



ARCHITECTURAL DRAFTING

15.1300.20

EMBEDDED MATH CROSSWALK

The Architectural Drafting program has been recognized by the Arizona State Board of Career and Technical Education (CTE) as being eligible for consideration by local governing boards to grant 1 credit of 4th-year high school math. This document is the result of a committee analysis completed in 2021.

Architectural Standards	Math Standards	Reasoning/Rationale
STANDARD 1.0 APPLY MEASUREMENT AND SCALE CONCEPTS IN DESIGN DRAFTING		
1.1 Compare types of measurement instruments used by architects and engineers (e.g., architectural scale and engineering scale)	G.G-MG.A.3 Apply geometric methods to solve design problems utilizing real-world context.	Architectural scales/rulers, proportions, and conversions to scale up/down measurements.
1.2 Perform field measurements with handheld instruments (i.e., tape measure, lasers, digital applications, electronic measuring tools, etc.)	<p>G.G-MG-A.1 Use geometric shapes, their measures, and the properties to describe objects utilizing real-world context.</p> <p>G.G.CO.D.12 Make formal geometric constructions with a variety of tools and methods. Constructions include copying segments, copying angles; bisecting segments; bisecting angles; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</p> <p>G.G.CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle; with a variety of tools and methods.</p>	<p>Architectural scales, proportions, conversions to scale up/down measurements</p> <p>Geometric constructions - bisect a line, draw shapes, angles, and parallel lines (computer aided and sketching).</p>
1.3 Select and apply the appropriate scale for viewing information and drawings (i.e., readability, etc.)	GN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world content.	Look at drawing and decide what scale to use.
1.4 Transcribe illustrations and/or field measurements accurately to a scale	<p>GN-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.</p> <p>GN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting</p>	Documentation of accurate scale.

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	quantities utilizing real-world content.	
1.5 Verify interior dimensions for spatial awareness	<p>GN-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world content.</p> <p>G.G.CO.D.12 Make formal geometric constructions with a variety of tools and methods. Constructions include: copying segments, copying angles; bisecting segments; bisecting angles; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.</p> <p>G.G.CO.D.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle; with a variety of tools and methods.</p>	<p>Designing interior of rooms in standard sizing and bubble diagrams-area.</p> <p>Shape properties -how to fit a square in an octagon.</p>
1.6 Assess measurements for accuracy by documenting existing conditions (i.e., photographs, portable drones, etc.)	<p>G.G-MG-A.1 Use geometric shapes, their measures, and the properties to describe objects utilizing real-world context.</p> <p>G.G-MG.A.3 Apply geometric methods to solve design problems utilizing real-world context. Using tools to measure and document.</p>	Architectural scales, proportions, and conversions to scale up/down measurements.

Architectural Standards	Math Standards	Reasoning/Rationale
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STANDARD 2.0 INTERPRET TECHNICAL DOCUMENTS AND BUILDING SPECIFICATIONS USED BY ARCHITECTS AND ENGINEERS

2.1 Interpret dimensions, symbols, legends, scales, and directions/orientations		
2.2 Read and interpret content and information communicated in schematics (preliminary concept) and technical drawings		
2.3 Locate and interpret information on specific documents (i.e., schedules, existing drawings, reference callouts, plan notes, cut sheets, etc.)		
2.4 Analyze schematics (preliminary concept) and technical drawings for clarity, completeness, and accuracy		
2.5 Recognize cross-referencing on technical drawings (e.g., sections,		

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elevations, and details related to a floor plans and roof plan)		
2.6 Identify and describe basic types of drawings by trade (e.g., architecture, mechanical, structural, electrical, plumbing, HVAC, and civil engineering systems)		
2.7 Verify and justify documents for dimensional accuracy, completeness, and detail (i.e., plans, elevations, doors, windows, etc.)		
2.8 Compare schematics to technical drawings (i.e., isometric schematic related to electrical plans, plumbing plans, etc.)		
2.9 Interpret legal land descriptions (i.e., ALTA, GIS, plat maps, etc.) needed for a site plan		
2.10 Verify state, county, local, and national building standards, codes, and regulations used in architectural drafting (i.e., ADA, ANSI, etc.)		
2.11 Apply appropriate specifications for project-specific jobs (i.e., CSI format, outline, drawing, etc.)		

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STANDARD 3.0 UTILIZE HARDWARE AND SOFTWARE TOOLS INCLUDING BASIC COMPUTER CONCEPTS, OPERATIONS, AND TECHNICAL APPLICATIONS

3.1 Use computer hardware/software for design drafting solutions		
3.2 Apply electronic file management techniques (e.g., consistency, folders/subfolders, reference files, PDFs, simple/intuitive naming, and follow through)		
3.3 Maintain electronic file management techniques (e.g., archiving, file cleanup, and void folders)		
3.4 Use various formats (e.g., dxf, dxb, Tiff, gif, pcx, eps, spd, and pdf) to import and export data files		
3.5 Prepare files for electronic transfer and/or storage		

