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**Subject Area: Trade and Industrial Education
Course: Drafting, Grades 9-12**

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	TO BE COMPLETED BY PUBLISHER	FOR COMMITTEE MEMBER USE ONLY
Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
A. Standard 1: Fundamental Drafting Skills		
A. DRAWING MEDIA AND RELATED DRAFTING MATERIALS		
(1) Identify the characteristics and types of vellum, mylar, paper, etc.	76, 360–362	
(2) Select drawing media from among the following choices: mylar, vellum, paper, etc.	76, 360–362	
(3) Identify the characteristics and types of vellum, mylar, plotting pens, plotting pencils, ink, and toner cartridges.	76, 358–62	
(4) Select related drafting materials from among the following choices: plotting pens, plotting pencils, ink, and toner cartridges. Consider the following criteria: costs, equipment, use, compatibility, and accuracy.	76, 358–62	
B. BASIC MEASUREMENT SYSTEMS		
(1) List the elements of the English/Imperial system and the metric system.	80–81, 220–221, 237–241	
(2). Identify basic measurement systems using: fractions, decimals, metric, English, degrees, and radians.	80–81, 106, 220–221, 237–241, 468	
(3). Evaluate each measuring system using the criteria of: length, mass (weight), area, perimeter, circumference, and volume.	106, 468, 527–528	
(4) Apply the elements of the English/Imperial system and the metric system.	80–81, 106, 220–221, 237–241	

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(5) Apply basic measurement systems' measurements to the mathematical operations of length, mass (weight), area, perimeter, circumference, and volume.	106, 468, 527–528	
C. ANNOTATING DRAWINGS		
(1) Identify notes, symbols, and the placement of notes and symbols.	229–243	
(2) Prepare notes and proportionately sized symbols for features requiring description (e.g., electrical symbols).	229–243, 451	
(3) Apply annotation notes, symbols, and placement to correct the feature being described (e.g., electrical symbols).	229–243, 451	
D. LINE STYLES AND WEIGHTS		
(1) Identify line styles (e.g., center line, hidden line, phantom, object, section).	42–47, 92–95	
(2) Identify line weights (e.g., center line, hidden line, phantom line, object line, section line).	42–47, 92–95	
(3) Evaluate line styles and correct line style in order to represent/define features	42–47, 92–95, 114	
(4) Apply various line styles in accordance with industry-accepted standards.	42–47, 92–95, 114	
E. PREPARING TITLE BLOCKS AND OTHER DRAFTING FORMATS		

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Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
(1) Identify title block components (e.g., sale, sheet, number, revision).	107–112	
(2) Evaluate the title block using the following criteria: location on the drawing, content, and appropriate letter height and justification.	107–112	
(3) Prepare a title block.	107–112, 347–348	
(4) Identify the components of a bill of materials, parts list, and schedules.	347–348	
(5) Prepare a title block including bill of materials, parts list and schedule.	107–112, 347–348	
(6) Identify/prepare a tolerance block.	107–112, 347–348	
(7) Reference/information chart, identify the size, quantity, symbol, and location of each feature and proprietary information.	107–112, 347–348	
(8) Evaluate the tolerance block using the following criteria: location on the drawing, content, and appropriate letter height and justification.	107–112, 347–348	
(9) Identify/prepare a revision status of sheet blocks.	342	
(10) Identify/prepare a border, incorporating fold lines, microfilm, arrows and zones. (11) Evaluate the border using the following criteria: location on the drawing, content, and appropriate letter height and justification.	107–112, 347–348, 363–365	
(12) Identify and apply industry standard symbols, identify the finish mark, electrical/electronic, welding, GD&T, machine tool, and architectural symbols	242–245	

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F. REPRODUCTION OF ORIGINALS USING DIFFERENT METHODS		
(1) Identify methods for reproduction of originals.	358–366	
(2) Evaluate the appropriate copying method with the cost and purpose of the drawing.	358–366	
(3) Create a first generation plot by developing a plotted drawing.	358–360	
G. CREATE FREEHAND TECHNICAL SKETCHES		
(1) Identify the purpose of a freehand sketch.	42–65	
(2) Create freehand technical sketches.	42–65	
H. ORTHOGRAPHIC PROJECTIONS		
(1) Identify appropriate orthographic views to completely describe an object.	192–217	
(2) Identify the proper size and location of necessary orthographic views.	203–210	
(3) Identify, create, and place appropriate orthographic views.	203–217	
(4) Create orthographic views utilizing the criteria: necessary views, surface and edge relationships, and hidden lines/surfaces.	203–210	
(5) Identify, create, and place appropriate section views.	254–271	

