



# AutoCAD<sup>®</sup> 2022

## FOR INTERIOR DESIGN AND SPACE PLANNING

THE DESIGN APPROACH

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JAMES KIRKPATRICK  
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FREE SAMPLE CHAPTER

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# ***AutoCAD® 2022 for Interior Design and Space Planning***

## ***The Design Approach***

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***Hossein Assadipour***

***David Byrnes***



Pearson

## **AutoCAD 2022® for Interior Design and Space Planning**

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# Features of AutoCAD® 2022 for Interior Design and Space Planning

This text uses the features of AutoCAD® 2022 in a variety of exercises specifically for interior design and architecture. Features include:

**Chapter Objectives** with a bulleted list of learning objectives at the beginning of each chapter provide users with a roadmap to the commands, concepts, and practices to be introduced.

## CHAPTER OBJECTIVES

- Describe the AutoCAD user interface and begin using parts of the screen.
- Modify and

## TUTORIAL 2-1

### Part 1, Beginning an AutoCAD Drawing: Saving Your Work; Setting Units, Limits, Grid, and Snap; Creating Layers

#### Beginning an AutoCAD Drawing

When you click **New...** from the **Quick Access Toolbar** or **New** from the application menu button, or the **New** down arrow at the left side of the **Start** tab, AutoCAD allows you to select a template file from the **Template** folder or use the default template file. A template file has settings already established. These settings can include units, limits, grid, snap, and a

Because users need a lot of practice, Chapter 2, **Quick-Start Tutorials**, challenges the user to make 2D drawings. These tutorials are designed with special step-by-step instructions that will walk the reader through the entire development process while raising interest in mastering the content to come in the rest of the chapters.

The first appearance of each **key term** is bold and italic within the running text and accompanied by a brief definition in the margin. The glossary at the end of the book contains a complete list of the key terms and more detailed definitions to help students understand and use the language of the computer-aided drafting (CAD) world.

## Drawing Window and Graphics

**user interface:** All the elements such as the AutoCAD screen that make up the interface between the user and the AutoCAD program.

The AutoCAD **user interface** (Figure 1-4) contains access to commands. The drawing window is where played. The graphics cursor (or crosshairs) follows mouse when points of a drawing are entered or a box at the center of the crosshairs is called a *pick*

OPTIONS		Other components of the user interface.	
Ribbon/Panel	View/Interface/Dialog Box Launcher	• Application Menu Button	
Menu Bar:	Tools/Options	• Quick Access Toolbar	
Type a Command:	OPTIONS	• Share Drawing Button	
Command Alias:	OP	• Infocenter	
		• Ribbon and its Tabs and Panels	
		• ViewCube	
		• Navigation Bar	

**Command Grids** appear in the margin alongside the discussion of the command or the particular exercise in which it is demonstrated. These grids provide specific information about the ways of invoking each command, including any of the following:

- Ribbon panel
- Toolbar icon
- Pull-down menu
- Command line
- Command alias

**Tip, Note, and For More Details** boxes highlight additional helpful information for the student. Such information may contain dos and don'ts, facts, warnings, and alternative ways of proceeding, as well as cross-references to other chapters and topics.

#### TIP

Items can automatically be added to a path array when you lengthen the path using the **Measure** option of **ARRAYEDIT**.

#### NOTE

After an object has been selected, you can use the **Array** option of the **COPY** command to make multiple copies of the object.

#### FOR MORE DETAILS

See Chapter 6 for more information about annotative text and Chapter 7 for more information about annotative dimensions.

#### EXERCISE 1-1

#### Examine the AutoCAD User and Save a Workspace

Launching AutoCAD 2022 displays the interface shown in Figure 1-1. The **Start** tab is controlled by the **STARTMODE** system variable. The **Start** tab is visible and remains open as drawing files are opened. The revised **Start** tab contains three areas.

On the left side area you can **Open** an existing drawing. The display in the center and right areas changes based on the selection.



**New to AutoCAD® 2022** icons indicate the commands and tools that are new to this specific release of the program. This feature allows instructors and other users to quickly identify topics that are completely new, saving them a good amount of research time. It also demonstrates to students the recent improvements to the AutoCAD software, as well as the valuable updated information contained in this textbook. This book uses many of the features new to the software since the previous release of this book for AutoCAD 2015.

**End-of-Chapter** material can easily be located by the shading on the page edges. This material will help students evaluate and practice the knowledge they've acquired about the most important concepts explained in the chapter. This material's content includes:

- Chapter Summary
- Chapter Test Questions
  - Multiple Choice
  - Matching
  - True or False
  - List (Five different ways of executing commands in AutoCAD 2022)

#### chapterone

#### Chapter Summary

This chapter described the AutoCAD user interface and how to save a workspace so you can begin a new drawing.

#### Chapter Test Questions

#### Multiple Choice

#### chapterthree

#### Chapter Projects

#### Project 3-1: Rectangular Including Furniture [BASIC]

1. Draw the floor plan of the lecture room, including the dimensions shown in Figure 3-58, and measure the floor plan and draw it full.

**Chapter Projects** are additional assignments located at the end of each chapter in which students are directed to solve particular tasks on their own. The projects are labeled as basic, intermediate, and advanced according to the degree of complexity. Students will use the knowledge acquired throughout the chapter as well as in previous chapters in completing these assignments.

# Preface

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AutoCAD has become the industry-standard graphics program for interior design and space planning. This program is used to complete the many contract documents (CDs) that make up a design project. Many design firms have adopted AutoCAD as their standard because:

- It saves time.
- Affiliated professions have chosen it so that they can exchange files and work on the same drawing.
- Their competitors use it.
- Their clients expect it.

To be successful in design today, students must be proficient in the use of AutoCAD as it relates to interior design and space planning. The need for an AutoCAD textbook geared specifically to this field is what led us to write *AutoCAD® 2022 for Interior Design and Space Planning*.

This text, newly updated for AutoCAD® 2022, is divided into three parts:

- Part I: Preparing to Draw with AutoCAD (Chapter 1).
- Part II: Two-Dimensional AutoCAD (Chapters 2–13).
- Part III: Three-Dimensional AutoCAD (Chapters 14–15).

This new edition includes many features designed to help you master AutoCAD® 2022:

- The prompt-response format is clearly defined with numbered steps. This step-by-step approach is used in the beginning exercises of all chapters and then moves to an outline form in projects at the end of most chapters. This allows students to learn commands in a drawing situation and then practice applying them on their own.
- Lineweights have been carefully assigned to provide line contrast in all drawing exercises.
- Plotting is used in Chapter 2 to allow students to plot their first drawings.
- Chapter 7 covers updated ways to change dimension variables, as well as the recently introduced **DIM** command.
- Chapter 9 updates the process of finding and inserting blocks using the **BLOCKS** palette.
- Chapter 15 updates the sections on adding lights and rendering models.
- Exercises are geared to architects, interior designers, and space planners, allowing students to work with real-world situations.
- More than 600 illustrations (many printed to scale) support the text and reinforce the material.
- Screen shots and command grids help the user locate AutoCAD commands within the AutoCAD menus and ribbon.

- “Tip,” “Note,” and “For More Details” boxes give students additional support and information.
- Practice projects at the end of every chapter review the commands learned.
- Learning objectives and review questions in every chapter reinforce the learning process.
- An online Instructor’s Manual is available to support the text.

Organized around architectural and interior design–related projects, *AutoCAD® 2022 for Interior Design and Space Planning* gives students an understanding of the commands and features of AutoCAD® 2022 and demonstrates how to use the program to complete interior design and space planning projects. The book is appropriate for self-paced and lecture classes and covers both two-dimensional and three-dimensional drawings.

Throughout the exercises in this book, steps numbered in color provide instructions. **Prompt** and **Response** columns in the numbered steps provide step-by-step instructions for starting and completing a command. The **Prompt** column text repeats the AutoCAD prompt that appears in the command area of the AutoCAD screen. The **Response** column text shows how you should respond to the AutoCAD prompt. Screen shots of menus and command grids show you how to locate the command you are using.

Using numerous illustrations, the text captures the essence of this powerful program and the importance it plays in the interior design, architecture, and space planning professions.

Most importantly, this text was written to help you, the reader, master the AutoCAD program, which will be a valuable tool in your professional career.

## Hallmark Features

### Progresses from Basic Commands to Complex Drawing Exercises

- Builds confidence and basic skills before moving on to more complex assignments.
- Ensures students have mastered the fundamental features and commands of the AutoCAD program before they apply it to more complex problems.
- Guides readers step-by-step through each new AutoCAD command.
- Encourages students to learn commands and features on their own.

### Provides More Than 100 Exercises and Projects

- Gives students the opportunity to work with a variety of real-world situations, including both commercial and residential projects.



## Highlights Projects Appropriate for Interior Design, Space Planning, and Architecture Students

- Projects are a tenant space, hotel room, and wheelchair-accessible commercial restroom.
- Includes project floor plans, dimension plans, elevations, furniture plans, reflected ceiling plans, and voice/data/power plans, as well as isometric drawings, a presentation sheet, and the sheet set command that combines multiple plans.

## Includes More Than 600 Figures

- Helps students by allowing them to compare their work and progress with the many figures available.
- Shows many drawings to scale so students can assess and check their understanding of chapter material.

## The AutoCAD DesignCenter

- The **DesignCenter** is used to import blocks, layers, and dimension styles from other drawings into existing drawings.

## Covers Solid Modeling in Two Chapters

- Splits solid modeling material into two chapters: Chapter 14, Solid Modeling; and Chapter 15, Advanced Modeling.
- Uses the **3DWALK** and **Animation Motion** commands to create walk-through presentations.

## New to This 2022 Edition

- **Revised Start Tab**
- **Floating drawing tabs**
- **Commands introduced in all areas of the program since the previous edition**
- **Enhanced Help (to locate tools in AutoCAD)**
- **(View) Ribbon Enhancements**

## Instructor Resources

The **Online Instructor's Manual** provides answers to unit exercises and tests, solutions to end-of-chapter questions, and lecture-supporting PowerPoint® slides.

Instructor materials are available from Pearson's Instructor Resource Center. Go to <https://www.pearson.com/us/higher-education/subjectcatalog/download-instructor-resources.html> to register, or to sign in if you already have an account.



## Style Conventions in AutoCAD® 2022 for Interior Design and Space Planning

Text Element	Example
<b>Key Terms</b> — <b>Boldface</b> and italic on first mention (first letter lowercase, as it appears in the body of the text). Brief definition in margin alongside first mention. Full definition in Glossary at back of book.	Views are created by placing <i>viewport</i> objects in the paper space layout.
<b>AutoCAD commands</b> —Bold and uppercase.	Start the <b>LINE</b> command.
<b>Ribbon and panel names, palette names, toolbar names, menu items, and dialog box names</b> —Bold and follow capitalization convention in AutoCAD toolbar or pull-down menu (generally first letter cap).	The <b>Layer Properties Manager</b> palette The <b>File</b> menu
<b>Panel tools, toolbar buttons, and dialog box controls/buttons/input items</b> —Bold and follow the name of the item or the name shown in the AutoCAD tooltip.	Choose the <b>Line</b> tool from the <b>Draw</b> panel. Choose the <b>Symbols and Arrows</b> tab in the <b>Modify Dimension Style</b> dialog box. Choose the <b>New Layer</b> button in the <b>Layer Properties Manager</b> palette. In the <b>Lines and Arrows</b> tab, set the <b>Arrow size</b> : to <b>.125</b> .
<b>AutoCAD prompts</b> —Dynamic input prompts are set in a different font to distinguish them from the text. Command window prompts are set to look like the text in the command window, including capitalization, brackets, and punctuation. Text following the colon of the prompts specifies user input in bold.	AutoCAD prompts you to <i>Specify first point:</i> <i>Specify center point for circle or [3P 2P Ttr (tan radius)]:</i> <b>3.5</b>
<b>Keyboard Input</b> —Bold with special keys in brackets.	Type <b>3.5 &lt;Enter&gt;</b>

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# 3 chapter three

## Drawing with AutoCAD: Conference and Lecture Rooms

### CHAPTER OBJECTIVES

- Correctly use the following commands and settings:

**BREAK**  
**CHAMFER**  
**COPY**  
Distance

**DIVIDE**  
Drawing Template  
**EXPLODE**  
**EXTEND**

**FILLET**  
From  
Grips  
**HATCH**  
ID Point  
**MEASURE**  
**MIRROR**

**OFFSET**  
**OSNAP**  
**POINT**  
**POLAR ARRAY**  
**POLYGON**  
Polyline

Polyline Edit  
Rectangle  
**RECTANGULAR ARRAY**  
**ROTATE**  
Tracking  
**TRIM**

- Draw using polar tracking.
- Use Point Style to set the appearance of points.

### EXERCISE 3-1

## Drawing a Rectangular Conference Room, Including Furniture

In Exercise 3-1, you learn to draw a conference room, including walls and furnishings. When you have completed Exercise 3-1, your drawing will look similar to Figure 3-1.

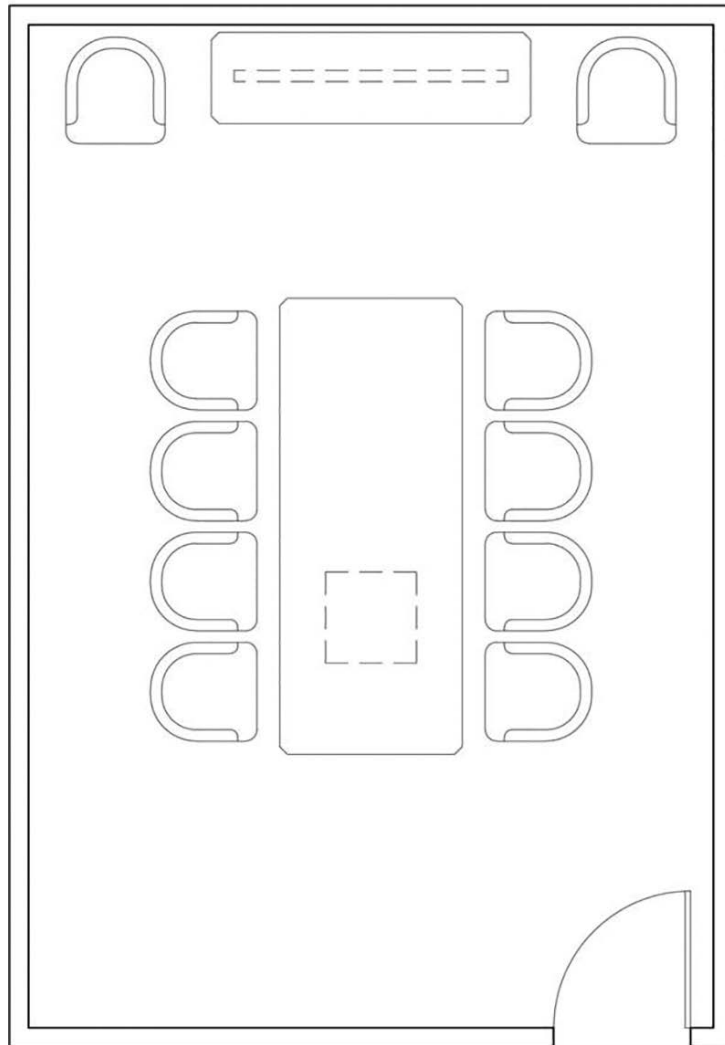
**Step 1.** Use your workspace to make the following settings:

1. Use **Save As...** to save the drawing with the name **CH3 EXERCISE1**
2. Set drawing units: **Architectural**

### Figure 3-1

Exercise 3-1: Drawing  
a rectangular conference  
room, including furniture  
(scale: 1/4" = 1'-0")

NAME  
CLASS  
DATE



3. Set drawing limits: **25',35'** (Don't forget the foot marks.)
4. Set **GRIDDISPLAY: 0**
5. Set grid: **12"**
6. Set snap: **6"**
7. Create the following layers:

Layer name	Color	Linetype	Lineweight
a-anno-text	green	continuous	.006[dp] (.15 mm)
a-door	red	continuous	.004[dp] (.09 mm)
a-wall-intr	blue	continuous	.010[dp] (.25 mm)
i-eqpm-ovhd	red	hidden	.004[dp] (.09 mm)
i-furn	cyan	continuous	.004[dp] (.09 mm)

**TIP**

You can create the layers by clicking the **New layer** icon and then typing the layer names separated by a comma. When you type the comma, the **Name** list moves to the next layer, and you can type the next layer name.

8. Set layer **a-wall-intr** current.
9. Use **Zoom-All** to view the limits of the drawing.
10. Turn **SNAP**, **GRID**, and **LWDISPLAY** on. The remaining buttons in the status bar are off.

## Making a Drawing Template

**drawing template:** A drawing used to ensure consistency by providing standard styles and settings.

You will be able to use these settings for the remaining tutorials in this chapter. Making a **drawing template** of the settings will save you the time of setting up Exercises 3-2, 3-3, and 3-4.

**Step 2.** Save the drawing as a template on the drive and/or folder in which you want to save (Figures 3-2 and 3-3), as described next:

**Prompt**

Type a command:

The **Save Drawing As** dialog box appears:

**Response**

**Save As...**

Click the down arrow in the **Files of type:** input box and click **AutoCAD Drawing Template (\*.dwt)**

Type **Ch3-conference-rm-setup** (in the **File name:** input box so the **Save Drawing As** dialog box appears as shown in Figure 3-2). Notice the text in the **Save in:** input box has changed to **Template**

Click the down arrow in the **Save in:** input box and highlight the drive and folder in which you want to save

Click **Save**

The **Template Options** dialog box appears (Figure 3-3):

Type **Setup for Ch3 conference rooms** (as shown in Figure 3-3)

Click **OK**

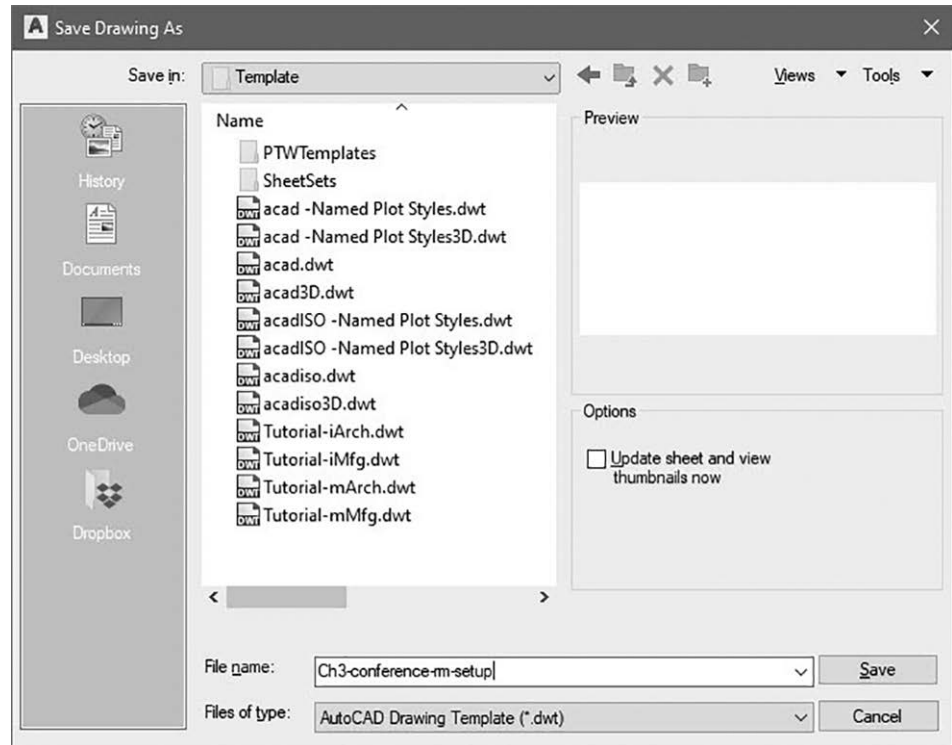
**NOTE**

Remember to save often to avoid losing your work. Backing up your work by saving on two drives is always a good idea.



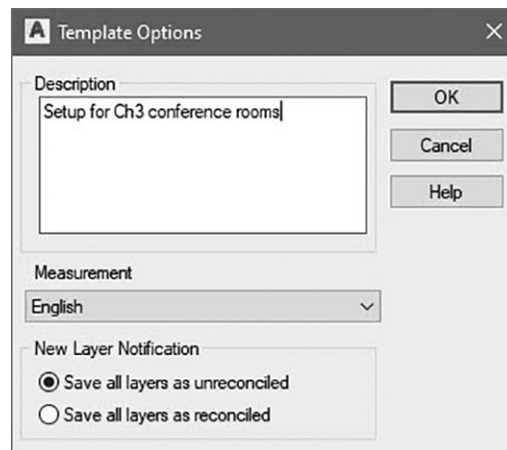
**Figure 3-2**

Save the drawing as a template



**Figure 3-3**

Template Options dialog box



**Step 3.** The drawing remains as a template in the **Template** folder, so you must save it again as a drawing file. Save the drawing as a drawing file on the drive and/or folder in which you want to save, as described next:

**Prompt**

Type a command:

The **Save Drawing As** dialog box appears:

**Response**

**Save As...**

Click the down arrow in the **Files of type:** input box and click **AutoCAD 2018 Drawing (\*.dwg)**. (Remember, **AutoCAD 2018 Drawing** is the drawing file format used by AutoCAD 2022.)

**Prompt****Response**

Click the down arrow in the **Save in:** input box and highlight the drive and folder in which you want to save

Click **CH3-EXERCISE1** (to appear in the **File name:** input box)



Click **Save**

The **Save Drawing As** dialog box appears saying *The drawing already exists. Do you want to replace it?*

Click **Yes**

## Polyline

**polyline:** A continuous line or arc composed of one or more segments, the width of which can be changed.

POLYLINE	
Ribbon/Panel	Home/Draw  Polyline
Draw Toolbar:	
Menu Bar:	Draw/Polyline
Type a Command:	PLINE
Command Alias:	PL

Begin by drawing the conference room walls using the **Polyline** command. A **polyline** is different from a regular line in that regardless of the number of segments that make up a polyline, AutoCAD treats a polyline drawn with one operation of the **Polyline** command as a single entity. This is especially helpful when you are drawing walls, because after you draw the outline of a single room or entire building, you can offset the entire polyline to show the thickness of the walls.

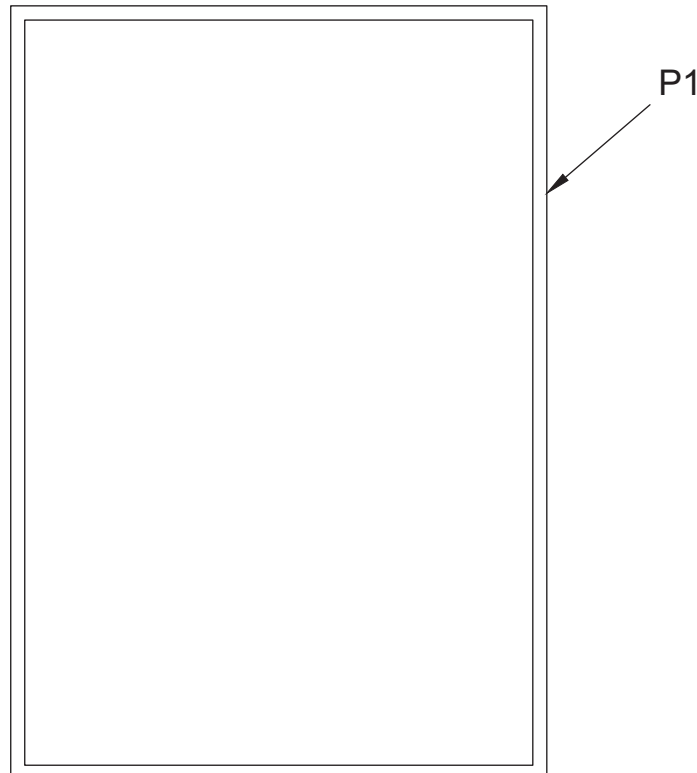
**Step 4.** Use **Polyline** to draw the inside lines of the conference room walls (Figure 3-4), as described next:

**Prompt**

Type a command:  
Specify start point:

**Response**

**Polyline** (or type **PL<Enter>**)  
Type **5',5' <Enter>**



**Figure 3-4**

Draw the conference room walls

## Prompt

Current line-width is 0'-0".  
Specify next point or [Arc  
Halfwidth Length Undo Width]:  
  
Specify next point or [Arc Close  
Halfwidth Length Undo Width]:  
  
Specify next point or [Arc Close  
Halfwidth Length Undo Width]:  
  
Specify next point or [Arc Close  
Halfwidth Length Undo Width]:

## Response

(You have just entered absolute coordinates; the polyline starts 5' to the right on the x-axis and 5' up on the y-axis.)  
Set **ORTHO** on (press <F8> or click **ORTHO**)  
  
Move your mouse to the right and type **15' <Enter>** (direct distance entry)  
  
Move your mouse up and type **22' <Enter>**  
  
Move your mouse to the left and type **15' <Enter>**  
  
Type **C <Enter>**

## Undo



The **Polyline Undo** option is similar to the **LINE** command. If you do not like the last polyline segment drawn, use the **Undo** option to erase it and continue with the *Specify next point or [Arc Close Halfwidth Length Undo Width]:* prompt.

You can enter any of the capitalized options in the **Polyline** prompt by typing the letters in either upper- or lowercase, or you can simply click the option in the command-line window. The remaining options in the **Polyline** prompt are described later in this chapter.

## OFFSET

Because the polyline is treated as a single entity, when you click one point on the polyline, you are able to offset the entire outline of the conference room at once. If the outline of the room had been drawn with the **LINE** command, using the **OFFSET** command would offset each line segment individually, and the corners would not meet.

**Step 5.** Use the **OFFSET** command to draw the outside line (showing depth) of the conference room walls (Figure 3-4), as described next:

OFFSET	
Ribbon/Panel	Home/ Modify 
Draw Toolbar:	
Menu Bar:	Modify/ Offset
Type a Command:	OFFSET
Command Alias:	O

## Prompt

Type a command:  
Specify offset distance or [Through  
Erase Layer] <Through>:  
Select object to offset or [Exit  
Undo] <Exit>:  
Specify point on side to offset or  
[Exit Multiple Undo] <Exit>:  
  
Select object to offset or [Exit  
Undo] <Exit>:

## Response

**Offset** (or type **O <Enter>**)  
  
Type **5 <Enter>**  
  
Click anyplace on the polyline  
  
**P1→** (outside the rectangle,  
Figure 3-4)  
  
**<Enter>**

The four options in the **Offset** prompt are **offset distance**, **Through**, **Erase**, and **Layer**. To complete the conference room wall, 5" was set as the offset distance. To use any of the other options, type and enter the capital letter shown for the option in the command line or press **<Enter>** to start the **<Through>** default option.

## Through

When you start the **Through** option and select the object to be offset, AutoCAD prompts: *Specify through point or [Exit Multiple Undo] <Exit>:*. You respond by clicking a point on the drawing through which you want the object to be offset.

## Erase

When you start the **Erase** option, AutoCAD prompts: *Erase source object after offsetting? [Yes No] <No>:*. You can then respond with **Yes** or **No**, and AutoCAD continues by asking you to specify the offset distance, object to offset, and point on side to offset.

## Layer

When you start the **Layer** option, AutoCAD prompts: *Enter layer option for offset objects [Current Source] <Source>:*. You can then respond with the selection of current or source layer, and AutoCAD continues by asking you to specify the offset distance, object to offset, and point on side to offset.

## EXPLODE

Because the polyline is treated as a single entity, it must be “exploded” before individual line segments can be edited. The **EXPLODE** command splits the solid polyline into separate line segments. After the polyline is exploded into separate line segments, you will be able to add the conference room door.

**Step 6.** Use the **EXPLODE** command to split the two polylines that make the conference room walls, as described next:

### Prompt

Type a command:  
Select objects:  
Select objects:  
Select objects:



### Response



**Explode** (or type **X <Enter>**)  
Click anyplace on the outside polyline  
Click anyplace on the inside polyline  
**<Enter>**

After you use the **EXPLODE** command, the walls do not look different, but each line segment is now a separate entity.

## ID Point

A useful command, **ID Point** (located under the expanded **Utilities** panel of the **Home** tab on the ribbon) allows you to locate a point on a drawing and have the position of the point displayed in coordinates. AutoCAD remembers the coordinate location of the point. You can initiate a command, such as **LINE**, *immediately* after the **ID Point** command has located a point on the drawing. You can enter the start point of the **LINE** command by using

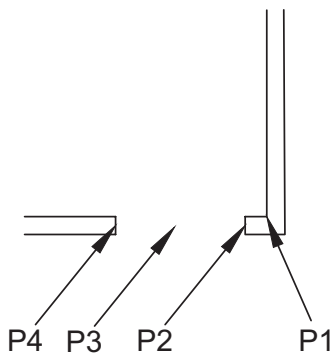
EXPLODE	
Ribbon/ Panel	Home/ Modify 
Draw Toolbar:	
Menu Bar:	Modify/ Explode
Type a Command:	EXPLODE
Command Alias:	X

ID POINT	
Ribbon/ Panel	Home/ Utilities 
Draw Toolbar:	
Menu Bar:	Tools/ Inquiry/ ID Point
Type a Command:	ID

relative or polar coordinates, or you may also use direct distance entry to specify a distance from the established ID point location. Alternatively, you can use the **From** option of the **Osnap** menu (shown later in Figure 3-16 and used in Step 39) to define a reference point and then define the x- and y-offset from that point. The upcoming steps explain this further. Let's continue with the exercise using **ID Point**.

**Step 7.** Use **Zoom-Window** to magnify the lower-right corner of the conference room where the door will be located.

**Step 8.** Use **ID Point** to locate a point on the drawing. Use **LINE** to draw the right side of the door opening (Figure 3-5), as described next:



**Figure 3-5**  
Draw the door opening

**Prompt**

Type a command:

Specify point:

Point: X = 20'-0" Y = 5'-0" Z = 0'-0"

Type a command:

Specify first point:

Specify next point or [Undo]:

Specify next point or [Undo]:

**Response**

**ID Point** (or type **ID <Enter>**)

**P1→** (with **SNAP** on, snap to the inside lower-right corner of the conference room, Figure 3-5)

Type **L <Enter>**

Type **@6<180 <Enter>** (you have just entered polar coordinates; move your mouse so you can see where the line is attached)

Type **@5<-90 <Enter>** (using polar coordinates; the line 5") is extended downward

**<Enter>**

**TIP**

Instead of typing **@5<-90 <Enter>**, type **PER <Enter>** and draw the line down until it intersects at a 90° angle with the outside line of the wall. This is an **Object Snap** mode (**Perpendicular**), which is described more fully later in this exercise.

