CTESTAR™ Course Curriculum Cross-Walk by Task

Pathway
Engineering/Manufacturing and Industrial Technology

Course
Machine Trades Main

Instructor
Terry Morse

Number
267

Section
2

Host School
Bay-Arenac Career Center

Facility
BACC

JOB PLANNING AND MANAGEMENT
01.01 Job Process Planning

01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.	
	Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
	Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
	Geom.1.L4.3.1	Know the basic structure for the proof of an "If..., then..." statement (assuming the hypothesis and ending with the conclusion) and that proving the contrapositive is equivalent.
	Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.
	Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.
	Geom.3.G1.1.3	Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.
	Geom.3.G1.1.4	Given a line and a point, construct a line through the point that is parallel to the original line using straightedge and compass. Given a line and a point, construct a line through the point that is perpendicular to the original line. Justify the steps of the constructions.
	Geom.3.G1.1.5	Given a line segment in terms of its endpoints in the coordinate plane, determine its length and midpoint.
	Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.
	Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.
	Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
	Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30º- 60º- 90º triangles and 45º- 45º- 90º triangles.
	Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.
	Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.
	Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.

Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.
Geom.3.G1.4.1	Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.
Geom.3.G1.5.1	Know and use subdivision or circumscription methods to find areas of polygons (e.g., regular octagon, nonregular pentagon).
Geom.3.G1.5.2	Know, justify, and use formulas for the perimeter and area of a regular n-gon and formulas to find interior and exterior angles of a regular n-gon and their sums.
Geom.3.G1.6.1	Solve multistep problems involving circumference and area of circles.
Geom.3.G1.6.2	Solve problems and justify arguments about chords (e.g., if a line through the center of a circle is perpendicular to a chord, it bisects the chord) and lines tangent to circles (e.g., a line tangent to a circle is perpendicular to the radius drawn to the point of tangency).
Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.
Geom.3.G1.6.4	Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.
Geom.3.G2.1.1	Know and demonstrate the relationships between the area formula of a triangle, the area formula of a parallelogram, and the area formula of a trapezoid.
Geom.3.G2.1.2	Know and demonstrate the relationships between the area formulas of various quadrilaterals (e.g., explain how to find the area of a trapezoid based on the areas of parallelograms and triangles).
Geom.3.G2.1.3	Know and use the relationship between the volumes of pyramids and prisms (of equal base and height) and cones and cylinders (of equal base and height).
Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.
Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.
Geom.3.G2.3.4	Use theorems about similar triangles to solve problems with and without use of coordinates.
Geom.3.G3.1.1	Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.
Geom.3.G3.1.3	Find the image of a figure under the composition of two or more isometries and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.
Geom.3.G3.2.2	Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.
01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
Geom.1.L4.3.1	Know the basic structure for the proof of an "If..., then..." statement (assuming the hypothesis and ending with the conclusion) and that proving the contrapositive is equivalent.
Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.

Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.
Geom.3.G1.1.3	Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.
Geom.3.G1.1.4	Given a line and a point, construct a line through the point that is parallel to the original line using straightedge and compass. Given a line and a point, construct a line through the point that is perpendicular to the original line. Justify the steps of the constructions.
Geom.3.G1.1.5	Given a line segment in terms of its endpoints in the coordinate plane, determine its length and midpoint.
Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.
Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.
Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30º- 60º- 90º triangles and 45º- 45º- 90º triangles.
Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.
Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.
Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.
Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.
Geom.3.G1.4.1	Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.
Geom.3.G1.5.1	Know and use subdivision or circumscription methods to find areas of polygons (e.g., regular octagon, nonregular pentagon).
Geom.3.G1.5.2	Know, justify, and use formulas for the perimeter and area of a regular n-gon and formulas to find interior and exterior angles of a regular n-gon and their sums.
Geom.3.G1.6.1	Solve multistep problems involving circumference and area of circles.
Geom.3.G1.6.2	Solve problems and justify arguments about chords (e.g., if a line through the center of a circle is perpendicular to a chord, it bisects the chord) and lines tangent to circles (e.g., a line tangent to a circle is perpendicular to the radius drawn to the point of tangency).
Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.
Geom.3.G1.6.4	Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.
Geom.3.G1.8.1	Solve multistep problems involving surface area and volume of pyramids, prisms, cones, cylinders, hemispheres, and spheres.
Geom.3.G1.8.2	Identify symmetries of pyramids, prisms, cones, cylinders, hemispheres, and spheres.
Geom.3.G2.1.1	Know and demonstrate the relationships between the area formula of a triangle, the area formula of a parallelogram, and the area formula of a trapezoid.

