CTESTAR™ Course Curriculum Cross-Walk

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

Geom

Geom.L **Geometry**

Geom.1.L1 **REASONING ABOUT NUMBERS, SYSTEMS, AND QUANTITATIVE SITUATIONS**

Geom.1.L1.1 **Number Systems and Number Sense**

Geom.1.L1.1.6 Explain the importance of the irrational numbers v2 and v3 in basic right triangle trigonometry, the importance of p because of its role in circle relationships, and the role of e in applications such as continuously compounded interest.

Geom.1.L1.2 **Representations and Relationships**

Geom.1.L1.2.3 Use vectors to represent quantities that have magnitude and direction, interpret direction and magnitude of a vector numerically, and calculate the sum and difference of two vectors.

Geom.1.L2.1 **Calculation Using Real and Complex Numbers**

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).

01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
01.01.03	Fill out an operation sheet detailing the process plan and required speeds and feeds.
02.01.01	Using aluminum or mild steel, hand drill and hand tap holes.
02.01.02	Use hand drills, hand taps, tap wrench, files, .
02.01.03	Use arbor presses to perform press fits.
02.02.01	Layout the location of hole centers and surfaces within an accuracy of +/-.015.
02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
02.03.01	Setup and carry out between centers turning operations for ALL turning.
02.04.01	Setup and carry out chucking operations for turning.
02.06.01	Setup and operate vertical milling machines.
02.10.01	Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.1.L3.1 **Measurement Units, Calculations, and Scales**

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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
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Geom.1.L4.1 Mathematical Reasoning

Geom.1.L4.1.1	Distinguish between inductive and deductive reasoning, identifying and providing examples of each.
Geom.1.L4.1.2	Differentiate between statistical arguments (statements verified empirically using examples or data) and logical arguments based on the rules of logic.
Geom.1.L4.1.3	Define and explain the roles of axioms (postulates), definitions, theorems, counterexamples, and proofs in the logical structure of mathematics. Identify and give examples of each.

Geom.1.L4.2 Language and Laws of Logic

Geom.1.L4.2.1	Know and use the terms of basic logic (e.g., proposition, negation, truth and falsity, implication, if and only if, contrapositive, and converse).
Geom.1.L4.2.2	Use the connectives “not,” “and,” “or,” and “if..., then,” in mathematical and everyday settings. Know the truth table of each connective and how to logically negate statements involving these connectives.
Geom.1.L4.2.3	Use the quantifiers “there exists” and “all” in mathematical and everyday settings and know how to logically negate statements involving them.
Geom.1.L4.2.4	Write the converse, inverse, and contrapositive of an “If..., then...” statement. Use the fact, in mathematical and everyday settings, that the contrapositive is logically equivalent to the original while the inverse and converse are not.

Geom.1.L4.3 Proof

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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
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Geom.1.L4.3.2 Construct proofs by contradiction. Use counterexamples, when appropriate, to disprove a statement.

Geom.1.L4.3.3 Explain the difference between a necessary and a sufficient condition within the statement of a theorem. Determine the correct conclusions based on interpreting a theorem in which necessary or sufficient conditions in the theorem or hypothesis are satisfied.

Geom.3.G1 FIGURES AND THEIR PROPERTIES

Geom.3.G1.1 Lines and Angles; Basic Euclidean and Coordinate Geometry

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.
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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.
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01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
02.03.01 Setup and carry out between centers turning operations for ALL turning.
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Geom.3.G1.1.3 Perform and justify constructions, including midpoint of a line segment and bisector of an angle, using straightedge and compass.
01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
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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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.3.G1.1.5	Given a line segment in terms of its endpoints in the coordinate plane, determine its length and midpoint.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.3.G1.1.6	Recognize Euclidean geometry as an axiom system. Know the key axioms and understand the meaning of and distinguish between undefined terms (e.g., point, line, and plane), axioms, definitions, and theorems.
Geom.3.G1.2	**Triangles and Their Properties**
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.
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	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
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	02.06.01 Setup and operate vertical milling machines.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
	02.03.01 Setup and carry out between centers turning operations for ALL turning.
	02.04.01 Setup and carry out chucking operations for turning.
	02.06.01 Setup and operate vertical milling machines.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G1.2.3	Know a proof of the Pythagorean Theorem and use the Pythagorean Theorem and its converse to solve multistep problems.
01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
02.03.01	Setup and carry out between centers turning operations for ALL turning.
02.04.01	Setup and carry out chucking operations for turning.
02.06.01	Setup and operate vertical milling machines.
02.10.01	Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
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.
01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
02.03.01	Setup and carry out between centers turning operations for ALL turning.
02.04.01	Setup and carry out chucking operations for turning.
02.06.01	Setup and operate vertical milling machines.
02.10.01	Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
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.
01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
02.03.01	Setup and carry out between centers turning operations for ALL turning.
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02.10.01	Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G1.3 Triangles and Trigonometry

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.
01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
02.03.01	Setup and carry out between centers turning operations for ALL turning.
02.04.01	Setup and carry out chucking operations for turning.

