

Interior Design Tools and Equipment

Unit: Science of Textiles and Manufacturing

Problem Area: Equipment Use and Care

Lesson: Interior Design Tools and Equipment

■ **Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

- 1 Identify interior design drafting tools and equipment.**
- 2 Review computer-aided design (CAD) software.**
- 3 Summarize interior design trends.**

■ **Resources.** The following resources may be useful in teaching this lesson:

E-unit(s) corresponding to this lesson plan. CAERT, Inc. <http://www.mycaert.com>.

“Back to Nature: Interior Design Trends and Materials used by Interior Designers,” *Christopher James Interiors*. Accessed Jan. 19, 2017. <https://newportcoastinteriordesign.com/interior-design-trends-and-materials-used-by-interior-designers/>.

“Basic Color Theory,” *Colors Matters*. Accessed on Jan. 19, 2017. <http://www.colormatters.com/color-and-design/basic-color-theory>.

Boyd, Karen. “Basic Drafting Tools and Their Uses,” *e-How*. Accessed Jan. 19, 2017. http://www.ehow.com/info_8102890_basic-drafting-tools-uses.html.

Chechar, Linda. “What Tools Do Interior Designers Use?,” *e-How*. Accessed Jan. 19, 2017. http://www.ehow.com/facts_5191952_tools-do-interior-designers-use_.html.



- “Contemporary vs. Modern Style: What’s the Difference?” *homedit Interior Design and Architecture*. Accessed Jan. 19, 2017. <http://www.homedit.com/difference-between-contemporary-and-modern-design/>.
- “Drafting Equipment,” *Prointeriordesigner.com*. Accessed Jan. 19, 2017. <http://prointeriordesigner.com/drafting-drawing/drawing-equipment/>.
- “How to Choose a Drafting Table,” *SuppliesNet.com*. Accessed Jan. 19, 2017. <http://www.suppliesnet.com/howtochooseadraftingtable.aspx>.
- Kingsley, Diana Bennet Wirtz. *Hand Drafting for Interior Design*, 2nd ed. Bloomsbury, 2014.
- “Open Concept Floor Plan Home Design Photos,” *Houzz*. Accessed Jan. 19, 2017. <http://www.houzz.com/open-concept-floor-plan>.
- Thompson-Ditch, Linda A. “At Home Living: What’s your style? Modern, Contemporary, Traditional Offer Distinct Décor,” *The Topeka Capital-Journal cjonline.com*. Accessed Jan. 19, 2017. <http://cjonline.com/life/home/2014-07-25/home-living-whats-your-style-modern-contemporary-traditional-offer-distinct#>.
- “The Tools of an Interior Designer,” *Interior Design School*. Accessed Jan. 19, 2017. <http://www.interior-design-school.net/toolsarticle.htm>.
- “Top CAD Software for Interior Designers: Review,” *L’Essenziale Home Designs*. Accessed Jan. 19, 2017. <http://essenziale-hd.com/2013/03/11/top-cad-programs-for-interior-designers-review/>.
- “What Interior Designers Do,” *Bureau of Labor Statistics: Occupational Outlook Handbook*. Accessed Jan. 19, 2017. <http://www.bls.gov/ooh/arts-and-design/interior-designers.htm#tab-2>.

■ **Equipment, Tools, Supplies, and Facilities**

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

■ **Key Terms.** The following terms are presented in this lesson (shown in bold italics):

- ▶ 2020 Design
- ▶ 2D
- ▶ 3D
- ▶ 3D HomePlanner
- ▶ ArchiCAD
- ▶ AutoCAD
- ▶ color scheme
- ▶ computer-assisted purchasing (CAP)
- ▶ computer-aided design (CAD)

- ▶ Design CAD 3D Max Drawing
- ▶ drafting
- ▶ drafting table
- ▶ drafting templates
- ▶ floor plan
- ▶ Google SketchUp
- ▶ interior decorator
- ▶ interior design
- ▶ interior designer
- ▶ level
- ▶ open concept
- ▶ plotter
- ▶ plotting
- ▶ rendering
- ▶ scale-ruler
- ▶ tape measure
- ▶ Vectorworks
- ▶ Wonderful Interior Design App

■ **Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

What do interior designers do? They help design functional living spaces to be safe and aesthetically pleasing. They help determine and select lighting, color schemes, and the type of materials to be used in a given space and for a given purpose. They draw and read blueprints and are familiar with safety regulations and codes for interior spaces. Interior designers work closely with architects, engineers, and construction workers to ensure a space that is both functional and beautiful.