	Geom.3.G2.1.2	Know and demonstrate the relationships between the area formulas of various quadrilaterals (e.g., explain how to find the area of a trapezoid based on the areas of parallelograms and triangles).
	Geom.3.G2.1.3	Know and use the relationship between the volumes of pyramids and prisms (of equal base and height) and cones and cylinders (of equal base and height).
	Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.
	Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.
	Geom.3.G2.3.4	Use theorems about similar triangles to solve problems with and without use of coordinates.
	Geom.3.G3.1.1	Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.
	Geom.3.G3.1.3	Find the image of a figure under the composition of two or more isometries and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.
	Geom.3.G3.2.2	Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.
01.01.03	Fill out an operation sheet detailing the process plan and required speeds and feeds.	
	Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
	Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.

JOB EXECUTION
02.01 Manual Operations: Benchwork

02.01.01	Using aluminum or mild steel, hand drill and hand tap holes.	
	Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
	Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
02.01.02	Use hand drills, hand taps, tap wrench, files, .	
	Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
	Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
02.01.03	Use arbor presses to perform press fits.	
	Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
	Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
02.01.04	Use bench vises and hand tools appropriately.	
02.01.05	Locates, understands, and interprets written technical and non-technical information for the purpose of finding the correct tools for the job.	

02.02 Manual Operations: Layout

02.02.01	Layout the location of hole centers and surfaces within an accuracy of +/-.015.	

Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).	
Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.	
Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.	
Geom.3.G1.5.1	Know and use subdivision or circumscription methods to find areas of polygons (e.g., regular octagon, nonregular pentagon).	
Geom.3.G1.5.2	Know, justify, and use formulas for the perimeter and area of a regular n-gon and formulas to find interior and exterior angles of a regular n-gon and their sums.	
Geom.3.G1.6.1	Solve multistep problems involving circumference and area of circles.	
Geom.3.G1.6.2	Solve problems and justify arguments about chords (e.g., if a line through the center of a circle is perpendicular to a chord, it bisects the chord) and lines tangent to circles (e.g., a line tangent to a circle is perpendicular to the radius drawn to the point of tangency).	
Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.	
Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.	
Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.	
Geom.3.G3.1.1	Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.	
Geom.3.G3.1.3	Find the image of a figure under the composition of two or more isometries and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.	
Geom.3.G3.2.2	Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.	
02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015	
Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).	
Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.	
Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.	
Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.	
Geom.3.G1.1.3	Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.	
Geom.3.G1.1.4	Given a line and a point, construct a line through the point that is parallel to the original line using straightedge and compass. Given a line and a point, construct a line through the point that is perpendicular to the original line. Justify the steps of the constructions.	
Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.	
Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.	

Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30º- 60º- 90º triangles and 45º- 45º- 90º triangles.
Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.
Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.
Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.
Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.
Geom.3.G1.5.1	Know and use subdivision or circumscription methods to find areas of polygons (e.g., regular octagon, nonregular pentagon).
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Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.
Geom.3.G2.1.1	Know and demonstrate the relationships between the area formula of a triangle, the area formula of a parallelogram, and the area formula of a trapezoid.
Geom.3.G2.1.2	Know and demonstrate the relationships between the area formulas of various quadrilaterals (e.g., explain how to find the area of a trapezoid based on the areas of parallelograms and triangles).
Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.
Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.
Geom.3.G3.1.1	Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.
Geom.3.G3.1.3	Find the image of a figure under the composition of two or more isometries and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.
Geom.3.G3.2.2	Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.
02.02.03	Locates, understands, and interprets written technical and non-technical information for the purpose of constructing lines, arcs, angles...

