(CTE) MATHEMATICS IN COMPUTER AIDED DRAFTING
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	1st quarter 1 week	After completing this unit the Student will be able to calculate whole numbers through the mathematical processes of addition, subtraction,	MA1, Goals: 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	1st 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, Goals: 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	1st quarter 1 week	After completing this unit the student will be able to add & subtract proper and improper fractions	MA1 Goals: 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	1st 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 Goals: 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	1st quarter 1 week	After completing this unit the student will be able to add rational numbers with unlike denominators	MA 1, MA 5 Goals: G 3.3, 1.6, 3.4	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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			CLEs N-1C, N-2D, N-3D, N-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	1st 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 Goals: 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	1st quarter 1 week	After completing this unit the student will be able to add mixed numbers with like denominators.	MA 1, MA 5 Goals: 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	1st 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 Goals: 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

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
				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 Goals: 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	2nd quarter 1 week	After completing this unit the student will be able to subtract rational numbers with unlike denominators.	MA 1, MA 5 Goals: 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	2nd 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 Goals: 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	2nd quarter 1 week	After completing this unit the student will be able to subtract rational numbers when borrowing	MA 1, MA 5 Goals:	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		is necessary.	G 1.6, 1.10, 3.4 CLEs N-1B, N-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	2nd quarter 1 week	After completing this unit the student will be able to multiply rational numbers.	MA 1, MA 5 Goals: 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	2nd quarter 1 week	After completing this unit the student will be able to multiply rational numbers and whole numbers.	MA 1, MA 5 Goals: 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	2nd quarter 1 week	After completing this unit the student will be able to divide rational numbers.	MA 1, MA 5 Goals: G 1.6, 1.10, 3.4 CLEs N-1B, N-	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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			1C,N- 2D, N-3D,	Denominator Reciprocal Equivalent			
Changing common fractions to decimal fractions and decimal fractions to common fractions	2nd 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 Goals: 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.	2nd t quarter 1 week	After completing this unit the student will be able to add, subtract, multiply and divide decimal fractions.	MA 1, MA 5 Goals: 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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Unit Title: (Current Knowledge) Module # I Measurements, Conversions, Rotation of Angles, and Trigonometry Ratios of Acute and General Angles							
Core Concepts: Students will learn: How to accurately interpret different measurements using different scales and units of measure; Differentiate between standard English and Metric conversions; Assess different directions and rotations of angles in reference to the unit circle; and discover the relationships between acute and general angles.							
Comp. # 1 Be able to accurately interpret different units of measure using different scale measuring devices. (Architect Scale)	3rd quarter 2 weeks	After completing this unit the student will know all fraction and decimal incremental equivalents on an exploded view of an inch; understand and identify all ratios, scales, actual size, and smallest calibrations found on an architect rule; be able to measure with any of the 12 different scales on an architect rule :	MA 1, MA 2, MA 4, MA 5 Goals: G 1.6, 1.10, 2.7 CLEs N-3D, N-3E, G 4B, M-2Dc	Architect Rule Angles Degrees (Fractional Degree) Numerator Denominator Vertex Side (Center Mark) Unit Circle Units of Measure Smallest Calibration Ratios Scales	Dividers/compass Protractors Rulers Meter sticks Yard sticks Angle finder Architect Rule Elmo Projector	Classroom demonstration of how to use various measuring devices Lecture on how to interpret various scales and units of measure using an Elmo Zoom overhead projector The students will be given guided practice on how to complete a table of all ratios, scales, actual size, and smallest calibrations found on an architect rule. The students will complete an extensive assignment on scale interpretation and actual measuring practices	Students will be given a 50 question test involving the recognition of fraction to decimal conversions, decimal to fraction conversions, fill in ratios when given a scale, and fill in scale when given a ratio. There will be a written test on measuring and accuracy.