CONTENT SUMMARY AND TEACHING STRATEGIES

Objective 1: Identify interior design drafting tools and equipment.

Anticipated Problem: What are interior design drafting tools and equipment?

I. Drafting tools and equipment

- A. **Interior design** is a complex artistic profession in which creative and technical solutions are applied within a structure for a built environment. Solutions are functional, culturally expressive, attentive to life-safety codes, and aesthetically attractive. In the United States and Canada, interior designers must be licensed or registered and able to document their formal education. Many states and provinces require the NCDIQ certification (National Council for Interior Design Qualification).
1. An **interior designer** is a professional who applies “creative and technical solutions for a structure that is functional, attractive, and beneficial” to a client’s quality of life and culture. An interior designer uses drafting tools and equipment as well as knowledge of color, psychology, and safety codes and tools (National Council for Interior Design Qualification). An interior designer oversees the design of a given space that sometimes includes elements of the building exterior. An interior designer must consider design elements, principles of design, and current trends. In addition, an interior designer must communicate to others in the design process to complete the development of a given space.
 2. An **interior decorator** is a person who furnishes a space with fashionable or beautiful items. An interior decorator requires no formal training or licensure.
- B. **Drafting** is technical or mechanical drawing that visually communicates how something works or is constructed. Drafting symbols, units of measurement, and notation systems help decode the blueprint, floor plan, etc.
1. A **floor plan** is a scale diagram of a room or building drawn as if seen from above. A floor plan shows the relationship between rooms, spaces, and other physical features at one level of a structure.
 2. A **drafting table** is a work surface for creating drawings or sketches and may be adjusted up or down to suit the drafter or designer. It may be collapsible and may have a limited work surface. Some tables have a large drawing surface and are typically a stationary piece with drawers and various drawing attachments as well as lighting.

- C. Drafting and drawing tools: Sketching tools include pencils, rulers, erasers, compass, protractor, and graph paper.
1. A **scale-ruler** is a measurement tool with a range of calibrated scales (ratios) for drawing and measuring from reduced scale drawings (e.g., blueprints and floor plans). For example, if the scale is in $\frac{1}{2}$ -inch increments, each $\frac{1}{2}$ inch represents 1 foot. Scales are calibrated in feet and inches or in metric measurements.
 2. **Drafting templates** are stencils that create uniform architectural and interior design shapes on floor plans and blueprints. Templates are scaled to size: $\frac{1}{8}$, $\frac{1}{4}$, or $\frac{1}{2}$ inch. Templates create accurate shapes for floor plan drawings and drafting purposes: kitchens, bathrooms, bedrooms, home and office furniture, banquet furniture, cabinets, plants, and other construction and design accessories.
 3. A **tape measure** is a flexible ruler (cloth, plastic, fiberglass, metal strip, etc.) with linear measurement markings. It is used to calculate measurements of a room or space as well as furniture or design elements. Soft tape measures are made from cloth and are used to measure curved and angled lines and surfaces. Stiff tape measures are made from metal and are for straight line and surface measurements.
 4. A **level** is an instrument that indicates whether a surface is flat and even. Plumb is vertical, and level is horizontal. A level is used on horizontal and vertical surfaces to ensure shelves, pictures, light fixtures, or other accessories are “straight.” Using a level involves adjusting the work piece until the “bubble” in the level is centered between two lines on the instrument’s surface.
 5. Color scheme guides and swatches allow a designer to identify color use with a client for a particular design space. A **color scheme** is an arrangement of colors based on a color system (e.g., a color wheel) that is applied to an illustration, design, or artwork. Guides are used to show an assortment of sample colors for furniture, paint color, flooring, fabrics, and other features. Guides help designers plan a room and give clients a visual sample.
 6. **Computer-aided design (CAD)** is software that creates a 2D or 3D visual interpretation of a floor plan or design space. CAD software is much faster to use than drawing by hand and allows for emphasis on smaller details (e.g., cabinetry, flooring, color schemes, and lighting). **2D** (two-dimensional) visuals are a blueprint or floor plan that shows length and width. **3D** (three-dimensional) visuals are images or models that provide the perception of depth (in addition to length and width). Both 2D and 3D images are referred to as renderings. A **rendering** is a drawing that depicts a designer or a builder perspective of a given room or floor plan. It is the process of generating an image from 2D or 3D models in digital or raster graphics: the final appearance of a model or animation.