02.03 Turning Operations: Between Centers Turning

02.03.01	Setup and carry out between centers turning operations for ALL turning.
Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.

Geom.1.L4.3.1	Know the basic structure for the proof of an "If..., then..." statement (assuming the hypothesis and ending with the conclusion) and that proving the contrapositive is equivalent.	
Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.	
Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.	
Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.	
Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.	
Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.	
Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30°- 60°- 90° triangles and 45°- 45°- 90° triangles.	
Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.	
Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.	
Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.	
Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.	
Geom.3.G1.4.1	Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.	
Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.	
Geom.3.G1.6.4	Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.	
Geom.3.G1.8.1	Solve multistep problems involving surface area and volume of pyramids, prisms, cones, cylinders, hemispheres, and spheres.	
Geom.3.G1.8.2	Identify symmetries of pyramids, prisms, cones, cylinders, hemispheres, and spheres.	
Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.	
Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.	
Geom.3.G2.3.4	Use theorems about similar triangles to solve problems with and without use of coordinates.	
02.03.02	Clean and lubricate machine.	
02.03.03	Align tail stock using test bar and indicator.	
02.03.04	Cut diameters to specifications using power feed.	
02.03.05	Square shoulders using parting tools to specifications.	
02.03.06	Cut under cuts to specifications using proper tools.	
02.03.07	Cut threads to specifications using single point tools.	
02.03.08	Cut tapers using taper attachment.	
02.03.09	Cut taper using tails stock off-set method.	
02.03.10	Machine knurl	
02.03.11	Perform lathe filing.	

02.03.12	Polish surface finish to specifications using emery cloth.
02.03.13	Locates, understands, and interprets written technical and non-technical information to carry out the various operations performed during turning, threading...

02.04 Turning Operations: Chucking

02.04.01	Setup and carry out chucking operations for turning.

Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
Geom.1.L4.3.1	Know the basic structure for the proof of an "If..., then..." statement (assuming the hypothesis and ending with the conclusion) and that proving the contrapositive is equivalent.
Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.
Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.
Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.
Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.
Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30º- 60º- 90º triangles and 45º- 45º- 90º triangles.
Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.
Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.
Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.
Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.
Geom.3.G1.4.1	Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.

02.04.02	Properly install chucking devise.
02.04.03	Properly mount work piece in chuck.
02.04.04	Perform face cuts.
02.04.05	Demonstrate difference between qualifing cut and clean-up cuts.
02.04.06	Turn diameters to specifications.
02.04.07	Turn shoulders at right angles.
02.04.08	Turn shoulders at angles other than 90 degrees.
02.04.09	Turn shoulders leaving radius in corner.
02.04.10	Part under cuts to print specifications.
02.04.11	Center drill, drill, ream and tap.
02.04.12	Cut threads to specifications using single point tool .
02.04.13	Machine knurls to specifications.
02.04.14	Machine tapers using compound slide.
02.04.15	Machine tapers using taper attachment.

02.04.16	Bore hole to specifications.
02.04.17	Cut internal under-cuts to specifications.
02.04.18	Cut internal threads to specifications using single point tools.
02.04.19	Mount work in collet chuck.
02.04.20	Mount work in four jaw chuck. Indicat to within .001 run out.
02.04.21	Mount work using face plate.
02.04.22	123
02.04.23	Locates, understands, and interprets written technical and non-technical information to perform various turning, threading, boring... operations.