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(6) Identify the purposes of section views.	254–265	
(7) Create section views with (e.g., full, rib, half).	254–271	
(8) Identify, create, and place appropriate auxiliary views.	274–283	
(9) Identify the purposes of primary and secondary auxiliary views.	274–278	
(10) Identify primary and secondary auxiliary purposes for use.	274–278	
I. PICTORIAL DRAWINGS		
(1) Identify isometric, diametric, trimetric, and exploded drawings.	288–292	
(2) Identify and create axonometric drawings.	288–292, 315–317	
(3) Create in detail axonometric; isometric, diametric, trimetric, and exploded drawings. Evaluate the drawings by the criteria: size and angle.	288–292, 315–317	
(4) Identify cabinet and cavalier oblique drawings.	293–294	
(5) Identify and create oblique and cavalier drawings.	293–294, 315–317	
(6) Create cabinet and cavalier oblique drawings, using proper size and angle.	293–294, 315–317	
(7) Identify perspective drawings.	300–305	
(8) Identify 1, 2, and 3-point views, evaluating different types of perspective drawings.	300–305	

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J. DIMENSIONING		
(1) Identify extension, dimension and leader lines from a drawing.	221–228	
(2) Identify and describe generally accepted dimensioning practices (e.g., spacing, crossing lines).	221–228	
(3) Apply dimensioning rules to extension, dimension, and leader lines.	221–228	
(4) Identify and outline the use of generally accepted dimension line terminators.	224	
(5) Identify the generally accepted practices of dimensioning a line, an angle, radii, and diameter.	225–237	
(6) Apply the proper size and location to: dimensions of lines, arcs, angles, radii, and diameters.	225–237	
(7) Identify the generally accepted practices of dimensioning spheres, cylinders, tapers, pyramids, irregular objects, and pictorial drawings.	229–234, 294–298	
(8) Apply the proper size and location to spheres, cylinders, tapers, pyramids, irregular objects, and pictorial drawings.	294–298	
(9) Identify the purpose of size and location of a center line for dimensioning symmetrical features.	45–46, 95	

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Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
(10) Apply the symmetrical features of a center line to its proper size and location.	45–46, 95	
(11) Identify and provide a use for different types of dimensioning style (e.g., Cartesian, polar, datum, coordinate).	220–228	
(12) Apply the proper size and location to Cartesian, polar, datum, and coordinate dimensioning methods.	220–228	
(13) Identify and place tolerance dimensioning and Geometric Dimensioning and Tolerance.	242–245	
(14) Apply the proper size and location to GD &T (tolerancing and datum) symbols.	242–245	
B. Standard 2. Fundamental Computer Skills		
A. HARDWARE		
(1) Demonstrate proper care of equipment for care of computer components.	82–86	
(2) Explain the standard procedures regarding care of equipment: keyboard, monitor, CPU, etc., based on the survey of operators' manuals.	82–86	
(3) Identify/explain standard procedures for input devices (mouse, keyboard, tablet/digitizer) based on the survey of the operators' manual.	82–86	
(4) Operate and interface with computers and software through the use of input devices (e.g., mouse, keyboard, tablet/digitizer).	82–86	

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(5) Identify and explain output devices (printers/plotters) based on the standard procedures found in the survey of operators' manuals.	84, 358–360	
(6) Operate and adjust output devices..	84, 358–360	
(7) Identify different types if storage media and the proper operating methods/protection capabilities for each type.	82–85	
(8) Explain the standard techniques and procedures for the care and usage of storage media (e.g., diskettes, tapes, CDs).	82–86	
(9) Demonstrate power-up with system function intact and initialization/exit procedures.	82–85	
(10) Demonstrate the ability to adjust monitor controls. (e.g., brightness, contrast, etc.).	83–84	
(11) Recognize availability of information services.	360	
(12) Describe the purpose of e-mail, bulletin boards, internal/external computer networks, and online information services.	360	
B. PHYSICAL AND SAFETY NEEDS		
(1) Demonstrate an understanding of ergonomic considerations.	86–87	
(2) List and explain the importance of each feature of an ergonomic environment for a computer operator.	86–87	

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(3) Identify/explain ergonomic applications (e.g., lighting, posture, keyboard position).	86–87	
(4) Demonstrate personal safety.	86–87, 366	
(5) List safety standards and describe potential safety hazards that may affect a computer operator. (6) List and describe the OSHA and national Electrical Code safety standards, e.g., extension cords, daisy chaining, and watts usage for an outlet. 86–87	86–87	
C. OPERATING SYSTEMS		
(1) Start and exit software programs as required.	163–164	
(2) Demonstrate proper file management techniques.	163–164	
(3) List and describe the function of file management commands.	163–164	
(4) Explain definitions and procedures for file management techniques: copying, deleting, finding, saving, and renaming.	163–166	
(5) Demonstrate definitions and procedures for file management techniques.	163–164	
(6) Explain and demonstrate formatting a floppy disk.	82–83	
(7) Identify, create, and use directory structure and change paths.	82–83	