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–A and VM–B.*

Objective 2: Review computer-aided design (CAD) software.

Anticipated Problem: What is CAD software?

II. CAD software

- A. **Google SketchUp** is a CAD drafting software that allows for the creation of 2D and 3D models. SketchUp is a Google product available in various models and with various accessories. Free versions are available but are limited, and the pro-version has a price tag. Software properties and limitations include:
1. Downloads are easy.
 2. It is user-friendly.
 3. The software creates realistic 2D floor plans and 3D models.
 4. It is able to import photos of custom items and spaces to design a floor plan around the space or add accessories into the floor plan.
 5. Visualizing 3D models can be difficult because curved surfaces are difficult to create or incorporate into the floor plan.
 6. A rendering program is basic but is compatible with other software packages.
 7. The basic version is limited in floor plan options and accessories. Most users tend to upgrade to the pro-version.
- B. The **Wonderful Interior Design App** is CAD software for interior design by Belight Software and is easy to learn. A basic version and an upgradeable professional version are available. The professional series is more extensive and detailed; it allows access to more features. It has an unlimited number of stories, colors, upscale materials and applications, and wall cutouts. Software properties and limitations include:
1. It creates high-resolution images.
 2. It is compatible with other software, including Google SketchUp.
 3. The software creates 2D floor plans and 3D models.
 4. No software tutorial is available.
 5. It has limited templates: room sizes and shapes.
 6. It is compatible with Apple MAC only.
- C. **3D Homeplanner** is a CAD program for interior design from dmlights. It is an easy-to-learn program. Software properties and limitations include:
1. It provides an ease of modifying floor plans by adjusting wall and floor measurements.
 2. It has customizable materials with software upgrades.
 3. The program has a large selection of furniture categorized by room.
 4. It includes a 3D preview option.
 5. It includes some, but not all, architectural features of other CAD programs.
 6. The program requires constant Internet access; no offline mode is available.

- D. **ArchiCAD** is CAD software for architects and interior designers from GRAPHISOFT. This CAD program includes the ability to make complex shapes. Software properties and limitations include:
1. Floor plans are saved as PDF files.
 2. It has the ability to quickly create 3D models from 2D floor plans.
 3. The software houses numerous interior design object templates/profiles.
 4. It is available to Mac and Windows users.
 5. The software is expensive and difficult to master if the person is not AutoCAD fluent.
 6. It requires AutoCAD to view 2D floor plans.
 7. The software is unable to be opened with other software.
- E. **AutoCAD** is 2D and 3D computer software that allows interior designers, architects, and engineers to draft blueprints and floor plans for construction and manufacturing purposes by Autodesk. AutoCAD is the most popular software among designers. Software properties and limitations include:
1. It produces detailed floor plans.
 2. The software is easy to use with 3D and animation options.
 3. It is expensive and difficult to learn compared to other CAD programs.
 4. It is unable to open floor plans with other software.
- F. **DesignCAD 3D Max Drawing** is 2D and 3D computer software for interior designers and architects by TurboCAD. The software is relatively easy to learn. Software properties and limitations include:
1. It allows for an instant exchange of 2D and 3D information to view both types of floor plans as they are created.
 2. Numerous tools and upgrades are available.
 3. Extra resources are available, such as online resources and the capability to chat with experts.
 4. Rendering, simulation, visual details, and animation of floor plans are available.
 5. Software is slow and is incompatible with other software.
- G. **2020 Design** is a kitchen and bath CAD software program from 20-20 Technologies, Inc. The software is an import from Google SketchUp and is primarily designed for kitchen and bath cabinetry. Properties and limitations include:
1. It has the ability to create realistic 3D renderings (photos) of kitchens and baths.
 2. CAP is available on 2020 Design. **Computer-assisted purchasing (CAP)** is the ability to include catalog prices from retail stores to be entered in to the CAD software. This property makes pricing, shipping costs, and product availability easy for architects, engineers, and interior designers to calculate for a specific floor plan.
 3. 2020 Design is expensive software.