02.05 Milling: Square Up a Block

02.05.01	Set up and perform squaring up the six surfaces of a block to within +/-.002 and .002 over 4.5" squareness.

02.06 Vertical Milling

02.06.01	Setup and operate vertical milling machines.	
	Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
	Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
	Geom.1.L4.3.1	Know the basic structure for the proof of an "If..., then..." statement (assuming the hypothesis and ending with the conclusion) and that proving the contrapositive is equivalent.
	Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.
	Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.
	Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.
	Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.
	Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
	Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30º- 60º- 90º triangles and 45º- 45º- 90º triangles.
	Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.
	Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.
	Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.
	Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.
	Geom.3.G1.4.1	Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.
	Geom.3.G1.6.1	Solve multistep problems involving circumference and area of circles.
	Geom.3.G1.6.2	Solve problems and justify arguments about chords (e.g., if a line through the center of a circle is perpendicular to a chord, it bisects the chord) and lines tangent to circles (e.g., a line tangent to a circle is perpendicular to the radius drawn to the point of tangency).

	Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.
	Geom.3.G1.6.4	Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.
	Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.
	Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.
	Geom.3.G2.3.1	Prove that triangles are congruent using the SSS, SAS, ASA, and AAS criteria and that right triangles are congruent using the hypotenuse-leg criterion.
	Geom.3.G2.3.3	Prove that triangles are similar by using SSS, SAS, and AA conditions for similarity.
	Geom.3.G2.3.5	Know and apply the theorem stating that the effect of a scale factor of k relating one two-dimensional figure to another or one three-dimensional figure to another, on the length, area, and volume of the figures is to multiply each by k, k^2, and k^3, respectively.
	Geom.3.G3.1.1	Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.
	Geom.3.G3.1.3	Find the image of a figure under the composition of two or more isometries and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.
	Geom.3.G3.2.2	Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.
02.06.02	Perform routine milling, and location of hole centers within +/-.005".	
02.06.03	Clean, lubricate and adjust milling machine.	
02.06.04	Mount and align work holding devise.	
02.06.05	Mount work piece to table using proper clamping devises.	
02.06.06	Align mill head to table with in .002 TIR over 8 inch swing arm.	
02.06.07	Aling milling maching work holding attachment using test indicator.	
02.06.08	Align milling machine fixture using test indicator.	
02.06.09	Machine steps to specifications.	
02.06.10	Machine key seats and slots to specifications.	
02.06.11	Machine angluar surfaces to specifications using sine bar or angle paralles.	
02.06.12	Locates, understands, and interprets written technical and non-technical information to perform various milling operations.	

02.07 Surface Grinding, Grinding Wheel Safety

02.07.01	Ring test grinding wheels, perform visual safety inspection, mount and dress a grinding wheel in preparation for surface grinding.

02.08 Surface Grinding, Horizontal Spindle, Reciprocating Table

02.08.01	Setup and operate manual surface grinders with an 8" and smaller diameter wheel.
02.08.02	Perform routine surface grinding, location of surfaces, and squaring of surfaces.
02.08.03	Perform wheel dressing.
02.08.04	Locates, understands, and interprets written technical and non-technical information to perform various grinding operations.

02.09 Drill Press

02.09.01	Setup and operate drill presses.
02.09.02	Perform routine drill press operations.
02.09.03	Clean and lubricate drill press
02.09.04	Counter bore hole to specific depth.
02.09.05	Counter sink hole to specific depth.
02.09.06	Drill hole to specific depth and diameter.
02.09.07	Drill hole using automatic feed.
02.09.08	Drill work piece with drill jigs.
02.09.09	Mount work in V-blocks
02.09.10	Ream hole to size.

02.09.11	Spot face to specifications.
02.09.12	Tap hole with tapping attachment
02.09.13	Locates, understands, and interprets written technical and non-technical information to perform various drilling operations.