**Step 9.** Offset the line 3' to the left to form the door opening, as described next:

**Prompt**

Type a command:

Specify offset distance or [Through

Erase Layer] <0'-5">:

Select object to offset or [Exit

Undo]<Exit>:

Specify point on side to offset or

[Exit Multiple Undo]<Exit>:

Select object to offset or [Exit

Undo]<Exit>:

**Response**



**Offset** (or type **O <Enter>**)

Type **3' <Enter>**

**P2→** (the 5" line you just drew; Figure 3-5)

**P3→** (pick to the left)

**<Enter>**

TRIM	
Ribbon/ Panel	Home/ Modify 
Draw Toolbar:	
Menu Bar:	Modify/ Trim
Type a Command:	TRIM
Command Alias:	TR

## TRIM

Watch the **Trim** prompts carefully. You cannot pick the objects to trim until you have selected all cutting edges (the edge to which the object is trimmed) and pressed the **<Enter>** key, so that the prompt *Select object to trim or shift-select to extend or [Fence Crossing Project Edge eRase Undo]*: appears. If you are unable to trim an object because it does not intersect a cutting edge, and you have selected **all** as the cutting edges, hold the **<Shift>** key down and click on the entity to extend while still in the **TRIM** command.

### NOTE

Press **<Enter>** at the **Trim** prompt *Select objects or <select all>*: to select all objects as cutting edges.

**Step 10.** Use the **TRIM** command to trim the horizontal wall lines between the two 5" vertical lines that represent the door opening (Figure 3-5), as described next:

#### Prompt

Type a command:  
Current settings: Projection = UCS  
Edge = None, Mode = Quick  
Select object to trim or Shift-select  
to extend or [cuTting edges  
Crossing mOde Project eRase]  
  
Select objects or <select all>:  
Select objects: 1 found  
Select objects:  
Select objects: 1 found, 2 total  
Select objects:  
Select object to trim or Shift-select  
to extend or [Fence Crossing  
Project Edge eRase Undo]:

#### Response

**Trim** (or type **TR <Enter>**)



Click **CuTting edges** in the  
command-line window, or type **T**  
**P2→** (the 5" vertical line; Figure 3-5)

**P4→** (the second 5" vertical line)

**<Enter>**

Click the two horizontal wall lines  
between **P2→** and **P4→** (Figure 3-5)  
**<Enter>** (to complete the command)

**Step 11.** Set layer **a-door** current.

RECTANGLE	
Ribbon/Panel	Home/ Draw 
Draw Toolbar:	
Menu Bar:	Draw/ Rectangle
Type a Command:	RECTANG
Command Alias:	REC

## Rectangle

Use the Rectangle command to create a door for the floor plan.

**Step 12.** Draw a 1-1/2"-long by 3'-wide rectangle to represent the door (Figure 3-6):

#### Prompt

Type a command:  
Specify first corner point or  
[Chamfer Elevation Fillet  
Thickness Width]:

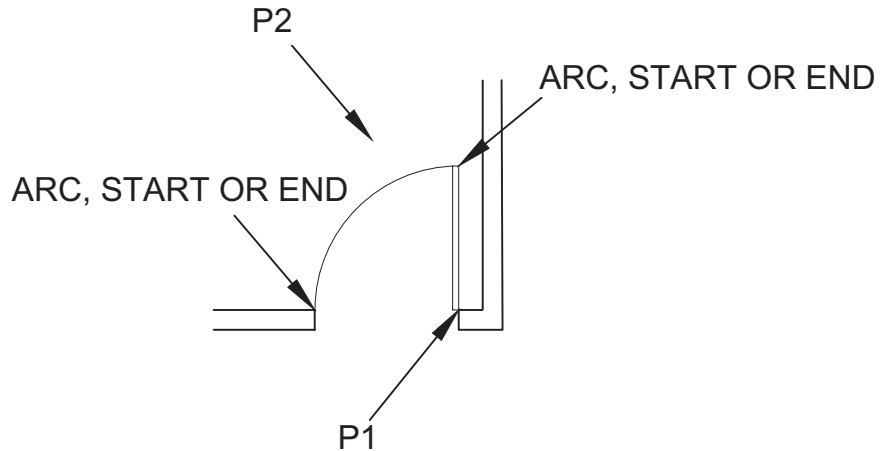
#### Response

**Rectangle** (or type **REC <Enter>**)

**P1→** (be sure **SNAP** is on); snap to  
the upper-right corner of the door  
opening to begin the rectangle

**Figure 3-6**

Draw the door using  
**Rectangle** and **Arc-Start,**  
**End, Direction** commands



**Prompt**

Specify other corner point or  
[Area Dimensions Rotation]:  
Specify length for rectangle  
<0'-1-1/2">:  
Specify width for rectangle  
<3'-0">:  
Specify other corner point or  
[Area Dimensions Rotation]:

**Response**

Type **D** <Enter>

Type **1-1/2** <Enter>

Type **3'** <Enter>

**P2**→ (pick any point to the left of  
the door symbol so the rectangle  
appears as shown in Figure 3-6)

**Step 13.** Use the **Arc-Start, End, Direction** method to draw the door swing arc. Be sure **SNAP** and **ORTHO** are on. The arc can be drawn clockwise or counterclockwise. Move your mouse so the direction of the arc appears, as shown in Figure 3-6.

**TIP**

The default setting for the **Rectangle** command when the **Dimension** option is selected is:

**Default Rotation setting of 0:**

Length is the x direction value.

Width is the y direction value.

**When you change the Rotation setting to 90:**

Length is the y direction value.

Width is the x direction value.

When the rectangle is visible, and the prompt *Specify other corner point:* appears, you change the position of the rectangle by moving your mouse right or left, up or down.

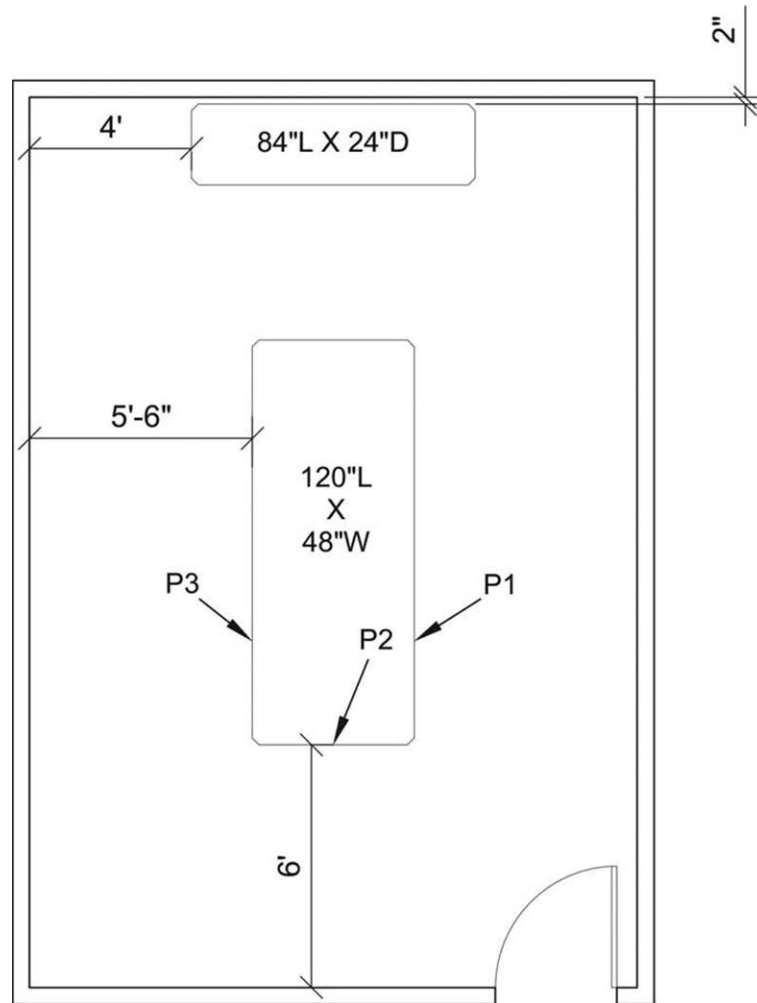
**Step 14.** Set layer **i-furn** current. Use **Zoom-Extents**.



**Step 15.** Use the **Polyline** command to draw a credenza (84" long by 24" deep) centered on the 15' rear wall of the conference room, 2" away from the wall. Locate an ID point by snapping to the inside upper-left corner of the conference room. Start the polyline @48,-2 (relative coordinates) away from the point. Finish drawing the credenza by using direct distance entry. You can use feet or inches. Remember, AutoCAD defaults to inches in architectural units, so use the foot (') symbol if you are using feet. Be sure to draw the credenza using one operation of **Polyline** so it is one continuous polyline. Use the **Close** option for the last segment of the polyline (Figure 3-7).

**Figure 3-7**



Draw a credenza and a conference table; chamfer the corners



**Step 16.** Draw a conference table 120" long by 48" wide using the **LINE** command. You can determine the location of the first point by using **ID Point** or by using grid and snap increments. Use direct distance entry to complete the table. Refer to Figure 3-7 for the location of the table in the room.

**Step 17.** Zoom in on the table.

# CHAMFER

CHAMFER	
Ribbon/ Panel	Home/ Modify (Fillet drop-down)  Chamfer
Draw Toolbar:	
Menu Bar:	Modify/ Chamfer
Type a Command:	CHAMFER
Command Alias:	CHA

A **chamfer** is an angle (usually 45°) formed at a corner. The following steps will use the **CHAMFER** command to make the beveled corners of the conference table and credenza.

**Step 18.** Use the **CHAMFER** command to bevel the corners of the table (Figure 3-7), as described next:

## Prompt

Type a command:  
(TRIM mode) Current chamfer  
Dist1 = 0'-0" Dist2 = 0'-0"  
Select first line or [Undo Polyline  
Distance Angle Trim mEthod  
Multiple]:  
Specify first chamfer distance  
<0'-0">:  
Specify second chamfer distance  
<0'-2">:  
Select first line or [Undo Polyline  
Distance Angle Trim mEthod  
Multiple]:  
Select second line or Shift-select to  
apply corner or [Distance Angle  
mEthod]:  
Type a command:  
(TRIM mode) Current chamfer  
Dist1 = 0'-2", Dist2 = 0'-2"  
Select first line or [Undo Polyline  
Distance Angle Trim mEthod  
Multiple]:  
Select second line or Shift-select to  
apply corner:

## Response

**Chamfer** (or type **CHA** <Enter>)

Type **D** <Enter>

Type **2** <Enter>

<Enter>

**P1**→ (Figure 3-7)

**P2**→  
<Enter> (repeat **CHAMFER**)

**P2**→

**P3**→

## NOTE

Type **M** <Enter> (for **Multiple**) at the **Chamfer** prompt so you do not have to repeat the **CHAMFER** command.

**Step 19.** Chamfer the other corners of the table (Figure 3-7).

**Step 20.** Zoom in on the credenza.

# Polyline

Because you drew the credenza using one operation of the **Polyline** command and used the **Close** option to complete the credenza rectangle, it is treated as a single entity. The **CHAMFER** command **Polyline** option chamfers all corners of a continuous polyline with one click.

# Undo

Undo allows you to undo the previous chamfer.

## Angle

The Angle option of the **CHAMFER** command allows you to specify an angle and a distance to create a chamfer.

## Trim

The Trim option of both the **CHAMFER** and **FILLET** commands allows you to specify that the part of the original line removed by the chamfer or fillet remains as it was. To do this, type **T <Enter>** at the **Chamfer** prompt and **N <Enter>** at the *Trim/No trim <Trim>*: prompt. Test this option on a corner of the drawing so you know how it works. Be sure to return it to the **Trim** option.

## mEthod

The **mEthod** option of the **CHAMFER** command allows you to specify whether you want to use the **Distance** or the **Angle** method to specify how the chamfer is to be drawn. The default is the **Distance** method.

## Multiple

Multiple allows you to chamfer multiple corners without repeating the **CHAMFER** command.

**Step 21.** Use chamfer distance 2" to chamfer the corners of the credenza (Figure 3-7), as described next:

Prompt	Response
Type a command:	<b>Chamfer</b>
(TRIM mode) Current chamfer Dist1 = 0'-2", Dist2 = 0'-2"	
Select first line or [Undo Polyline Distance Angle Trim mEthod Multiple]:	Type <b>P &lt;Enter&gt;</b> (accept 2" distances as previously set)
Select 2D polyline or [Distance Angle mEthod]:	Click anyplace on the credenza
Four lines were chamfered	

### TIP

If the last corner of the credenza does not chamfer, this is because the **Close** option of the **Polyline** command was not used to complete the polyline rectangle. Explode the credenza and use the **CHAMFER** command to complete the chamfered corner.

### NOTE

While in the **CHAMFER** command, hold down the **<Shift>** key to select any two lines that do not meet, and you can make 90° corners of those two lines. This is the same as a 0 chamfer distance but will work regardless of the chamfer distance set.

When setting the chamfer distance, you can set a different distance for the first and second chamfers. The first distance applies to the first line

clicked, and the second distance applies to the second line clicked. You can also set the distance by clicking two points on the drawing.

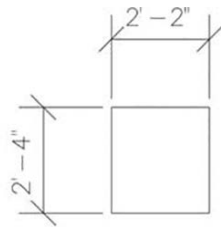
You can set a chamfer distance of zero and use it to remove the chamfered corners from the table. Using a distance of zero will make 90° corners on the table. Then you can erase the old chamfer lines. This will change the table but not the credenza because it does not work with a polyline. If you have two lines that do not meet to form an exact corner or that overlap, use the **CHAMFER** command with 0 distance to form an exact corner. The **CHAMFER** command will chamfer two lines that do not intersect. It automatically extends the two lines until they intersect, trims the two lines according to the distance entered, and connects the two trimmed ends with the chamfer line.



**NOTE**

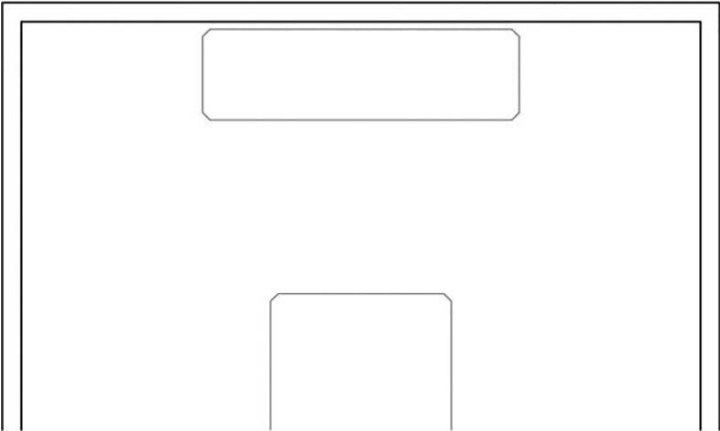
Remember to turn **SNAP** off and on as needed. Turn **SNAP** off when it interferes with selecting an entity. Turn it back on as needed.

- Step 22.** Zoom in on a portion of the grid outside the conference room walls.
- Step 23.** Draw a rectangle 26" wide by 28" deep using the **POLYLINE** command (Figure 3-8). Be sure to have **SNAP** on when you draw the rectangle. Next, you will edit this rectangle using the **FILLET** command to create the shape of a chair.

**Figure 3-8**  
Draw a rectangle 26" wide x 28' deep using the **POLYLINE** command

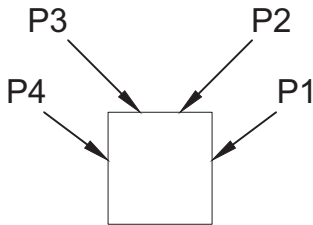


FILLET	
Ribbon/Panel	Home/Modify  Fillet
Draw Toolbar:	
Menu Bar:	Modify/ Fillet
Type a Command:	FILLET
Command Alias:	F

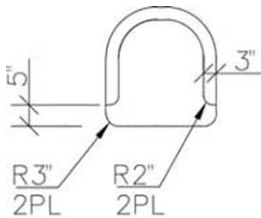


**FILLET**

The **FILLET** command is similar to **CHAMFER**, except the **FILLET** command creates a round instead of an angle.





**Figure 3-9**  
Use **FILLET** to create the chair symbol



**Figure 3-10**  
Use **OFFSET**, **TRIM**, **EXTEND**, and **FILLET** commands to complete the shape of the chair

**Osnap:** An abbreviation of *object snap*, which specifies a snap point at an exact location on an object.

COPY	
Ribbon/Panel	Home/Modify  Copy
Draw Toolbar:	
Menu Bar:	Modify/Copy
Type a Command:	COPY
Command Alias:	CO or CP

**Step 24.** Use the **FILLET** command to edit the back of the rectangle to create the symbol of a chair (Figure 3-9), as described next:

#### Prompt

Type a command:  
Current settings: Mode = TRIM,  
Radius = 0'-0"  
Select first object or [Undo Polyline  
Radius Trim Multiple]:  
Specify fillet radius <0'-0">:  
Select first object or [Undo Polyline  
Radius Trim Multiple]:  
Enter Trim mode option  
[Trim No trim]<Trim>:  
Select first object or [Undo  
Polyline Radius Trim Multiple]:  
Select second object or shift-select  
to apply corner or [Radius]:  
Type a command:  
Current settings: Mode = TRIM,  
Radius = 1'-0"  
Select first object or [Undo Polyline  
Radius Trim Multiple]:  
Select second object or Shift-select  
to apply corner or [Radius]:

#### Response

**Fillet** (or type **F** <Enter>)  
  
Type **R** <Enter>  
Type **12** <Enter>  
  
Type **T** <Enter>  
  
Type **T** <Enter> (verify **Trim** option)  
  
**P1**→ (Figure 3-9)  
  
**P2**→  
<Enter> (repeat **Fillet**)  
  
**P3**→  
  
**P4**→

The **Polyline** option of **Fillet** automatically fillets an entire continuous polyline with one click. Remember to set the fillet radius first.

Fillet will also fillet two circles, two arcs, a line and a circle, a line and an arc, or a circle and an arc.

**Step 25.** Use the commands **OFFSET**, **TRIM**, **EXTEND**, and **FILLET** to complete the shape of the chair, as shown in Figure 3-10.

#### NOTE

When using **TRIM**, you can invoke the **EXTEND** command by holding down the space bar as you select objects. For more on **EXTEND**, see Chapter 6.

## COPY and Osnap-Midpoint

The **COPY** command allows you to copy any part of a drawing either once or multiple times. Object snap modes (**Osnap**), when combined with other commands, help you to draw very accurately. As you become more familiar with the object snap modes, you will use them constantly to draw with extreme accuracy. The following introduces the **Osnap-Midpoint** mode, which helps you snap to the midpoint of a line or arc.

#### NOTE

Save your drawing often so you do not lose your work.

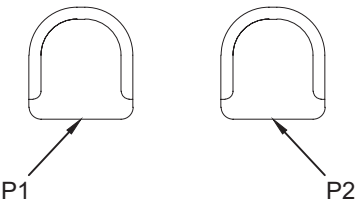
**Step 26.** Use the **COPY** command, combined with **Osnap-Midpoint**, to copy the chair you have just drawn (Figure 3-11), as described next:

**Prompt**

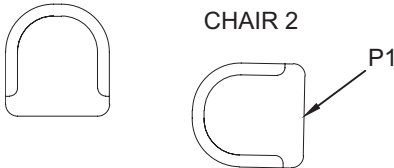
Type a command:  
Select objects:  
  
Specify opposite corner:  
  
Select objects:  
Specify base point or [Displacement  
mOde] <Displacement>:  
mid of  
  
Specify second point or [Array  
<use first point as displacement>:  
  
Specify second point or [Array  
Exit Undo]<Exit>:

**Response**

**Copy** (or type **CP <Enter>**)  
Click the first corner of a window  
that will include the chair  
Click the other corner of the  
window to include the chair  
**<Enter>**  
  
Type **MID <Enter>**  
**P1→** (Figure 3-11) (Turn **SNAP**  
off as needed)  
  
**P2→** (be sure **SNAP** is on, and leave  
enough room to rotate the chair,  
Figure 3-12)  
  
**<Enter>**



**Figure 3-11**  
Copy the chair using **Osnap-Midpoint**



**Figure 3-12**  
The rotated chair

The **Osnap-Midpoint** mode helped you snap very accurately to the midpoint of the line; you used the midpoint of the line that defines the front of the chair as the base point. When using the **COPY** command, carefully choose the base point so that it helps you easily locate the copies.

**ROTATE**

The **ROTATE** command rotates a selected drawing entity in the counter-clockwise direction; 90° is to the left, and 270° (or -90°) is to the right. You select a base point of the entity to be rotated, and the entity rotates about that base point.

**TIP**

The AutoCAD system variable **ANGDIR** sets the direction of positive angles. If the variable is set to 1, the direction is clockwise and is the same as selecting the **Clockwise** check box on the **Drawing Units** dialog box. When **ANGDIR** is set to 0, the direction is counter-clockwise, and the **Clockwise** check box of the **Drawing Units** dialog box is not selected.

**Step 27.** Use the **ROTATE** command to rotate CHAIR 2 (Figure 3-12), as described next:

**Prompt**

Type a command:  
Current positive angle in UCS:  
    ANGDIR=counterclockwise  
    ANGBASE=0  
Select objects:  
Specify opposite corner:  
  
Select objects:  
Specify base point:  
mid of  
Specify rotation angle or [Copy  
    Reference]:

**Response**



**Rotate** (or type **RO** <Enter>)  
  
Start the window to include CHAIR 2  
Complete the window to include  
    CHAIR 2  
**<Enter>**  
Type **MID** <Enter>  
**P1**→ (Figure 3-12)  
  
Type **90** <Enter>

**NOTE**

If part of the entity that is to be rotated lies on the specified base point, that part of the entity remains on the base point while the entity's orientation is changed.

## Reference

If you don't know the specific rotation angle, the **Reference** option of the **Rotate** prompt is sometimes easier to use. It allows you to select the object to be rotated and click the base point. Type **R** <Enter> for **Reference**. Then you can enter the *Reference angle*: (current angle) of the object by typing it and pressing <Enter>. If you don't know the current angle, you can show AutoCAD the *Reference angle*: by picking the two endpoints of the line to be rotated. You can specify the *New angle*: by typing it and pressing <Enter>. If you don't know the new angle, you can show AutoCAD the *New angle*: by picking a point on the drawing.

POINT	
Ribbon/ Panel	Home/Draw (slideout) 
Draw Toolbar:	
Menu Bar:	Draw/Point
Type a Command:	POINT
Command Alias:	PO

## POINT

The **POINT** command allows you to draw points on your drawing. **Object Snap** recognizes these points as nodes. You use the **Osnap** mode **Node** to snap to points.

You can choose from many different styles of points. The appearance of these points is determined by the **PDMODE** (point definition mode) and **PDSIZE** (point definition size) options within the **POINT** command.


**Step 28.** Use the **Point Style...** command to set the appearance of points, as described next:

**Prompt**

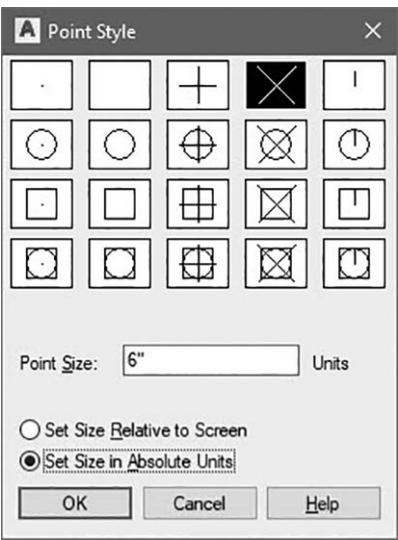
Type a command:  
  
The **Point Style** dialog box  
appears (Figure 3-13):

**Response**

**Point Style...** (or type **PTYPE**  
    <Enter>)  
  
Click the **X** box  
Type **6"** in the **Point Size:** input box  
Click **OK**

POINT STYLE	
Ribbon/ Panel	Home/ Utilities (slideout)  Point Style...
Menu Bar:	Format/Point Style
Type a Command:	PTYPE

**Figure 3-13**  
Point Style dialog box




You have just set the points to appear as an X, and they will be 6" high. The **Point Style** dialog box shows the different types of points available. You may set the size of the point in a size relative to the screen or in absolute units.

**Step 29.** Use the **OFFSET** command to offset the line that defines the long left side of the conference table. The chairs will be placed 6" from the edge of the table, so set 6" as the offset distance. Offset the line outside the table, as shown in Figure 3-14. You will use this line as a construction line to help locate the chairs.

**DIVIDE**

The **DIVIDE** command indicates the divisions of an entity in equal parts and places point markers along the entity at the dividing points. The **PDMODE** variable has been set to 3 (an X point), so an X will appear as the point marker when you use **DIVIDE**.

**Step 30.** Use **DIVIDE** to divide the offset line into eight equal segments (Figure 3-14), as described next:

DIVIDE	
Ribbon/ Panel	Home/Draw (slideout) 
Menu Bar:	Draw/Point/ Divide
Type a Command:	DIVIDE
Command Alias:	DIV

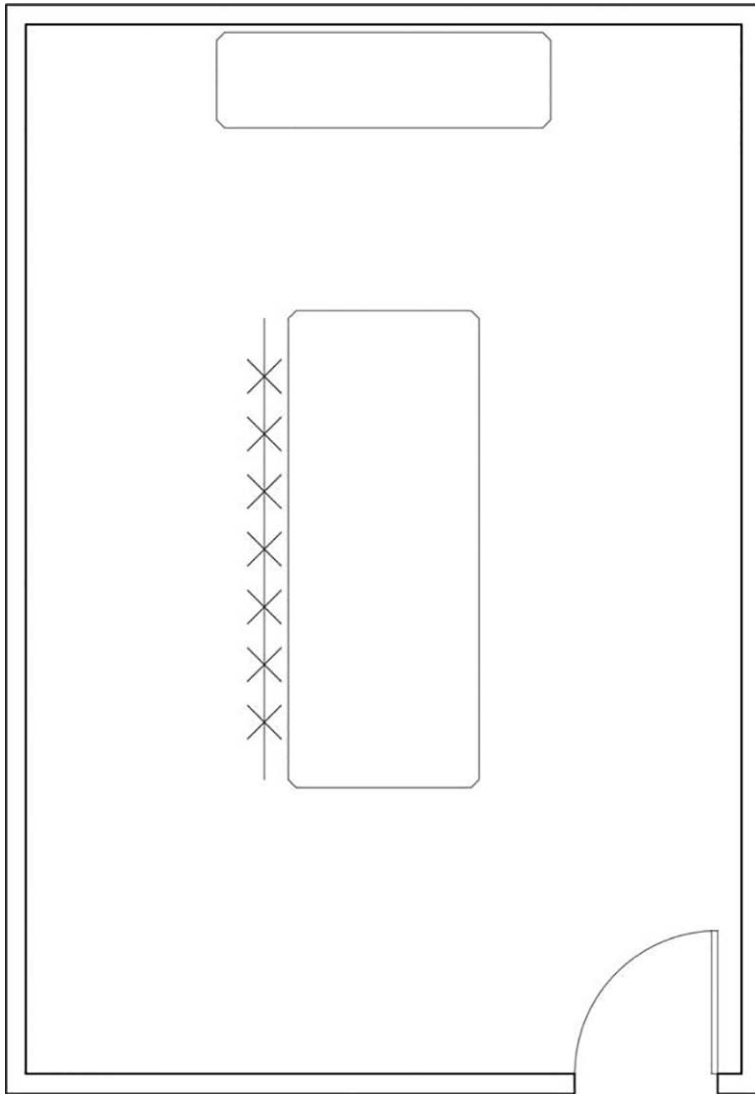
**Prompt**

Type a command:  
Select object to divide:  
Enter the number of segments  
or [Block]:

**Response**

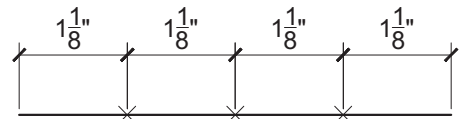
**Divide** (or type **DIV <Enter>**)  
Click anyplace on the offset line  
  
Type **8 <Enter>** (the X points divide  
the line into eight equal segments)



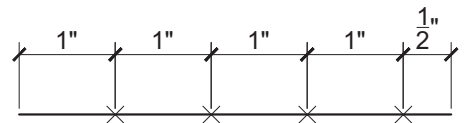


**Figure 3-14**

Offset the lines defining the long left side of the conference table and use the **DIVIDE** command to show eight equal segments along the line object



**DIVIDE:** Four equal parts of a 4-1/2" line



**MEASURE:** 1" lengths of a 4-1/2" line


**Figure 3-15**

Examples of the **DIVIDE** and **MEASURE** commands

## MEASURE

The **MEASURE** command is similar to the **DIVIDE** command (Figure 3-15) except that with **MEASURE**, you specify the distance. **DIVIDE** calculates the interval to divide an entity into a specified number of equal segments. The **MEASURE** command places point markers at a specified distance along an entity.

The measurement and division of a circle start at the angle from the center that follows the current snap rotation. The measurement and division of a closed polyline start at the first vertex drawn. The **MEASURE** command also draws a specified block at each mark between the divided segments.

MEASURE	
Ribbon/ Panel	Home/Draw (slideout) 
Menu Bar:	Draw/Point/ Measure
Type a Command:	MEASURE

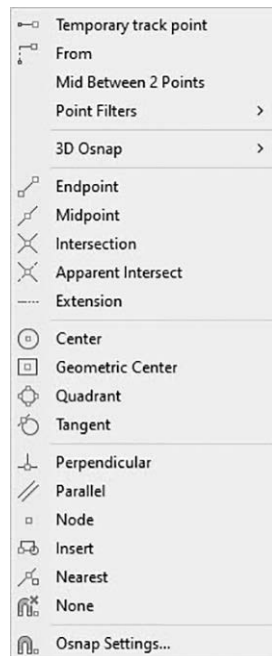
## OSNAP

It is important that you become familiar with and use object snap modes in combination with **DRAW**, **MODIFY**, and other AutoCAD commands. When an existing drawing object is not located on a snap point, connecting a line or other drawing entity exactly to it is impossible. You may try, and you may think that the two points are connected, but a close examination (**Zoom-Window**) will reveal that they are not. Object snap modes are used in combination with other commands to connect exactly to points of existing objects in a drawing. You need to use object snap modes constantly for complete accuracy.

### Activating Osnap

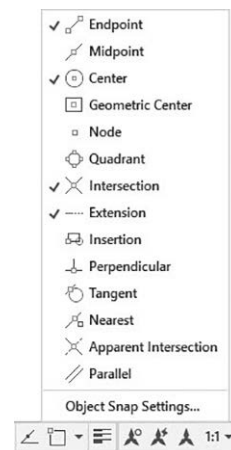
You can activate **Osnap** mode in the following ways:

- Type the **Osnap** abbreviation (first three letters of the object snap mode).
- Press **<Shift>** and right-click in the drawing area, then choose an object snap mode from the **Object Snap** menu that appears (Figure 3-16).
- Right-click **OSNAP** on the status bar, and then click Object Snap **Settings...** (Figure 3-17) to access the **Drafting Settings** dialog box (Figure 3-18). Select the desired **Osnap** mode or modes check boxes.