- H. **Vectorworks** is a CAD software geared primarily to interior designers, although it is available for architects and other designers from Vectorworks, Inc. Software properties and limitations include:
1. It is easy to use integration of 2D floor plans to 3D models.
 2. The software has built-in worksheets, including material lists, budget lists, cost sheets, and a scheduling calendar.
 3. Various effects can be applied to the floor plan.
 4. It is inexpensive compared to other software.
 5. It supports other formats, such as PDF, Google SketchUp, and 3D.
 6. There is an extra charge for high-resolution images.
 7. Plotting in batches is difficult. **Plotting** is printing floor plans, designs, or images using a CAD printer. Another name for a CAD printer is a **plotter**.

Teaching Strategy: Many techniques can be used to help students master this objective. Use VM-C to illustrate 2D and 3D renderings. Assign LS-A.

Objective 3: Summarize interior design trends.

Anticipated Problem: What are interior design trends?

III. Interior design trends

- A. Interior design types include traditional, modern, and contemporary.
1. Traditional design is elegant and luxurious, with antique furnishings and neutral colors with touches of deep colors: reds, blues, greens, and browns.
 2. Modern design is an open concept: sleek and clutter free. The dominant color concept is black and white, with touches of primary colors. **Open concept** is the creation of common spaces in which the rooms have no walls or doors between (other than bathrooms, bedrooms, and office spaces), and beams carry the weight of the floor above. The goal of open concept floor plans is clean traffic flow. Modern designs include angles and curved lines. Floor plans reference the 1920s to 1950s eras.
 3. Contemporary design is constantly changing. Some similarities to modern floor plans exist, such as open concept. However, contemporary design uses more neutral colors, with softer lines and angles than a modern design. Contemporary designs reference the 1960s to 1980s eras and are considered “retro” (because of the timeframe).
- B. Material trends and properties
1. Wood: Hard, natural wood is available in oak, hickory, maple, walnut, cherry, beech, and birch. It is used for furniture, such as chairs, tables, bookcases, and flooring.
 - a. Soft wood accents—pine, cedar, and fir—are best suited for closet spaces and accent pieces because they hold shape best.

- b. Raw wood surfaces are unvarnished and in a natural state, which gives a pale appearance to the interior.
 - c. Wood wallpaper creates a cottage-like feel and is currently trending.
 - d. Wood flooring is trending dark versus golden or light.
 - e. Wood grain ceramic tiles are trending in bathrooms and kitchens, areas in which wood is not sanitary as flooring must be resistant to moisture.
2. Glass: Decorative mirrors, cut glass, mosaic tiles, vases, and candleholders are trends found throughout the interior of homes and offices.
 3. Marble: Marble is expensive when used for countertops, tabletops, chairs, accent wall tiles, and floors. Marble accessories are more reasonably priced (e.g., vases, bath vanity, wastebasket items, nooks, and niches).
 4. Leather: Leather is from animal sources and is often used for furniture and floor tiles. It is also used as an accent wall application.
 5. Plant designs: Leaf prints and patterns on wood furniture are currently trending.
 6. Metal: Brass, chrome, and steel are trending metals. Brass provides a soft, warm gold. Bronze pairs well with cooler hues. Brass is currently replacing many chrome and steel accents.
 7. Accent colors: Color accents—in the form of pillows, curtains, rugs, and picture frame accessories—“dress up” walls and furniture by adding hints of color (“pops of color”) throughout the space. Accessories are often updated seasonally.
 8. Floor tile: Ceramic floor tiles are trending, especially as applied in patterns: herringbone, diagonal, running bond, checkerboard, pinwheel, basketweave, modular, and windmill. Hexagon shapes are trending in kitchen and bath backsplashes. Ceramic tiles are more durable and aesthetically pleasing. However, they cost more than linoleum. Wood grain tile is currently trending.
 9. Open concept: Open concept living spaces that give a cohesive flow to a space are trending in kitchens and family rooms. In some cases, bath and shower installations are designed in open concept.
 10. Color schemes: Black, white, and gold provide a tasteful, stylish, and interesting approach. However, neutrals and grays are trending color schemes in home, hotel, and spa interiors.