02.10 CNC Programming

02.10.01	Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.1.L2.1.6	Recognize when exact answers aren't always possible or practical. Use appropriate algorithms to approximate solutions to equations (e.g., to approximate square roots).
Geom.1.L3.1.1	Convert units of measurement within and between systems; explain how arithmetic operations on measurements affect units, and carry units through calculations correctly.
Geom.1.L4.3.1	Know the basic structure for the proof of an "If..., then..." statement (assuming the hypothesis and ending with the conclusion) and that proving the contrapositive is equivalent.
Geom.3.G1.1.1	Solve multistep problems and construct proofs involving vertical angles, linear pairs of angles, supplementary angles, complementary angles, and right angles.
Geom.3.G1.1.2	Solve multistep problems and construct proofs involving corresponding angles, alternate interior angles, alternate exterior angles, and same-side (consecutive) interior angles.
Geom.3.G1.1.3	Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.
Geom.3.G1.1.4	Given a line and a point, construct a line through the point that is parallel to the original line using straightedge and compass. Given a line and a point, construct a line through the point that is perpendicular to the original line. Justify the steps of the constructions.
Geom.3.G1.1.5	Given a line segment in terms of its endpoints in the coordinate plane, determine its length and midpoint.
Geom.3.G1.2.1	Prove that the angle sum of a triangle is 180° and that an exterior angle of a triangle is the sum of the two remote interior angles.
Geom.3.G1.2.2	Construct and justify arguments and solve multistep problems involving angle measure, side length, perimeter, and area of all types of triangles.
Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
Geom.3.G1.2.4	Prove and use the relationships among the side lengths and the angles of 30°- 60°- 90° triangles and 45°- 45°- 90° triangles.
Geom.3.G1.2.5	Solve multistep problems and construct proofs about the properties of medians, altitudes perpendicular bisectors to the sides of a triangle, and the angle bisectors of a triangle. Using a straightedge and compass, construct these lines.
Geom.3.G1.3.1	Define the sine, cosine, and tangent of acute angles in a right triangle as ratios of sides. Solve problems about angles, side lengths, or areas using trigonometric ratios in right triangles.
Geom.3.G1.3.2	Know and use the Law of Sines and the Law of Cosines and use them to solve problems. Find the area of a triangle with sides a and b and included angle ? using the formula Area = (1/2) a b sin?.
Geom.3.G1.3.3	Determine the exact values of sine, cosine, and tangent for 0°, 30°, 45°, 60°, and their integer multiples and apply in various contexts.
Geom.3.G1.4.1	Solve multistep problems and construct proofs involving angle measure, side length, diagonal length, perimeter, and area of squares, rectangles, parallelograms, kites, and trapezoids.
Geom.3.G1.5.2	Know, justify, and use formulas for the perimeter and area of a regular n-gon and formulas to find interior and exterior angles of a regular n-gon and their sums.
Geom.3.G1.6.1	Solve multistep problems involving circumference and area of circles.

Geom.3.G1.6.2	Solve problems and justify arguments about chords (e.g., if a line through the center of a circle is perpendicular to a chord, it bisects the chord) and lines tangent to circles (e.g., a line tangent to a circle is perpendicular to the radius drawn to the point of tangency).
Geom.3.G1.6.3	Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.
Geom.3.G1.6.4	Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.
Geom.3.G1.8.1	Solve multistep problems involving surface area and volume of pyramids, prisms, cones, cylinders, hemispheres, and spheres.
Geom.3.G2.2.1	Identify or sketch a possible three-dimensional figure, given two-dimensional views (e.g., nets, multiple views). Create a two-dimensional representation of a three-dimensional figure.
Geom.3.G2.2.2	Identify or sketch cross sections of three-dimensional figures. Identify or sketch solids formed by revolving two-dimensional figures around lines.
Geom.3.G2.3.1	Prove that triangles are congruent using the SSS, SAS, ASA, and AAS criteria and that right triangles are congruent using the hypotenuse-leg criterion.
Geom.3.G2.3.2	Use theorems about congruent triangles to prove additional theorems and solve problems, with and without use of coordinates.
Geom.3.G2.3.3	Prove that triangles are similar by using SSS, SAS, and AA conditions for similarity.
Geom.3.G2.3.4	Use theorems about similar triangles to solve problems with and without use of coordinates.
Geom.3.G2.3.5	Know and apply the theorem stating that the effect of a scale factor of k relating one two-dimensional figure to another or one three-dimensional figure to another, on the length, area, and volume of the figures is to multiply each by k, k^2, and k^3, respectively.
Geom.3.G3.1.1	Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.
Geom.3.G3.1.3	Find the image of a figure under the composition of two or more isometries and determine whether the resulting figure is a reflection, rotation, translation, or glide reflection image of the original figure.
Geom.3.G3.2.2	Given two figures that are images of each other under some dilation, identify the center and magnitude of the dilation.
02.10.02	Use G code and M function to create tool path.
02.10.03	Make Tool Off Sets and Work Coordinate Set to locate part.
02.10.04	Use off line software to create programs. Load program to machine control using transfer devise.(3.5 floppy)
02.10.05	Load program directly to control using DNC.
02.10.06	Make revisions to program and save back to floppy or computer.
02.10.07	Locates, understands, and interprets written technical and non-technical information to write programs for a tool path.