	02.06.01 Setup and operate vertical milling machines.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
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?.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
	02.03.01 Setup and carry out between centers turning operations for ALL turning.
	02.04.01 Setup and carry out chucking operations for turning.
	02.06.01 Setup and operate vertical milling machines.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
	02.03.01 Setup and carry out between centers turning operations for ALL turning.
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Geom.3.G1.4	**Quadrilaterals and Their Properties**
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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.03.01 Setup and carry out between centers turning operations for ALL turning.
	02.04.01 Setup and carry out chucking operations for turning.
	02.06.01 Setup and operate vertical milling machines.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.3.G1.4.2	Solve multistep problems and construct proofs involving quadrilaterals (e.g., prove that the diagonals of a rhombus are perpendicular) using Euclidean methods or coordinate geometry.
Geom.3.G1.4.3	Describe and justify hierarchical relationships among quadrilaterals (e.g., every rectangle is a parallelogram).
Geom.3.G1.4.4	Prove theorems about the interior and exterior angle sums of a quadrilateral.

Geom.3.G1.4.5 Understand the definition of a cyclic quadrilateral and know and use the basic properties of cyclic quadrilaterals.

Geom.3.G1.5 Other Polygons and Their Properties

Geom.3.G1.5.1 Know and use subdivision or circumscription methods to find areas of polygons (e.g., regular octagon, nonregular pentagon).

- 01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
- 01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
- 02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
- 02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015

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.

- 01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
- 01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
- 02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
- 02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
- 02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G1.6 Circles and Their Properties

Geom.3.G1.6.1 Solve multistep problems involving circumference and area of circles.

- 01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
- 01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
- 02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
- 02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
- 02.06.01 Setup and operate vertical milling machines.
- 02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

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).

- 01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
- 01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
- 02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
- 02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
- 02.06.01 Setup and operate vertical milling machines.
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Geom.3.G1.6.3 Solve problems and justify arguments about central angles, inscribed angles, and triangles in circles.

	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
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	02.06.01 Setup and operate vertical milling machines.
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Geom.3.G1.6.4	Know and use properties of arcs and sectors and find lengths of arcs and areas of sectors.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
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Geom.3.G1.8 Three-dimensional Figures

Geom.3.G1.8.1	Solve multistep problems involving surface area and volume of pyramids, prisms, cones, cylinders, hemispheres, and spheres.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.03.01 Setup and carry out between centers turning operations for ALL turning.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.3.G1.8.2	Identify symmetries of pyramids, prisms, cones, cylinders, hemispheres, and spheres.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.03.01 Setup and carry out between centers turning operations for ALL turning.

Geom.3.G2 RELATIONSHIPS BETWEEN FIGURES

Geom.3.G2.1 Relationships Between Area and Volume Formulas

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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
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).
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.

	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
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).
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.

Geom.3.G2.2 Relationships Between Two-dimensional and Three-dimensional Representations

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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
	02.03.01 Setup and carry out between centers turning operations for ALL turning.
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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.
	01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.01 Layout the location of hole centers and surfaces within an accuracy of +/-.015.
	02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
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Geom.3.G2.3 Congruence and Similarity

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.
	02.06.01 Setup and operate vertical milling machines.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.3.G2.3.2	Use theorems about congruent triangles to prove additional theorems and solve problems, with and without use of coordinates.
	02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.
Geom.3.G2.3.3	Prove that triangles are similar by using SSS, SAS, and AA conditions for similarity.
	02.06.01 Setup and operate vertical milling machines.

02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G2.3.4 Use theorems about similar triangles to solve problems with and without use of coordinates.

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01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.

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02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

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.

02.06.01 Setup and operate vertical milling machines.

02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G3.1 Distance-preserving Transformations: Isometries

Geom.3.G3.1.1 Define reflection, rotation, translation, and glide reflection and find the image of a figure under a given isometry.

01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.

01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.

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

02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015

02.06.01 Setup and operate vertical milling machines.

02.10.01 Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G3.1.2 Given two figures that are images of each other under an isometry, find the isometry and describe it completely.

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.

01.01.01 Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.

01.01.02 Develope a process plan detailing the required materials,machinery and measuring tools.

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

02.02.02 Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015

02.06.01 Setup and operate vertical milling machines.

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Geom.3.G3.2 Shape-preserving Transformations: Dilations and Isometries

Geom.3.G3.2.1 Know the definition of dilation and find the image of a figure under a given dilation.

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.

	01.01.01	Develop a process plan for a part requiring sawing, milling, drilling, turning, and/or grinding.
	01.01.02	Develope a process plan detailing the required materials,machinery and measuring tools.
	02.02.01	Layout the location of hole centers and surfaces within an accuracy of +/-.015.
	02.02.02	Use common layout tools to scribe horizontal, vertical, angled lines and radiuses. within an accuracy of +/-.015
	02.06.01	Setup and operate vertical milling machines.
	02.10.01	Using the principles of cartesian coordinates develop a program for the manufacture of a simple part.

Geom.3.G3.2.3 Find the image of a figure under the composition of a dilation and an isometry.

Cross Walk Summary

Subject	Items	Alignable	Aligned	Percent
Geom	80	57	38	67