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Comp. # 2 Differentiate between Standard English and Metric conversions	3rd quarter 1 week	After completing this unit the student will be able to compare equivalent measurement units and conversions to interpret proper dimensioning.	MA 1, MA 2, MA 5 Goals: G-1.10, 1.7, 3.4. CLEs N-1C, M-2D	English system Metric system Equivalent Meter Decimeter Centimeter Millimeter Kilometer Feet Inches Yard	Access to an on-line computer source Paper and pencils Chart of metric conversions Worksheets which contain conversion problems Chart of Metric-Customary Equivalents	On-line conversion programs 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. # 3 Assess different types of angles and their measure of rotation. (Positive and Negative rotation/Terminal and Co terminal) Understand the relationship between deg/min/seconds	3rd quarter 2 weeks	After completing this unit the student will understand angles and angle measurements, know the difference between terminal and co terminal angles, and differentiate between degrees, minutes, and seconds.	MA-1, MA-2, MA-4 Goals: G-1.8 CLEs N-3E, G-1A, M-1B.	Trigonometry Angles Terminal Co terminal Rotation Unit Circle Standard-Position Quadrennial Radians Reference-Angles Degrees Minutes Seconds	Handouts of Trigonometry examples in reference to the unit circle and terminal/co terminal illustrations Software presentation of how angle direction change from positive to negative	Class will watch a video lesson about the unit circle and how terminal and co terminal angles change directions. Short class lecture with corresponding worksheet examples for guided practice	There will be a written test to check for comprehension concerning positive and negative angle direction as well as angle measurement in degrees, minutes, and seconds

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Comp. # 4 Apply concepts concerning the functions of acute and general angles (Trig ratios for 30, 45, and 60 degree angles)	3rd quarter 2 weeks	After completing this unit the student will be able to understand and use the concepts of trigonometric ratios to find the values of the six trigonometric functions for angles that measure 30, 45, and 60 degrees.	MA-1, MA-2, MA-5. 1.10 Goals: G-3.4, G-2.3, G-2.7. CLEs N-1B, N-3D, G-1A, G-4B, M-1B, M-2D	Functions Acute Angles Trigonometric-ratios Degrees Radians Reference-Triangles Sine Cosine Tangent Cosecant Secant Cotangent	Scientific Calculators Detailed Lesson Plan Work sheets CAD drawings	Short lecture Hand out worksheets for guided practice Examine a CAD drawing that provide examples of trigonometric ratios being used to find unknown measurements Assign math problems to check for understanding	Paper and pencil test to demonstrate mastery of trigonometric functions concerning common angles Provide a CAD drawing that has unknown line lengths to be found using trigonometric ratios

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Unit Title: (Current Knowledge) Module # II Right triangles, General triangles, Transversals, and Area of Triangles **Core Concepts:** Students will investigate: Right triangles using the functions sine, cosine, tangent, secant, cosecant, cotangent, and Pythagorean's theorem; The Law of Sines and Cosines to solve acute or obtuse triangles; general triangles SSS, SAS, ASA, AAS, and SSA; Problems of angle measure in reference to parallel lines cut by a transversal; and use appropriate formulas to calculate the area of a triangle.							
Comp. # 1 Be able to solve right triangles using the functions of sine, cosine, tangent, secant, cosecant, and cotangent in addition to using Pythagorean's theorem	4th quarter 2 weeks	After completing this unit the student will be able to make a distinction between the trigonometric ratios of sine, cosine, secant, cosecant, tangent and cotangent and know the proper application of each one and apply Pythagorean's theorem to any right triangle to find unknown sides and angles.	MA-1, MA-2, MA- 4, MA-5 Goals: G-1.6, G-1.8, G-1.10, G-3. 4. G-4.1 CLEs N-1B, N-3D, N-3E, A-1B, A-1C, G-1A, G-4B, and M-2D.	Ratio Proportions Hypotenuse Right triangle Sine Cosine Tangent Secant Cosecant Cotangent Pythagorean's theorem	Pencil Paper Scientific Calculator Blank table or Spreadsheet CAD drawings of non-right triangles	The class will analyze several different triangles ranging from 30 to 90 degrees and fill in a table of all ratios of sides. The class will then use a scientific calculator to find trigonometric ratios of all angles. The class will discover that the functions on the calculator are only ratios of the sides of a triangle. The class will then do problems using Pyth. Theor.	A test will be given to check for student's understanding of how to solve right triangles by hand and by using the trigonometric functions on a scientific calculator. Students will also be given a blueprint with unknown measurements to find and calculate and will solve several different measurement exercises using CAD drawings of non-right triangles
Comp. # 2 Be able to manipulate formulas such as the Law of Sines	4th quarter 2 weeks	Be able to construct any acute or obtuse angle and solve for unknown sides or angles with existing given information using the Law of Sines and the Law of cosines.	MA-1, MA-2, MA- 4 Goals: G-1.6, G-1.8, G-1.10,	Proportions Direct Indirect Law of Sines Law of Cosines Altitude	Pencil Paper Scientific Calculator	The student's will solve several triangles using the law of Sines and Cosines.	A test will be given to check for student's understanding of how to solve non-traditional