QUALITY CONTROL AND INSPECTION
03.01 Part Inspection

03.01.01	Develop an inspection plan and inspect simple parts using precision tools and techniques.
03.01.02	Prepare reports on the compliance of the parts.

03.02 Process Control

03.02.01	Follow a sampling plan.
03.02.02	Inspect the samples for the required data.
03.02.03	Enter the data on appropriate charts.
03.02.04	Graph the data.
03.02.05	Respond to the warning conditions indicated by the process charts.

PROCESS ADJUSTMENT AND IMPROVEMENT
04.01 Process Adjustment-Single Part Production

04.01.01 Analyze the performance of a single-part production process.
04.01.02 Formulate process adjustments or improvements where appropriate.
04.01.03 Where appropriate, notify supervision of the proposed adjustment and/or improvement.
04.01.04 Where authorized, carry out the strategies for process adjustment and/or improvement.

04.02 Participation in Process Improvement
04.02.01 As a member of a process team, analyze the performance of a production process.
04.02.02 With the team formulate process adjustments or improvements where appropriate.
04.02.03 Where appropriate, notify supervision of the proposed adjustments and/or improvement.
04.02.04 Where authorized, carry out the strategies for process adjustment and/or improvement.

GENERAL MAINTENANCE
05.01 General Housekeeping and Maintenance
05.01.01 Keep the duty station clean and safe for work.
05.01.02 Keep the tools, workbenches, and manual equipment clean, maintained, and safe for work.

05.02 Preventive Maintenance, Machine Tools
05.02.01 Inspect and assess the general condition of an assigned machine tool.
05.02.02 Make routine adjustments as necessary and as authorized.
05.02.03 Report problems to supervision which are beyond the scope of authority.
05.02.04 Carry out daily, weekly, and/ or monthly routine upkeep chores cited on checklists for a
given machine tool.
05.02.05 Use maintaince chart to inspect and report condition of machine.
05.02.06 Develope a maintance plan for each machine type.

05.03 Tooling Maintenance
05.03.01 Inspect and assess the condition of tooling.
05.03.02 Refurbish tooling where appropriate. (drills, lathe and mill cutters)
05.03.03 Refer tooling for repair or regrind where appropriate.

INDUSTRIAL SAFETY AND ENVIRONMENTAL PROTECTION
06.01 Machine Operations and Material Handling
06.01.01 Carry out assigned responsibilities while adhering to safe practices in accordance with OSHA
requirements and guidelines.
06.01.02 Document safety activities as required.

06.02 Hazardous Materials Handling and Storage
06.02.01 Handle and store hazardous materials as assigned while adhering to safe practices in
accordance with OSHA and EPA requirements and guidelines.
06.02.02 Document safety activities as required.