Teaching Strategy: *Many techniques can be used to help students master this objective. Use VM–D and VM–E. Assign LS–B.*

Review/Summary. Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. If a textbook is being used, questions at the ends of chapters may be included in the Review/Summary.

- **Application.** Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.
- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.
- **Answers to Sample Test:**

Part One: Matching

1. a
2. h
3. e
4. b
5. d
6. f
7. g
8. c

Part Two: True/False

1. T
2. F
3. F
4. T
5. T
6. T

Part Three: Short Answer

Answers would vary and should include one of the following materials and a description (as detailed in Objective 3): wood, glass, marble, leather, plant designs, metal, floor tiles, color accents, open concept, or color schemes. For instance, Marble is expensive when used for countertops, tabletops, chairs, accent wall tiles, and floors. Marble accessories are more reasonably priced (e.g., vases, bath vanity, wastebasket items, nooks, and niches).

Interior Design Tools and Equipment

► Part One: Matching

Instructions: Match the term with the correct definition.

- | | |
|-----------------------|----------------|
| a. drafting templates | e. level |
| b. interior design | f. plotting |
| c. interior designer | g. rendering |
| d. interior decorator | h. scale-ruler |

- _____ 1. Stencils that create uniform architectural and interior design shapes on floor plans and blueprints
- _____ 2. A measurement tool with a range of calibrated scales (ratios) for drawing and measuring from reduced scale drawings, such as blueprints and floor plans
- _____ 3. An instrument that indicates whether a surface is flat and even
- _____ 4. A complex artistic profession in which “creative and technical solutions are applied within a structure for a built environment”
- _____ 5. A person who furnishes a space with fashionable or beautiful items
- _____ 6. Printing floor plans, designs, or images using a plotter
- _____ 7. A drawing that depicts a designer or a builder perspective of a given room or floor plan
- _____ 8. A professional who applies “creative and technical solutions for a structure that is functional, attractive, and beneficial” to a client’s quality of life and culture



► **Part Two: True/False**

Instructions: Write T for true or F for false.

- ___ 1. CAD stands for computer-aided design.
- ___ 2. CAP is for computer-aided printing.
- ___ 3. Another term for modern design is “retro.”
- ___ 4. The work surface of a drafting table can be adjusted.
- ___ 5. Brass is currently a trending metal that is replacing chrome and steel.
- ___ 6. Contemporary design is constantly changing.