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
and Cosines to solve any triangle whether right, acute, or obtuse in addition to using Pythagorean's theorem			G-3. 4. G-4.1 CLEs N-1B, N-3D, N-3E, A-1B, A-1C, G-1A, G-4B	Acute Obtuse	CAD drawings of non-right triangles Poster board	The student's will then develop a real-life scenario using the law of Sines and cosines to solve for unknowns in their example. Presentation of their example	triangles by using the law of Sines and cosines by hand and students will also be given a blueprint with unknown measurements to find and calculate and will solve several different measurement exercises using CAD drawings of non-right triangles
Comp. # 3 Solving general triangles SSS, SAS, ASA, AAS, and SSA and problems of angle measure in reference to parallel lines cut by a transversal	4th quarter 2 weeks	After completing this unit the student will be able to solve for the unknown parts of a triangle by using the known parts of that same triangle using the SSS, SAS, ASA, and AAS postulates of congruence. The students will also learn that special relationships exist between pairs of angles formed when parallel lines are cut by a transversal. These concepts will be illustrated, proven, and drawn on one or more CAD drawings.	MA 1, MA 2, MA 5 Goals: G- 1.10, 2.3, 3.4, 4.1, 4.6. CLEs N-1B, N-3D, G-1A, G-4A, G-4B, M-2B, M-2D	Congruent Right triangle Correspondences SSS ASA SSA SAS Postulates Planes Lines Parallel lines Converses Transversal Acute Obtuse Alternate interior Alternate exterior Complementary Supplementary Corresponding	Compass Protractor Scientific-Calculator Illustrations on Worksheets Architect ruler Common-Triangles Paper/Pencil CAD drawings	Short in class lecture with illustrations drawn on the board In class math problems with worksheet illustrations The students will work individually and in pairs on CAD drawing that illustrate the use of these principal of analytical geometry	The students will be given a CAD drawing that requires a working knowledge of the SSS, SAS, ASA, and AAS postulates and the theory of transversals to complete. The students will be given a written test to check for mastery of all concepts reviewed in this lesson plan

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Comp. # 4 Be able to identify and use the appropriate formulas for calculating the areas of triangles. (Heron's Formula)	4th quarter 3 weeks	After completing this unit the student will be able to calculate the area of a triangle by using the formulas K=1/2 bh and herons formula of K= √s(s-a)(s-b)(s-c) were s is equal to ½ perimeter of the triangle.	MA 1, MA 2, MA 4. Goals: G- 1.8, 1.10, G-2.1, 2.3, G-3.4, 3.8, G-4.6. CLEs N-1B, N-3D, G-1B, G-4A, G-4B, G-2D, D-1C.	Area Equilateral Reference-triangle Semi perimeter Heron (Hero) Formula	Scientific-Calculator Poster Example of a possible business venture calculating lot size Flash cards of a business scenario Spread sheets for cost justification	Lecture entailing all knowledge needed to master comprehension of triangular area & Choose a private business venture to calculate all associated costs which will include purchasing a triangular lot. The surface area of the lot will have to be covered with such material as marble, sod, or tile.	Paper and Pencil Test to illustrate competency in finding the area of several different triangle figures. The students will be asked to draw an aerial view of their business on CAD and include all the measurements to their drawing

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& Unit Title: (Current Knowledge) Module # III Graphing trigonometric functions, calculating volumes in English and Metric units, understanding vectors, and studying the mechanics of gears and pulleys. Core Concepts: Student will be able to: Recognize trigonometric functions and graph them on a graphing calculator; Calculate volumes in English and Metric units; understand the principals of vectors; and calculate the various arrangements and uses of gears and pulleys.							
Comp. # 1 To interpret graphs of trigonometric functions	5th quarter 2 weeks	After completing this unit the student will be able to recognize trigonometric function, their basic position represented by Cartesian coordinates and graph the function on a graphing calculator. Solve vectors and how they relate to gears and pulleys	MA 1, MA 2, MA 4 Goal: G 1.10, 3.4, 3.6 CLEs N-1B, N-3D, N-3E, Alg-2B, Alg-3A, G-2A- G-4B	Radius Degrees Radians Trig-functions Scale Arcs Equivalencies Proportional Central-angles Periodic Symmetric Vectors Vector quantity Terminal point Directed line segment Initial point Magnitude Components	Graphing-calculator Geometer's-sketchpad Pencil and Paper Graph paper Handouts with graphic examples	Lecture illustrating the differing trigonometric function. Graph some trig-functions on graph paper Use graphing calculator to make graphs of different trig-functions Math worksheet problems	Written test demonstrating competency in recognizing the different trigonometric functions Written test to prove that each student can successfully graph a trigonometric function on a graphing calculator and once given a graph of a function the student will have to write the proper corresponding trigonometric function
Comp. # 2 To observe different shaped 3-D object and calculate their	5th quarter 2 weeks	After completing this unit the student will be able to observe 3-D objects and complex containers to calculate their volumes in English and Metric units	MA 1, MA 2, MA 5 G 1.10, 2.3, 3.4, 3.6	Volume English system Metric system Area Circumference Length	Many various size and shaped containers to represent various volumes	Review volume formulas for various geometric shapes and sized The students will	Students will be given a written test over volume and a container will be given to each one to