**Figure 3-16**

Activate the **Osnap** menu by pressing **<Shift>** and right-click in the drawing area

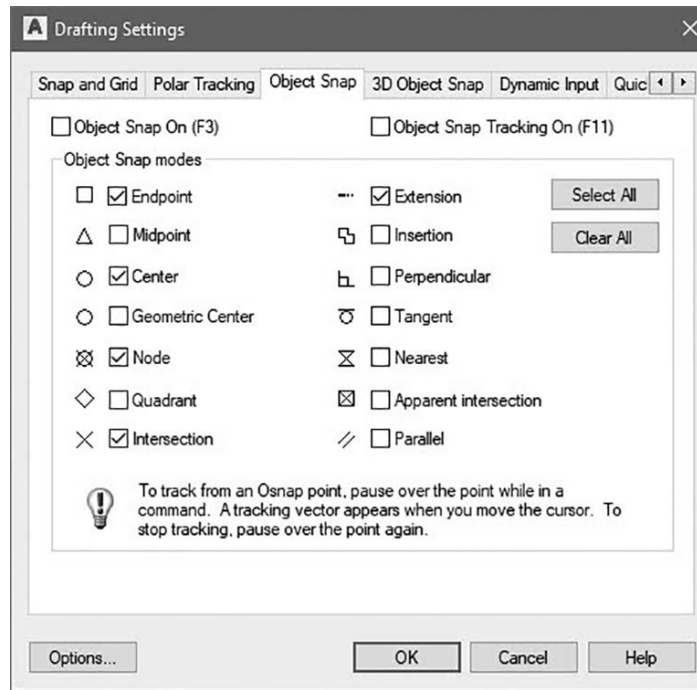


**Figure 3-17**

Activate **OSNAP** by right-clicking **Object Snap** on the status bar, then clicking **Settings...** to access the **Drafting Settings** dialog box

**Figure 3-18**

Drafting Settings dialog box with **Node** selected



## Copy, Osnap-Midpoint, Osnap-Node

Next, you copy the chair several times using different object snap modes.

**Step 31.** Right-click **Snap cursor to 2D reference points** on the status bar, click **Object Snap Settings...**, and set a running **Osnap** mode of **Node** (Figures 3-17 and 3-18).

**Step 32.** Make sure **ORTHO** and **SNAP** are off and **OSNAP** is on in the status bar.

**Step 33.** Use the **COPY** command (combined with **Osnap-Midpoint** and **Osnap-Node**) to copy CHAIR 2 four times on the left side of the conference table (Figure 3-19), as described next:

### Prompt

Type a command:  
Select objects:  
Specify opposite corner:  
Select objects:  
Specify base point or [Displacement  
mOde] <Displacement>:  
mid of

Specify second point or [Array]  
<use first point as displacement>:

### Response

**Copy** (or type **CP <Enter>**)  
Click below and to the left of CHAIR 2  
Window CHAIR 2  
**<Enter>**

Type **MID <Enter>**  
**P1→** (anyplace on the straight line  
that forms the front of the chair  
symbol)

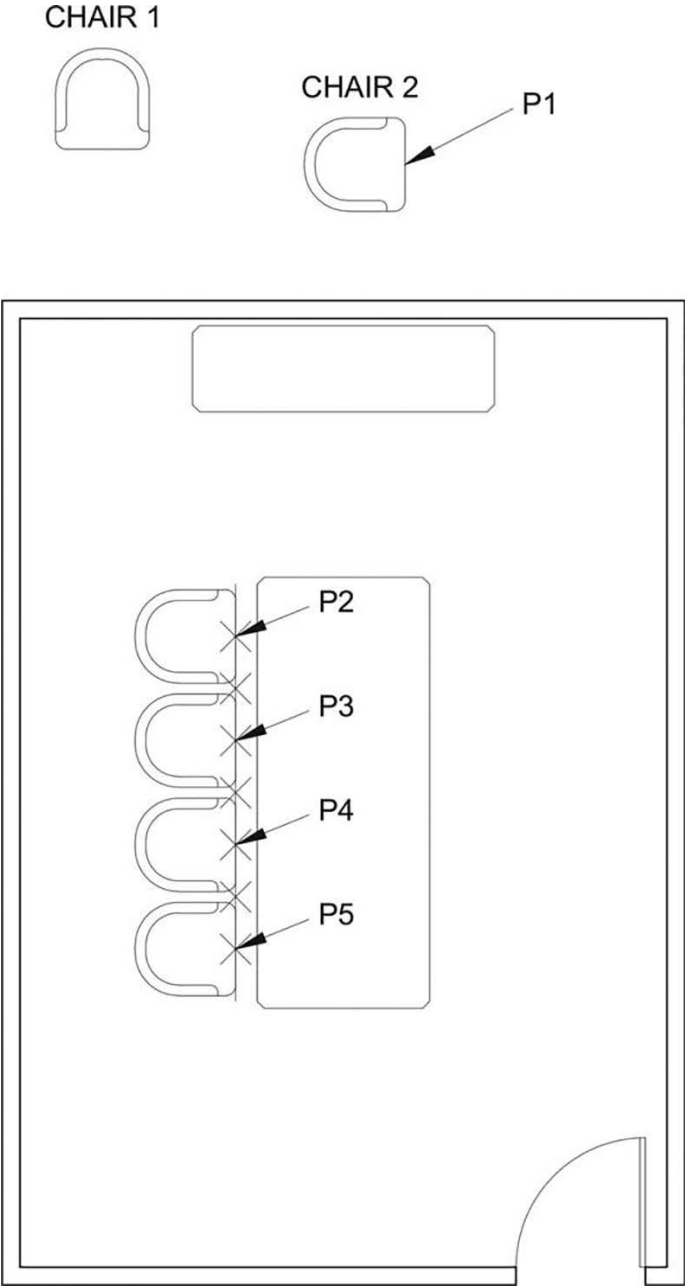
**P2→, P3→, P4→, P5→ <Enter>**  
(Figure 3-19)



The points act as nodes (snapping exactly on the center of the X) when a running **Object Snap** is set.

**Step 34.** Type **PDMODE <Enter>** at the command prompt. Set the **PDMODE** to **1**, and the drawing is regenerated. The Xs will disappear. You have set the **PDMODE** (point definition mode) to be invisible.

**Step 35.** Erase the offset line used to locate the chairs on the left side of the table. Use **<F7>** to redraw if it looks as if part of the chairs has been erased.

**Figure 3-19**  
Copy CHAIR 2 four times  
on the left side of the  
conference table using  
**Osnap-Midpoint** and  
**Osnap-Node**



MIRROR	
Ribbon/ Panel	Home/Modify  Mirror
Draw Toolbar:	
Menu Bar:	Modify/ Mirror
Type a Command:	MIRROR
Command Alias:	MI

## MIRROR

The **MIRROR** command allows you to mirror about an axis any entity or group of entities. The axis can be at any angle.

**Step 36.** Draw the chairs on the right side of conference table using the **MIRROR** command (Figure 3-20), as described next:

### Prompt

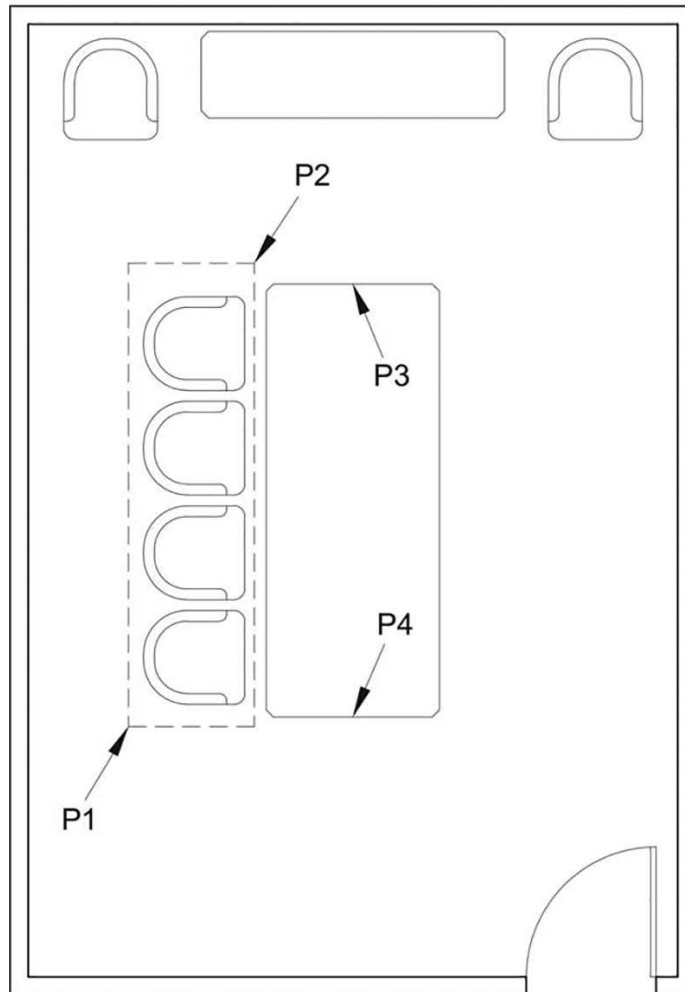
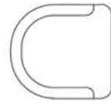
Type a command:  
Select objects:

### Response

**MIRROR** (or type **MI <Enter>**)  
**P1→**

**Figure 3-20**

Use the **MIRROR** command to copy the four chairs on the left side to the right side, and then copy CHAIR 1 to both sides of the credenza

**CHAIR 1****CHAIR 2****Prompt**

Specify opposite corner:

68 found

Select objects:

Specify first point of mirror line:

mid of

Specify second point of mirror line:

mid of

Erase source objects? [Yes No] <N>:

**Response**

**P2**→ (window the chairs on the left side of the conference table)

**<Enter>**

Type **MID** **<Enter>**

**P3**→

Type **MID** **<Enter>**

**P4**→

**<Enter>**

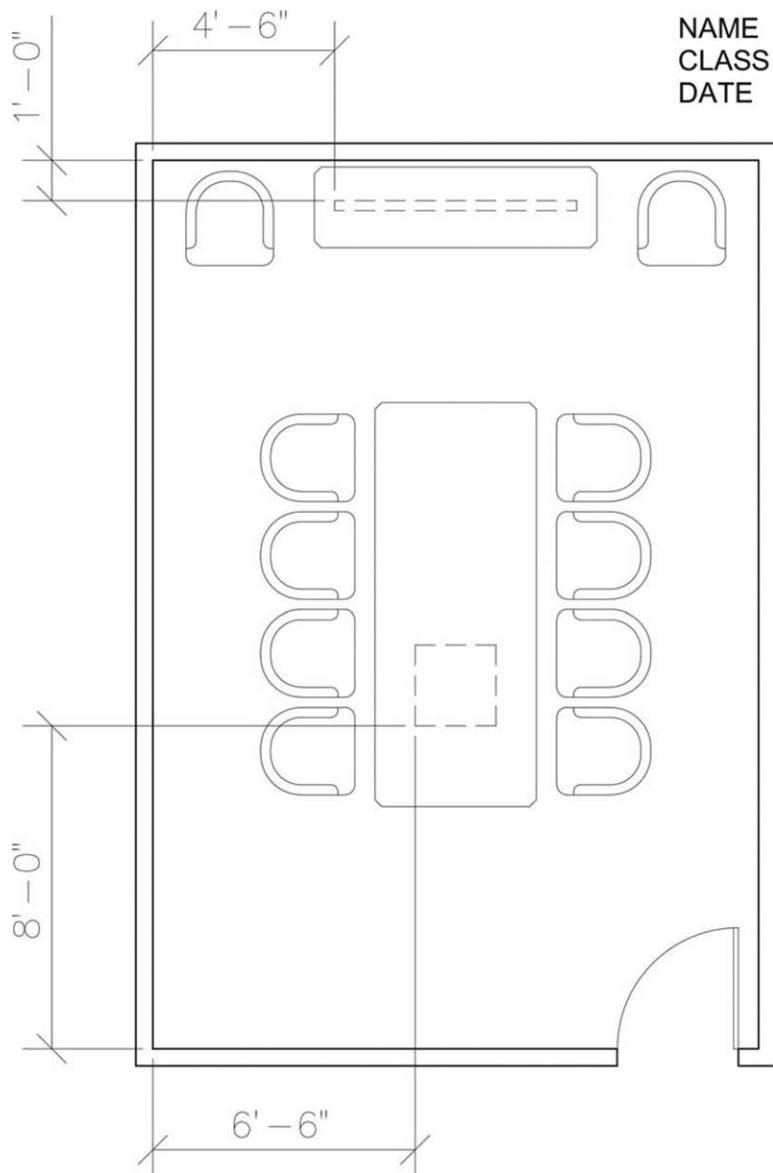
**Step 37.** Add the chairs on each side of the credenza as shown in Figure 3-20.

**Step 38.** Set layer **i-eqpm-ovhd** current.

**Step 39.** Add the 72" × 3" recessed projection screen and the 24" × 24" ceiling-mounted projector to the plan as shown in Figure 3-21. Let's use the **From** option of the **OSNAP** menu to do this.

Start the **Rectangle** command, **<Shift>** and right-click to open the **OSNAP** menu, select **From**, and then show the inner upper-left corner of the room as the reference point. You will be prompted to define the x- and y-offsets: 4'6" and -1', respectively. 72" and 3". This fixes one corner of the rectangle for the recessed projection screen. The second corner is fixed by typing in **@72,-3** and pressing **<Enter>**. As for the ceiling-mounted projector, use the inner lower-left corner of the room as the reference, 6'6" and 8'0" as the x- and y-offsets to fix the lower-left corner of the rectangle and **@24,24** to fix the second point of the rectangle.

**Figure 3-21**  
Add the projection screen  
and projector



**Step 40.** Erase the chairs you have drawn outside the conference room walls.

**Step 41.** Set layer **a-anno-text** current.

#### TIP

Remember to change the **LTSCALE** setting if your hidden linetype does not show as hidden. To make the line segment length or spacing smaller, enter a linetype scale factor smaller than 1 but larger than 0 at the **LTSCALE** prompt. To make the line segment length and spacing larger, enter a linetype scale factor larger than 1.

**Step 42.** Use the **Single Line Text** command (type **DT** <Enter>) to type your name, class number, and date, 6" high in the upper-right corner. When plotted to a scale of  $1/4" = 1'-0"$ , the 6"-high text will be  $1/8"$  high.

## FOR MORE DETAILS

Chapter 6 describes and covers using annotative text. When adding annotative text, you have to enter only the size of the text you want in the printed drawing, and AutoCAD automatically calculates the size of the text on the drawing.

**Step 43.** When you have completed Exercise 3-1 (Figure 3-22), save your work in at least two places.

**Step 44.** Print your drawing from the **Model** tab at a scale of  $1/4" = 1'-0"$ .

## FOR MORE DETAILS

In Chapter 5 you will use a color-dependent plot style to change layer colors 1 through 7 to the color black when printing and plotting.

## Osnap Modes That Snap to Specific Drawing Features

You have already used **Osnap-Midpoint** and **Node**. They are examples of **Osnap** modes that snap to drawing features. **Midpoint** snaps to the midpoint of a line or arc, and **Node** snaps to a point entity.

The following list describes other **Osnap** modes that snap to specific drawing features. AutoCAD **Osnap** modes treat each edge of a solid and each polyline segment as a line. You will use many of these **Osnap** modes while completing the exercises in this book.

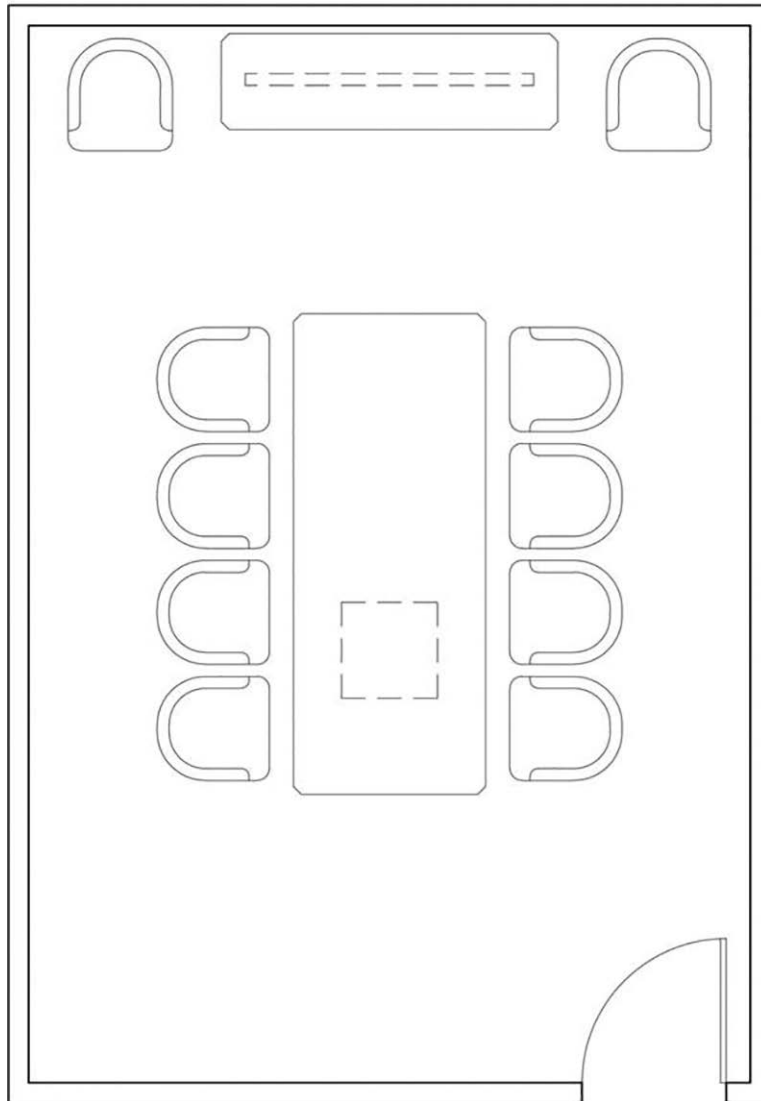
**Mid Between 2 Points (M2P):** Snaps to a point midway between two points that you pick on the drawing.

**Endpoint (END):** Snaps to the endpoint of a line or arc. The end of the line or arc nearest the point picked is snapped to.

**Midpoint (MID):** Snaps to the midpoint of a line or arc.

**Figure 3-22**  
Exercise 3-1 complete

NAME  
CLASS  
DATE



**Center (CEN):** Snaps to the center of an arc, ellipse, or circle.

**Geometric Center (GCEN):** Snaps to the centroid of a closed polyline or spline.

**Node (NOD):** Snaps to a point (**POINT** command).

**Quadrant (QUA):** Snaps to the closest quadrant point of an arc or circle. These are the 0°, 90°, 180°, and 270° points on a circle, arc, or ellipse.

**Intersection (INT):** Snaps to the intersection of two lines, a line with an arc or circle, or two circles and/or arcs.



**Extension (EXT):** Extends a line or arc. With a command and the **Extension** mode active, pause over a line or arc, and after a small plus sign is displayed, slowly move along a temporary path that follows the extension of the line or arc. You can draw objects to and from points on the extension path line.

**Insertion (INS):** Snaps to the insertion point of text, attribute, or block. (These objects are described in later chapters.)

**Perpendicular (PER):** Snaps to the point on a line, circle, or arc that forms a 90° angle from that object to the last point. For example, if you are drawing a line, click the first point of the line, and then use **Perpendicular** to connect the line to another line. The new line will be perpendicular to the first pick.

**Tangent (TAN):** Snaps to the point on a circle or arc that when connected to the last point entered forms a line tangent to (touching at one point) the circle or arc.

**Nearest (NEA):** Snaps to the point on a line, arc, or circle that is closest to the position of the crosshairs; also snaps to any point (**POINT** command) node that is closest to the crosshairs. You will use this mode when you want to be sure to connect to a line, arc, circle, or point, and cannot use another **Osnap** mode.

**Apparent intersect (APP):** Snaps to what appears to be an intersection even though one object is above the other in 3D space.

**Parallel (PAR):** Draws a line parallel to another line. With the **LINE** command active, click the first point of the new line you want to draw. With the **Parallel** mode active, pause over the line you want to draw parallel to, until a small parallel line symbol is displayed. Move the cursor away from but parallel to the original line, and an alignment path is displayed for you to complete the new line.

For the **LINE** command, you can also use the **Tangent** and **Perpendicular** modes when picking the first point of the line. This allows you to draw a line tangent to, or perpendicular to, an existing object.

## Running Osnap Modes

You can use individual **Osnap** modes while in another command, as you did with **Midpoint**. You can also set a running **Osnap** mode, as you did with **Node**. A running **Osnap** mode is constantly in effect while you are drawing, until it is disabled. This saves time by eliminating your constant return to the **Osnap** setting.

Clicking **OSNAP** on in the status bar (or pressing function key <F3>) will activate any running **Osnap** modes you have set, and clicking it off will disable any running **Osnap** modes you have set.

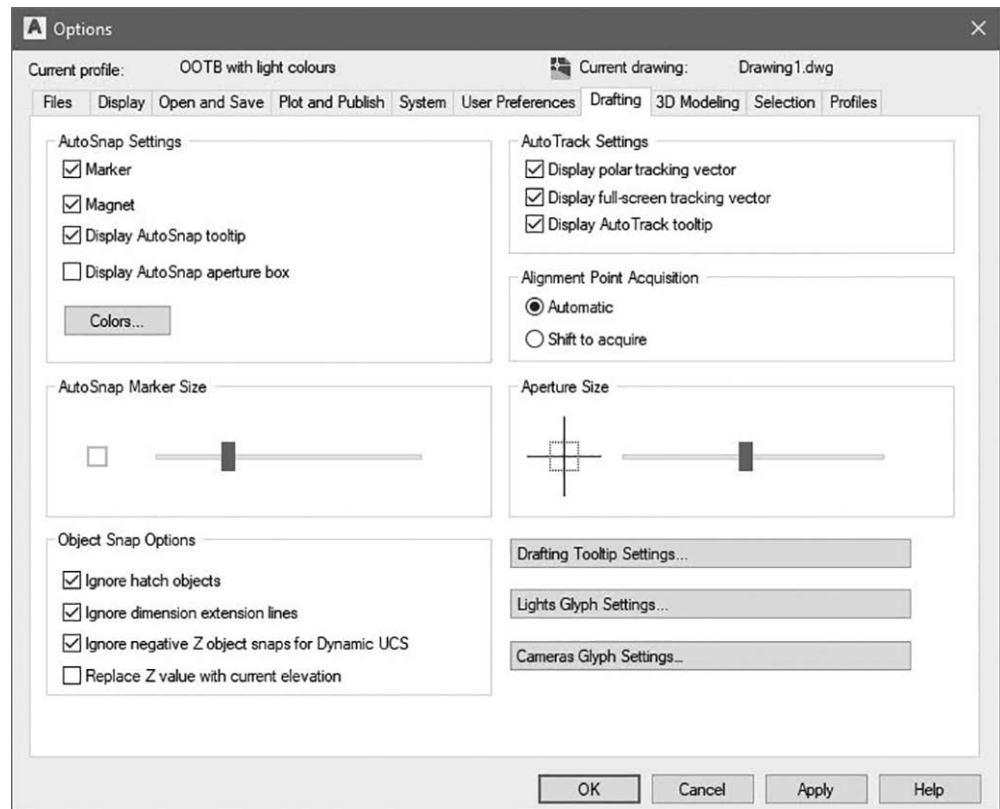
### NOTE

Be sure to disable a running **Osnap** mode when you are through using it. A running **Osnap** mode can interfere with your drawing if it snaps to a point to which you do not intend to snap.

## Osnap Settings: Marker, Aperture, Magnet, Tooltip

Note the markers (small symbols) beside each **Object Snap** mode in the **Drafting Settings** dialog box, **Object Snap** tab (Figure 3-18). You control the display of the markers via the **Drafting** tab of the **Options** dialog box (Figure 3-23). Selecting the **Marker** check box adds the marker symbol to the crosshairs. The **AutoSnap Marker Size** slider bar near the bottom of the dialog box specifies the size of the marker.

**Figure 3-23**  
Options dialog box,  
Drafting tab



When **Osnap** is activated, you can also add a small target box called an *aperture* to the screen crosshairs. This small box shows the area within which AutoCAD will search for **Object Snap** candidates. Select the **Display AutoSnap aperture box** on the **Drafting** tab of the **Options** dialog box. The **Aperture Size** slider bar on the right side of the dialog box specifies the size of the box.

## EXERCISE 3-2 Drawing a Rectangular Lecture Room, Including Furniture

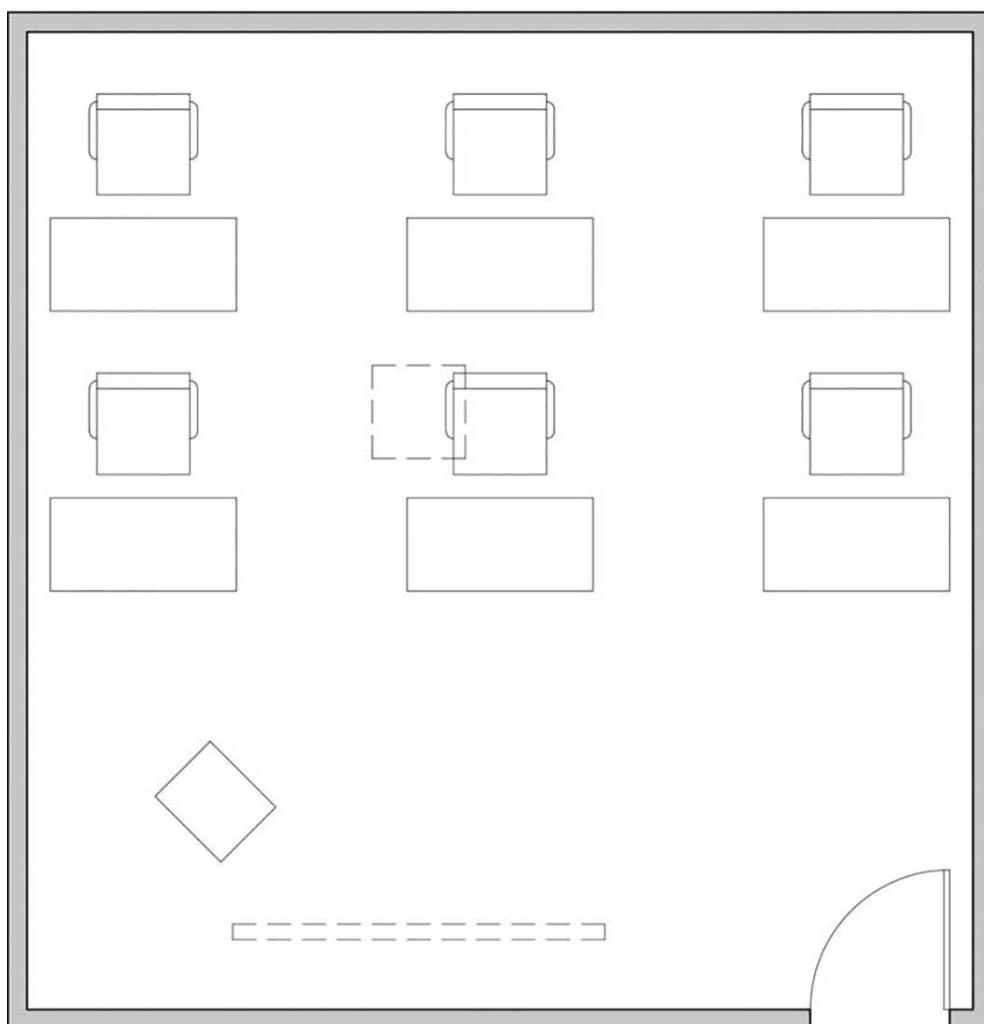
In Exercise 3-2, you draw a lecture room, including walls and furnishings. When you have completed Exercise 3-2, your drawing will look similar to Figure 3-24.

- Step 1.** Click **Open...**, change the **Files of type:** input box to **Drawing Template (\*.dwt)**, and open template **Ch3-conference-rm-setup**, which you previously made at the beginning of Exercise 3-1.
- Step 2.** Click **Save As...**, change the **Files of type:** input box to **AutoCAD 2018 Drawing (.dwg)**, and save the template as a drawing file named **CH3-EXERCISE2**.
- Step 3.** Verify the following settings:
1. Drawing units: **Architectural**
  2. Drawing limits: **25',35'**
  3. **GRDDISPLAY: 0**
  4. Grid: **12"**
  5. Snap: **6"**
  6. Verify the following layers:

**Figure 3-24**

Exercise 3-2: Drawing a rectangular lecture room, including furniture (scale: 1/4" = 1'-0")

NAME \_\_\_\_\_  
CLASS \_\_\_\_\_  
DATE \_\_\_\_\_



Layer name	Color	Linetype	Lineweight
a-anno-text	green	continuous	.006" (.15 mm)
a-door	red	continuous	.004" (.09 mm)
a-wall-intr	blue	continuous	.010" (.25 mm)
i-eqpm-ovhd	red	hidden	.004" (.09 mm)

**Step 4.** Set layer **a-wall-intr** current.

**Step 5.** Use **Zoom-All** to view the limits of the drawing.

**Step 6.** Turn **SNAP**, **GRID**, and **LWDISPLAY** on. The remaining buttons in the status bar should be off.

## Making Solid Walls Using Polyline and Solid Hatch

In Exercise 3-2 you will use the **LINE** command to draw the lecture room walls; you will then use the **Polyline Edit** command to change the lines to a polyline before you offset the walls. After you have completed drawing the walls, you will use the **HATCH** command to make the walls solid.