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Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
(8) Identify the correct method to organize files on a particular workstation and recognize potential problems.	82–83	
(9) Create and apply a directory structure (e.g., directories, sub-directories, files) to organize files on a particular workstation. (10) Identify, explain, and demonstrate the file back-up procedure for files, directories, programs, etc., based on the operating/application system. 82–83, 360	82–83	
(11) Translate, import, and export data files between formats.	82–83	
(12) Explain the procedure and limitations for data files and data types based on the application system (i.e., justification, advantages and disadvantages).	82–83	
(13) Identify the location and purpose of online help.	163–164	
(14) Use an online help tutorial based on the application system.	163–164	
(15) Save drawings to storage devices such as hard drives, floppy disks, CDs, etc., based on the application system.	82–84	
C. Standard 3. Basic CADD Skills		
A. CREATE		
(1) Demonstrate the ability to open a drawing data file and create a drawing.	163–164	
(2) Demonstrate the ability to perform a drawing setup (e.g., sheet size, border, title block).	163–164	

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(3) Construct geometric figures through the use of multiple construction techniques. (e.g., lines, conics, circles, splines, arcs, and location specifications. polygons) given size, orientation,	164–165	
(4) Create text using appropriate style and size to annotate drawings.	182–183	
(5) Use and control accuracy enhancement tools such as snap, grid, construction plane, etc.	158–161	
B. EDIT		
(1) Identify and define the editing commands: mirror, trim, extend, scale, rotate, etc., which are used as techniques for construction.	165–169	
(2) Demonstrate an accurate and unambiguous representation of an object utilizing the editing commands: mirror, trim, extend, scale, rotate, etc.	165–169	
(3) Identify non-geometric entities such as text, title blocks, fonts, attributes, annotations, color, and dimensions.	161–163, 182–183	
(4) Demonstrate editing and sizing skill utilizing non-geometric commands: text sizing, editing, font, and orientation.	161–163, 182–183	
C. MANIPULATE		
(1) Identify coordinate type, origin, scale, axis orientation, and origin locations.	155–158	
(2) Demonstrate the modification and selection of origin, scale, and axis orientation.	158	

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Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
(3) Identify line style properties and types such as color, thickness, style, etc.	161	
(4) Demonstrate the modification of entity properties (e.g., color type, line type, thickness type).	161	
(5) Demonstrate viewing commands (e.g., dynamic rotation, zooming, panning, change view, view names, multiview-view).	169	
(6) Define and apply the correct use for display commands (e.g., hidden line, no hidden, shading, meshing, wire frame, etc.).	169, 171–172	
(7) Define and identify standard parts and symbol libraries (e.g., scale, location, entity properties).	161–163	
(8) Demonstrate the location, use, and creation of standard parts and symbol libraries (e.g., scale, location, entity properties).	161–163	
(9) Plot drawings on media using correct layout and scale.	358–360	
(10) Define and understand the various purposes and usage of layering techniques (e.g., freeze, visibility).	161	
(11) Demonstrate and apply the various laying techniques (e.g., freeze, visibility).	161	
(12) Define and understand the various purposes and the use of grouping techniques (e.g., ungroup, delete, regroup, create).	161–163	

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(13) Demonstrate various grouping techniques.	161–163	
(14) Determine file size/extraneous entities and the need for file size reduction.	360	
(15) Demonstrate reduction of file size/extraneous entities.	360	
D. ANALYZE		
(1) Use query commands to interrogate database.	169–171	
(2) Apply the use of query commands (e.g., mass properties, geometric measure, system status, entity characteristics).	169–171	
E. DIMENSIONING		
(1) Correctly identify and define the various descriptors of associative dimensioning (e.g., horizontal, vertical, ordinate).	243–245	
(2) Demonstrate the various descriptors of associative dimensioning (e.g., horizontal, vertical, ordinate).	243–245	
D. Standard 4. Advanced CADD Skills		
A. CREATE WIREFRAME AND/OR SOLID MODELS		
(1) Create multiple radii fillets, sculpted surfaces, variable fillets, complex/compound wireframe or solid 3-D models.	167–168	
(2) State the difference between analytic and non-analytic surfaces; define NURSBS, B-spline, Gordon, Coons patch, etc.	169–172	