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volumes in English and Metric units			CLEs N-1B, N-3B, G-1B, G-4B G-3C, M-2C, M-2D	Width Height Depth Special Prisms Polygon Base Lateral faces Cylinder Cone Sphere	Several measuring devices List of formulas Worksheets with various volume problems to solve Scientific calculator Have students bring an odd shaped container from home	do some paper and pencil problems The students will be asked to measure containers they brought in and calculate the volume for each one using different measuring devices	measure and calculate the volume
Comp. # 3 To understand vectors and their components and use vectors to solve problems	5th quarter 2 weeks	After completing this unit the student will understand vectors and their components and be able solve problems that entail the use of vectors.	MA-1, MA-2, MA-4 Goals: G-1.7, 1.10, 2.1, 2.3, 3.5, 4.6 CLEs N-1B, 3D, 3E, G-2A, G- 4B, M-2B	Vector quantity Directed line-segment Initial point Terminal point Geometric vector Magnitude Norm Zero Vector Equivalent – vector Resultant Velocity vector Bearing Component-vector Projections	Chapter handout that explains vector operations, vectors in the rectangular coordinate system, and the properties of vectors Math Advantage Software Scientific graphic calculators	Short video showing the motion of vectors from Math Advantage software Lecture explaining chapter handouts and lesson plan Guided practice of solving problems. Real examples ill. Tension and compression	Written test to prove successful comprehension of vector concepts The students will present a real life application of using a vector with ropes, pulleys, and weights and then prove their findings mathematically

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Comp. # 4 To study the phenomenon of mechanics involving gears and pulleys	5th quarter 3 weeks	After completing this unit the student will be able to understand the phenomenon of mechanics involving gears and pulleys	MA-1, MA-2, MA-4, MA-5 Goals: G-1.4, 1.8, 1-10, G-2.3, 3.4, 4.1, 4.6, CLEs N-1B, 3D, 3E, G-1A, 1.B, 4.A, 4B, M-1B, 2D.	Torque Pulleys Gears Block Force Mass Velocity Gravitational-force Freebody-diagram Tension Compression Acceleration Pitch diameter Pitch circle Addendum Base Root Radial Dedendum Involute Throat diameter Face radius Bevel gear Central distance Spur gear Worm gear Gear ratio	Bock & Tackle Ropes Coma long List of Definitions and Formulas Working drawing of bevel gears Illustrations of CAMS and shafts Displacement diagrams with typical curves Disk CAM profile constructions CAD software CAM gear CAM shaft 3-D printer	The students will be given a ratio such as a (4:11 rear end to an automobile) and be asked to design a set of gears from this ratio and then make a drawing of their design on CAD with associated mathematic computations on drawing The students will design a pulley system with CAD software and print their drawings on a 3-D printer	The students will print their set of CAD drawn gears and transform their two dimensional drawing into three dimensional figures to demonstrate their drawing, of the gears, to be of the correct scale and workable. The students will print their three dimensional pulley system, add ropes and weights to each pulley, place scales on every rope going through every pulley, then check to see if their measured weights match their calculated weights. If they do not the students will identify errors and make corrections

