

(CTE) MATHEMATICS IN WELDING

Professional 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 Rational 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

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
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-3E	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	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
				denominator reciprocal equivalent		and interaction	
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 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 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	Hardcopy worksheets, video, internet and other electronic sources	Paper and pencil problems and software demonstrational activities. Peer	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
				expression numerator denominator reciprocal equivalent		grouping for additional support and interaction	
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 necessary	2 nd quarter 1 week	After completing this unit the student will be able to subtract rational numbers when borrowing is necessary.	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	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-	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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			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 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 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
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

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
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

Unit Title: (Current Knowledge) Module # I Direct measurement, tolerances, equivalent units of measure, perimeter interpretation and calculations concerning squares, rectangles, circles, and arcs.

Core Concept: Students will learn the skill of direct measure and how to interpret different increments on several measuring devices. Identify English and metric equivalent units of measure. Review and apply principles of combined operations with equivalent units. Define, analyze, and compare tolerance. Calculate the perimeter of squares and rectangles from graphical images and then model the results by welding steel.. Solve problems that identify the perimeter of such geometric shapes as circles, semicircles, and combined shapes.

Comp. # 1 To discover the principles of direct measuring instrumentation and learn how to interpret different increments on various measuring devices	3 rd quarter 2 weeks	After completing this unit the student will be able to interpret, evaluate and understand how different increments are used on several measuring devices	MA 1, MA 2, MA 5 G 1.10, 2.7, 4.8 CLEs M-2D, M-2E	Accuracy Resolution Precision Uncertainty Systematic error Random error Traceability Non-Linearity Error	Dividers/compass Protractors Rulers Meter sticks Yard sticks Drafting ruler Angle finder Speed square Feeler gauges Various thickness gauges	Classroom demonstration of how to use various measuring devices Students will measure several objects using different measuring devices	There will be a written test to demonstrate student's ability to measure accurately.
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<p>Comp. # 2</p> <p>To analyze and investigate the theory weld symbols and discover the practical use of tolerance</p>	3 rd quarter 1 week	After completing this unit the student will be able to interpret groove angles, angle of countersink, pitch, reference lines, number of spot or projection welds. The student will also be able to calculate +/- tolerances to allow for a fit-test.	MA 1, MA 2, G 1.10, 4.1 CLEs N-3E, M-2D	Groove angle Pitch Reference line Angle of Countersink Depth of preparation Weld size Length of weld Dimension Tolerance	Blueprint videos Handouts	Classroom lecture Practice problems done in class Student participation of working problems in class with class discussion. Work sheets	Test over tolerance calculations using pictorial illustrations of 3-dimensional steel objects. Test over fillet weld symbols that demonstrate fillet weld size and dimensioning
<p>To examine different equivalent relationships and discover how denominate numbers (which are numbers that that include units of measurement) can be different but represent the same amount 1ft/12in = 1 or 12in/1ft = 1</p>	3 rd quarter 2 weeks	After completing this unit the student will be able to understand how denominate numbers are defined and in what order they appear, are grouped, and can be used. How measurements can be equal but expressed in different terms. That the word Per can be used and expressed as a fraction bar such as 50 miles per hour.	MA 1, MA G 1.4, 3.3 CLEs N- 3D, N-3E	English length Metric length Equivalent units Denominate numbers Per/Division bar Numerator Denominator Foot yard inches millimeter centimeter decimeter meter decameters hectometer kilometers round stock I-beam plate stock	Equivalence charts and graphs Worksheets of problems demonstrating 3-D objects Examples of objects from the shop	In class lecture The students will be asked to measure several objects demonstrated in class using several different measuring tools with different units of measure. They will work problems on the board and in groups.	The students will be given a test with problems illustrating the use of equivalent units, English-Metric conversions, and combined operations with equivalent units.
<p>Comp. # 3</p> <p>To examine the perimeter around squares, triangles and</p>	3 rd quarter 2 weeks	After completing this unit the student will be able to calculate the perimeter on square, triangles and rectangular objects for application on steel welding projects.	MA 2 G 3.1, 3.3, 3.5 CLEs G- 1A, G-4A, G-4B, M 1B, M-2B	Square Rectangle Triangle Perimeter Hypotenuse Isosceles triangle	Worksheet encountering mathematical relationships of perimeter on squares, triangles,	Short lecture using cardboard models Students will measure the	The students will be asked to measure the perimeter of several objects displayed in the