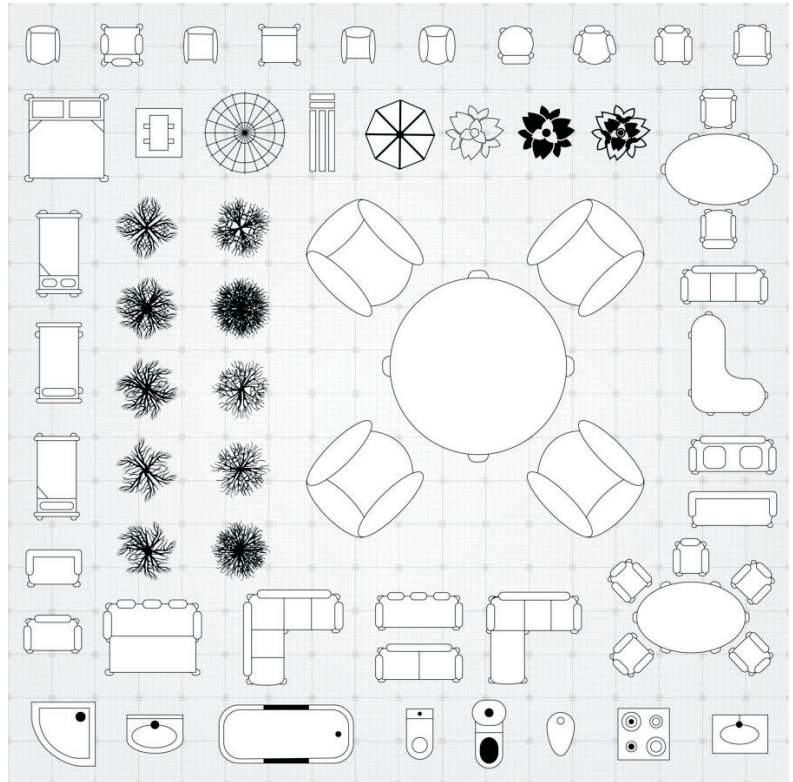
► **Part Three: Short Answer**

Instructions: Answer the following.

List and describe three currently trending interior design materials.