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
Unit Title: (Current Knowledge) Module # IV Electrical theory, ergonomic design, load bearing capacity, and characteristics of the geometric circle **Core Concepts:** The Student will be able to Calculate volts, amps, watts, and ohms, create ergonomic designs such as cabinets and stairways, calculate load bearing capacity of beams and support systems, and understand the characteristics of a geometric circle.							
Comp. # 1 (Electrical Theory)– to calculate volts, amps, watts, and ohms as direct and indirect proportional units	6th quarter 2 weeks	After completing this unit the student will have a general understanding of where electrical energy originates and how such energy changes forms. The student will be able to recognize electrical symbols on a blueprint, calculate total voltage, current, ohms, and watts using an ohm's power wheel, review color codes, draw electrical symbols on a CAD drawing, calculate available current vs. maximum rating of current breaker source, compare total amperage used by devices, appliances, and air conditioning units to total available amperage of breaker box, use information of calculations to determine what size of entry cable to use, and estimate a dwelling's monthly utility bill by kilowatt usage.	MA 1, MA 5 Goals: G-1.10, 2.3, 2.7, 3.4, 3.8 CLEs N-1A, 1C, 3D, 3E, M-2D, D-1C	Volts Ohms Current Resistance Watts Gauge of wire Voltage drop Schematics Blueprints Kilowatts Ohm's Law Conductance Outlets Fixtures Switches	Calculator Worksheets Board examples Wire gauge chart Electrical CAD drawings and blueprints	Introduce the lesson by explaining how energy changes form from mineral (stored) energy, through a process of transformations until it becomes electrical energy. Class lecture explaining Ohm's law and how to do electrical calculations Work through some drawing that have numbers assigned to electrical voltages, current, and resistance and calculate unknowns	Written test containing problems similar to the ones worked in class Students will be asked to draw a detailed electrical diagram in CAD and calculate the size of their entry cable, breaker box, and estimate their monthly bill in kilowatts

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
Comp. # 2 Create ergonomic designs involving stairways and cabinets	6th quarter 2 weeks	After completing this unit the student will be able to Create a set of stairs so the rise and run will meet the International Residential Code (IRS) to accommodate a given set of conditions such as a basement floor to 1st level floor. The student will also be able to design an ergonomically accessible and/or usable set of cabinets for a person's specific stature with an ergonomic design within a feasible work triangle.	MA1, MA 2 Goals: G-1.2, 1.4, 1.7, 1.10, 2.4, 2.7, 3.2, 4.5, 4.7 CLEs N-1A, 3-D, A-1C, G-4A, 4B, M-2D	Tread Riser Step Headroom Layout Handrail Studs Elevation Ergonomics Human motion Rise Run Slope y-intercept $y = mx + b$	International Residential Stair Codes Auto CAD 2009 Architectural Drafting and Design Text	Instructor will do a demonstration of a wall structure and go from 1st floor to basement. Student will consult the (IRS) to consider and calculate all acceptable rise heights and tread lengths. A comparison will be made to make students aware of rise, run, slope and y-intercept Students will establish a median height for a family and design a cabinet layout to accommodate their physical attributes.	Students will take a paper and pencil test designed from information taught in the lesson. Students will draw a specified set of steps on CAD according to (IRS) Codes. Students will design and draw a cabinet according to specifications.
Comp. # 3 To calculate load bearing capacity of beams and support systems	6th quarter 2 weeks	After completing this unit the student will be able to calculate sizes of I beams, grades and spans to determine load capability.	MA-1, MA-2 Goals: G-1.7, 1.8, 1.10, 2.7, 3.4, 4.6 CLEs N-1B, N-3D, 3E, G-4A, 4B, M-2D	KIPS- 1000s of lbs Live loads Dead loads Span Joist Beams I Beams Wide flange	Text on Architecture residential drawing and design	The students will decide the most economical way to build a basement by comparing alternate configurations and calculating various arrangements of load bearing materials.	An assessment will be given that requires the student to compare values of different configurations of load bearing materials on a paper and pencil test.

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
Comp. # 4 To study the characteristics of geometric circles such as the centra, radius, diameter, circumference, sectors, segments, arcs, Tangents, chords, and secants	6th quarter 3 weeks	After completing this unit the student will be able to calculate the circumference of a circle by using the radius and pi, calculate the diameter of a circle using circumference and pi, calculate the area of a circle using πr^2, and be able to identify the difference between a sector, segment, or arc.	MA-1, MA-2, MA-5 Goals: G-1.6, 1.8, 1.10, 2.3, 3.5, 4.1, CLEs N-1B, 3D, 3E, G-1B, 4B, M-2D,	Circumference Pi Radius Diameter Chord Segment Arc Tangent Segment Centra	Compass Protractor Geometry worksheets demonstrating circles Scientific calculator	The students will be asked to draw several circles with a compass and measure the diameter and circumference of the circles and fill out a table with these measurements. They will then find a common ratio between the two known as pi. The students will then be given several examples in industry of circle measurements that are required to complete a job	The students will be given a written test to show competency in how to calculate circle measurements and will be asked to draw several sized circles in a practical drawing application according to specified instructions

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
Unit Title: (Post Knowledge) Higher education/career prep project **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.							
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.	4th Semester	After completing this unit the student will be able to unite with fellow students to complete a real world situational workplace endeavor or task.	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,	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.	All material and resources available from the Cass Career Center	Project jointly agreed upon by trade specific instructor, CCC administration, and core resource teachers.	Assessment will be designed and designated at the beginning of each project.