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rectangles for the application of denominate numbers to make calculations on pictorially depicted steel objects				Polygon Area Pythagorean's Theorem Theory of similar triangles Equilateral triangle	and rectangles. Cardboard models of steel plates. Various steel objects used as examples	perimeter of several steel objects Worksheets handed out for guided practice.	shop. They will then be given a written test
Comp. # 4 To complete perimeter calculations using π , diameter, and circumference on such geometric figures as circles and semicircles and propose future objects that may be developed for potential Projects	3 rd quarter 2 weeks	After completing this unit the student will be able to calculate the circumference of a circle when only radius or diameter is known. Calculate the diameter and radius when only the circumference is known. Know What a semicircle is and calculate such an object's circumference. Make decisions on how such geometric shapes can be used for industrial applications. Calculate a semicircle-sided tank.	MA 2, MA 5 G 3.1, 3.4, 3.5 CLEs G-2A, G 4A, G-4B	Circle Radius Diameter Circumference Semicircle Pi $C = \pi D$ $C = 2 \pi r$ $P = \pi r + D$ $P = \pi D + 2l$ Compass	3-D model of a sphere cut in half to demonstrate radius, diameter, and circumference .Moving 3-D example from an internet source	Short lecture. Mathematical problems demonstrating 2-D and 3-D circular and semicircular objects.	Paper and pencil test to demonstrate mastery of the concept of radius, diameter and circumference. In reference to circles and semicircles.

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<p>Unit Title: (Current Knowledge) Module # II Angular measure using protractors and other measuring devices. Area in reference to squares, rectangles, triangles, trapezoids, and circles.</p> <p>Core Concept: Students will study circles and discover angular measure of circles and how the circle is divided into degrees, minutes, and seconds. The student will also find the area of a square by using the rule side x side = area expressed as square measurement.. They will review the principles of triangles and trapezoids and associate them with mathematical problems that represent real world situations and objects. They will also investigate and solve problems concerning the area of circular figures.</p>							
<p>Comp. # 1</p> <p>To create unit circles that are divided into degrees, minutes, and seconds to associate these denominate numbers to angular measurement then utilize measuring devices such as protractors to check for accuracy.</p>	4 th quarter 2 weeks	After completing this unit the student will be able to formulate angular measurements from circles which can be interpreted in terms of degrees, minutes, and seconds. The student will also know how to read a protractor and determine the angular bend or position of a surface area of one side of a steel or metal object. In reference to the base of the same object.	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	Unit Circle Angle\ Acute Obtuse Pipe flange Protractor Degree Minute Second Transversal Complementary Supplementary Corresponding Alternate interior Alternate exterior Vertex	Protractor Compass On-line examples Software that demonstrate the theory of trigonometry	The students will watch some interactive trigonometry software There will be a demonstration of Google Earth and how degrees, minutes, and seconds are used to find locations Worksheets of addition and subtraction of degrees, minutes, and seconds	Paper and pencil test to show mastery of understanding in the area of angles and their units of measure in degrees, minutes and seconds.
<p>Comp. # 2</p> <p>To find the surface area of squares and rectangles by using the rule side x side and express these measurements as square measurements</p>	4 th quarter 2 weeks	After completing this unit the student will be able to calculate the surface area of squares, and rectangles using the appropriate geometric formulas.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G4-B	Rectangle Square Polygon Face Surface area Standard units of measure	Perforated cardboard models of square and rectangular polygons sectioned off into square inches and square millimeters Square and rectangular	Short lecture The students will measure items in the room that correspond to the appropriate polygonal shape desired for the lesson. Worksheet of	Paper and pencil quiz calculating Surface area on problems patterned after real welding project scenarios

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and convert sq. inches to sq. millimeters and sq. millimeters into sq. inches					surface areas in the room such as floor, walls, and tables	problems reflecting welding practices	
Comp. # 3 To calculate the area of triangles and trapezoids by using such formulas as $A = \frac{1}{2}bh$, and $A = (B+b)/2 \times h$,	4 th quarter 2 weeks	After completing this unit the student will be able to demonstrate their ability to figure the correct surface area of triangles and trapezoids	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C, M-2B	Perimeter Area Square units Parallelogram Trapezoid Face Isosceles Equilateral Right Triangle Perpendicular	Perforated cardboard models of trapezoidal and triangular polygons sectioned off into square inches and square millimeters	Short in class lecture In class word problems associated with triangular and trapezoidal shapes	The students will be asked to choose a mock job scenario, out of a list that resembles a job they would like to perform and complete, which demonstrates their ability to calculate triangles and trapezoids.
Comp. # 4 To solve problems associated with the areas of circular figures and then apply these areas to squares and rectangles to compose multi area objects such as steel tanks, cylinders, and tubes.	4 th quarter 3 weeks	After completing this unit the student will be able to combine their knowledge of how to calculate the multiple kinds of surface areas and understand why this knowledge is necessary to complete assigned jobs and tasks in industry.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C.	Gaskets Seals Tanks Cylinders Scrap Strapping Flanges Flame-cut Wrought iron Beams Frames Structural Angle iron Truss Palate Tubing Bracket	Real world job illustrations from on-line sources Work sheets Projects of interest that student would be asked to bring in that would be interesting for them to plan and maybe one day build on their own.	The students will each be asked to come forward and present their project and explain what the project is, how they performed the correct necessary calculation for construction and why this project will work	A rubric will be designed to evaluate the student's attitude toward the presentation, knowledge of project, ability to successfully accomplish calculations, and each ones' explanation of why this project is of interest to him or her.