**Step 7.** Use **LINE** to draw the walls of the lecture room (Figure 3-25), as described next:

### Prompt

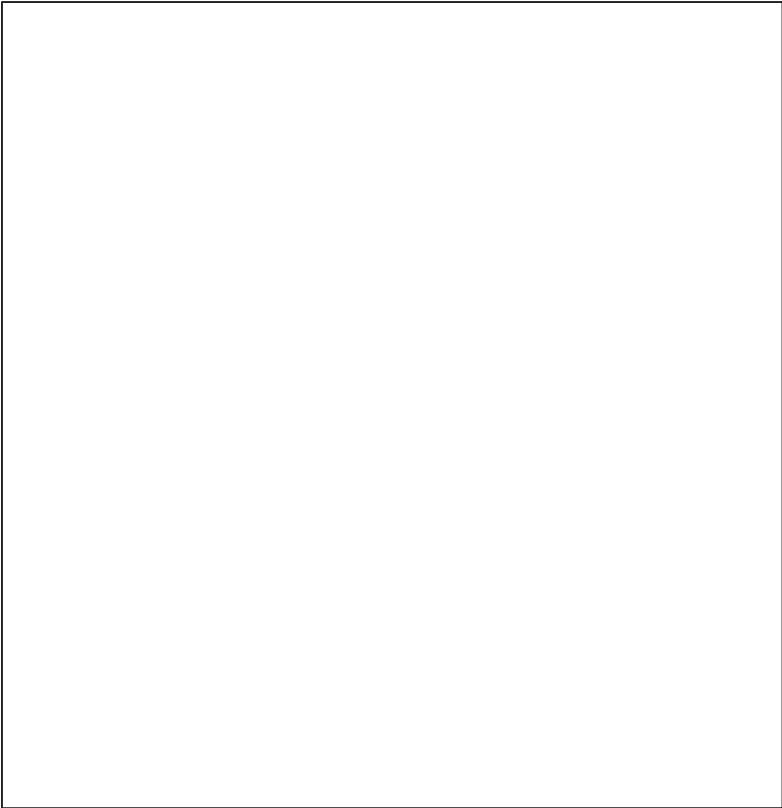
Type a command:  
Specify first point:  
Specify next point or [Undo]:  
  
Specify next point or [Undo]:  
  
Specify next point or [Close Undo]:  
  
Specify next point or [Close Undo]:

### Response

**Line** (or type **L** <Enter>)  
**Type 2',7'** <Enter>  
Turn **ORTHO** on  
Move your mouse to the right and  
type **20'6** <Enter>  
Move your mouse straight up and  
type **21'** <Enter>  
Move your mouse to the left and  
type **20'6** <Enter>  
Type **C** <Enter>

**Step 8.** Use **Zoom-Window** to magnify the lower right corner of the lecture room where the door will be drawn.

**Figure 3-25**  
Use the **LINE** command to draw the lecture room walls



**From:** A command modifier that locates a base point and then allows you to locate an offset point from the base point.



**From**

**From** is a command modifier that locates a base point and then allows you to locate an offset point from that base point. It is similar to **ID Point** but differs in that **From** is used within a command; **ID Point** must be used before the command is activated. You use **From** at a prompt that asks you to locate a point, and it does not work unless a command is active to issue that prompt. Both **From** and **ID Point** are usually used in combination with **Object Snap** modifiers when locating the initial base point.

**BREAK**

You can use the **BREAK** command to erase a part of a drawing object.

**Step 9.** Use the **BREAK** command to create an opening for the lecture room door (Figure 3-26), as described next:

BREAK	
Ribbon/ Panel	Home/ Modify (slideout) 
Draw Toolbar:	
Menu Bar:	Modify/Break
Type a Command:	BREAK
Command Alias:	BR

**Prompt**

Type a command:

Select object:

Specify second break point or

[First point]:

Specify first break point:

Base point:

int of

**Response**

**Break** (or type **BR** <Enter>)

Click anyplace on the bottom horizontal line

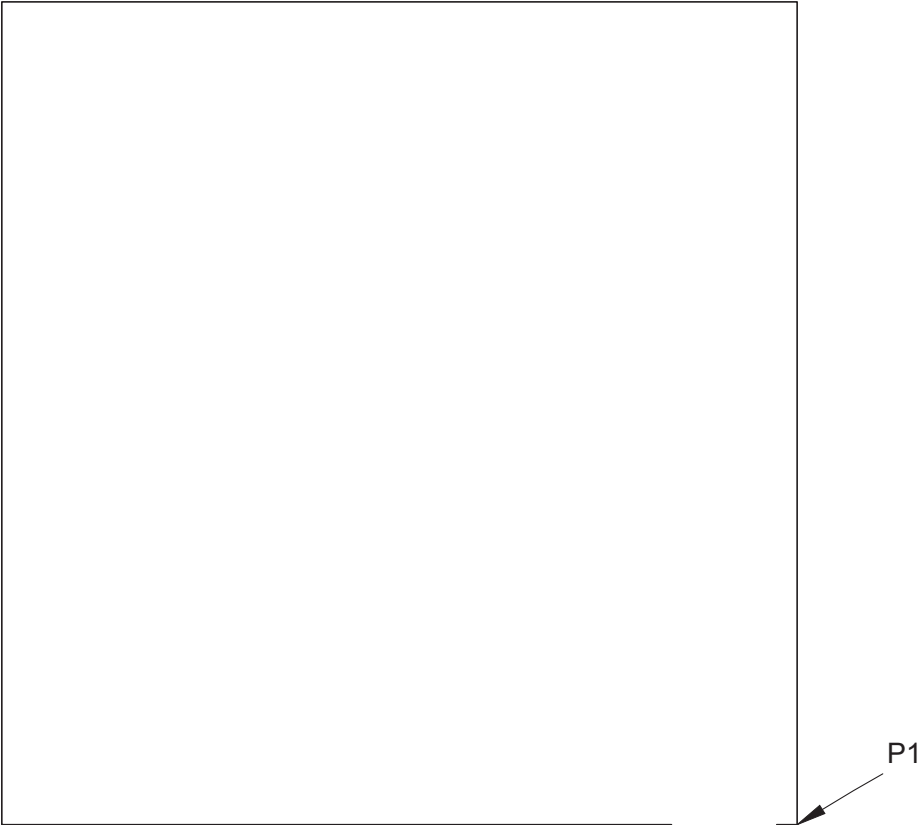
Type **F** <Enter> (for first point)

Type **FRO** <Enter> (abbreviation for **From**)

**Osnap-Intersection**

**P1**→ (Figure 3-26)



**Figure 3-26**  
 Use the **BREAK** command to make an opening for the lecture room door



<b>Prompt</b>	<b>Response</b>
<Offset>:	Type @6<180 <Enter> (polar coordinate)
Specify second break point:	Type @36<180 <Enter> (polar coordinate)

**First**

When selecting an entity to break, you may use the point entered in the selection process as the first break point, or you may type **F <Enter>** to be able to select the first break point. Using **F <Enter>** allows you to start over in specifically selecting both beginning and ending break points.

EDIT POLYLINE	
Ribbon/ Panel	Home/ Modify (slideout) 
Modify IToolbar:	
Menu Bar:	Modify/ Object/ Polyline
Type a Command:	PEDIT
Command Alias:	PE

**@**

Sometimes you need only to break an entity and not erase a section of it. In that case, use @ as the second break point. The line will be broken twice on the same point; no segments will be erased from the line.

**Polyline Edit**

**Edit Polyline** is a **Modify** command you use to edit polylines or to change lines into polylines. It can join lines or arcs together and make them a single polyline. You can also use it to change the width of a polyline.

**Step 10.** Use **Polyline Edit** to change the lines into a polyline, as described next:

**Prompt**

Type a command:  
 Select polyline or [Multiple]:  
 Object selected is not a polyline  
 Do you want to turn it into one? <Y>

Enter an option [Close Join Width  
 Edit vertex Fit Spline Decurve  
 Ltype gen Reverse Undo]:  
 Select objects: 5 found

Select objects:  
 4 segments added to polyline  
 Enter an option [Open Join Width  
 Edit vertex Fit Spline Decurve  
 Ltype gen Reverse Undo]:

**Response**

**Polyline Edit** (or type **PE** <Enter>)  
 Click any of the lines drawn

<Enter> (to tell AutoCAD yes, you  
 want to turn it into a polyline)

Type **J** <Enter> (for **Join**)  
 Type **ALL** <Enter> (to select all the  
 lines)

<Enter>

<Enter>

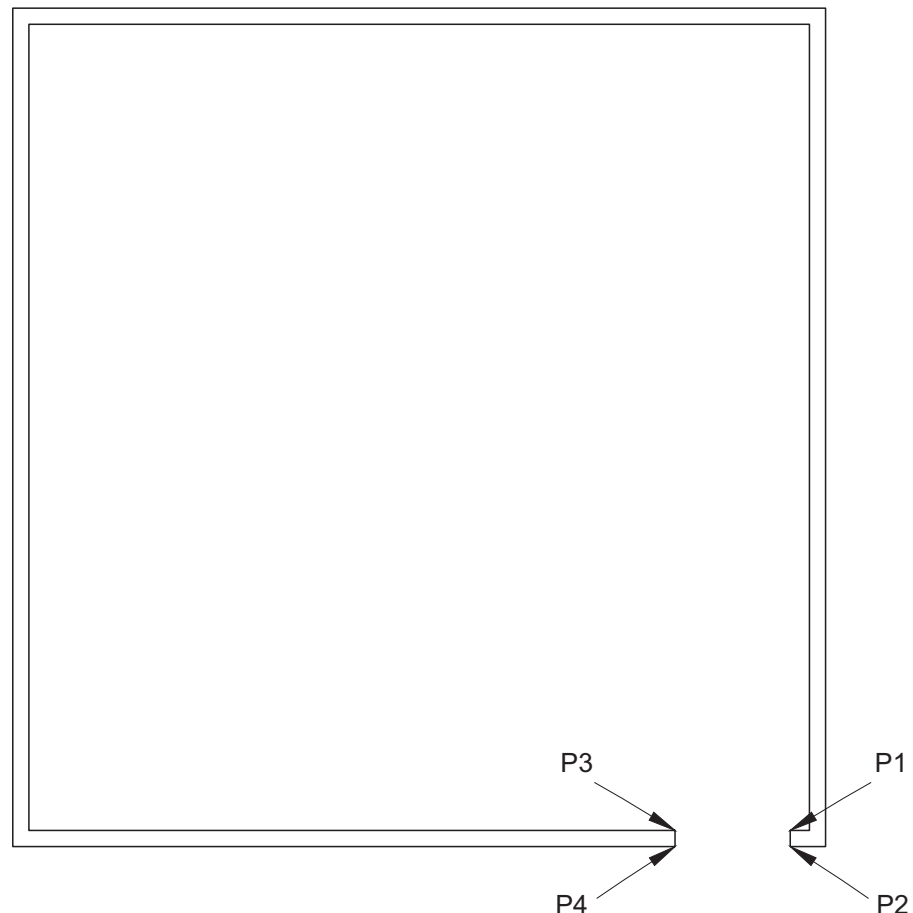
**Step 11.** Use the **OFFSET** command to offset the polyline 5" to the **outside** of the current polyline.

**Step 12.** Use the **LINE** command with a running **Osnap Endpoint** to close the polyline. Type **L** <Enter>. Click **P1**→, **P2**→ <Enter><Enter>. Click **P3**→, **P4**→ <Enter> as shown in Figure 3-27.

**Step 13.** Use **Zoom-Extents** so you can see the entire drawing graphics.

**Figure 3-27**

Use the **LINE** command to close the ends of the polylines



HATCH

**hatch:** The process of filling in a closed area with a pattern. Hatching can consist of solid filled areas, gradient-filled areas, or areas filled with patterns of lines, dots, or other objects.

You will use a single **hatch** pattern to create solid walls, as shown in Figure 3-24.

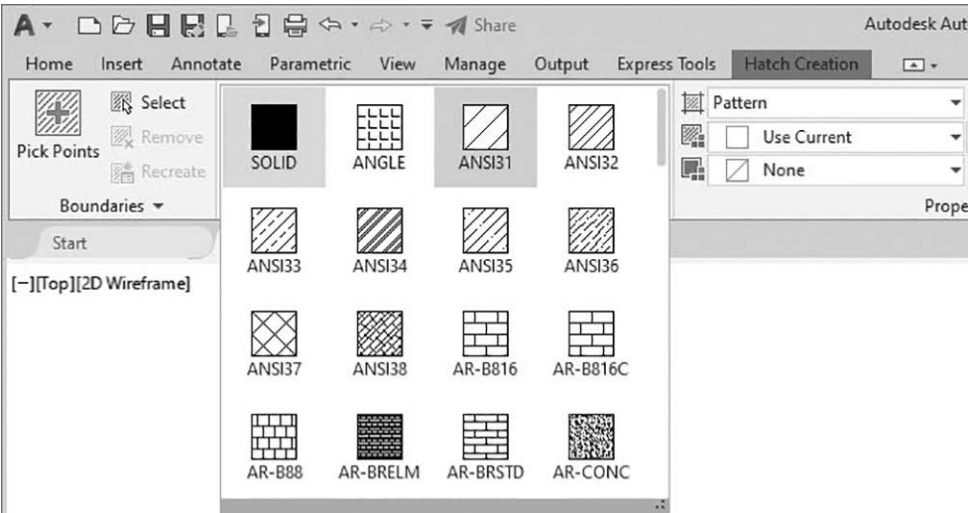
FOR MORE DETAILS

See Chapters 8 and 13 for more about the Hatch and Gradient dialog box.

**Step 14.** Create the following new layer and set it as the current layer:

Layer name	Color	Linetype	Lineweight
a-wall-patt-gray	gray (253)	continuous	.004" (.09 mm)

**Figure 3-28**  
Hatch Pattern Gallery with SOLID hatch selected



HATCH	
Ribbon/Panel	Home/Draw
Draw Toolbar:	
Menu Bar:	Draw/Hatch...
Type a Command:	HATCH
Command Alias:	H

**Step 15.** Use the **HATCH** command to make the walls solid, as described next:

Prompt

Type a command:  
The **Hatch Creation** ribbon tab appears:

Pick internal point or [Select objects seTtings]:

Pick internal point or [Select objects seTtings]:

Pick internal point or [Select objects seTtings]:

Response

**Hatch** (or type **H <Enter>**)

Click the down arrow button of the **Hatch Pattern Gallery** (Figure 3-28)

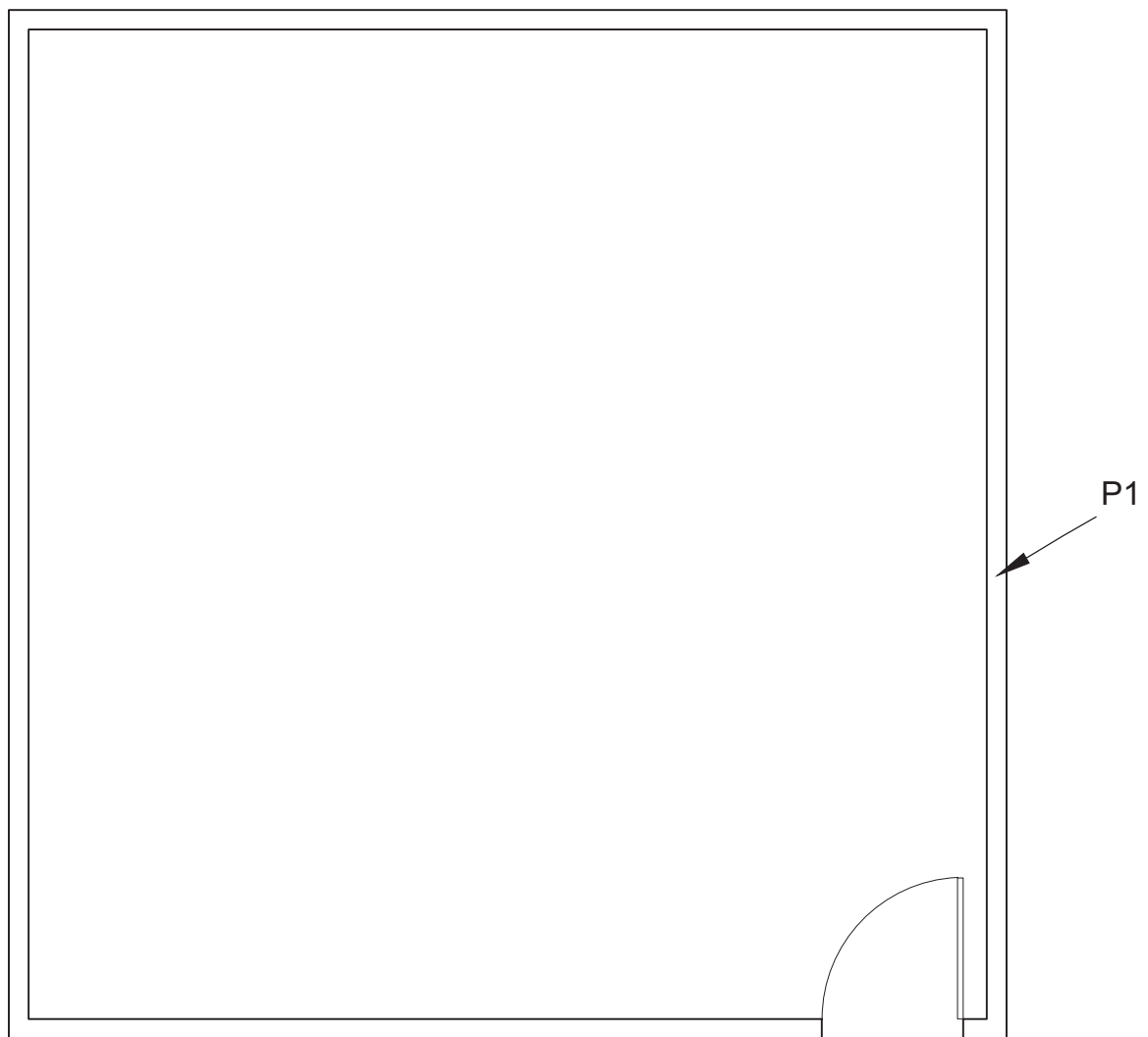
Click the **SOLID pattern**, as shown in Figure 3-28

Click **P1→** (any point between the two polylines forming the wall, Figure 3-29—you may have to turn **SNAP** off)

**<Enter>**





- Step 16.** Set layer **a-door** current.
- Step 17.** Draw a 1-1/2"-long by 3'-wide rectangle to represent the door (Figure 3-29). Be sure to use **Osnap-Endpoint** or **Osnap Intersection** to start the rectangle at the upper-right corner of the door opening.
- Step 18.** Use the **Arc-Start, End, Direction** method to draw the door swing arc. Be sure **OSNAP** and **ORTHO** are on. You can draw the arc clockwise or counterclockwise. Move your mouse so the arc appears as shown in Figure 3-29.
- Step 19.** Set layer **i-furn** current.
- Step 20.** Locate the table and chair symbols as shown in Figure 3-30. Use the **LINE** or **Rectangle** command to draw the 48"-long × 24"-wide table. Center a 24"-long × 26"-wide rectangle 6" from the table to start the chair symbol, as shown in Figure 3-30.



**Figure 3-29**

Click any point between the two polylines forming the wall to make the walls solid; draw the door

- Step 21.** Complete the chair symbol as shown in Figure 3-31.
- Step 22.** Use **Zoom-Extents** after you finish drawing the chair symbol.

RECTANGULAR ARRAY	
Ribbon/ Panel	Home/ Modify  Array
Modify Toolbar:	
Menu Bar:	Modify/ Array/ Rectangular Array
Type a Command:	ARRAY
Command Alias:	AR

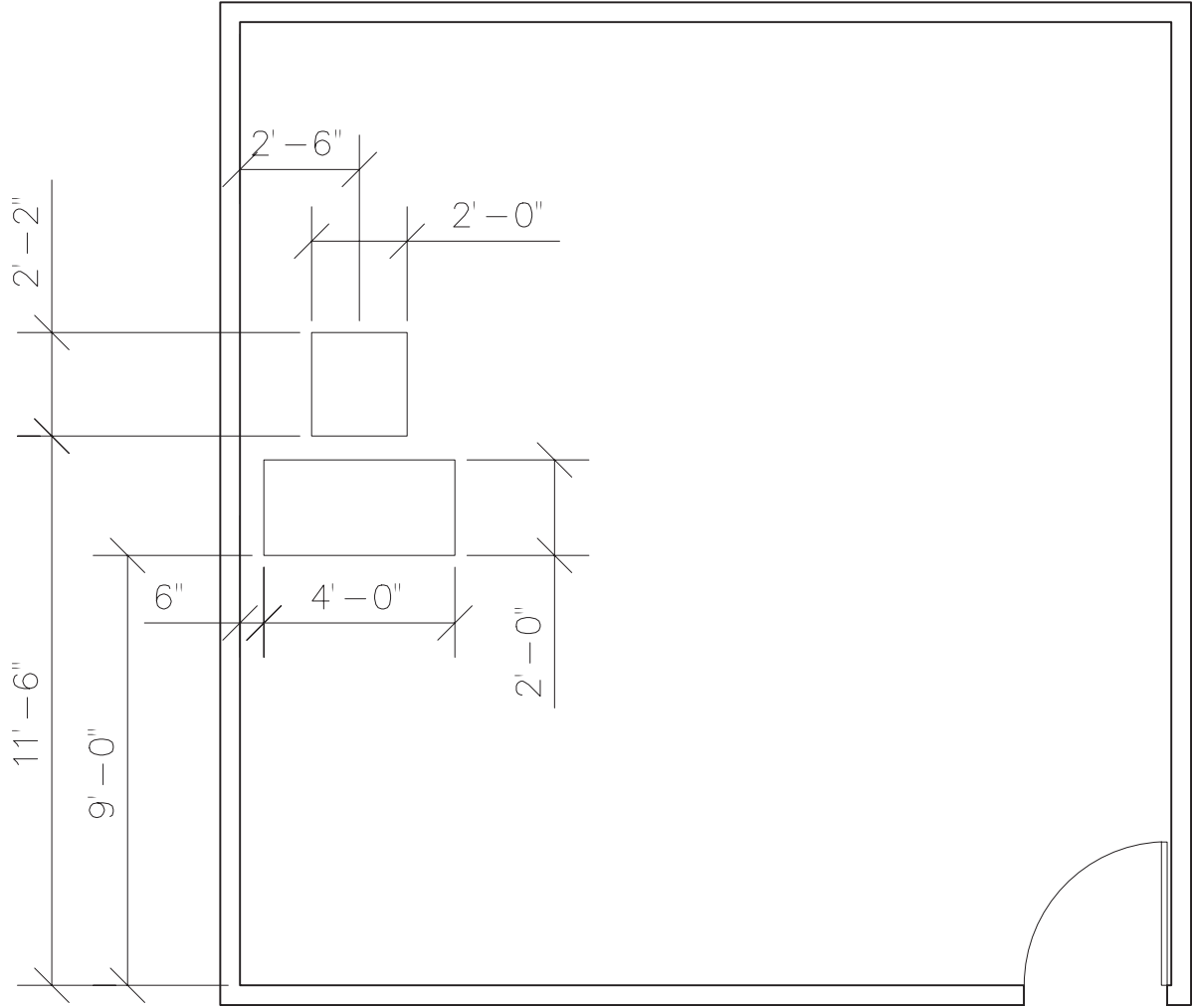
# ARRAY

The **ARRAY** command allows you to make multiple copies of an object in a rectangular or polar (circular) array and along a path, as shown in Figure 3-33. You use the **Rectangular** option in Exercise 3-2; the **Polar** option is described in Exercise 3-3.

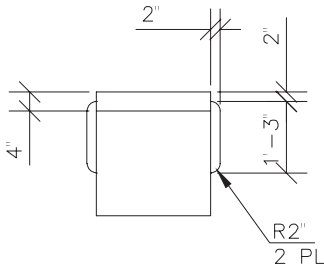
## NOTE

In the **ARRAY** command, include the original item in the number of rows and columns.

**Step 23.** Use the **ARRAY** command to make a rectangular pattern of six chairs and tables (Figures 3-32 and 3-33), as described next:



**Figure 3-30**  
Locate the table and chair symbols



**Figure 3-31**  
Complete the chair symbol

### Prompt

Type a command:

Select objects:

Specify opposite corner:

Select objects:

Type = Rectangular Associative = Yes

Select grip to edit array or

[Associative Base point COUn

Spacing COLUmns Rows Levels

eXit]<eXit>:

Specify the distance between  
columns or [Unit cell] <6'>:

### Response

**Rectangular Array** (or type  
**ARRAYRECT** <Enter>)

Click **P1**→ to locate the first corner  
of a window to include the entire  
chair and table

Click **P2**→ to window the chair and  
table just drawn

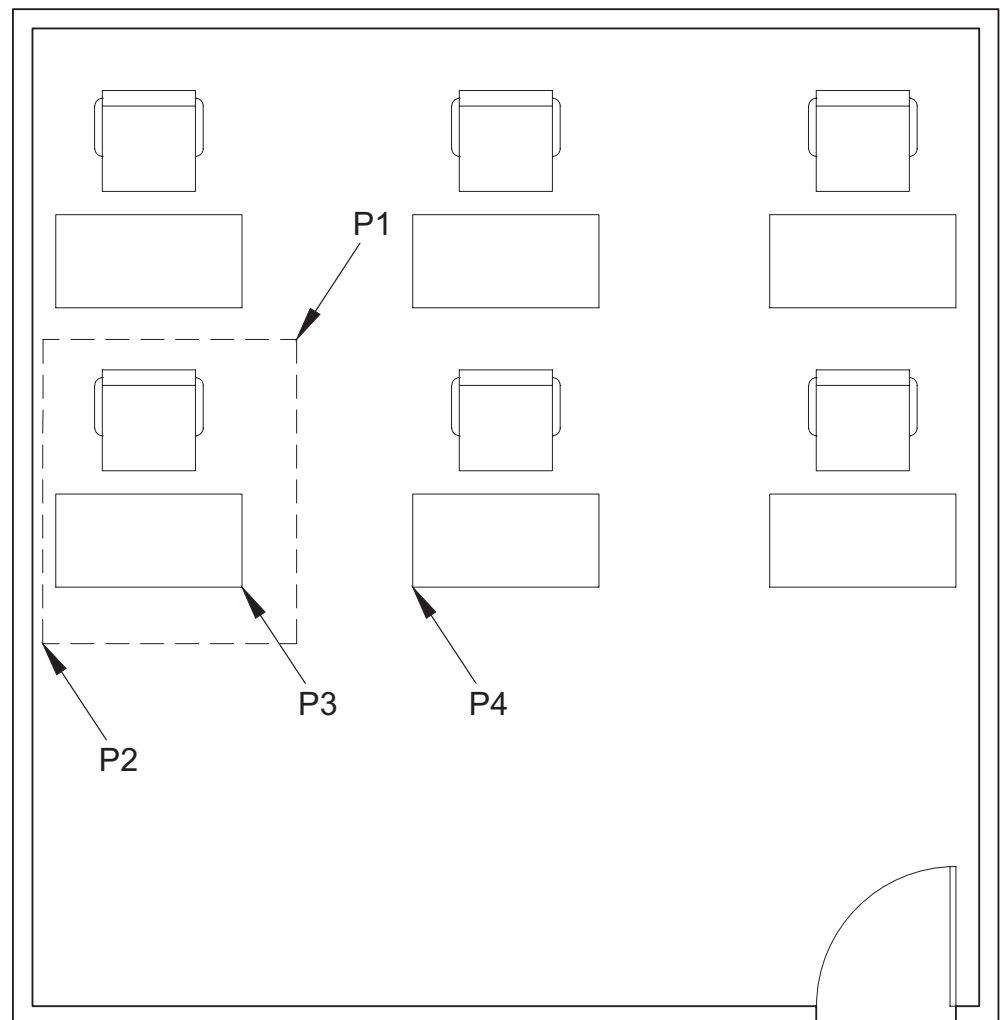
**<Enter>**

An array preview of the table and  
chair is shown on the screen.

Specify the array type and  
whether or not it's associative

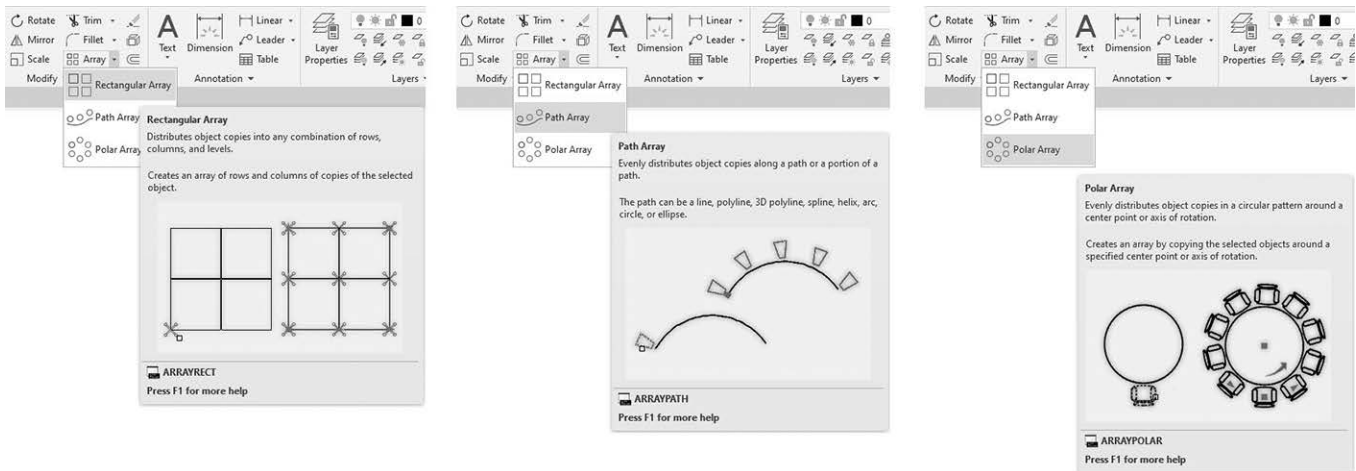
Type **S** <Enter>

Type **7'6**<Enter>



**Figure 3-32**

Array the tables and chairs; use **Distance** to measure the aisle width



**Figure 3-33**  
The three types of arrays

### Prompt

Specify the distance between  
rows <7'>:  
Select grip to edit array or  
[Associative Base point COUn  
Spacing COLUmns Rows Levels  
eXit]<eXit>:  
Enter the number of columns or  
[Expression] <4>:  
Enter the number of rows or  
[Expression] <3>:  
Select grip to edit array or  
[Associative Base point COUn  
Spacing COLUmns Rows Levels  
eXit]<eXit>:

### Response

Type **6'**<Enter>

Type **COU**<Enter>

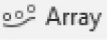

Type **3**<Enter>



Type **2**<Enter>



<Enter>

## Rectangular

The **Rectangular** option of **ARRAY** allows you to make multiple copies of an object in a rectangular array. The array is made up of horizontal rows and vertical columns. The direction and spacing of the rows and columns are determined by the distance you specify between each. In the previous example we used the table and chair as the cornerstone element in the lower-left corner of the array. Positive numbers were used for the distance between the rows and columns, and the array went up and to the right. When you enter a positive number for the rows, they proceed up; when you enter a negative number, they proceed down. When you enter a positive number for the columns, they proceed to the right; when you enter a negative number, they proceed to the left.