CAREER MANAGEMENT AND EMPLOYMENT RELATIONS
07.01 Career Planning
07.01.01 Develop and explain a short-term career plan and resume.
07.01.02 Create and present information related to Occupations in manufacturing including skill
levels, salery levels, local opportunities for employment, benefits and drawbacks for type of
employment.

07.02 Job Application and Interviewing
07.02.01 Complete job application form and demonstrate interviewing skills.

07.03 Teamwork and Interpersonal Relations
07.03.01 Demonstrate appropriate interpersonal skills in job performance evaluations, group
communication and decision-making, and conflict resolution.

07.04 Organizational Structures and Work Relations
07.04.01 Identify and explain the major departments or functions in a metalworking company and how
they affect production units.

07.05 Employment Relations
07.05.01 Understand and explain employment rights and responsibilities in metalworking companies.

WRITTEN AND ORAL COMMUNICATION
08.01 Reading

| 08.01.01 | Locates, understands, and interprets written technical and non-technical information in documents commonly found in the metalworking industry. These documents contain short and simple sentences, paragraphs and passages, phrases, quantitative informatio |

08.02 Writing

| 08.02.01 | Communicates technical and non-technical information, messages, and ideas in writing using standard English commonly found in the metalworking industry. This writing includes the completion of forms, information sheets, reports, group meeting materials |
| 08.02.02 | Write a detailed report on how to set up and operate a piece of equipment. |

08.03 Speaking

08.03.01	Communicates technical and non-technical detailed information, messages, multi-step directions and ideas through oral communication using standard English and related cues and communication aids in conversations, discussions, and group meetings.
08.03.02	Understands and responds to listener feedback and asks questions when needed in two-way and group conversations.
08.03.03	Demonstrate ability to communicate with other professionals using telephone etiquette.(order materials for class)

08.04 Listening

| 08.04.01 | Listens for, receives, interprets, and recalls specific details, ideas, and multi-step instructions in verbal presentations, conversations, discussions, and group meetings conducted in standard English and supported by written materials and other commun |
| 08.04.02 | Uses active listening skills in comprehending simple technical and non- technical verbal information. |

MATHEMATICS

09.01 Arithmetic

| 09.01.01 | Performs addition, subtraction, multiplication, and division of whole numbers without a calculator, and performs calculation of fractions and decimals, as well as conversion to metric measurement with or without a calculator. |
| 09.01.02 | Uses addition to make calculations |

09.02 Applications of Geometry

| 09.02.01 | Understands and applies basic geometric concepts and terminology which form the analytical foundation of job planning and execution including planes perpendicularity, Cartesian coordinates, concentricity, parallelism, straightness, flatness, circularity |

09.03 Applications in Algebra

| 09.03.01 | Uses standard formulas and arithmetic operations to make required calculations with or without a calculator. |
| 09.03.02 | Can solve for an unknown in a trade formula. |

09.04 Applications in Trigonometry

| 09.04.01 | Uses standard formulas and arithmetic operations to make required calculations with or without a calculator, solving for unknowns in right triangles. |
| 09.04.02 | Uses standard formulas and arithmetic operations to make required calculations with a calculator, solving for unknowns in right triangle |

09.05 Applications of Statistics

| 09.05.01 | Uses standard formulas and arithmetic operations to calculate means, medians, modes, and ranges with or without a calculator. |

DECISION MAKING AND PROBLEM SOLVING

10.01 Applying Decision Rules

10.01.01	Can follow a set of instructions laid out in a sequence.
10.01.02	Can interpret and follow if....then.... instructions.
10.01.03	Basic Problem Solving
10.01.04	Can establish new responses to unexpected problems of a simple nature.
10.01.05	Can formulate the new responses into a sequence of instructions or a set of "if ... then ..." rules.