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(3) Create non-analytic surfaces using appropriate modeling.	169–172	
(4) Define conics, cylinders, revolved ruled tabulated surfaces, etc.	169–172	
(5). Create analytic surfaces using modeling with planes and analytic curves.	169–172	
(6). Create offset surfaces at a specified distance.	169–172	
(7). Find an intersection of two surfaces through a show of lines or curves at the intersection of surfaces.	169–172	
(8) Create joined surfaces, single surface, from multiple surfaces.	169–172	
(9) Create a fillet or blend between two surfaces.	169–172	
(10) Identify various types of feature-based geometry (e.g., holes, slots, round, fillets, counterbores, countersink, spotfaces).	169–172	
(11) Create various types of feature-based geometry based on size and location using features (e.g., holes, slots, round, fillets, counterbores, countersink, spotfaces).	308–311	
(12) Create and show sections of various types of styles of 3-D solid model sections (e.g., full, offset, rotates, half).	265–266	
(13) Construct and label exploded assembly drawings of multiple models.	170–172	

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Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
(14) Demonstrate mastery of advanced Boolean operations; keep model database small (e.g., multiple union, subtraction, intersection, instancing).	308–312	
B. EDIT WIREFRAME AND/OR SOLID MODELS		
(1) Demonstrate mastery or trimming surfaces, including multiple trimmed surfaces.	308–312	
(2) Demonstrate mastery of manipulating surface normals, including reverse and reverse normal.	169–172	
(3) Demonstrate mastery of skill by extending surfaces.	169–172	
(4) Define, identify, and edit control points of various non-analytical surface (e.g., Bezier, mesh, NURBS, Coons Patch).	169–172	
(5) Demonstrate skill and modify surface by adding and/or removing the control point (e.g., Bezier, mesh, NURBS, Coons Patch).	169–172	
(6) Demonstrate skill by deleting solid primitives.	308–312	
(7) Demonstrate skill by moving, copying, and resizing primitives.	308–312	
C. MANIPULATE WIREFRAME AND/OR SOLID MODELS		
(1) Perform and axis new clipping using a plane to display desired pre-determined view, including hidden line removal.	169	
(2) Extract wireframe data from surface/solid geometry data to create a 3-D wireframe from a 3-D model.	169–172	

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Course Standards	CORRELATION NOTATIONS	✓ if the content of the text material is sufficient to allow students to adequately meet the standard.
(3) Identify the purposes and uses of rendering a model's image as far as its reflectivity, opacity, light source, and material finishes.	172	
(4) Define <i>reflectivity, opacity, light source, type, and material finishes</i> .	172	
(5) Shade a rendered image of a model or object using reflectivity, opacity, and lights.	169–172	
(6) Render an image of the model or object using material properties and finishes.	169–172	
D. ANALYZE A WIREFRAME AND/OR SOLID MODEL		
(1) Identify the purposes and uses of extracting geometric data from surfaces and a wireframe.	169–172	
(2) Extract valid and usable geometric data from surfaces and a wireframe.	169–172	
(3) Identify the purposes and uses of attribute data.	161–163	
(4) Demonstrate ability to completely extract lists, files, and valid and usable attribute data from parts lists and bills of materials.	161–163	
(5) Identify gaps in non-intersecting surfaces.	169–172	
(6) Identify problems associated with surface-to-surface gaps in a database.	169–172	

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(7) Verify the existence of gaps, identify gaps in surfaces, and explain causes of gaps or non-intersection between surfaces.	169–172	
(8) Demonstrate mastery of skill by locating and querying surface-to-surface gaps.	169–172	
(9) Identify and define different kinds of surface properties (e.g., area, perimeter, normals).	169–172	
(10) Identify the purposes and uses of data extracted from surface properties (e.g., area, perimeter, normals).	169–172	
(11) List and define the purposes of mass properties, such as moments of inertia, centroids, volume, and mass.	169–172	
(12) Demonstrate mastery of skill by extracting mass properties such as moments of inertia, centroids, volume, and mass.	169–172	
E. PRODUCTIVITY AND WORK HABITS		
(1) Identify the features that can be customized (e.g., menus, script files, macros, key assignments).	152	
(2) Identify the purposes, uses, and needs for customization techniques in menus, key assignments, scripts, and macros.	152	
(3) Perform customization to improve productivity (e.g., customize menus, function keys, script files, macros).	152	
(4) Demonstrate results from applying customization techniques to menus, key assignments, scripts, and macros.	152	

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(5) Identify non-graphical data, then define the purpose and describe the techniques for inputting or extracting non-graphical data.	152	
(6) Identify the purpose and usage of non-graphical data.	169–171	
(7) Demonstrate skill by manipulating non-graphical data.	169–171	
(8) Define standard drawing defaults and identify the purpose of changing system defaults.	163	
(9) Identify the needs and purposes of drawing standard presets using template and library defaults.	163	
(10) Demonstrate skill by using template and library system defaults to create drawing standard presents.	163	
(11) Identify the need to construct geometry graphics using parametrically controlled programs.	170–171	
(12) Develop geometry using parametric programs.	170–171	