PATH ARRAY	
Ribbon/ Panel	Home/ Modify  Array
Modify Toolbar:	
Menu Bar:	Modify/Array/ Path Array
Type a Command:	ARRAYPATH

ARRAYEDIT	
Ribbon/ Panel	Home/ Modify (slideout) 
Modify II Toolbar:	
Menu Bar:	Modify/ Object/ Array
Type a Command:	ARRAYEDIT

DISTANCE	
Ribbon/ Panel	Home/ Utilities 
Inquiry Toolbar:	
Menu Bar:	Tools/ Inquiry/ Distance
Type a Command:	Distance
Command Alias:	DI

## Path

The **Path** option of **ARRAY** allows you to make multiple copies of an object evenly distributed along a path or part of a path. The path can be a line, polyline, arc, circle, or ellipse.

## ARRAYEDIT

An array must be associative, an option in the array commands, for the **ARRAYEDIT** command to work. When an array is associative, it is treated as a single object and you can edit it by using grips, **Properties**, or **ARRAYEDIT**.

### TIP

Items can automatically be added to a path array when you lengthen the path using the **Measure** option of **ARRAYEDIT**.

### NOTE

After an object has been selected, you can use the **Array** option of the **COPY** command to make multiple copies of the object.

## Distance

You can use the **Distance** command to determine measurements.

**Step 24.** Use the **Distance** command to measure a specified distance (Figure 3-32), as described next:

### Prompt

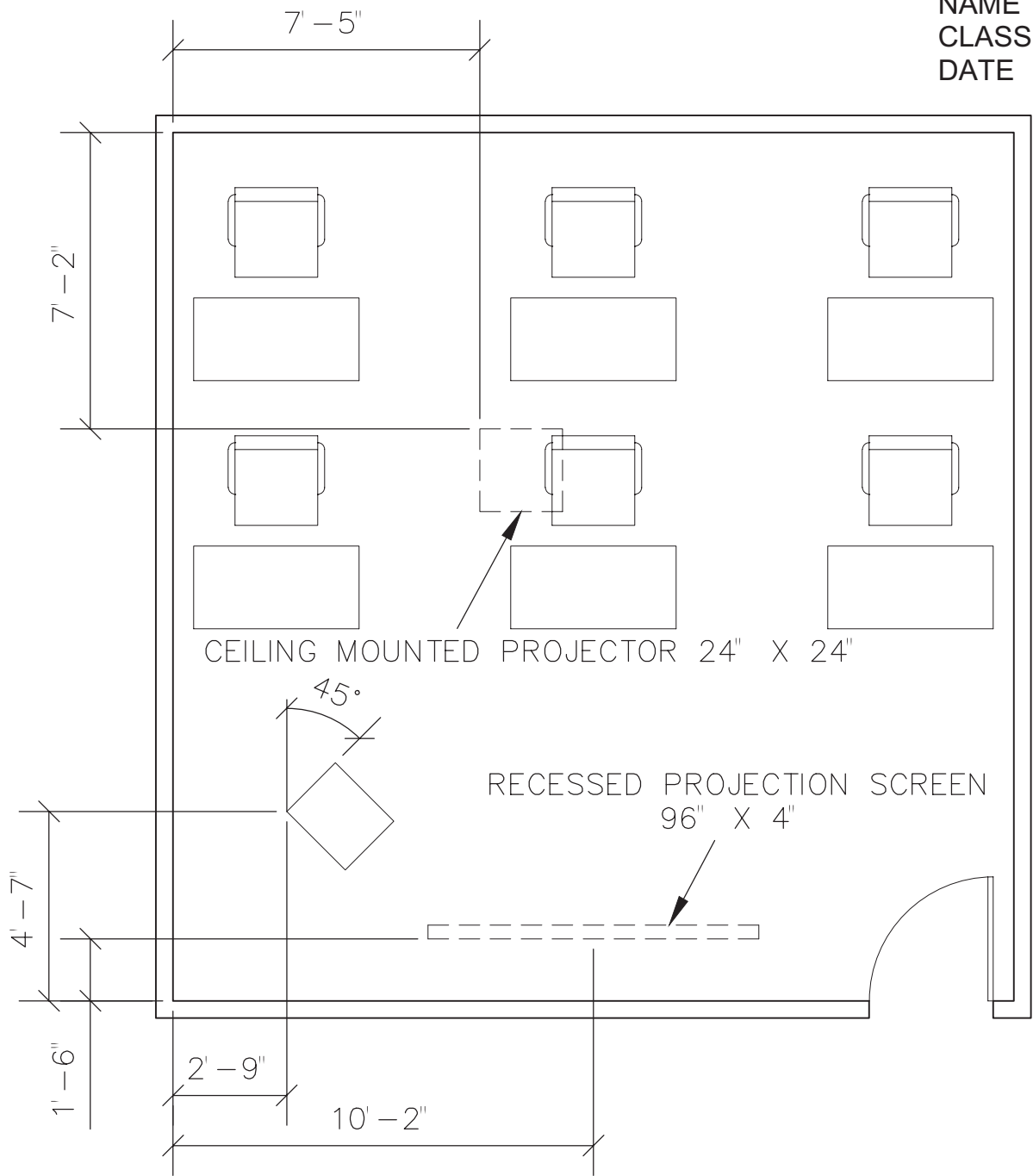
Type a command:  
Specify first point:  
int of  
Specify second point or  
[Multiple points]:  
int of  
Distance = 3'8", Angle in  
XY Plane = 0, Angle from  
XY Plane = 0, Delta X = 3'-8",  
Delta Y = 0'-0", Delta Z = 0'-0"

### Response

**Distance** (or type **DI <Enter>**)  
**Osnap-Intersection**  
**P3→** (Figure 3-32)

**Osnap-Intersection**  
**P4→** (Figure 3-32)

NAME  
CLASS  
DATE



**Figure 3-34**  
Draw the 24" x 20" lectern, the 24" x 24" ceiling projector, and the 96" x 4" recessed projection screen

**Step 25.** Draw the 24" × 20" lectern as shown in Figure 3-34.

**Step 26.** Set layer **i-eqpm-ovhd** current.

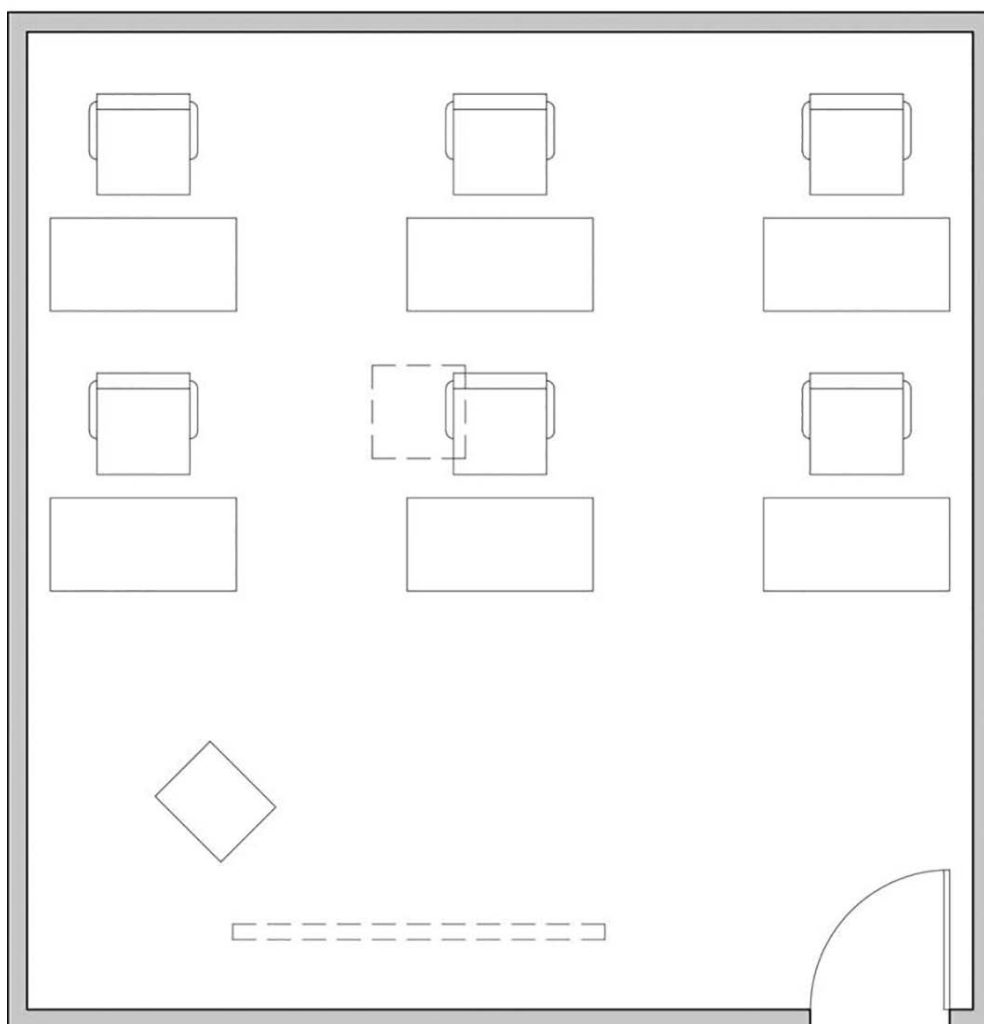
**Step 27.** Draw the 24" × 24" ceiling-mounted projector and the 96" × 4" recessed projection screen as shown in Figure 3-34.

**Step 28.** Set layer **a-anno-text** current.

**Step 29.** Use the **Single Line Text** command (type **DT <Enter>**) to type your name, class number, and date, 6" high in the upper-right corner.

**Step 30.** When you have completed Exercise 3-2 (Figure 3-35), save your work in at least two places.

NAME  
CLASS  
DATE



**Figure 3-35**  
Exercise 3-2 complete

As for the dimensions and other annotations shown in Figure 3-34, dimension and multi-leader tools are needed and will be discussed in future exercises.

**Step 31.** Print your drawing from the **Model** tab at a scale of **1/4" = 1'-0"**.

## EXERCISE 3-3

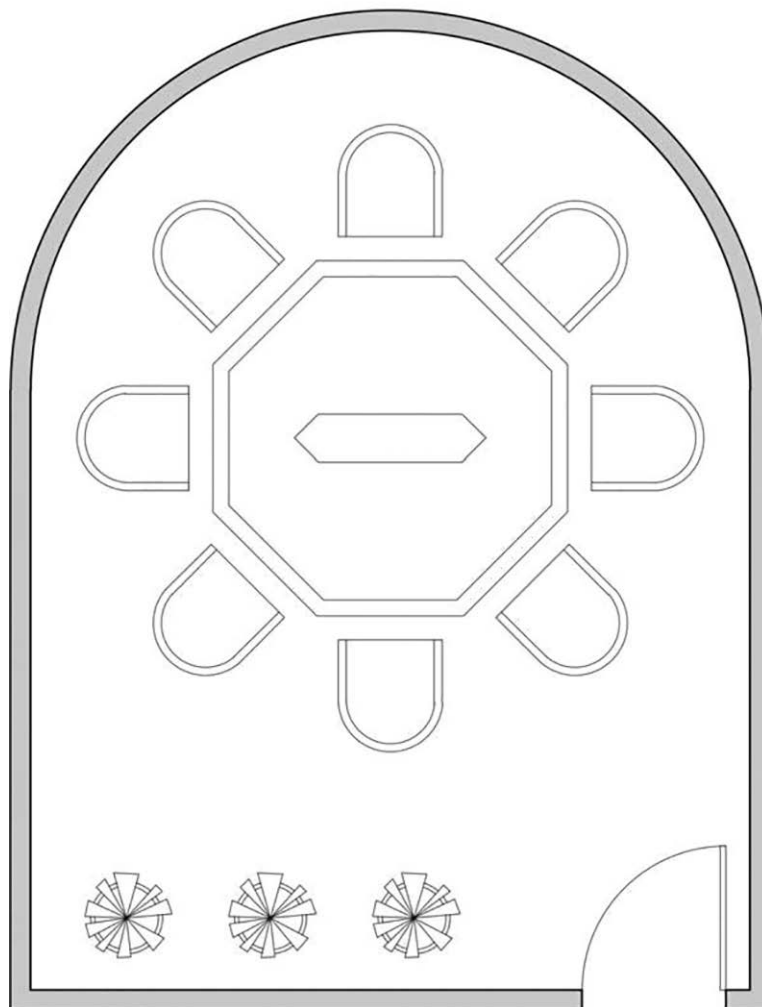
### Drawing a Curved Conference Room, Including Furniture

In Exercise 3-3, you draw a conference room, including walls and furnishings. When you have completed Exercise 3-3, your drawing will look similar to Figure 3-36.

**Figure 3-36**

Exercise 3-3: Drawing a curved conference room, including furniture (scale: 1/4" = 1'-0")

NAME  
CLASS  
DATE



**Step 1.** Click **Open...**, change the **Files of type:** input box to **Drawing Template (\*.dwt)**, and open the **Ch3-conference-rm-setup** template, which you previously made at the beginning of Exercise 3-1.



**Step 2.** Click **Save As...**, change the **Files of type:** input box to **AutoCAD 2018 Drawing (.dwg)**, and save the template as a drawing file named **CH3-EXERCISE3**.

**Step 3.** Verify the following settings:

1. Drawing units: **Architectural**
2. Drawing limits: **25',35'**
3. **GRIDDISPLAY: 0**
4. Grid: **12"**
5. Snap: **6"**
6. Verify the following layers:

Layer name	Color	Linetype	Lineweight
a-anno-text	green	continuous	.006" (.15 mm)
a-door	red	continuous	.004" (.09 mm)
a-wall-intr	blue	continuous	.010" (.25 mm)
i-eqpm-ovhd	red	hidden	.004" (.09 mm)
i-furn	cyan	continuous	.004" (.09 mm)

**Step 4.** Set layer **a-wall-intr** current.

**Step 5.** Use **Zoom-All** to view the limits of the drawing.

**Step 6.** Turn **SNAP**, **GRID**, and **LWDISPLAY** on. The remaining buttons in the status bar should be off.

## Polyline

Next, you create the inside walls with polylines, lines, and arcs.

**Step 7.** Use **Polyline**, **LINE**, and **ARC** to draw the inside lines of the conference room walls (Figure 3-37) as described next:

### Prompt

Type a command:  
Specify start point:

Current line-width is 0'-0"

Specify next point or [Arc  
Halfwidth Length Undo Width]:

Specify next point or [Arc Close  
Halfwidth Length Undo Width]:

Specify next point or [Arc Close  
Halfwidth Length Undo Width]:  
Specify endpoint of arc or  
[Angle CEnter CClose Direction  
Halfwidth Line Radius Second pt  
Undo Width]:

### Response

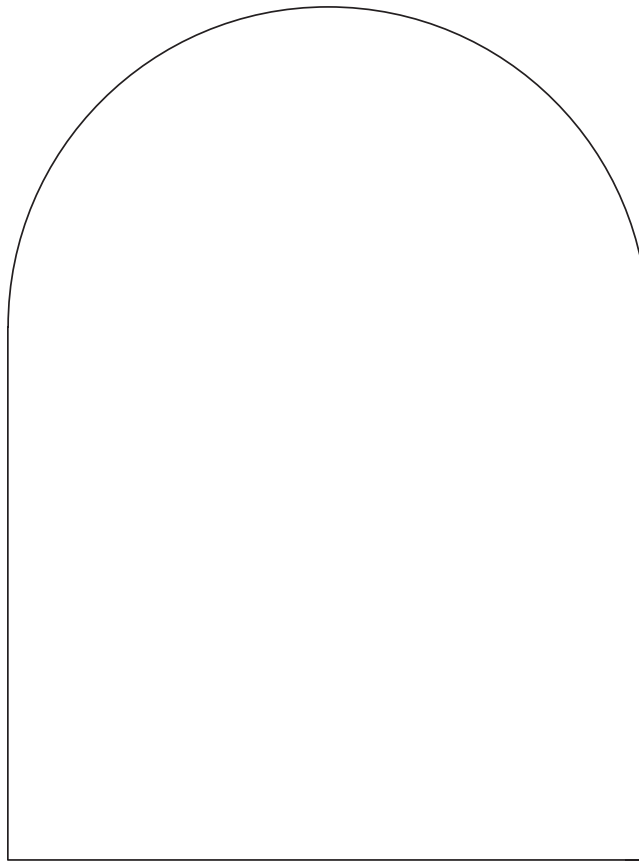
**Polyline** (or type **PL <Enter>**)  
Type **5',5'<Enter>**  
Set **ORTHO** on

Move your mouse to the right and  
type **15' <Enter>** (direct distance  
entry)

Move your mouse up and type  
**12'6 <Enter>**

Type **A <Enter>**

Move your mouse to the left and  
type **15' <Enter>**



**Figure 3-37**

Use the **Polyline** command with **LINE** and **ARC** options to draw the inside lines of the conference room walls

#### Prompt

Specify endpoint of arc or [Angle

CEnter CClose Direction Halfwidth

Line Radius Second pt Undo Width]: Type **L** <Enter>

Specify next point or [Arc Close

Halfwidth Length Undo Width]:

#### Response

Type **C** <Enter>

#### NOTE

When a wide polyline is exploded, the width information is lost, and the polyline changes to a line segment.

## Width

The **Polyline Width** option allows you to draw wide polylines. The starting and ending points of the polyline are the *center* of the polyline's width.

## Half Width

This option specifies the width of the polyline from the center of the polyline to either edge.

## Length

The **Length** option in the **Polyline** prompt allows you to draw a polyline segment at the same angle as the previously drawn polyline segment by specifying the length of the new segment.

## Close

Using the **Close** option when you are completing a wide polyline is always best. The effect of using **Close** is different from clicking or entering a point to complete the polyline. With the **Close** option, the last corner is completely closed.

**Step 8.** Use the **OFFSET** command to offset the polyline 5" to the **outside**, as shown in Figure 3-38.

**Step 9.** Draw the **3'** door opening as shown in Figure 3-38.

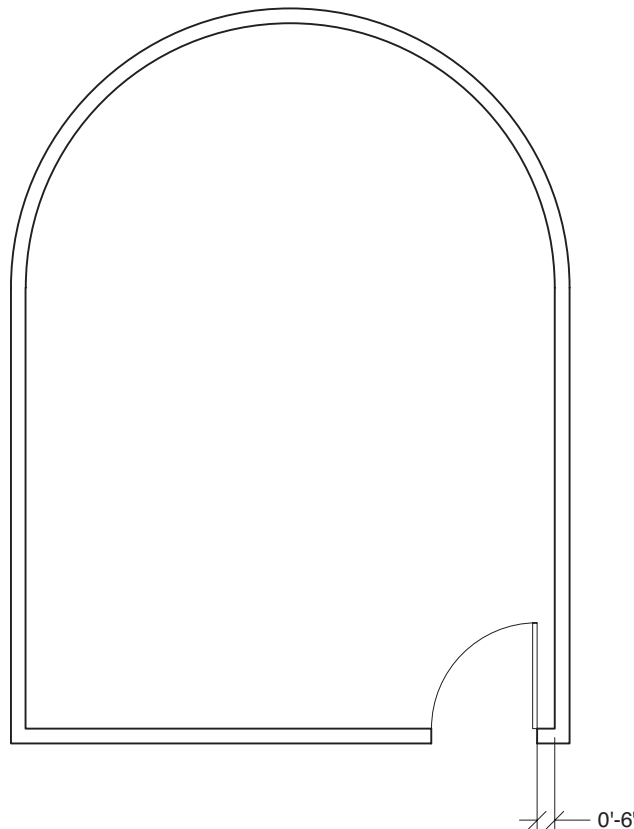
**Step 10.** Set layer **a-door** current.

**Step 11.** Use the **Rectangle** command to draw a **1-1/2"**-long by **3'**-wide rectangle to represent the door (Figure 3-38).

**Step 12.** Use the **Trim** command with the two vertical lines of step 9 as cutting edges and trim the 3' wide opening in the wall as shown in Figure 3-38.

**Step 13.** Use the **Arc-Start, End, Direction** method to draw the door swing arc (Figure 3-38). Be sure **SNAP** and **ORTHO** are on.

**Step 14.** Set layer **i-furn** current.





**Figure 3-38**

Offset the polyline and draw the door opening and the door

# POLYGON

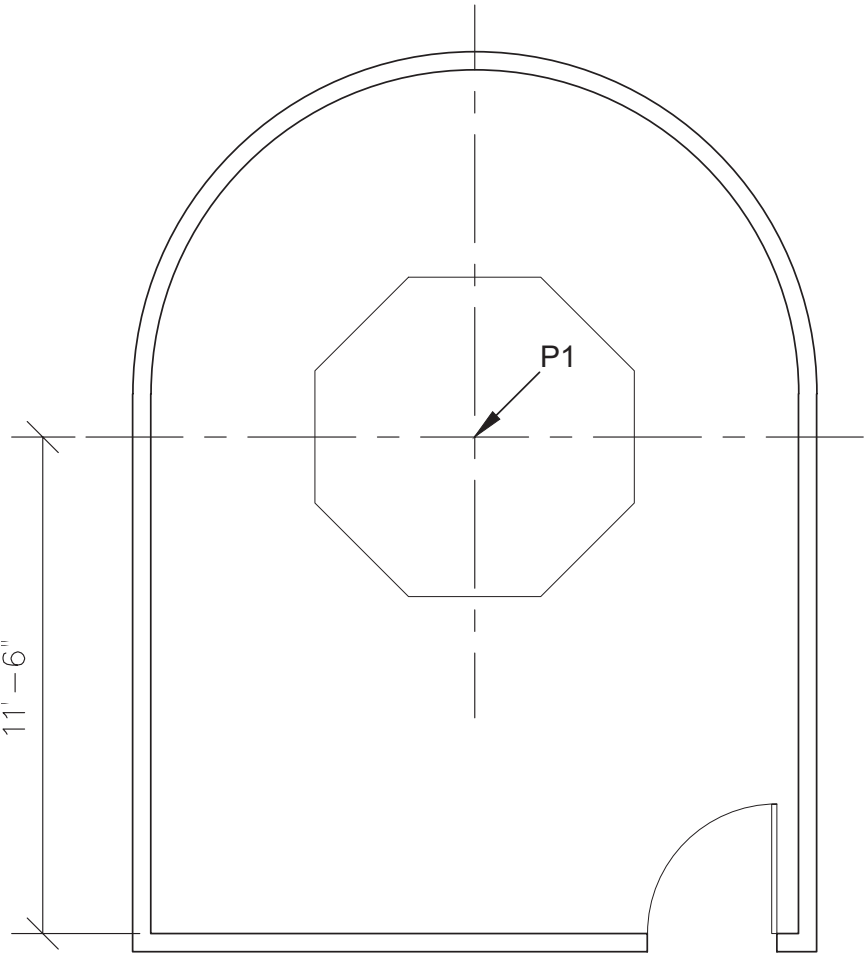
**POLYGON:** Command that draws a polygon with 3 to 1024 sides.

POLYGON	
Ribbon/ Panel	Home/Draw (Rectangle flyout) 
Draw Toolbar:	
Menu Bar:	Draw/ Polygon
Type a Command:	POLYGON
Command Alias:	POL

The **POLYGON** command draws a regular polygon with 3 to 1024 sides. After you specify the number of sides, the **Polygon** prompt is *Specify center of polygon or [Edge]:*. When you specify the center of the polygon (default option), the polygon can then be inscribed in a circle or circumscribed about a circle. When the polygon is inscribed in a circle, all the vertices lie on the circle, and the edges of the polygon are inside the circle. When the polygon is circumscribed about a circle, the midpoint of each edge of the polygon lies on the circle, and the vertices are outside the circle. A polygon is a closed polyline.

**Step 15.** Use the **POLYGON** command to draw the conference table (Figure 3-39), as described next:

Prompt	Response
Type a command:	<b>Polygon</b> (or type <b>POL</b> <Enter>)
Enter number of sides <4>:	Type <b>8</b> <Enter>
Specify center of polygon or [Edge]:	<b>P1</b> → (Figure 3-39)
Enter an option [Inscribed in circle Circumscribed about circle]<I>:	Type <b>I</b> <Enter> (or just <Enter> if <b>I</b> is the default)
Specify radius of circle:	Type <b>48</b> <Enter>



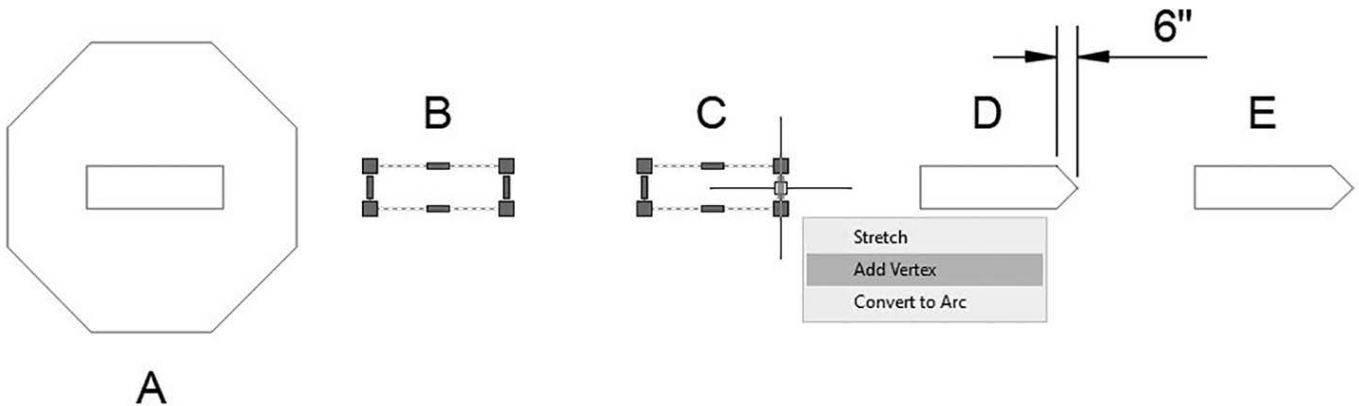
**Figure 3-39**  
Locate the polygon

The method of specifying the radius controls the orientation of the polygon. When you specify the radius with a number, as in the preceding responses, the bottom edge of the polygon is drawn at the current snap angle—horizontal in the polygon just drawn. When you specify the radius of an inscribed polygon with a point, a vertex of the polygon is placed at the point location. When you specify the radius of a circumscribed polygon with a point, an edge midpoint is placed at the point's location.

## Edge

When you select the **Edge** option of the prompt, AutoCAD prompts *Specify first endpoint of edge:* and *Specify second endpoint of edge:*. The two points entered at the prompts specify one edge of a polygon that is drawn counterclockwise.

**Step 16.** Use the **Polyline** or **Rectangle** command to draw a rectangle 36" long × 12" wide in the center of the polygon just drawn (Figure 3-40A). This is a good exercise to learn how to specify the center of the polygon as reference point (use **From** followed by **Mid Between 2 Points** from the **Osnap** menu) to construct the rectangle. After defining the center as the reference point, define the upper-left and lower-right corners with **@-18,6** and **@38,-12**, respectively. Try this on your own or ask your instructor to demonstrate it.



**Figure 3-40**

Steps for adding a 6" vertex to the right side of the rectangle

### NOTE

If you activate the grips on the vertex just added, you will get the grip option **Remove Vertex** when you hover over the vertex grip.

## Grips—Add Vertex

The **Add Vertex** grip is for objects drawn using the **Polyline**, **Rectangle**, or **POLYGON** command. When you hover over a grip, a tooltip displays the options **Stretch**, **Convert to Arc**, **Convert to Line**, and **Add Vertex**, or you can right-click and get a menu that shows all the grip options.

**Step 17.** Use the **Add Vertex** grip to draw a vertex on the right side of the rectangle just drawn, as described next (Figure 3-40):

**Prompt**

Type a command:

Small blue squares (grips) appear at each midpoint and intersection of the rectangle lines (Figure 3-40B):

A tooltip menu is displayed:

A vertex appears (Figure 3-40D):

**Response**

With no command active, click on the rectangle you have drawn

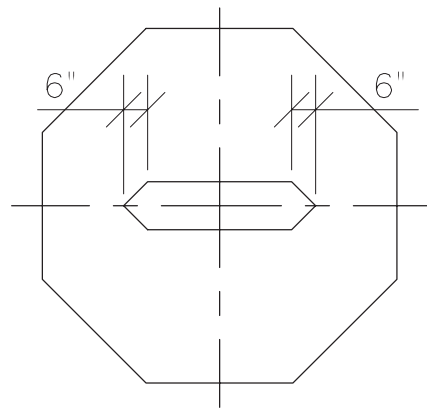
Hover over the midpoint grip on the right side of the rectangle (Figure 3-40C)

Click **Add Vertex**

With **ORTHO** on, move your cursor to the right and type **6 <Enter>** (Figure 3-40E)

Press **<Esc>** to clear the grips

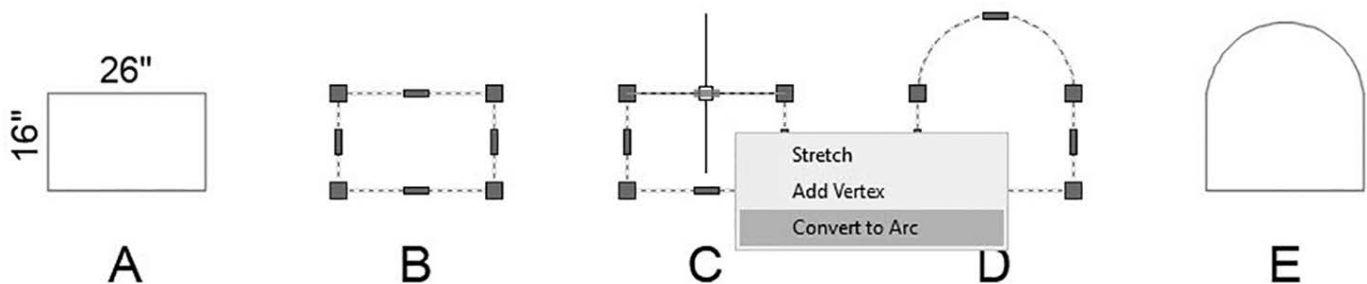
**Step 18.** Use the **Add Vertex** grip to add a 6" vertex on the left side of the rectangle (Figure 3-41).



**Figure 3-41**

Add a 6" vertex on the left side of the rectangle

**Step 19.** To begin drawing the chair symbol, use the **Polyline** or **Rectangle** command to draw a rectangle 26" long × 16" wide (Figure 3-42A) and 6" away from the outer edge of the table.



**Figure 3-42**

Steps in drawing the chair using **Convert to Arc**

## Grips—Convert to Arc

The **Convert to Arc** grip is for objects drawn using the **Polyline**, **Rectangle**, or **POLYGON** command.