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<p>Unit Title: (Current Knowledge) Module # III Volume of multidimensional shapes</p> <p>Core Concept: The Student will build upon previous knowledge of volume to improve their understanding of volume in reference to shapes such as cylindrical, semicircular, rectangular, and complex containers. The Student will also analyze pictorial drawings and classify the measurement of mass (weight) as $W = \pi r^2 \times h \times w$, where w = weight concerning the unit of measure being used.</p>							
<p>Comp. # 1</p> <p>To review the principles of volume concerning rectangular and triangular containers and associate these principles to practical applications of steel plated containers. V in gallons = $L \times W \times H$ / cubic inches per gallon</p>	5 th quarter 2 weeks	After completing this unit the student will be able to successfully compute the volume of rectangular containers, convert cubic measurements from one unit to another, and apply these calculations to real world applications found on the job site.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C, M-2C	Hexahedron – 6-sided cube Volume Cubes Rectangular solids Cubic inches, feet, yard, millimeters, and centimeters. Cross-section Similar figures (figures of the same shape but not necessarily the same size.)	The students will be asked to bring in one 3-dimensional object of their choice. Worksheets containing volume problems	The students will complete several volume problems in class. The students will be asked to perform measurements calculation on their object they brought to class.	A 10 problem test that demonstrates the students' mastery of how to calculate volume in rectangular objects.
<p>Comp. # 2</p> <p>To analysis the volume of cylindrical solids using the formula $V = \pi r^2 \times h$ and to review denominate units of volume measure for solids. To</p>	5 th quarter 2 weeks	After completing this unit the student will be able to determine the volume of round and cylindrical shaped containers, apply the correct dominate units of value to the item, and successfully use the formula that illustrates the volume of a semicircular object.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C, M-2C, M-2D	Round Cylinder Tube Pipe Cross-section Diameter Circumference Dimension Gallons Liters Cubic inches Cubic feet	.Volume measurement conversion chart. Worksheets with examples. Internet resources. Video supplements	Several cylindrical objects such as tubes, pipes, and canisters will be brought to class Students will design a cylindrical object on geometer's sketchpad	Students will be given a test of several pictorially illustrated cylindrical volume problems to solve.

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study the volume of semicircular-sided objects which is the area of the base times the height calculated by $[(\pi \times r^2) + (l \times w)] \times (h) = \text{Volume}$						Online lecture and illustrations will be presented.	
Comp. # 3 To evaluate the principles of volume concerning cylindrical and complex containers such as manifolds and welded 2-piece elbows. To understand and be able to use tables of equivalent units of volume measure	5 th quarter 2 weeks	After completing this unit the student will be able to apply previous knowledge of how to calculate the volume of individual 3-D type geometric objects and combine the volumes to compos and determine the volume of complex containers such as manifolds, baffles, weir, and settling tanks.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C, M-2C, M-2D	Complex containers Cylinders Manifolds Weir tanks Settling tanks Volume Cubic measurements Equivalent units	Equivalent unit of measure chart. Worksheets with examples Internet resources. Video supplements Elbow and fitting chart Geometer's sketchpad Microsoft Word	The class will work 2 or 3 complex container volume problems together. Students will design and draw 3-D geometric figure and then do all calculations to figure the volume of their self designed project.	Students will be given a test to calculate the volume of 1 or 2 complex containers.
Comp. # 4 To understand Mass (weight) measurement when an object is pushed, pulled, or	5 th quarter 3 weeks	After completing this unit the student will understand that when an object is pushed, pulled, or lifted the mass or quantity of the object is being moved. When this same object is placed on a scale, the gravitational pull or weight of the object is being measured.	MA 1, MA 2, MA 5 G 1.10, 4.1 CLEs N-3D, N-3E, G 4B	Mass Weight Gravity Measure Cubic measure Quantity Gravitational pull	Charts that show equivalent units of measure in reference to weights concerning materials being used as example	Several objects will be supplied in class for the students to weigh and measure The students will then be asked to	Students will be given a paper and pencil assessment to test for mastery of concepts concerning mass, weight, and measurement

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lifted.				Grams Push, lifted, pulled	problems	calculate the same object using numbers taken from a chart. They will then compare the 2 findings.	

Unit Title: (Current Knowledge) Module # IV Stretch outs of square, rectangular, circular and semicircular shapes and economic layout of rectangular and odd shaped plates.

Core Concept The Student will determine and calculate the liner expansion of metal as the metal is stretched, rolled, or bent at various angles. They will also be able to estimate and justify the economic layout of different shaped and thicknesses of metal plates.