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3.6 Use the Internet, Intranet, and/or third-party file transfer/storage programs (i.e., FTP, Cloud, etc.)		
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STANDARD 4.0 UTILIZE COMPUTER-AIDED SOFTWARE SYSTEMS FOR PROJECT MANAGEMENT		
4.1 Compare and contrast services and processes provided by CADD, VDCM, and BIM systems		
4.2 Determine the program to analyze drawings		
4.3 Use CADD, VDCM, and BIM software functions and commands to set up drawing scale, format, dimensioning, etc.		
4.4 Apply item properties, colors, line types, editing commands, text styles, and grouping techniques		
4.5 Incorporate standard parts, symbol libraries, and/or templates		
4.6 Control viewing commands		
4.7 Characterize the difference between model space and paper space to determine scale using computer aided software	<p>G.N-Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays, include utilizing real-world context.</p> <p>G.N-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.</p> <p>G.N-Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities utilizing real-world context.</p>	Scale and proportions.
Architectural Standards	Math Standards	Reasoning/Rationale
STANDARD 5.0 DETERMINE THE TYPES AND COMPONENTS OF BUILDING SYSTEMS		
5.1 Identify the components of a site plan		
5.2 Identify different types/parts of foundations/footings		

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5.3 Identify different types/parts of plans		
5.4 Identify different types of floor structures/systems		
5.5 Examine types of walls		
5.6 Distinguish components of a wall		
5.7 Identify parts of a staircase systems		
5.8 Identify parts of ramp systems		
5.9 Identify types of roofs		
5.10 Identify components of roofs		
Architectural Standards	Math Standards	Reasoning/Rationale
STANDARD 6.0 PRODUCE TECHNICAL DRAWING		
6.1 Use fundamental drafting techniques for drawings		
6.2 Demonstrate freehand lettering technique		
6.3 Determine correct line types and line weights		
6.4 Create title blocks		
6.5 Format a sheet set		
6.6 Apply notes/annotations and dimensions as appropriate and required		
6.7 Plot, print, or create digital drawings		
6.8 Organize a sequence of drawings and supporting documents		

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STANDARD 7.0 APPLY DESIGN DRAFTING CONCEPTS AS RELATED TO ARCHITECTURAL DESIGN		
7.1 Prepare a foundation or basement plan	<p>G.G-MG-A.1 Use geometric shapes, their measures, and the properties to describe objects utilizing real-world context.</p> <p>G.G-MG.A.3 Apply geometric methods to solve design problems utilizing real-world context.</p> <p>G.G-GPE.B.7 Uses coordinates to compute perimeters of polygons and areas of triangles and rectangles.</p>	<p>Shapes, spatial features, lines angles, and shapes to create plans.</p> <p>Linear measurements and area, coordinate systems, modeling.</p>
7.2 Prepare a floor plan or model from a preliminary sketch	<p>G.G-MG-A.1 Use geometric shapes, their measures, and the properties to describe objects utilizing real-world context.</p> <p>G.G-MG.A.3 Apply geometric methods to solve design problems utilizing real-world context.</p> <p>G.G-GPE.B.7 Uses coordinates to compute perimeters of polygons and areas of triangles and rectangles.</p>	<p>Shapes and spatial features.</p>
7.3 Prepare roof details	<p>G.G-GPE.B.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems, including finding the equation of a line parallel or perpendicular to a given line that passes through a given point.</p> <p>G.G-SRT.C.8 Use trigonometric ratios (including inverse trigonometric ratios) and the Pythagorean Theorem to find unknown measurements in right triangles utilizing real-world context.</p>	<p>Shapes, spatial features, slopes, lines angles and shapes to create plans.</p> <p>Linear measurements and area, coordinate systems, modeling.</p> <p>Perpendicular and parallel lines.</p> <p>Angles and Pythagorean theorem.</p>
7.4 Prepare an electrical plan locating receptacle, switch, and lighting fixtures	<p>G.G-MG-A.1 Use geometric shapes, their measures, and the properties to describe objects utilizing real-world context.</p> <p>G.G-MG.A.3 Apply geometric methods to solve design problems. utilizing real-world context.</p> <p>G.G-GPE.B.7 Uses coordinates to compute perimeters of polygons and areas of triangles and rectangles.</p>	<p>Shapes, spatial features, lines, angles, and shapes to create plans.</p> <p>Linear measurements and area, coordinate systems, modeling.</p>
7.5 Prepare a plumbing plan showing fixture locations and floor drains	<p>G.G-MG.A.3 Apply geometric methods to solve design problems utilizing real-world context.</p>	<p>3D height and isometric drawings.</p>
7.6 Prepare a basic HVAC plan locating air handlers, condensers, duct returns, return plenum, transfer ducts, and diffusers (vents)		

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7.7 Prepare drawings of four exterior elevations including keynote elements		
7.8 Identify and prepare the components of door and window schedules		
7.9 Assemble a set of working drawings for a residential or small commercial structure		
7.10 Prepare site plan		
7.11 Prepare a landscape plan including vegetation, irrigation, and retention basins		

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STANDARD 8.0 PREPARE DRAWINGS OF SECTIONS AND DETAILS
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8.1 Create and place one North/South and one East/West cross section on a plan		
8.2 Create a larger scale detail of one area of a cross section/detail		
8.3 Create plan details		
8.4 Identify parts and pieces for detailed drawings		

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STANDARD 9.0 CREATE PICTORIAL DRAWINGS, MODELS, AND RENDERINGS

9.1 Create isometric or perspective drawings using manual and/or electronic techniques	G.G-MG.A.3 Apply geometric methods to solve design problems utilizing real-world context.	3D drawings
9.2 Select appropriate materials and properties to apply to the entities		
9.3 Render a model to create a presentation drawing		
9.4 Create video of rendered model		