**Step 20.** Use the **Convert to Arc** grip to draw the back curved edge of the chair symbol as described next (Figure 3-42):

### Prompt

Type a command:

Small blue squares (grips) appear at each midpoint and intersection of the rectangle lines (Figure 3-42B):

A tooltip menu is displayed:

An arc appears (Figure 3-42D):  
up and type **12 <Enter>**

### Response

With no command active, click on the rectangle you have drawn

Hover over the midpoint grip on the top line of the rectangle (Figure 3-42C)

Click **Convert to Arc**

With **ORTHO** on, move your cursor

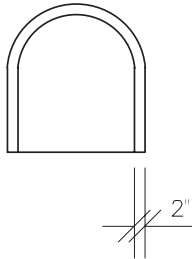
Press **<Esc>** to clear the grips (Figure 3-42E)

**Step 21.** Use the **EXPLODE** command to split the polylines.

**Step 22.** Use the **OFFSET** command (offset 2") to draw the **inside** lines of the chair symbol (Figure 3-43).

**Figure 3-43**

Explode the polylines and offset them



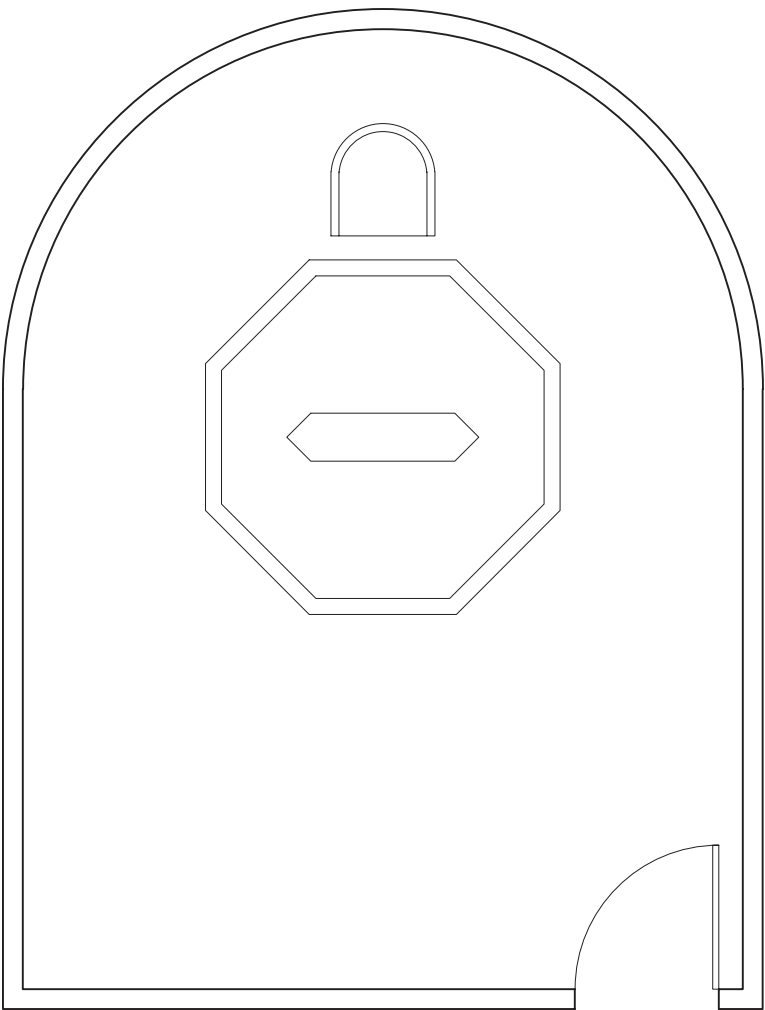
### NOTE



If you activate the grips on the chair symbol arc before it is exploded, you will get the grip option **Convert to Line** when you hover over the arc grip.

**Step 23.** The chairs are located 6" out from the outside edge of the table. Use the **MOVE** command, **Osnap-Midpoint** (to the front of the chair), and **From** to locate the front of the chair 6" outside the midpoint of an edge of the conference table polygon (Figure 3-44).

You could have avoided the use of the **Move** command in this step by using the .x, .y, and .z (x, y, z filters) to place the rectangle at its correct location 6" away from the outer edge of the table. Use the Help system of AutoCAD to learn about coordinate filters or ask your instructor to demonstrate them in class.

**Figure 3-44**  
Position the chair and offset  
the polygon



POLAR ARRAY	
Ribbon/ Panel	Home/ Modify  Array
Modify Toolbar:	
Menu Bar:	Modify/ Array/Polar Array
Type a Command:	ARRAY
Command Alias:	AR

**Polar:** The option of the **ARRAY** command that allows you to make multiple copies of an object in a circular array.

- Step 24.** Use the **OFFSET** command to offset the outside edge of the conference table 4" to the **inside** to form the 4" band (Figure 3-44).
- Step 25.** Use **Zoom-Extents** after you finish drawing the 4" band.

## ARRAY

### Polar

The **Polar** option of the **ARRAY** command allows you to make multiple copies of an object in a circular array. You can specify a 360° **Angle to fill** to form a full circular array. You can specify an angle less than 360° to form a partial circular array. When you specify a positive angle, the array is rotated counterclockwise (+ccw). When you specify a negative angle, the array is rotated clockwise (–cw).

AutoCAD constructs the array by determining the distance from the array’s center point to a point on the object selected. *If more than one object is selected, the reference point is on the last item in the selection set.*



**Step 26.** Use the **POLAR ARRAY** command to make a polar (circular) pattern of eight chairs (Figure 3-45), as described next:

**Prompt**

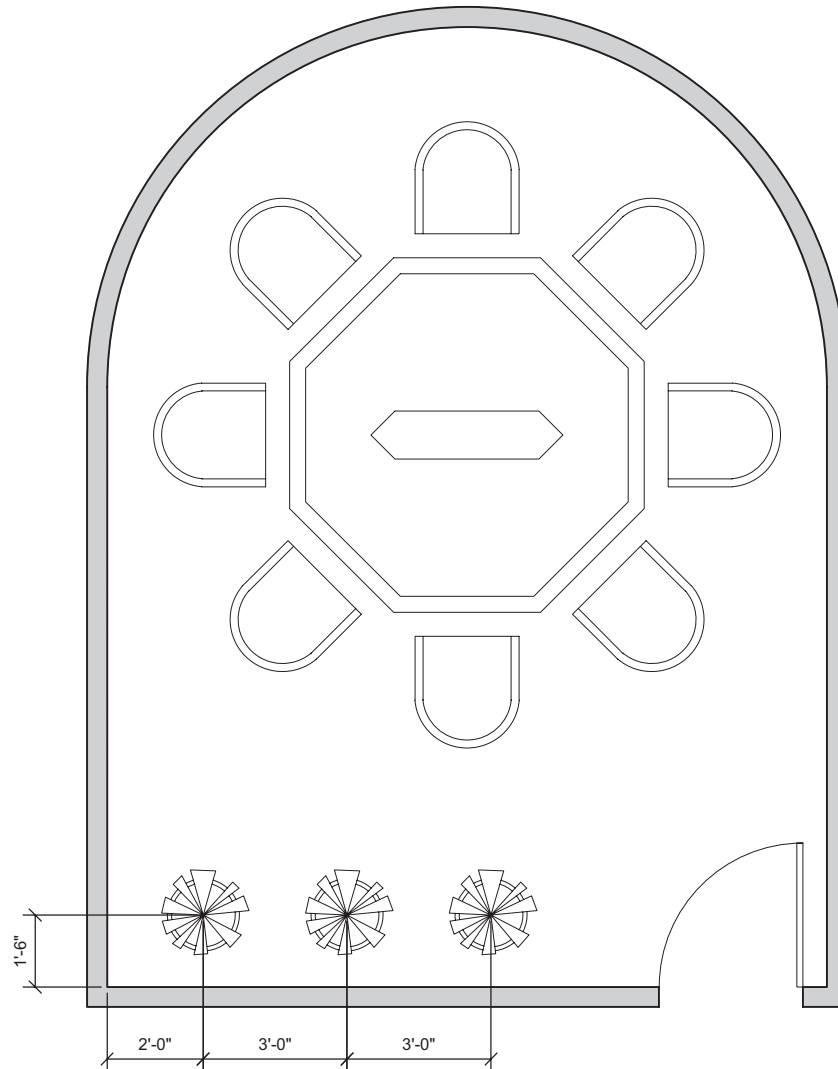
Type a command:

**Response**

**Polar Array** (or type **ARRAYPOLAR**  
<Enter>)

**Figure 3-45**

Array the chairs, draw the potted plant and copy it, and hatch the walls



**Prompt**

Select objects:

Specify opposite corner:

Select objects:

Specify center point of array [or  
Base point Axis of rotation]:

**Response**

Click the first corner for a window  
to select the chair just drawn

Window the chair just drawn

<Enter>

Click the center point of the  
polygon using the **Geometric  
Center (GCEN)** object snap mode.

Prompt	Response
Select grip to edit array or [ASsociative Base point Items Angle between Fill angle ROWs Levels ROTate items eXit] <eXit>:	Type <b>I&lt;Enter&gt;i</b>
Enter number of items in array or [Expression] <6>:	Type <b>8&lt;Enter&gt;</b>
Select grip to edit array or [ASsociative Base point Items Angle between Fill angle ROWs Levels ROTate items eXit]<eXit>:	<b>&lt;Enter&gt;</b>

**Step 27.** Use **Zoom-Window** to zoom in on the area of the conference room where the plants and planters are located (Figure 3-45).

**Step 28.** Use the **CIRCLE** command, **9"** radius, to draw the outside shape of one planter.

**Step 29.** Use the **OFFSET** command, offset distance **1"**, offset to the **inside** of the planter, to give a thickness to the planter.

**Step 30.** Use the **LINE** command to draw multisegmented shapes (to show a plant) in the planter (Figure 3-45).

**Step 31.** Use the **TRIM** command to trim the lines of the pot beneath the plant leaves. Window the entire planter to select the cutting edges, and then select the lines to trim.

**Step 32.** Use the **COPY** command to draw the next two planters, as shown in Figure 3-45.

**Step 33.** Create the following new layer and set it as the current layer:

Layer name	Color	Linetype	Lineweight
a-wall-patt-gray	gray (253)	continuous	.004" (.09 mm)

**Step 34.** Use the **HATCH** command to make the walls solid (Figure 3-45).

**Step 35.** Set layer **a-anno-text** current.

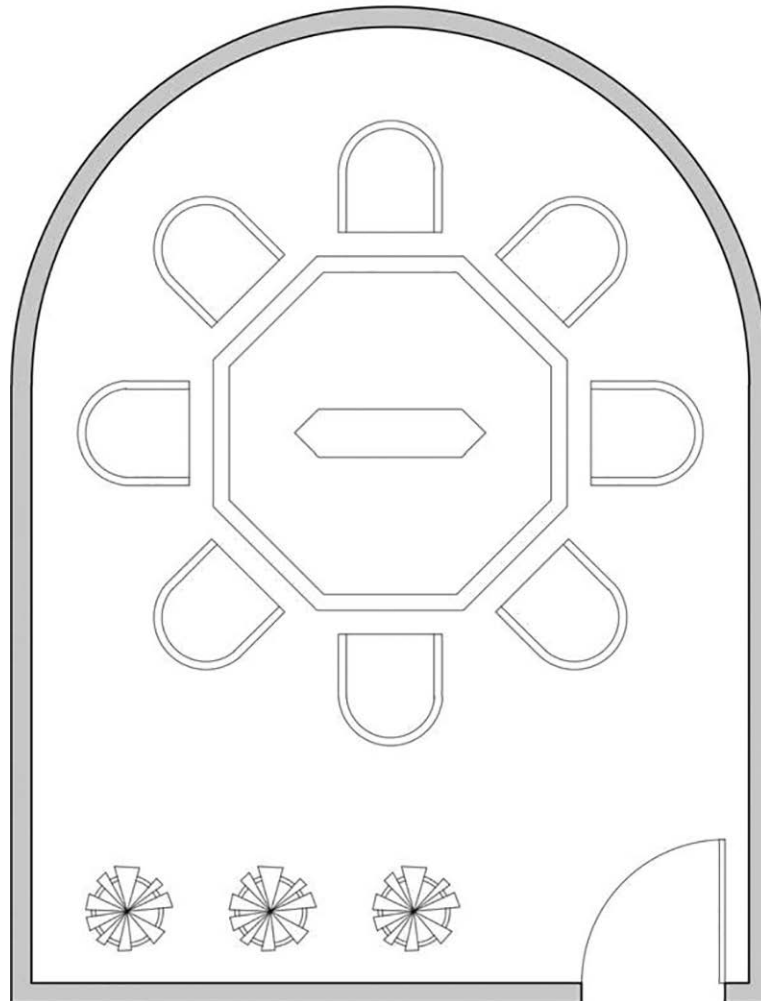
**Step 36.** Use the **Single Line Text** command (type **DT <Enter>**) to type your name, class number, and date, **6"** high in the upper-right corner.

**Step 37.** When you have completed Exercise 3-3 (Figure 3-46), save your work in at least two places.

**Step 38.** Print your drawing from the **Model** tab at a scale of **1/4" = 1'-0"**.

**Figure 3-46**  
Exercise 3-3 complete

NAME \_\_\_\_\_  
CLASS \_\_\_\_\_  
DATE \_\_\_\_\_



## EXERCISE 3-4

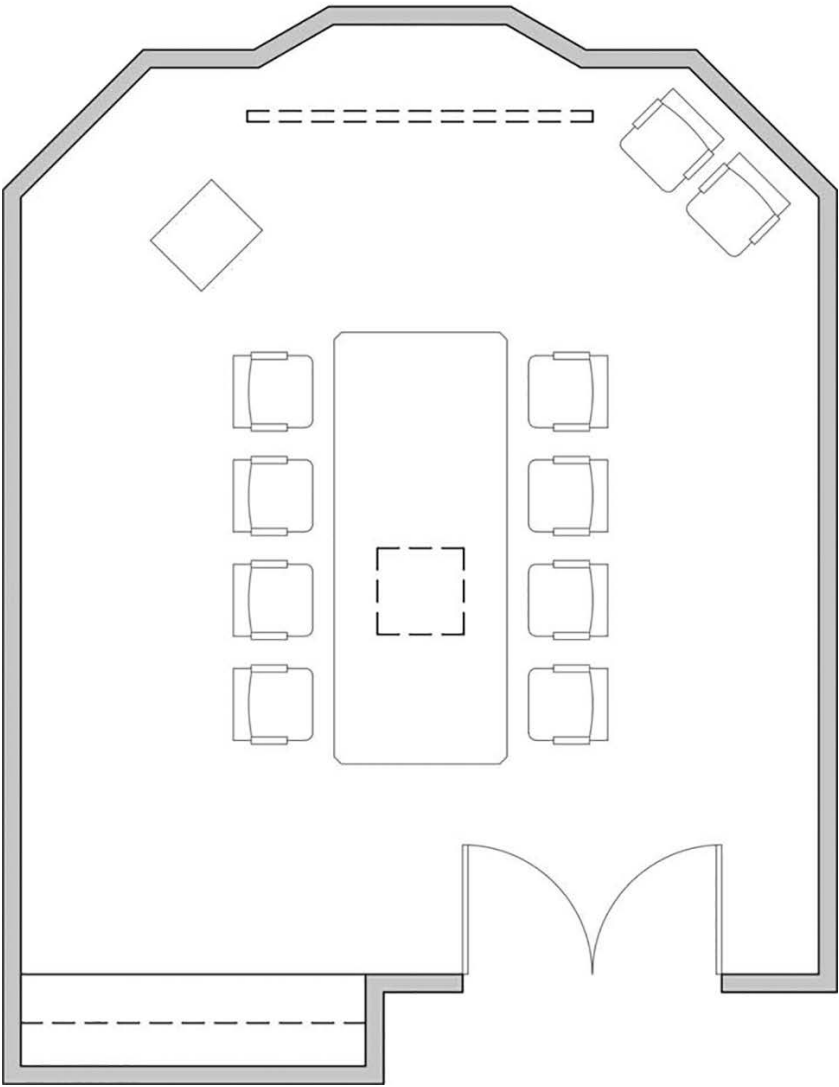
### Drawing a Conference Room Using Polar Tracking

In Exercise 3-4, you will use polar tracking to draw lines at angles in 15° increments. When you have completed Exercise 3-4, your drawing will look similar to Figure 3-47.

- Step 1.** Click **Open...**, change the **Files of type:** input box to **Drawing Template (\*.dwt)**, and open the **Ch3-conference-rm-setup** template, which you previously created at the beginning of Exercise 3-1.
- Step 2.** Click **Save As...**, change the **Files of type:** input box to **AutoCAD 2018 Drawing (.dwg)**, and save the template as a drawing file named **CH3-EXERCISE4**.

**Figure 3-47**  
 Exercise 3-4: Drawing a conference room using polar tracking (scale 1/4" = 1'-0")

NAME  
 CLASS  
 DATE



- Step 3.** Verify the following settings:
1. Drawing units: **Architectural**
  2. Drawing limits: **25',35'**
  3. **GRIDDISPLAY: 0**
  4. Grid: **12"**
  5. Snap: **6"**
  6. Verify the following layers:

Layer name	Color	Linetype	Lineweight
a-anno-text	green	continuous	.006" (.15 mm)
a-door	red	continuous	.004" (.09 mm)
a-wall-intr	blue	continuous	.010" (.25 mm)
i-eqpm-ovhd	red	hidden	.004" (.09 mm)
i-furn	cyan	continuous	.004" (.09 mm)

**Step 4.** Set layer **a-wall-intr** current.

**Step 5.** Use **Zoom-All** to view the limits of the drawing.

**Step 6.** Turn **SNAP**, **GRID**, and **LWDISPLAY** on. The remaining buttons in the status bar should be off.

## Polar Tracking

Polar tracking lets you specify angles at which to draw. Polar tracking is similar to Ortho mode, but unlike Ortho, polar tracking merely indicates your specified angles and does not force you to draw horizontally or vertically like Ortho does.

**polar tracking:** A means of specifying points using your own increment angle.

**Step 7.** Set **polar tracking** angles at 15°, as described next:

### Prompt

Type a command:

A right-click menu appears:  
The **Drafting Settings** dialog box appears with the **Polar Tracking** tab selected:

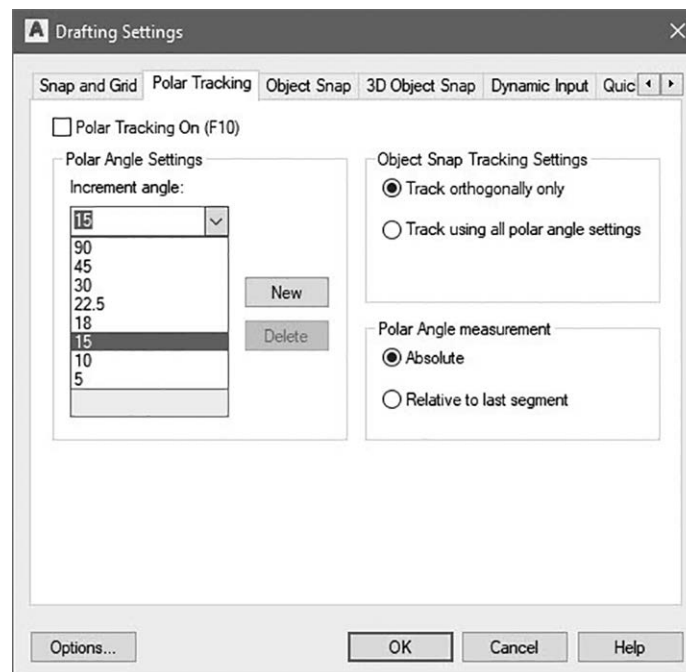
### Response

Place your mouse over **Polar Tracking** on the status bar and right-click  
Click **Tracking Settings...**

Click the list under **Increment angle:** and click **15** (as shown in Figure 3-48)  
Click **OK**

**Polar Tracking (<F10>):** Shows temporary alignment paths along specific angles of interest (for example, 15 degrees). Although the default increment for PolarSnap is 90 degrees, one can change it easily to 60, 45, 30, 15, and so on, as shown in Figure 3-48. You can use the system variable **POLARANG** to reset PolarSnap.

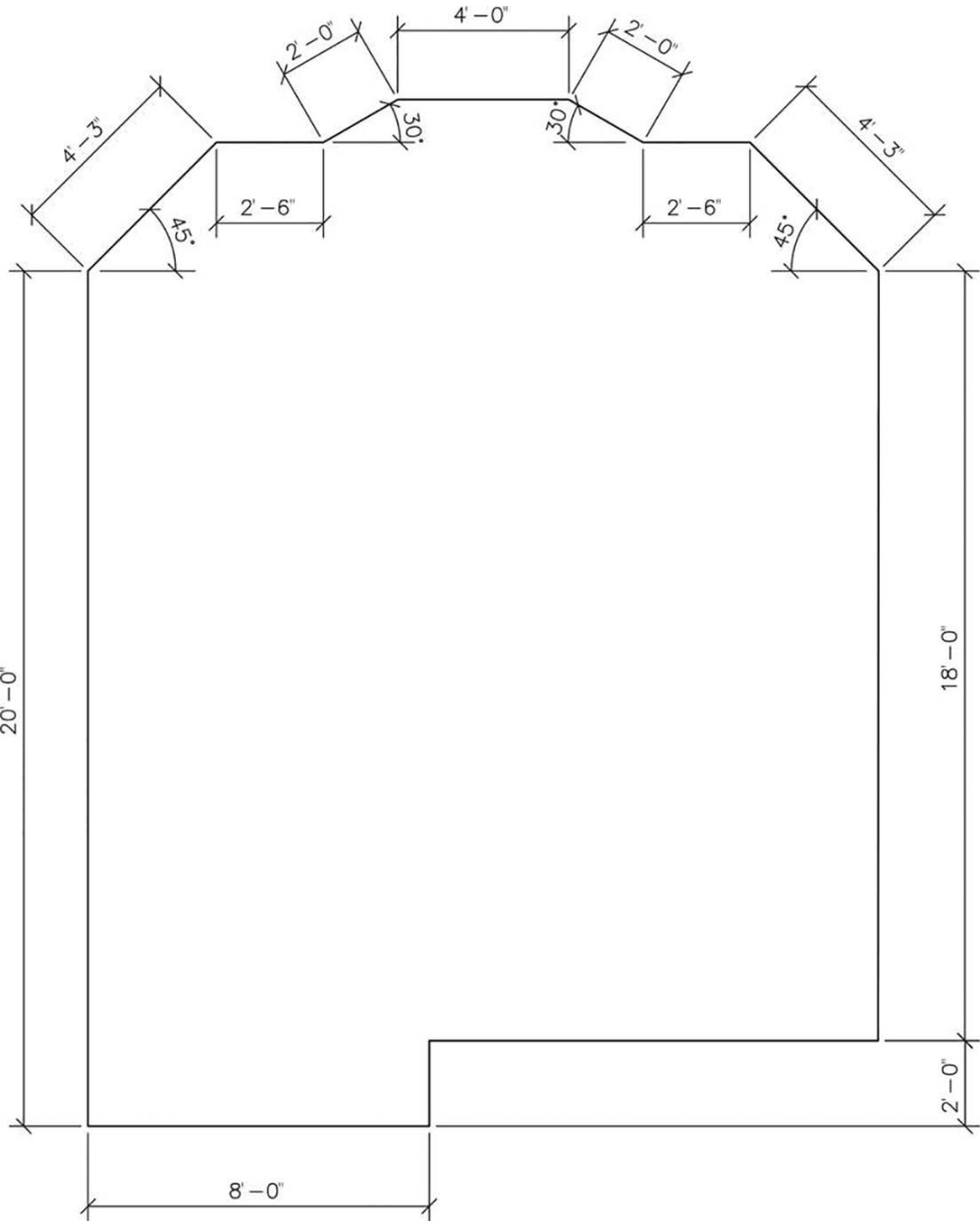
**Figure 3-48**  
Set polar tracking angles



**Step 8.** Use the **LINE** command with direct distance entry and polar tracking to draw the inside lines of the conference room walls (Figure 3-49), as described next:

Prompt	Response
Type a command:	<b>Line</b> (or type <b>L</b> <Enter>)
Specify first point:	Type <b>11'6,4'</b> <Enter>
Specify next point or [Undo]:	Turn <b>ORTHO</b> on
	Move your mouse down and type <b>2'</b> <Enter>

**Figure 3-49**  
Measurements for the walls



Prompt	Response
Specify next point or [Undo]:	Move your mouse to the left and type <b>8'</b> <Enter>
Specify next point or [Close Undo]:	Move your mouse straight up and type <b>20'</b> <Enter>

**Prompt**

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

Specify next point or [Close Undo]:

**Response**Turn **POLAR** on (**ORTHO** turns off automatically)Move your mouse so that **45°** shows and type **4'3 <Enter>**Move your mouse so that **<0°** shows and type **2'6 <Enter>**Move your mouse so that **<30°** shows and type **2' <Enter>**Move your mouse so that **<0°** shows and type **4' <Enter>**Move your mouse so that **<330°** shows and type **2' <Enter>**Move your mouse so that **<0°** shows and type **2'6 <Enter>**Move your mouse so that **<315°** shows and type **4'3 <Enter>**Move your mouse straight down so that **<270°** shows and type **18' <Enter>**Type **C <Enter>** (to complete the **LINE** command)**Polyline Edit**

Next, you join all the lines you created into a single polyline.

**Step 9.** Use **Polyline Edit** to join all lines into a single polyline, as described next:**Prompt***Type a command:*

Select polyline or [Multiple]:

Object selected is not a polyline

Do you want to turn it into one? &lt;Y&gt;

Enter an option [Close Join Width

Edit vertex Fit Spline Decurve Ltype

gen Reverse Undo]:

Select objects:

12 found

Select objects:

11 segments added to polyline

Enter an option [Open Join Width

Edit vertex Fit Spline Decurve

Ltype gen Reverse Undo]:

**Response****Polyline Edit** (or type **PE <Enter>**)

Click any of the lines

&lt;Enter&gt;

Type **J <Enter>**Type **ALL <Enter>** (or use a crossing window to select all)

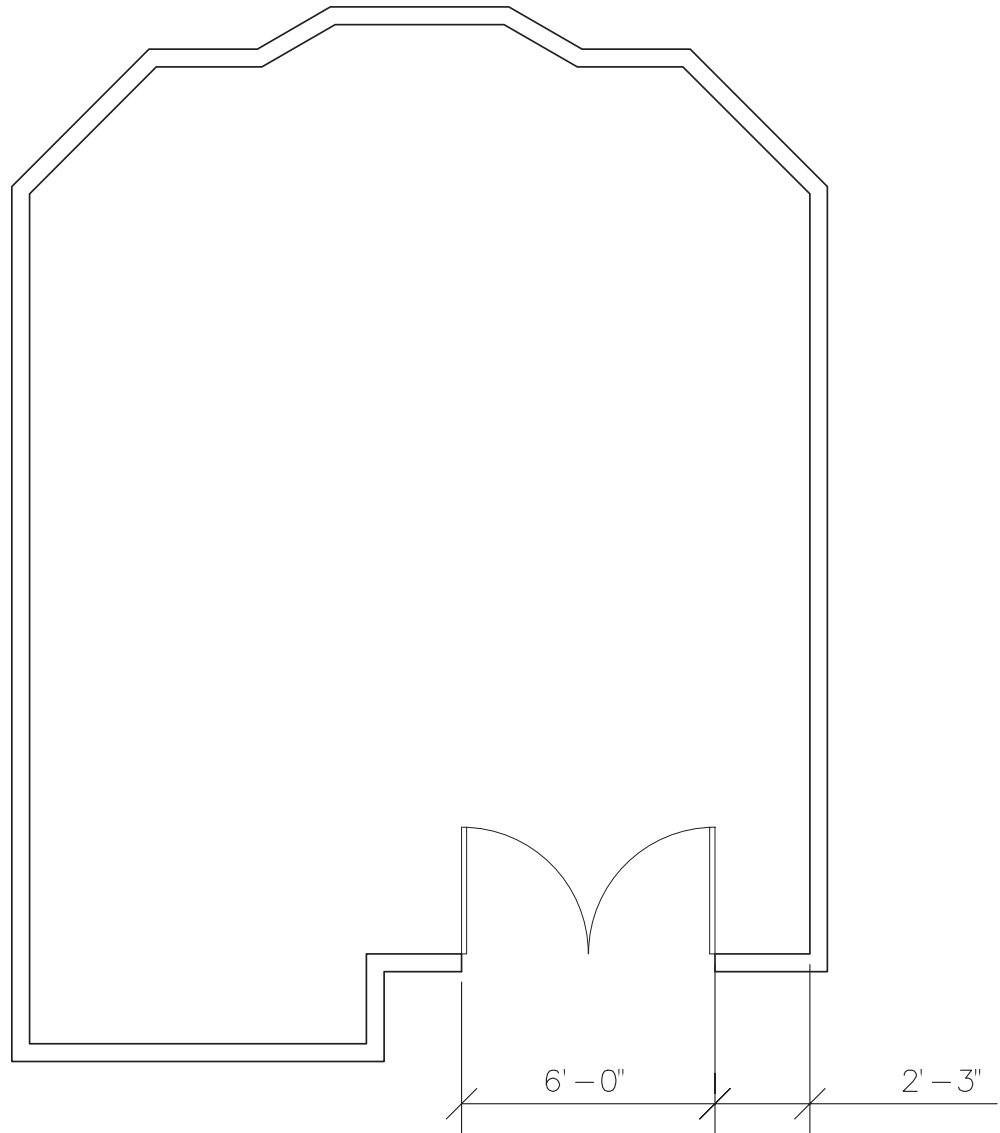
&lt;Enter&gt;

&lt;Enter&gt;

**Step 10.** Use the **OFFSET** command to offset the polyline 5" to the **outside**, as shown in Figure 3-50.**Step 11.** To split the two polylines that make the conference room walls into separate line segments, place two vertical lines (length: wall thickness = 5") and location as shown in Figure 3-50. **EXPLODE** both polylines.

**Figure 3-50**

Offset the polyline 5" to the outside, explode both polylines, make the 6' door opening, and draw the two doors



**Step 12.** Use the **Trim** command to create the 6' door opening as shown in Figure 3-50. The two vertical lines of the previous step will be the cutting edges for the **Trim** command.

**Step 13.** Set layer **a-door** current.

**Step 14.** Use the **Rectangle** command to draw the two 1-1/2" x 3' door symbols (Figure 3-50).

**Step 15.** Use the **Arc-Start, End, Direction** method to draw the door swing arcs (Figure 3-50).

**Step 16.** Set layer **i-furn** current.

**tracking:** A means of reducing, if not eliminating, the number of construction lines you draw by specifying points. Alternatively, use the **From** option of the **Object Snap** menu (shown earlier in Figure 3-16) to define a reference point and then define the x- and y-offset from that point. The upcoming steps explain this further. For now, let's continue with the exercise using **ID Point**.