SOCIAL SKILLS AND PERSONAL QUALITIES

11.01 Social Skills

11.01.01 Identify and demonstrate the appropriate social skills and related personal qualities in the performance of major duties requiring cooperative relations with supervisors, team leaders, and team members.

11.02 Personal Qualities

11.02.01 Identify and demonstrate the appropriate personal qualities in performing major job duties and maintaining positive employment relations.

11.02.02 Report to class on time.

11.02.03 Take break at scheduled time.

ENGINEERING DRAWINGS AND SKETCHES

12.01 Standard Orthographic Prints

12.01.01 Interprets orthographic blueprints.

12.01.02 Read and answer questions specific to orthographic drawings.

12.02 GDT Orthographic Prints

12.02.01 Interprets GDT orthographic prints.

12.02.02 Read and answer questions specific to GDT.

12.03 Datums, Symbology and Tolerances

12.03.01 Identify the common symbols, the use of datum references and tolerances used in GD&T.

12.03.02 Read and answer questions specific to datums, symbology and tolerances.

MEASUREMENT

13.01 Basic Measuring Instruments

13.01.01 Recognizes and applies basic measuring instruments such as rules, protractors, and basic transfer tools such as simple inside and outside calipers.

13.01.02 Read and answer questions specific to basic measuring insturments.

13.02 Precision Measuring Instruments

13.02.01 Recognizes and applies precision measuring instruments such as micrometers, vernier, dial, and electronic calipers, dial indicators, precision transfer tools such as telescoping gages and adjustable parallels.

13.02.02 Use and read inside micrometers to +/-.001.

13.02.03 Use and read outside micrometers to .0001inch.

13.02.04 Use and read depth micrometers to +/-.001

13.02.05 Use and read vernier, dial and digital calipers to +/-.001

13.02.06 Use and read vernier, dial and digital height gage to +/-.001

13.02.07 Use and read dial height gage to +/-.001

13.02.08 Use and read bevel protractors.

13.02.09 Calculate proper gage block stack up for specific dimension to .0001 inch.

13.02.10 Use dial and test indicators to transfer dimensions.

13.02.11 Demonstrate proper care of precision measuring tools.

13.02.12 Demonstrate proper calibration of precision measuring insturments.

13.02.13 Read and answer questions specific to precision measuring insturments.

13.03 Surface Plate Instruments

13.03.01 Recognizes and applies appropriately precision tools and instruments for surface plate work such as precision angle plates and tool blocks, precision transfer gages, and precision height gages.

13.04 Metric Conversion

13.04.01 Convert all measurements to metrics.

METALWORKING THEORY

14.01 Cutting Theory

14.01.01 Understands and can explain the ideas of heat, shock, friction, zone of distortion, cutting interface, machinability, cutter presentation, cutter geometry, and chip-holding capacity as they relate to machining applications.

14.02 Tooling

14.02.01 Recognizes a wide variety of cutting tools, tool holding devices, and work holding devices.

14.02.02 Understands the appropriate application of these cutters and devices.

14.03 Material Properties

14.03.01 Recognizes common materials and their principal properties relevant to machining tasks.

14.03.02 Recognizes differences between ferrous and non-ferrous, magnetic, and ductile materials.

14.03.03 Understands the changes which heat-treat imparts to materials.

14.04 Machine Tools

14.04.01 Recognizes the common classes of machine tools, understands the function of the major subsystems of the machine tools, selects and applies a given machine tool appropriately.

14.05 Cutting Fluids and Coolants

14.05.01 Recognizes, selects, and applies appropriate coolants and coolant delivery systems.

CAD/CAM

15.01 Use software to create part shape.

15.01.01 Create simple two dimensional shape using cad/cam software.

15.01.02 Create tool path using cam software.

15.01.03 Open file from another cad system and create tool path using cam software.

15.01.04 Post program according to machine system available.

15.01.05 Make changes to drawing and revise tool path.

15.01.06 Read and answer questions specific to cad/cam software.