1, 1.2, 1.4, 1.8, 1.10, 2.1, 2.2, 2.3, 2.7, 3.1, 3.2, 3.3, 3.5, 3.6, 3.7, 3.8, 4.1, 4.4, 4.5, 4.6, 4.7. CLEs N-1B, N-1C, N-3D, N-3E, G-1A, G-1B, G-2A, G-4B, M- 2C, M-2D,</p>	<p>determine, compare agree, support, prove, influence, estimate, choose decide justify, appraise, interpret, build disprove, test, compile, invent, solve, perceive, influence, plan, conclude, defend, evaluate, predict, measure, rate, design, select prioritize explain, criteria, assess value deduct. construct, and theorize.</p>	<p>All material and resources available from the Cass Career Center</p>	<p>Project jointly agreed upon by trade specific instructor, CCC administration, and core resource teachers.</p>	<p>Assessment will be designed and designated at the beginning of each project.</p>