## Specifying Points with Tracking

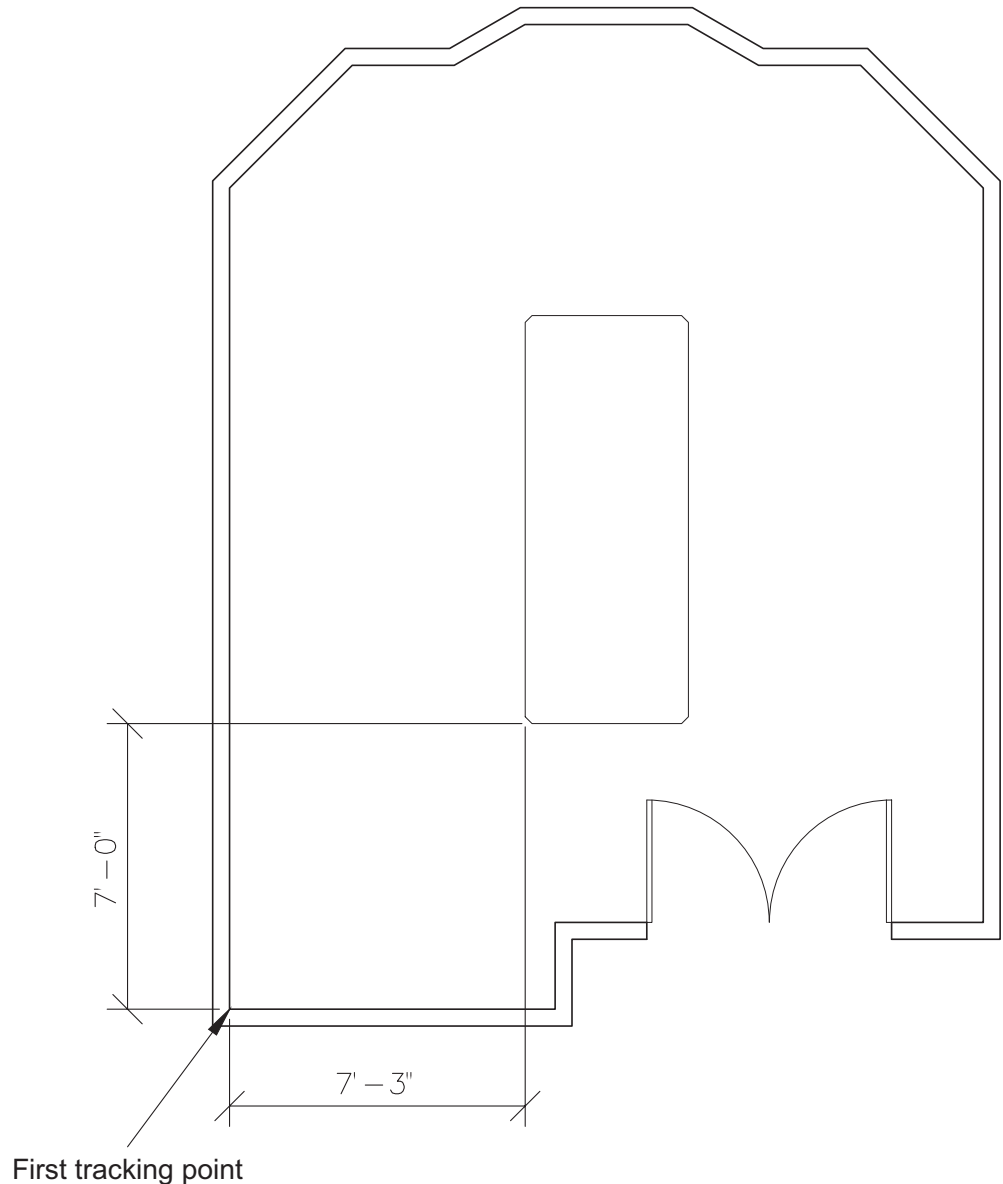
**Tracking**, which is similar to the **ID Point** command, allows you to specify points, except that you can activate tracking whenever AutoCAD asks for a point. You can also specify as many points as you need until you arrive at the desired location. You then press **<Enter>** to end the tracking mode.



**Figure 3-51**

Draw the table using **Rectangle** and **Osnap-Tracking**

**Step 17.** Draw the table using **Rectangle** and **Osnap-Tracking** (Figure 3-51), as described next:

**Prompt**

Type a command:

Specify first corner point or

[Chamfer Elevation Fillet

Thickness Width]:

Specify first chamfer distance for

rectangles <0'-0">:

Specify second chamfer distance for

rectangles <0'-2">:

Specify first corner point or

[Chamfer Elevation Fillet

Thickness Width]:

**Response**

**Rectangle** (or type **REC** <Enter>)

Type **C** <Enter>

Type **2** <Enter>

<Enter>

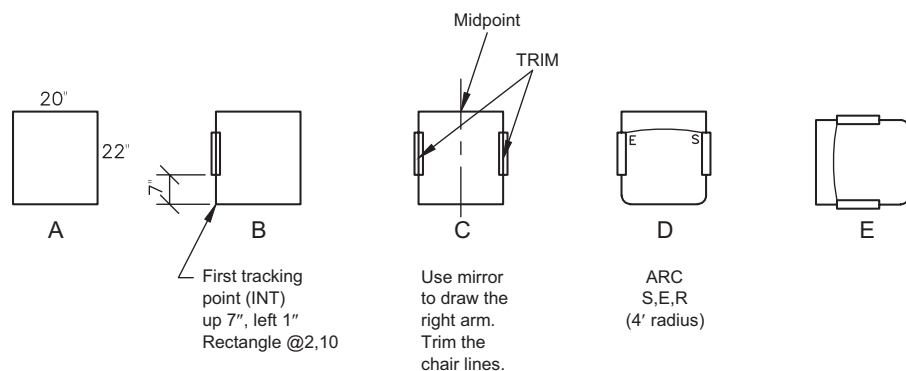
Type **TRACK** <Enter>

Prompt	Response
First tracking point:	Type <b>INT &lt;Enter&gt;</b> (with <b>ORTHO</b> off) in the lower-left inside corner of the room
Next point (Press ENTER to end tracking):	Move your mouse to the right (with <b>ORTHO</b> on and <b>OSNAP</b> off) and type <b>7'3 &lt;Enter&gt;</b>
Next point (Press ENTER to end tracking):	Move your mouse up and type <b>7' &lt;Enter&gt;</b>
Next point (Press ENTER to end tracking):	<b>&lt;Enter&gt;</b> (to end tracking)
Specify other corner point or [Area Dimensions Rotation]:	Type <b>@48,120 &lt;Enter&gt;</b> (relative coordinates)

## Drawing the Chairs around the Conference Table

- Step 18.** Zoom in on a portion of the grid so you can begin to draw the chair symbol.
- Step 19.** Draw a rectangle 20" wide by 22" deep (change chamfer distance to 0) using the **LINE** or **Rectangle** command (Figure 3-52A).
- Step 20.** Draw the 2" × 10" left chair arm using **Rectangle** and **Tracking** (Figure 3-52B).
- Step 21.** Use **MIRROR** and **TRIM** to place the right arm and trim the extra lines out (Figure 3-52C).

**Figure 3-52**  
Draw the conference room chair



- Step 22.** Draw a 2" fillet on the bottom two corners of the chair (Figure 3-52D).
- Step 23.** Use **Arc-Start, End, Radius** (4' radius) to complete the chair symbol (Figure 3-52D).

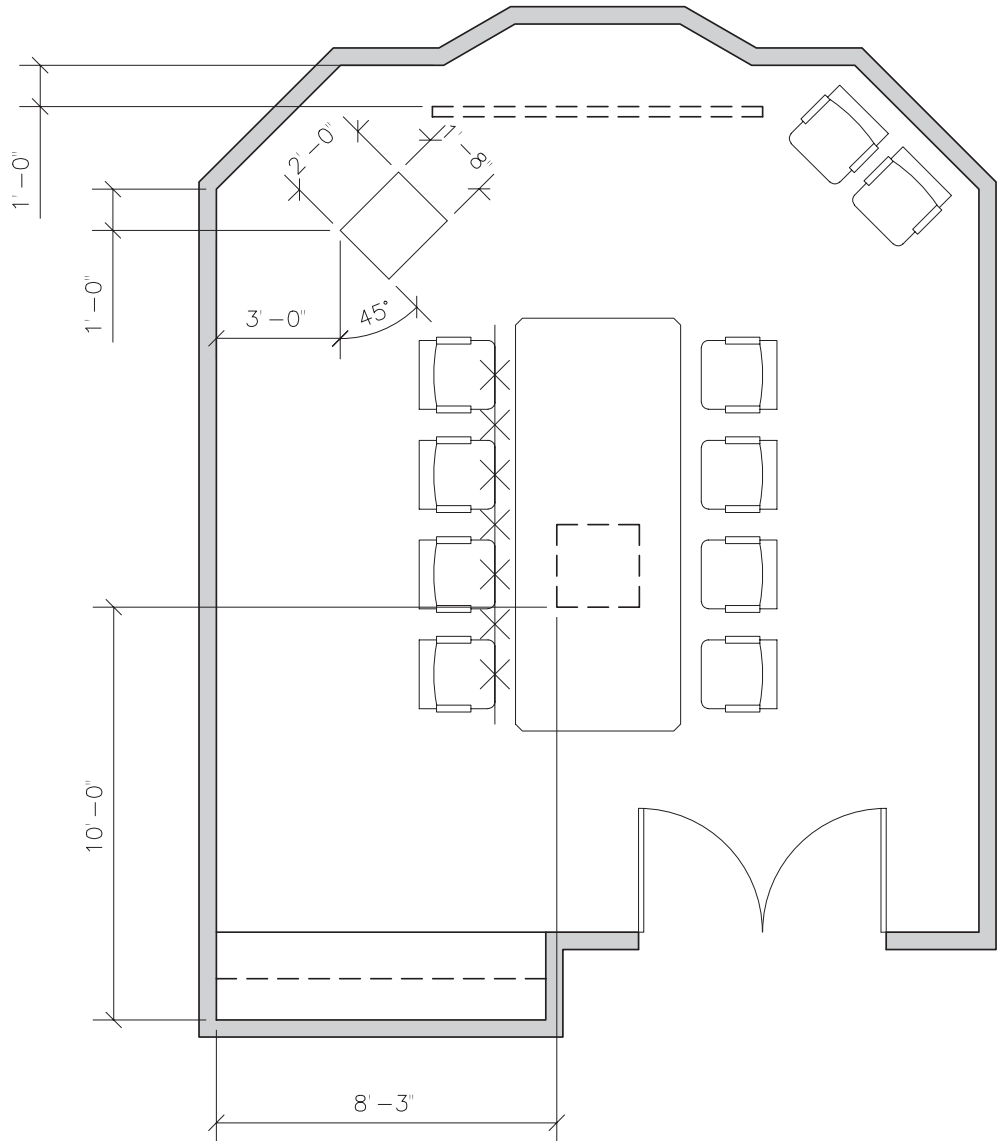
**Step 24.** Rotate the chair to appear as shown in Figure 3-52E.

**Step 25.** Explode the table, and then offset the line that defines the long left side of the table 6" to the outside of the table. Alternatively, place a line 6" away from the edge of the table to the left, using the **Line** command and **From** option of **Osnap**, as shown in Figure 3-53. Use **Explode** at a minimum, especially when you can avoid it.

**Step 26.** Set the **Point Style** to **X** and size to **6"**.

**Figure 3-53**

Complete the conference room



**Step 27.** Divide the offset line into eight equal segments.

**Step 28.** Use **COPY** and **Osnap-Midpoint** to pick up the chair and **Osnap-Node** to copy the chair on the points of the divided line (Figure 3-53).

- Step 29.** Use the **MIRROR** command to draw the chairs on the right side of the conference table (Figure 3-53).
- Step 30.** Set **PDMODE** to **1** (invisible).
- Step 31.** Erase the offset line used to locate the chairs.

## Completing the Conference Room

Finish the conference room by adding a lectern, projector screen, and cabinet. Add additional chairs and hatch the walls as shown in Figure 3-53.

- Step 32.** Draw the 24" × 20" lectern as shown in Figure 3-53.
- Step 33.** Set layer **i-eqpm-ovhd** current.
- Step 34.** Add the 96" × 3" recessed projection screen and the 24" × 24" ceiling-mounted projector to the plan as shown in Figure 3-53. Locating the 96" × 3" recessed projection screen will require use of the x, y, z-filters and the **Mid Between 2 Points** option of the **Osnap** menu. Ask your instructor to demonstrate it in class.
- Step 35.** Make the following new layers and draw the lines for the built-in upper and lower cabinets, as shown in Figure 3-53:

Layer name	Color	Linetype	Lineweight
a-flor-case	green	continuous	.006" (.15 mm)
a-flor-case-uppr	red	hidden line	.004" (.09 mm)

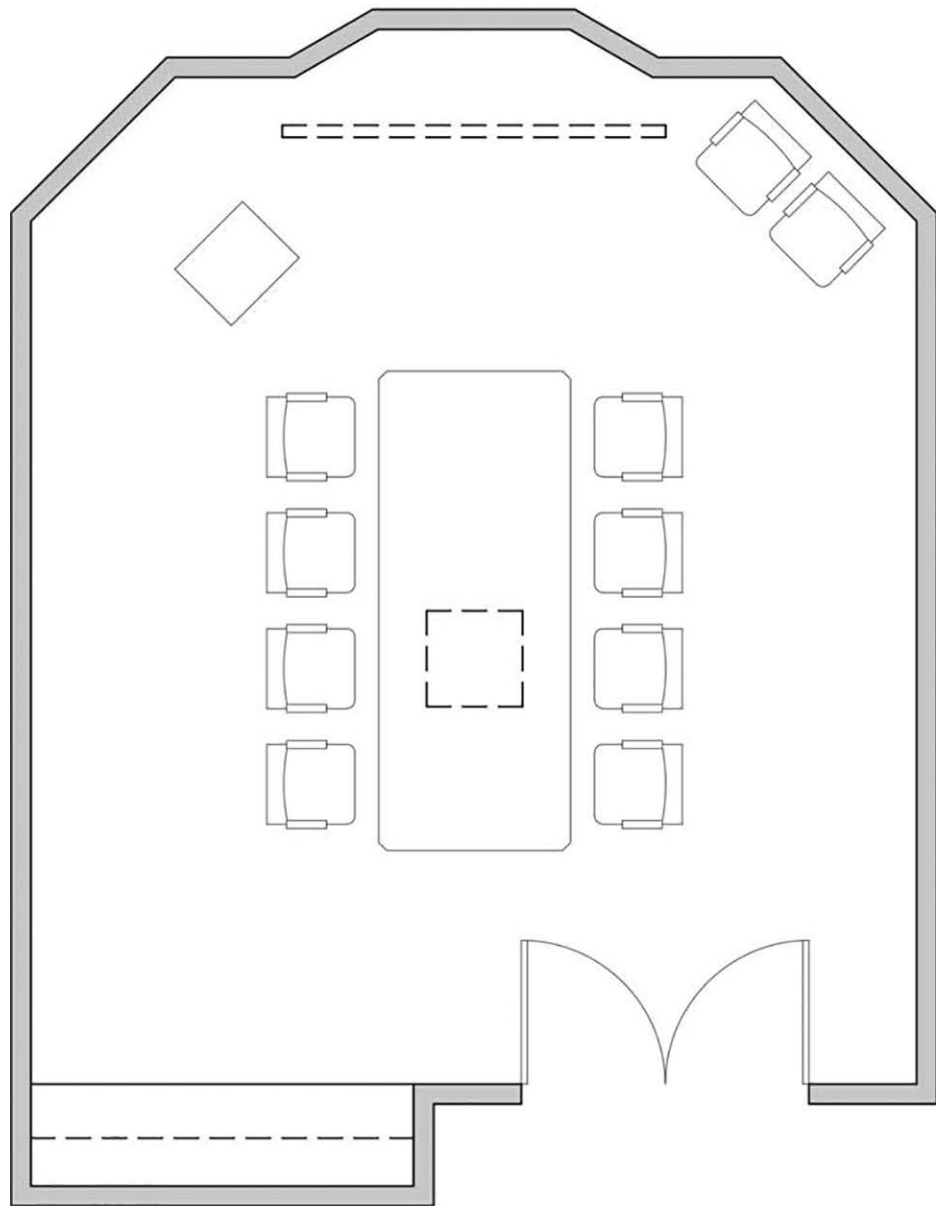
- Step 36.** Copy and rotate the two extra chairs in the room, as shown in Figure 3-53.
- Step 37.** Create the following new layer and set it as the current layer:

Layer name	Color	Linetype	Lineweight
a-wall-patt-gray	gray (253)	continuous	.004" (.09 mm)

- Step 38.** Use the **HATCH** command to make the walls solid, as shown in Figure 3-53.
- Step 39.** Set layer **a-anno-text** current.
- Step 40.** Use the **Single Line Text** command (type **DT <Enter>**) to type your name, class number, and date, 6" high in the upper-right corner (Figure 3-54).
- Step 41.** When you have completed Exercise 3-4 (Figure 3-54), save your work in at least two places.
- Step 42.** Print your drawing from the **Model** tab at a scale of **1/4" = 1'-0"**.

**Figure 3-54**  
Exercise 3-4 complete

NAME  
CLASS  
DATE

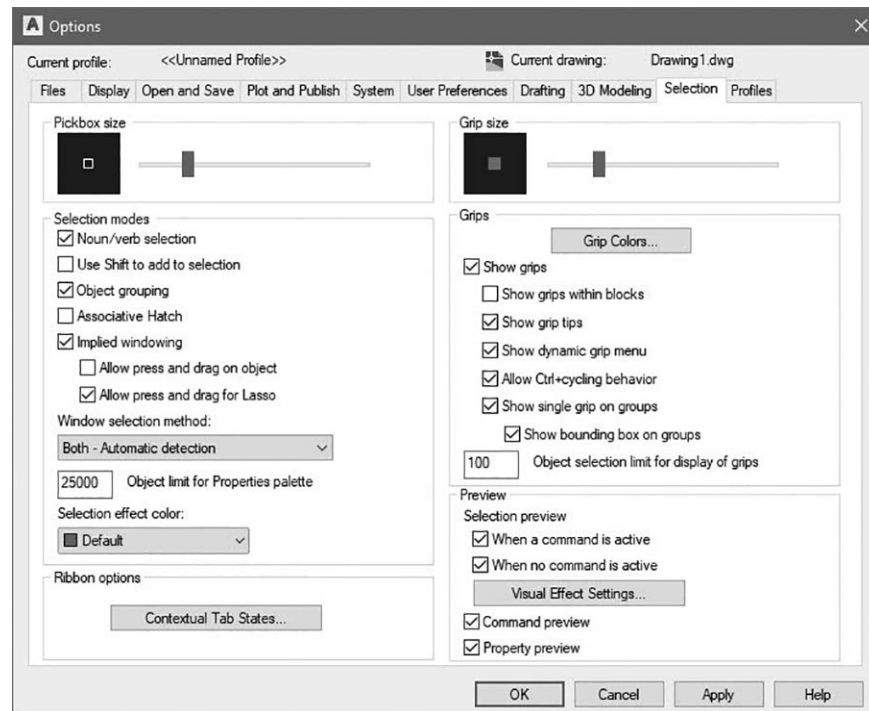


## Using Command Preview

**Command preview**, in the Preview area of the **Selection** tab of the **Options** dialog box (Figure 3-55), enables you to preview the results of **Trim**, **Extend**, **Lengthen**, **Break**, and **MatchProp** operations before actually selecting the objects. The command also enables you to preview **Fillet**, **Chamfer**, and **Offset** operations.

For example, the **Trim** and **Extend** tools provide a preview of the results before you commit the selection. After you select the cutting or boundary edges, you simply pass the cursor over the object you want to trim or extend. A preview of the resulting object is displayed. When you are

trimming, the segment to be removed is dimly displayed, and a cursor badge indicates that it will be deleted.



**Figure 3-55**  
Options dialog box, Selection tab – Command preview option

## Choosing Selection Options

In addition to selecting groups of objects using a window or a window crossing, you can also click the cursor in a blank area of the drawing and then drag around the objects to create a lasso selection. **Allow press and drag for Lasso** in the **Options** dialog box on the **Selection** tab enables you to specify the lasso (Figure 3-55). For a traditional rectangular window or crossing selection, click and release to pick each corner of the rectangle.

## Chapter Summary

This chapter provided you the information necessary to set up and draw conference and lecture rooms. You learned how to use many of the **Draw**, **Inquiry**, and **Modify** commands. You also learned how to use the command options **Osnap**, **From**, **Tracking**, and **Polar Tracking**, and you learned the uses of a drawing template. Now you have the skills and information necessary to produce conference and lecture rooms.

## Chapter Test Questions

### Multiple Choice

*Circle the correct answer.*

- When the outline of the walls of a room is drawn with a zero-width polyline, which of the following commands can you use to draw most quickly the second line that shows the depth of the walls?
  - Line**
  - Polyline**
  - OFFSET**
  - COPY**
- Which of the following commands do you use to split a solid polyline into separate segments?
  - ID Point**
  - OFFSET**
  - ARRAY**
  - EXPLODE**
- Which of the following commands do you use to locate a point on a drawing and to display the position of that point in absolute coordinates?
  - ID Point**
  - Inquiry**
  - First point**
  - Distance**
- Which of the following commands can you use to draw a rounded corner?
  - CHAMFER**
  - FILLET**
  - OFFSET**
  - TRIM**
- Which of the following **Osnap** modifiers do you use to snap to a point entity?
  - Perpendicular**
  - Endpoint**
  - Node**
  - Midpoint**
- Which of the following rotation angles is the same as  $-90^\circ$ ?
  - 90
  - 180
  - 270
  - 300
- Which of the following controls the appearance of the markers used in the **DIVIDE** command?
  - Aperture Size (APBOX)**
  - Point Style (DDPTYPE)**
  - Osnap (OSNAP)**
  - Pickbox Size (PICKBOX)**

8. Which of the following do you use to change the size of the target box that appears when using **Modify** commands?
  - a. **Aperture (APBOX)**
  - b. **Point Style (DDPTYPE)**
  - c. **Osnap (PICKBOX)**
  - d. **Pickbox Size (PICKBOX)**
9. Which of the following commands can you use to join lines or arcs together and make them a single polyline?
  - a. **EXPLODE**
  - b. **Polyline Edit (PEDIT)**
  - c. **Polyline**
  - d. **CLOSE**
10. Which of the following command options allows you to chamfer the corners of a rectangle using only the **Rectangle** command?
  - a. **C**
  - b. **D**
  - c. **P**
  - d. **All**

## Matching

Write the number of the correct answer on the line.

- |                          |  |
|--------------------------|--|
| a. <b>Osnap</b> _____    | 1. A setting option that allows you to start a line from the exact endpoint of an existing line                    |
| b. <b>Polyline</b> _____ | 2. A command used to draw a rectangle that can be offset with a single click                                       |
| c. <b>TRIM</b> _____     | 3. A command modifier that locates a base point and then allows you to locate an offset point from that base point |
| d. <b>Tracking</b> _____ | 4. A command that is used to cut off lines   |
| e. <b>From</b> _____     | 5. A method of locating points before the start point of a line is specified                                       |

## True or False

Circle the correct answer.

1. **True or False:** The **Chamfer** command will chamfer two lines that do not intersect.
2. **True or False:** All lines of a square drawn with a polyline can be offset with one use of the **OFFSET** command.
3. **True or False:** You can select all objects in the drawing as cutting edges by pressing **<Enter>** at the prompt *Select objects or <select all>.*
4. **True or False:** The width of a polyline cannot be changed.
5. **True or False:** The **ID Point** command is used to determine the exact distance from one point to another.



## List

1. Five commands under the **Modify** panel of the ribbon with the **Home** tab ON.
2. Five options under the **Polyline** command.
3. Five options under the **Offset** command.
4. Five options of the the **Osnap** toolbar.
5. Five options under the **Chamfer** command.
6. Five ways of launching the **Point** command.
7. Five options under the **Polyline Edit** command.
8. Five ways of launching the **Hatch** command.
9. Five commands accessible upon activating a grip.
10. Five tabs in the **Drafting Settings** window.

## Questions

1. How does **DIVIDE** differ from **MEASURE**?
2. When should you use **Osnap**?
3. When should you use **LINE** instead of **Polyline**?
4. When should you use **Polyline Edit**?
5. What is the **ARRAY** command used for and what are its options?

## Chapter Projects

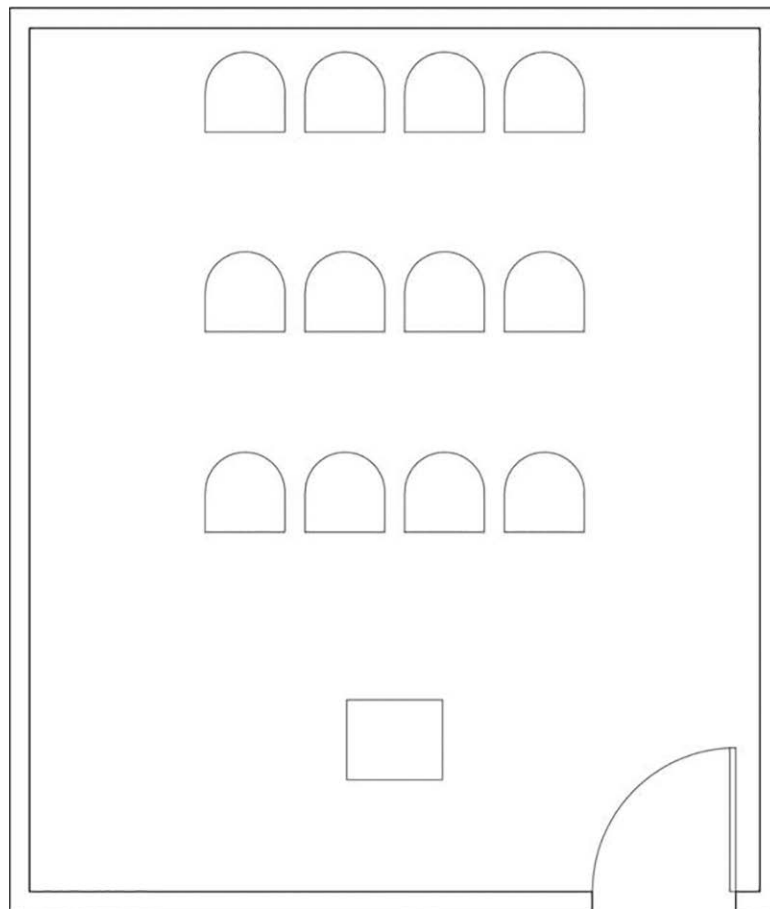
### Project 3-1: Rectangular Lecture Room Including Furniture [BASIC]

1. Draw the floor plan of the lecture room as shown in Figure 3-57. Use the dimensions shown in Figure 3-58, or use an architectural scale to measure the floor plan and draw it full scale.

**Figure 3-57**

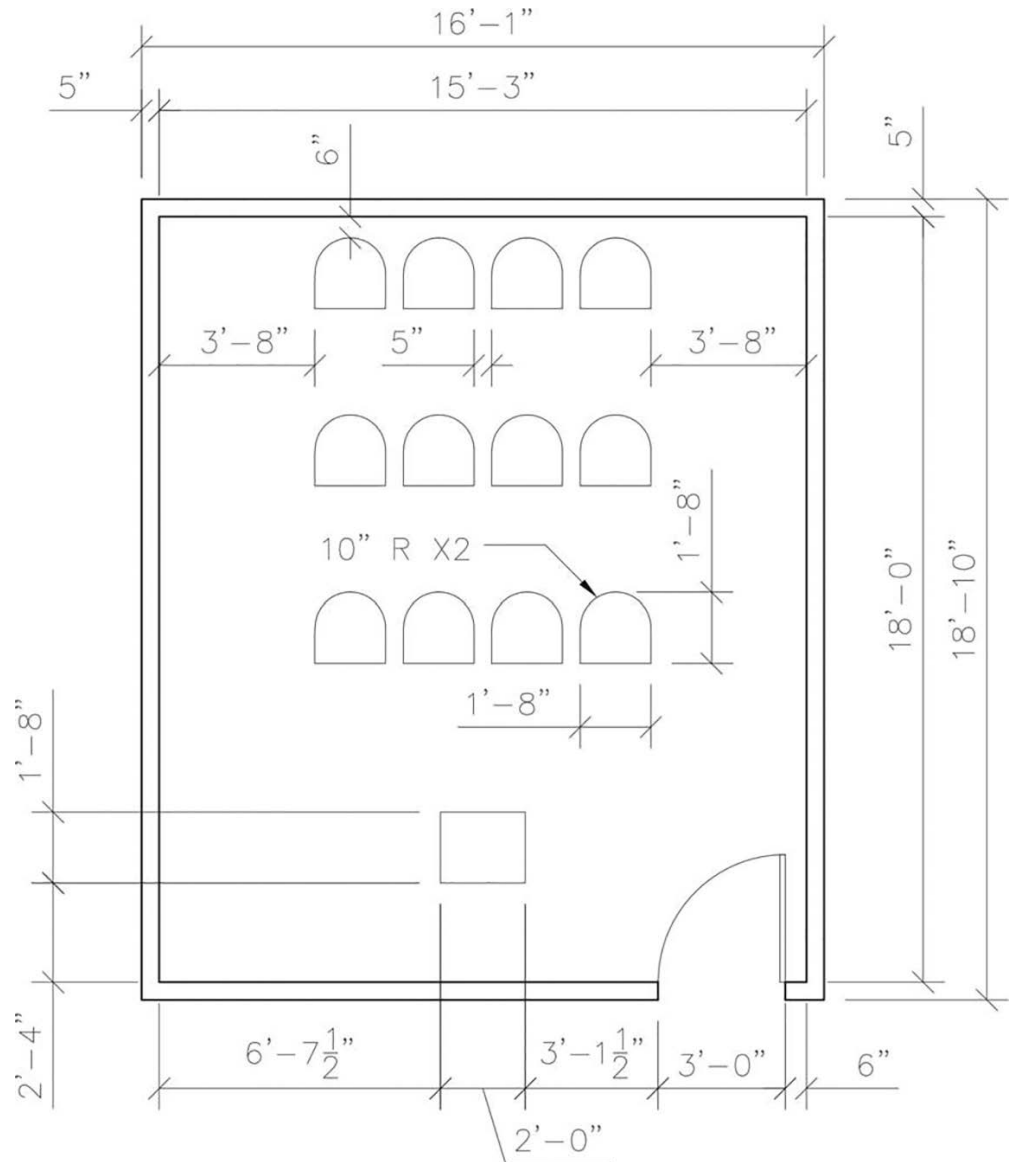
Project 3-1: Rectangular lecture room including furniture (scale: 1/4" = 1'-0")

NAME  
CLASS  
DATE



2. Use the **Single Line Text** command to type your name, class number, and date, 6" high in the upper-right corner (Figure 3-57).