Comp. # 1 To evaluate and study the principles of stretch outs as related to square and rectangular shapes by (Bending Metal).	6 th quarter 2 weeks	After completing this unit the student will be able to use formulas such as $L = X + Y + \frac{1}{2} T$ Where $L = Z + W - \frac{1}{2} T$ L = length of material and T = thickness of the material. X = internal vertical side Y = internal horizontal side Z = external vertical side W = external horizontal side	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G4-B	90 degrees Perpendicular 45 degrees 90° minimum radius bend Penetration corner weld Inside dimensional surface bend Outside dimensional surface bend	Examples of metal plates that have been broke or bent on a steel break Example problems on worksheet packets	Short in class lecture Weld bend problems using formulas worked together in class	Test containing problems similar to the ones worked in class.
Comp. # 2 To determine a change of length exists in any given metal when creating stretch outs of circular and semicircular shapes.	6 th quarter 2 weeks	After completing this unit the student will be able to justify that when a cylinder or semicircular shape is stretched out, the length is equal to the circumference of the cylinder, or perimeter of the semicircular-sided shape, using the average of the inside and outside diameters.	MA 1, MA 5 G 1.10, 3.4, 3.6, CLEs N-1B, G-1B, G-4B G-3C.	Stretch-out Circular Semicircular Cylindrical Average diameter Pi O.D. outside diameter I.D. inside diameter	Example of a once cylindrical shape object after it has been rolled out flat. Example of a flat steel plate being fed through a roller. Work sheets	Demonstration of how metal is bent or (broke) on a steel break machine. Demonstration of how flat steel plates are run through a rolling machine. Problems worked together in class	Test over how to calculate changes in metal length do to stretching and bending.

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						both together and separately.	
<p>Comp. # 3</p> <p>To discover the most economical layout of steel plating through the process of calculating the economical layout of rectangular plates</p>	6 th quarter 2 weeks	After completing this unit the student will be able to determine the most economical layout of a steel plate, make a sketch, and figure necessary material needed for a specified job.	MA 1, MA 5 G 1.10, 2.3, 3.4, 3.5, 3.6, 3.8, CLEs N-2D, N-3D, N-3E, G-1B, G 3A, G4A, G4B.	Economic layout Rectangular plate Steel plate Sketch Waste Size of material Base plates Dimension of pieces Sheet size Max no. of pieces	One large piece of flat cardboard for each student or team of students Worksheet problems 11 ½" X 17" blank white paper Pencils Erasers	Each student will be given a certain size piece of cardboard, a problem to figure, and then will be asked to get as many specified pieces out of the original sized material with a minimum amount of waste. Other problems will be worked in class.	A project will be given to each student that requires him or her to find the most economical layout of a steel plate.
<p>Comp. # 4</p> <p>A. To calculate the economic layout of odd-shaped plates to establish the importance of accuracy while accomplishing measurements to insure cost effective practices B. Blueprint reading</p>	6 th quarter 3 weeks	<p>A. After completing this unit the student will be able to determine the most economical layout of odd-shaped plates.</p> <p>B. After completing this unit the student will be able to view a 3-D object and extract the measurements of each side of that object from the top-view, side-view, and end-view displayed on a drafted blueprint to formulate decisions and make conjectures to answer specified questions.</p>	MA 1, MA 5 G 1.10, 2.3, 3.4, 3.5, 3.6, 3.8, CLEs N-2D, N-3D, N-3E, G-1B, G 3A, G4A, G4B.	Circular Economic layout Steel plate Sketch Waste Size of material Base plates Dimension of pieces Sheet size Max no. of pieces Blueprint Title Block Orthographic views	One large piece of flat cardboard for each student or team of students Worksheet problems 11 ½" X 17" blank white paper Pencils Erasers \ Blueprints and Worksheet	A. Each student will be given a certain size piece of cardboard, a problem to figure, and then will be asked to get as many specified pieces out of the original sized material with a minimum amount of waste. Other problems will be worked in class. B. Blueprints will be given to the students with worksheets that	<p>A project will be given to each student that requires him or her to find the most economical layout of odd-shaped steel plates.</p> <p>There will be a Blueprint reading test given to each student that will demonstrate the student's ability to read and interpret information</p>

Competencies	Time Span (quarter/wks)	Course Objectives	Show-Me Standards and CLE Code	Vocabulary	Resources	Learning Activities & Instructional Strategies	Assessment
						ask specific questions in reference to these Blueprints.	displayed on a blueprint.
<p><u>Unit Title:</u> (Post Knowledge) Higher education/career prep project</p> <p><u>Core Concept:</u> 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>							
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.	4 th 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,	Award, determine, judge, compare agree, opinion, support, prove, influence, estimate, choose decide dispute, 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. maximize, adapt, 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.