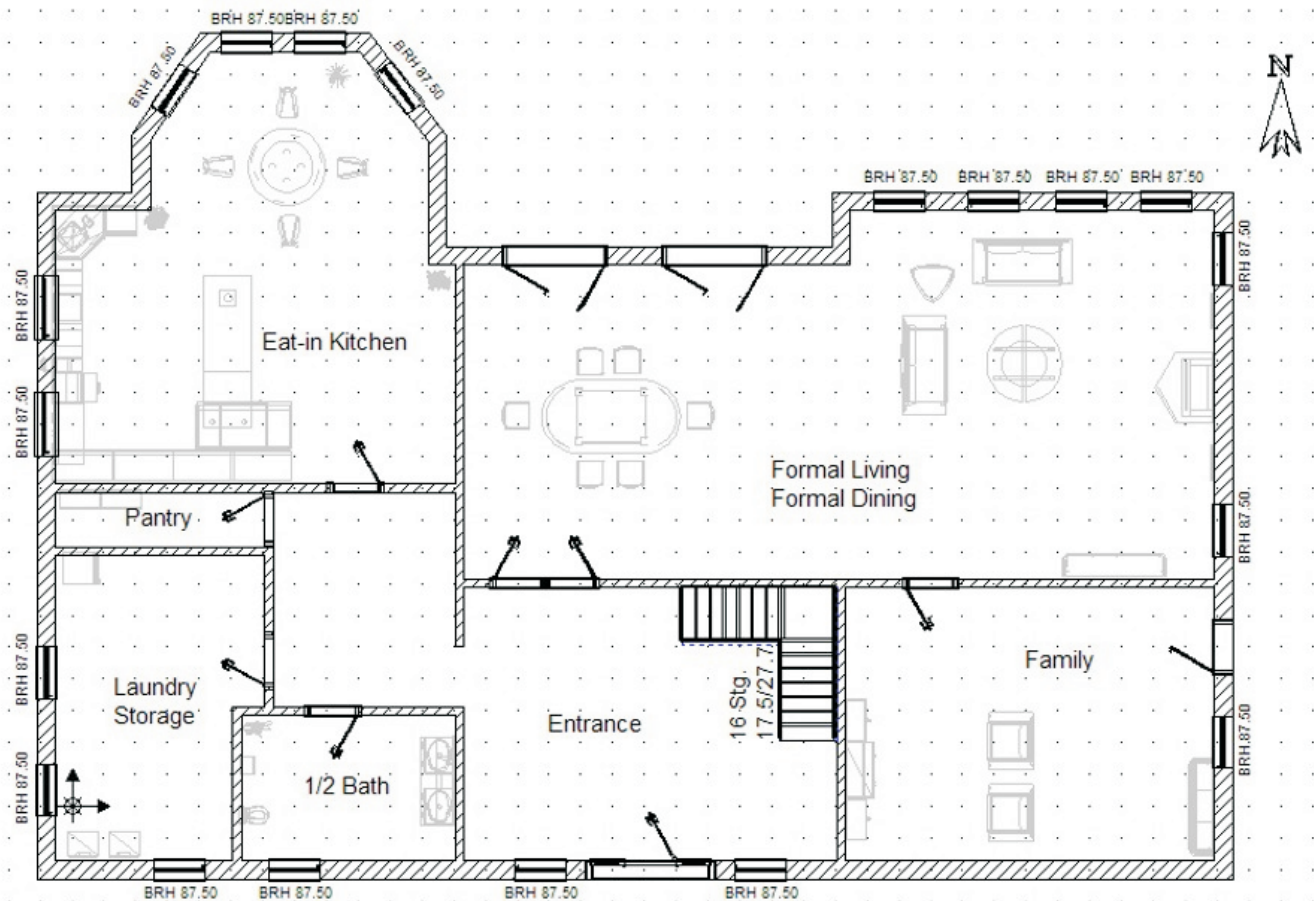
DRAFTING TOOLS AND EQUIPMENT

An interior designer oversees the design of a given space that sometimes includes elements of the exterior of the building. He or she must consider design elements, principles of design, and current trends. In addition, an interior designer must communicate to others in the design process to complete the development of a given space.



FLOOR PLAN

A floor plan is a scale diagram of a room or building drawn as if seen from above. A floor plan shows the relationships between rooms, spaces, and other physical features at one level of a structure. This floor plan shows one floor of a single-family detached home.



2D AND 3D CAD RENDERINGS

- ➔ Two-dimensional (2D) visuals are a blueprint or floor plan that show length and width. This is a 2D rendering of an apartment.
- ⬇ Three-dimensional (3D) visuals are images or models that provide the perception of depth (in addition to length and width). This is a 3D rendering of a modern living room interior.



OPEN CONCEPT

Open concept is the creation of common spaces in which the rooms have no walls or doors between them (other than bathrooms, bedrooms, and office spaces), and beams carry the weight of the floor above. The goal of open concept floor plans is a clean traffic flow.



INTERIOR DESIGN STYLES

→ This traditional bedroom has an antique chair, neutral colors, and red accents.

↓ Modern design is an open concept. It is sleek and free of clutter. A

modern design includes angles and curved lines. These floor plans reference the 1920's to 1950's eras.



Create a 2D Floor Plan of an Interior Room

Purpose

The purpose of this activity is to create a 2D floor plan for a room of your choice.

Objectives

1. Select an interior room to draw.
2. Design a 2D floor plan to scale.
3. Use hand-drafting tools and equipment or CAD software.
4. Present your 2D floor plan to the class.

Materials

- ◆ lab sheet
- ◆ drafting stencil templates
- ◆ eraser
- ◆ pencil
- ◆ graph paper
- ◆ protractor
- ◆ mechanical pencil
- ◆ scale-ruler
- ◆ templates
- ◆ optional: computer with CAD software (e.g., Google SketchUp)



Procedure

1. Select an interior room for which you will create a 2D floor plan.
2. Identify and gather materials needed to complete your model (e.g., scale-ruler, templates, graph paper, protractor, and software).
3. Draft a 2D floor plan to scale by hand or use CAD software.
4. Present your 2D floor plan to the class.
5. Turn in your drawing to your instructor.

Create a 3D Model for a 2D Floor Plan

Purpose

The purpose of this lab activity is to create a 3D model from a 2D floor plan.

Objectives

1. Select a 2D interior floor plan.
2. Convert a 2D floor plan to a 3D model using CAD software.
3. Edit the 3D model as needed.
4. Print or project the 3D model.
5. Showcase and present your model to the class.

Materials

- ◆ lab sheet
- ◆ 2D floor plan (created in LS-A)
- ◆ computer with Google SketchUp or other CAD software
- ◆ drafting tools for changes required to 2D floor plan (e.g., eraser, pencil, protractor, scale-ruler, and templates)

Procedure

1. Select a 2D interior floor plan (or use the one you created in LS-A).
2. Identify and gather materials to create the 3D model. [NOTE: If necessary, adjust your 2D floor plan to complete the CAD 3D model, using drafting tools as needed.]



3. Draft the 3D model using your 2D floor plan selection and CAD software of your choice. (TIP: You are able to create the same 2D CAD floor plan you previously sketched and then convert that sketch into a 3D model. Follow CAD software directives.)
4. Make any edits to the model using drafting tools.
5. Complete the 3D model. Print (or project) the 3D model.
6. Showcase and present your model to the class.
7. Turn in your completed 3D model to your instructor.