- Print your drawing from the **Model** tab at a scale of  $\frac{1}{4}" = 1'-0"$ .



**Figure 3-58**

Dimensions for Project 3-1 (scale:  $\frac{1}{4}" = 1'-0"$ )

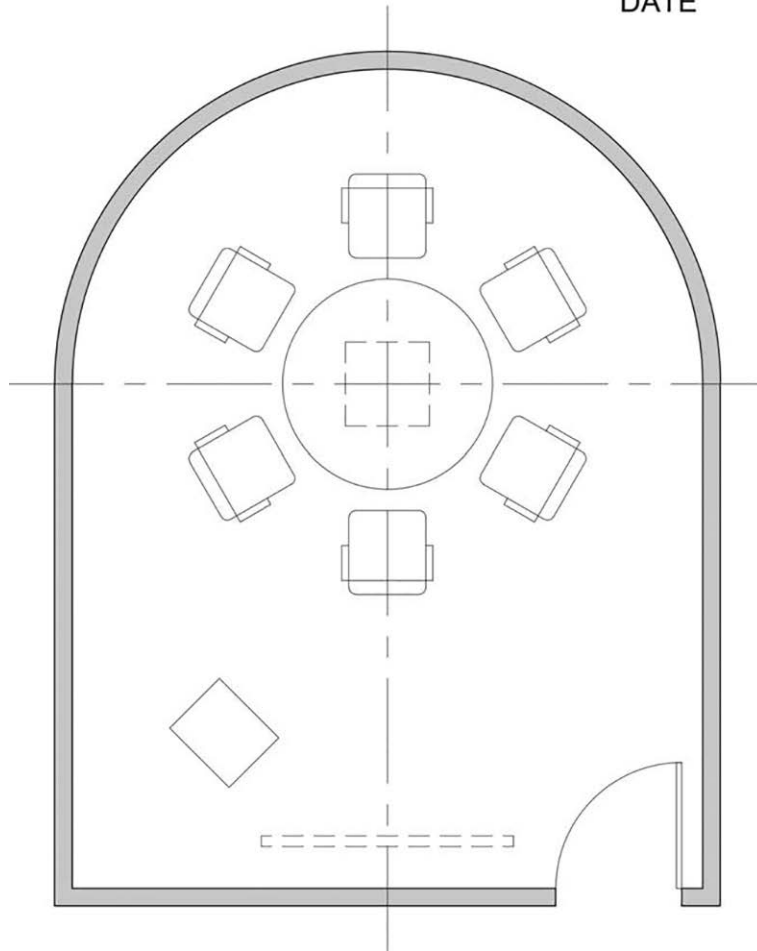
## Project 3-2: Curved Conference Room Including Furniture [INTERMEDIATE]

1. Draw the floor plan of the conference room as shown in Figure 3-59. Use the dimensions shown in Figure 3-60, or use an architectural scale to measure the floor plan and draw it full scale. Your drawing will look like Figure 3-59 without the centerline.

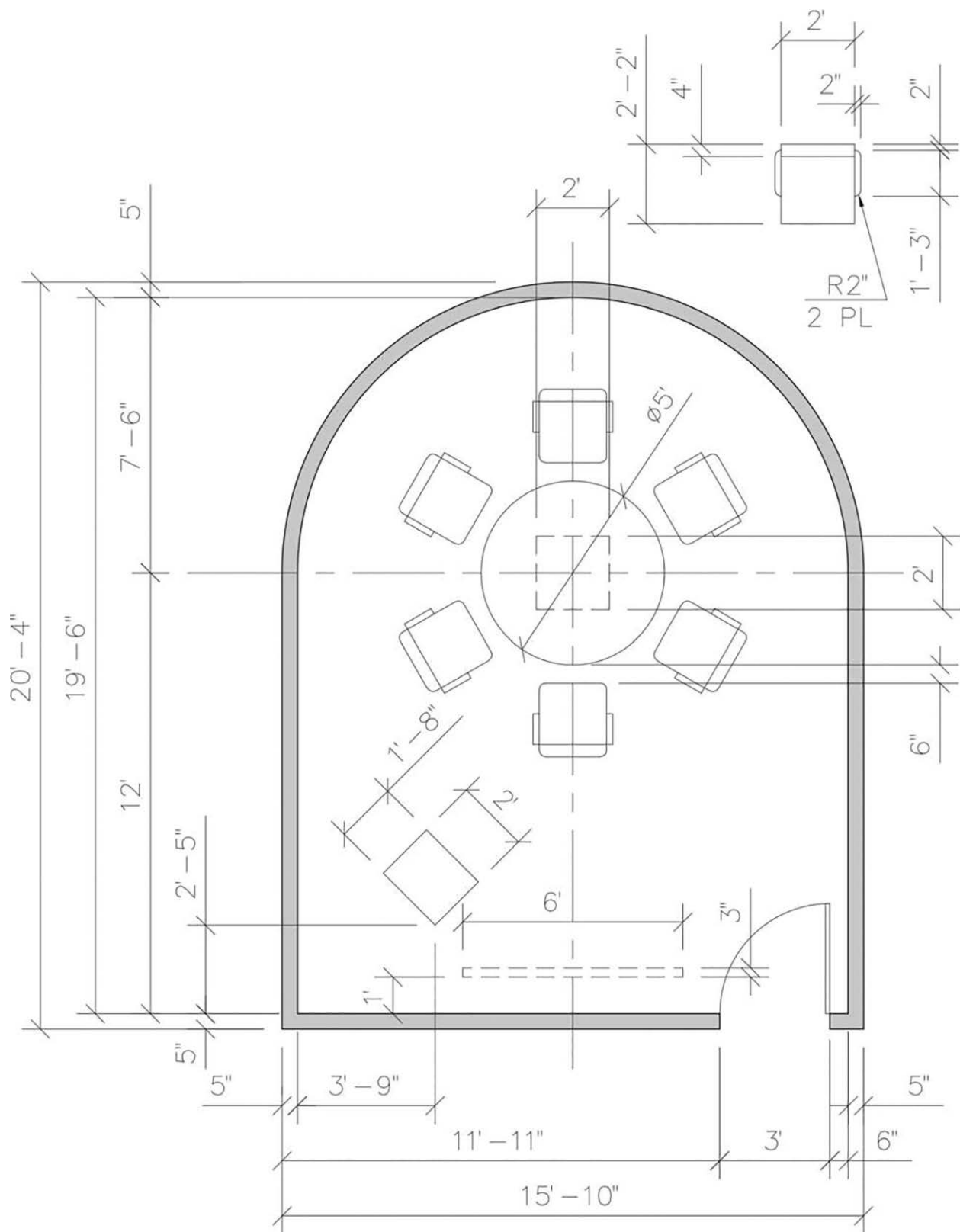
**Figure 3-59**

Project 3-2: Curved conference room including furniture (scale: 1/4" = 1'-0")

NAME  
CLASS  
DATE



2. Use the **Single Line Text** command to type your name, class number, and date, 6" high in the upper-right corner (Figure 3-59).
3. Print your drawing from the **Model** tab at a scale of 1/4" = 1'-0".



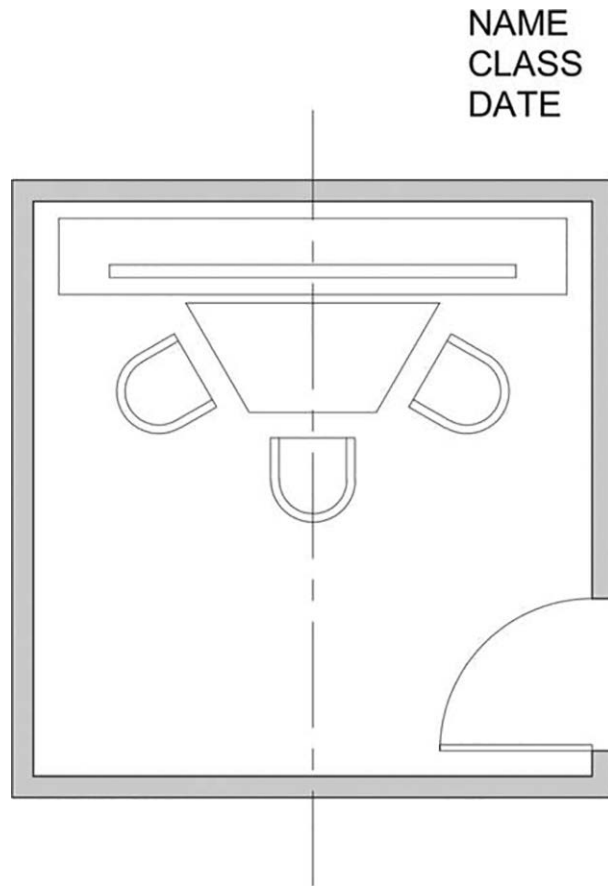
**Figure 3-60**

Dimensions for Project 3-2 (scale: 1/4" = 1'-0")

## Project 3-3: Video Conference Room Including Furniture [BASIC]

---

1. Draw the floor plan of the video conference room as shown in Figure 3-61. Use the dimensions shown in Figure 3-62, or use an architectural scale to measure the floor plan and draw it full scale. Your drawing will look like Figure 3-61 without the centerline.



**Figure 3-61**

Project 3-3: Video conference room including furniture (scale: 1/4" = 1'-0")



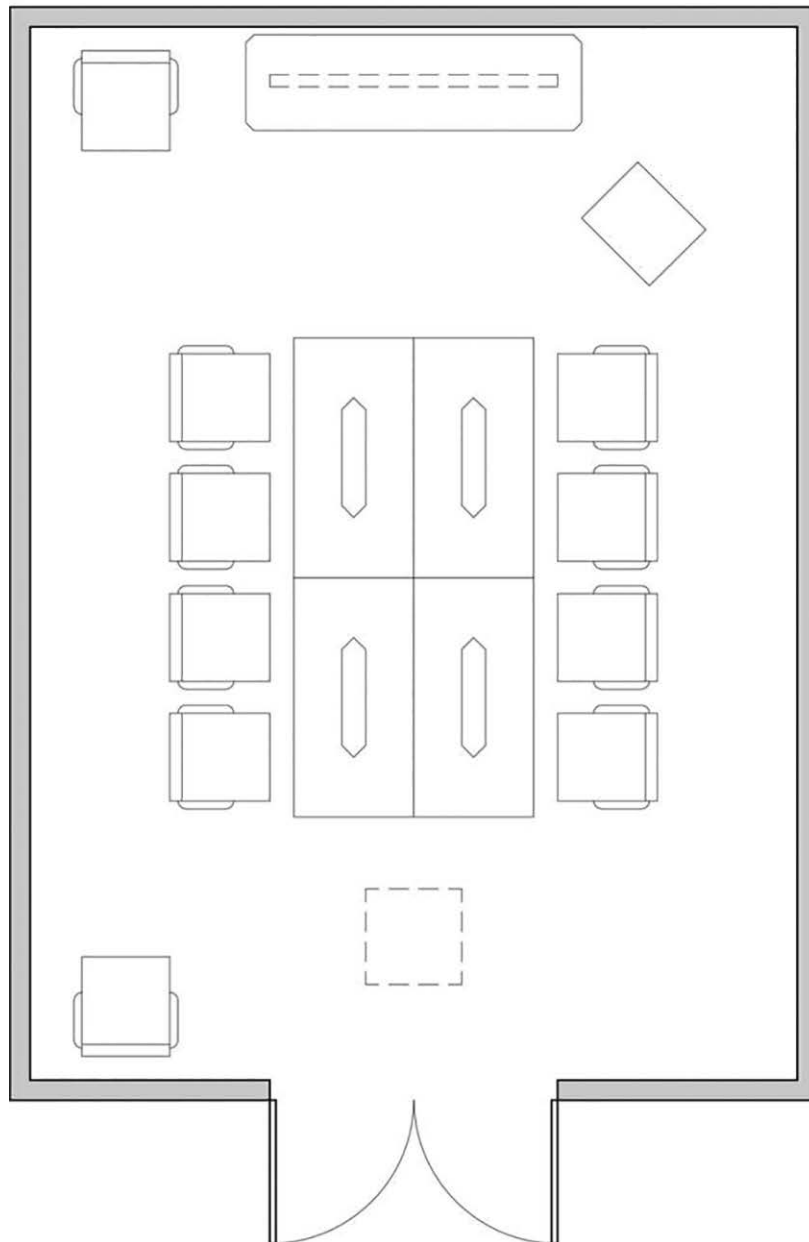
## Project 3-4: Rectangular Conference Room Including Furniture [INTERMEDIATE]

1. Draw the floor plan of the conference room as shown in Figure 3-63. Use the dimensions shown in Figure 3-64, or use an architectural scale to measure the floor plan and draw it full scale.

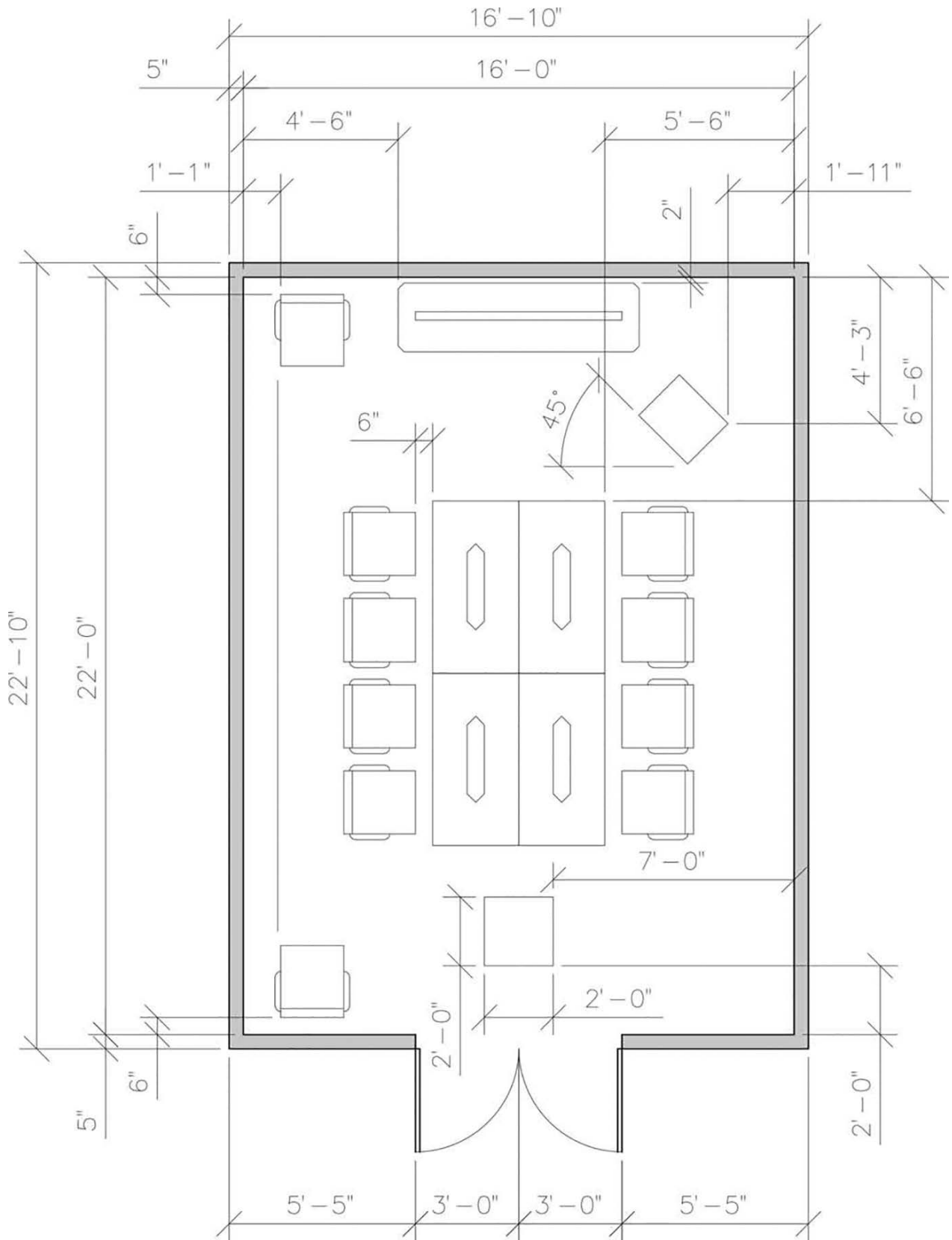
**Figure 3-63**

Project 3-4: Rectangular  
conference room including  
furniture (scale: 1/4" = 1'-0")

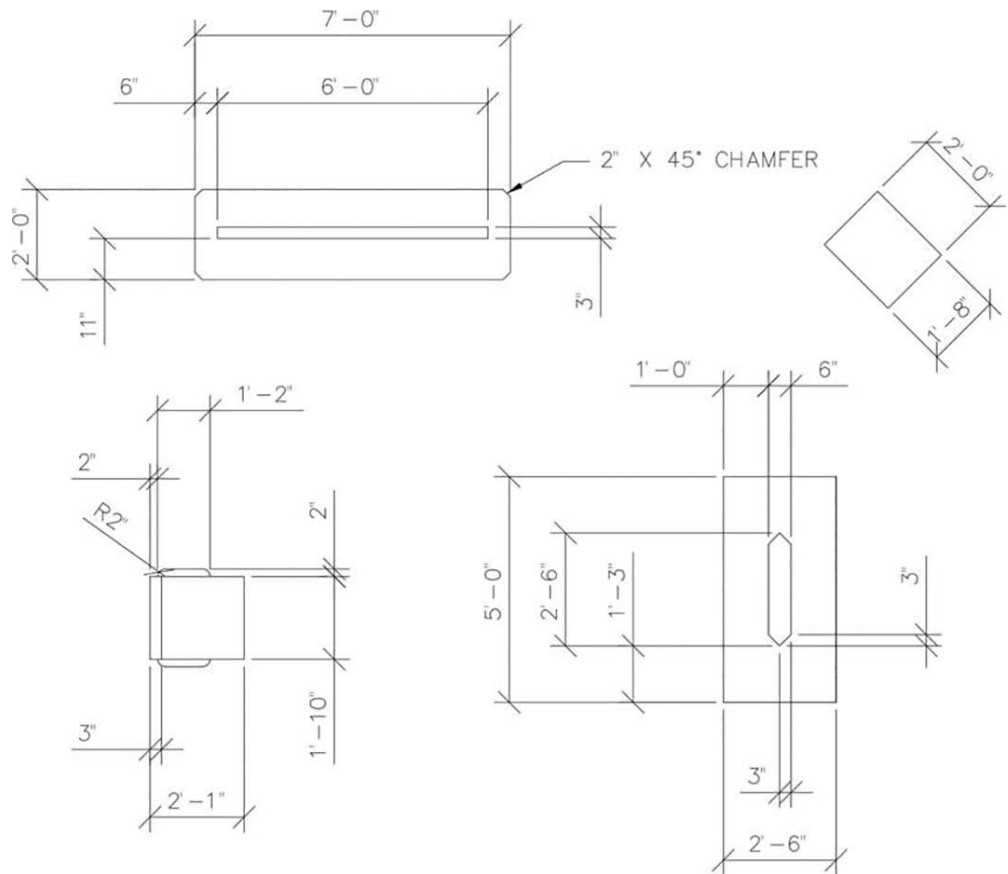
NAME \_\_\_\_\_  
CLASS \_\_\_\_\_  
DATE \_\_\_\_\_







**Figure 3-64**  
 Sheet 1 of 2, Dimensions for Project 3-4 (scale: 1/4" = 1'-0")



**Figure 3-64**

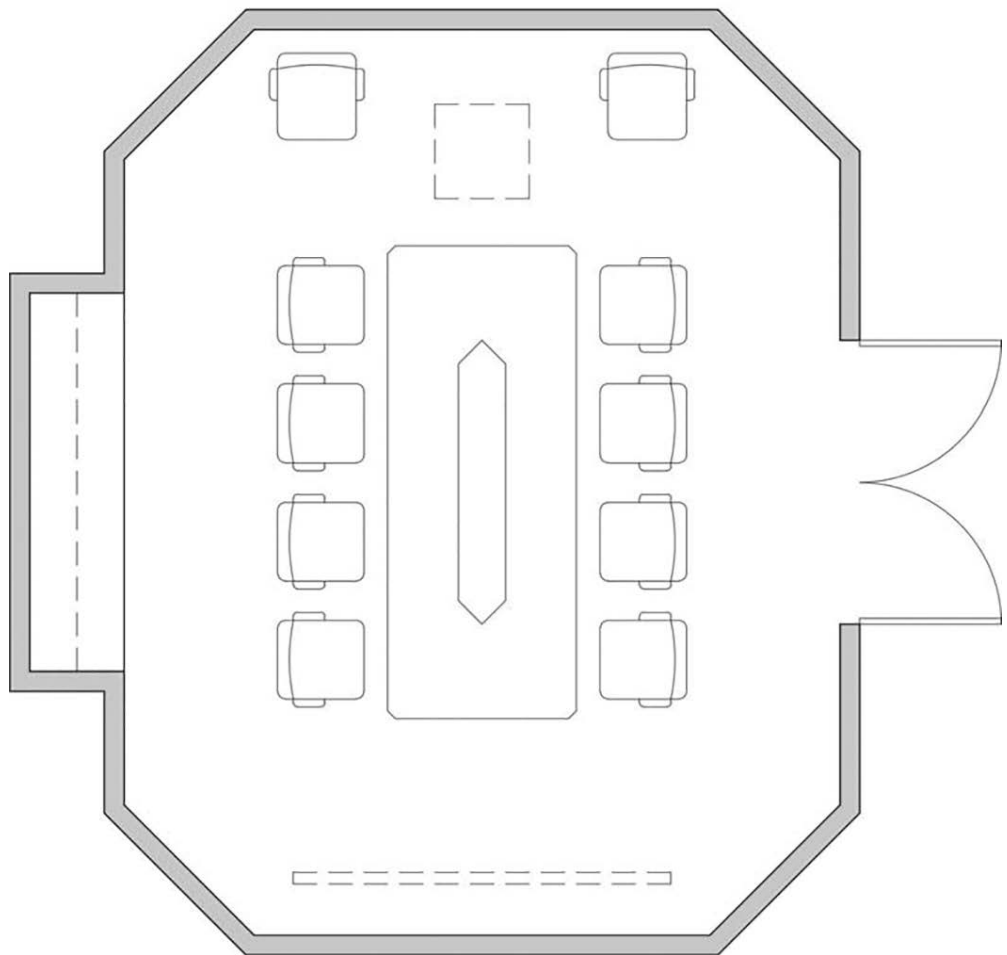
Sheet 2 of 2, Dimensions for Project 3-4 (scale:  $1/4" = 1'-0"$ )

2. Use the **Single Line Text** command to type your name, class number, and date, 6" high in the upper-right corner (Figure 3-63).
3. Print your drawing from the **Model** tab at a scale of  $1/4" = 1'-0"$ .

## Project 3-5: Conference Room with Angles Including Furniture [ADVANCED]

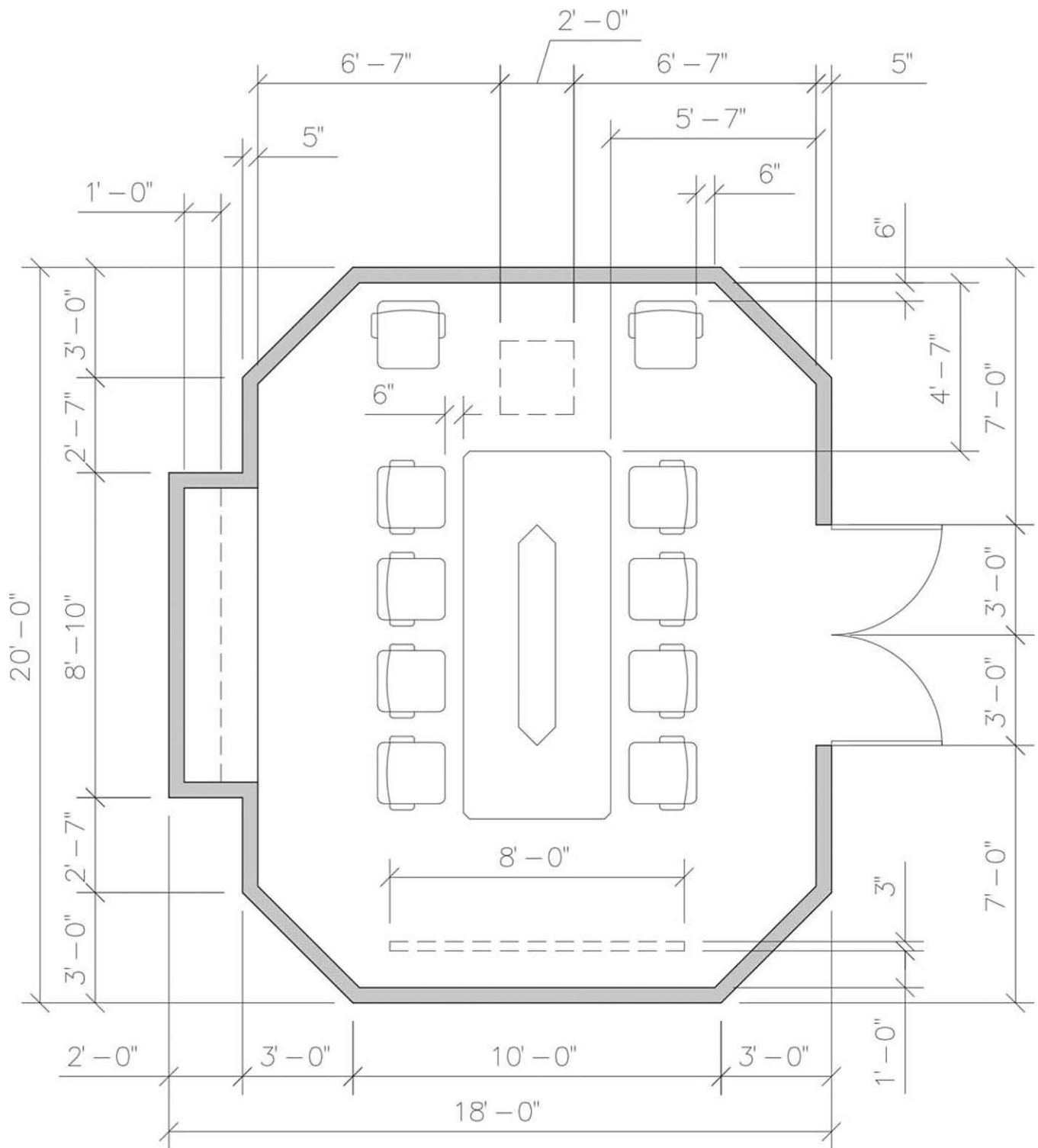
1. Draw the floor plan of the conference room as shown in Figure 3-65. Use the dimensions shown in Figure 3-66, or use an architectural scale to measure the floor plan and draw it full scale.

NAME  
CLASS  
DATE



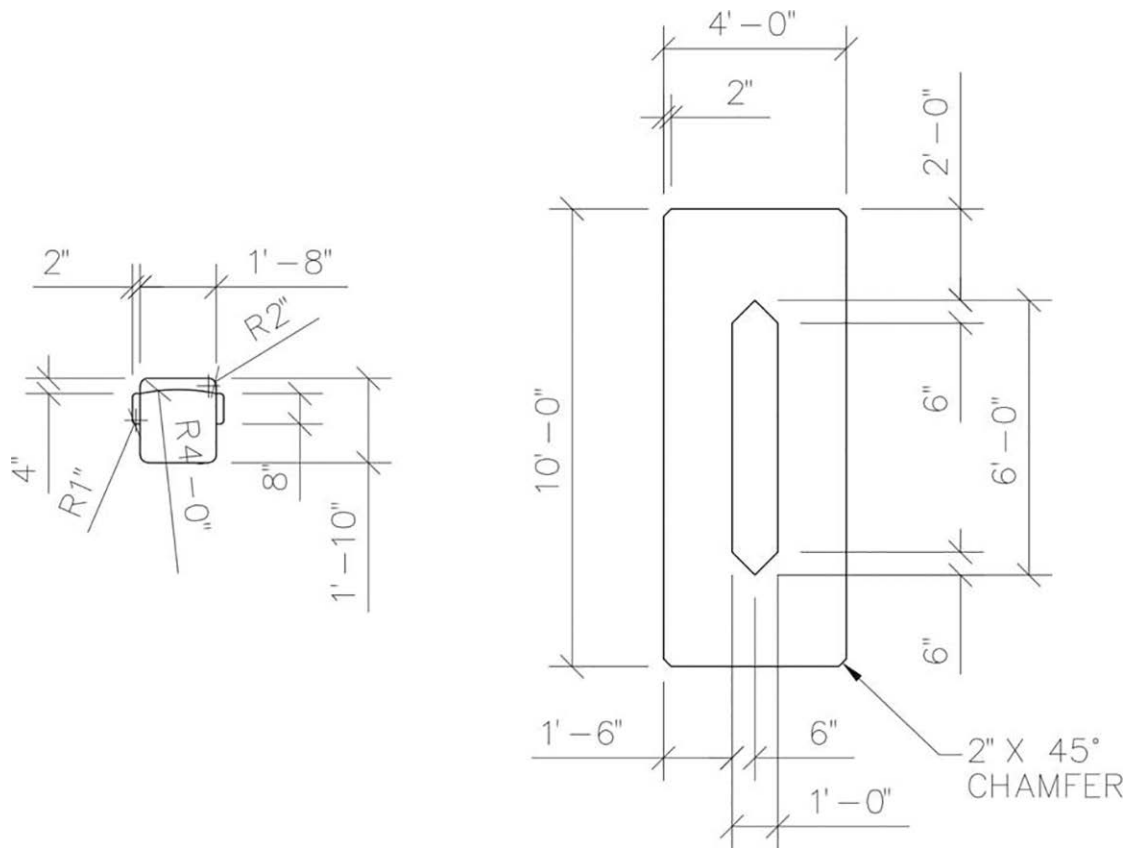
**Figure 3-65**

Project 3-5: Conference room with angles including furniture (scale:  $1/4" = 1'-0"$ )



**Figure 3-66**

Sheet 1 of 2, Dimensions for Project 3-5 (scale: 1/4" = 1'-0")



**Figure 3-66**

Sheet 2 of 2, Dimensions for Project 3-5 (scale: 1/4" = 1'-0")

2. Use the **Single Line Text** command to type your name, class number, and date, 6" high in the upper-right corner (Figure 3-65).
3. Print your drawing from the **Model** tab at a scale of **1/4" = 1'-0"**.

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