The Basics of A+CAD 2008

A Student's Guide

By Dr. Don Bilse

INTRODUCTION

Welcome to Basics of A+CAD 2008. By learning how to work with A+CAD, you are joining over a million others who use this IntelliCAD-based computer-aided design software to draft drawings. A+CAD is exciting software, because it has many of the features of CAD software costing ten times as much — yet is very similar to the market leader, AutoCAD®.

Basics of A+CAD, strives to make you efficient in using basic commands and understanding fundamental concepts. For more detailed curriculum and information for transitioning AutoCAD® users to A+CAD 2008 see the printed text "Inside A+CAD 2008".

This book is written to teach the fundamentals of the software program A+CAD 2008. A+CAD is a key component of The CAD Academy's package to help educators prepare students to learn the same type of technology that they may be exposed to in industry. The A+CAD technology offers the industry standard compatibility with AutoCAD®-native DWG files, commands, applications, and command set as well as programming APIs, such as LISP and SDS (A+CAD's application programming interface). A+CAD opens, edits, and saves any existing DWG files saved in numerous versions, including DWG Version 2.5 through 2008 without conversion or data loss. This means you can get to work immediately using the DWG files, commands, and applications you rely on. Current AutoCAD® users will realize a smooth transition and should feel comfortable making the switch.

Student's success in this course is directly related to his or her ability to understand how to proceed in traditional and non-traditional class settings. It is imperative for students to:

1. Read all material carefully. Reread the material several times for total understanding. DO NOT SKIM.

2. Understand the concept of an activity before you start entering commands on the keyboard.

3. The information you will type is presented in numbered sequence. Follow the steps carefully, watching the screen as you proceed.

4. Read the concepts again if you are having difficulty understanding a particular item.

5. Repeat the steps of an exercise over and over to develop mastery. Mastery means you are able to complete an exercise without looking at the book, and understand why you performed that particular function.

6. Ask questions if you do not understand or if you are having difficulty with the keystrokes.

The Basics of A+CAD resources are flexible and instructors should feel comfortable supplementing curriculum resources that they have found successful throughout the years.

We welcome your suggestions, and hope that you will become apart of the collaborative effort in educating our future engineers and architects.

ABOUT THE AUTHOR

Dr. Don Bilse was in charge of the Drafting Technology program at Glendale Community College for over 20 years. Glendale Community College is part of the Maricopa Community College District which is the largest community college district west of the Mississippi. He has been in technology education at both the community college and at the university level for over 40 years. This book was used in an open/entry open/exit for beginning students and also for articulation between the high schools and the community colleges. The problems in this book have been tested by students and instructors over the years.

This text was originally intended to be used with AutoCAD® and was converted/revised by Ralph Grabowski to use the A+CAD technology. Ralph Grabowski is one of the foremost CAD authors in the world. He has been writing about AutoCAD since 1985 and is the author of over 100 books in CAD. In addition, Mr. Grabowski is the former Senior Editor of CADalyst magazine, the original magazine for AutoCAD users.

NOTICE TO THE READER

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DRAWING # 1 – Happy Face

INTRODUCTION TO A+CAD

Only a two decades ago, drawing with a computer was a new concept. Today computer-aided drafting (CAD) is standard. With each new release of CAD, the powerful software packages perform enhanced functions at faster rates. As the complexity of the programs increases, the software manufacturers strive to make the software easier to use. A+CAD 2008 is an example of such a product, and is the software we are using for this course. It is very powerful and can create creditable drawings for both home and office use.

STARTUP PROCEDURES
Hard disk System

The following instructions are based upon a machine that has A+CAD 2008 already installed on the hard drive. The installation procedures used by most software companies today creates a shortcut icon that opens the software and takes you directly to the desired program.

As you create and edit drawings in these tutorials, the drawings will be stored on the computer's hard disk. It is good practice to make backup copies elsewhere, such as on a USB key (thumb-drive) or CD-R disc. Be sure to save your files in both locations for added safety.

PREPARING TO DRAW

Pick the **Start** button at the very lower left corner of your screen, then choose **Programs**, then **The CAD Academy**, and then A+CAD 2008. Alternatively, double-click the **A+CAD 2008 icon** on the desktop to open the program.

When A+CAD 2008 appears, a Tip of the Day dialog box might also show up. If so, move the cursor to **OK** button, and the click the left mouse button to dismiss the dialog box..

The mouse contains two or more buttons. The left button is the one used most often with this software. It selects commands and locates objects. The right button is used less often, usually to access shortcut menus that appear at the cursor. If the mouse has a roller wheel, it can be used for "zooming" -- making the drawing larger and smaller.

After A+CAD 2008 loads, it becomes ready for drawing. Figure 1.A shows you what the screen (computer monitor) looks like when the program is ready for drawing.
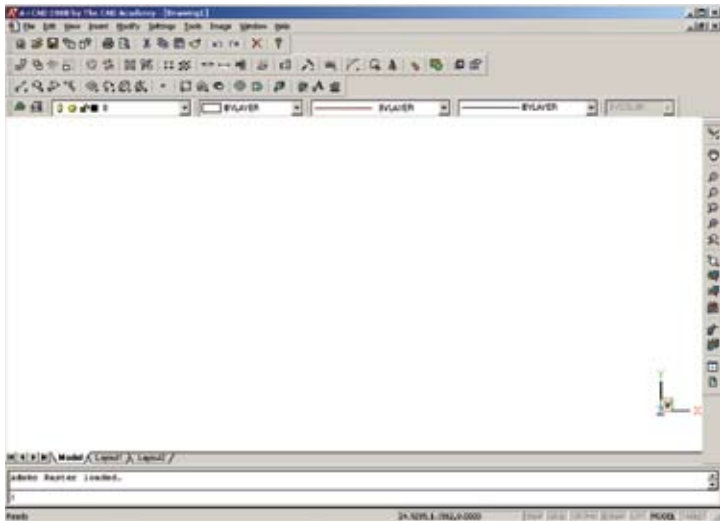

Figure 1.A

There are several things and terms you need to know before you can successfully draw.

MENUS

The "menus" are located at the top of the program. Each menu is categorized and contains commands that perform functions descriptive of the menu title. For example, contained within the Insert menu are commands like line, arc, and circle that are used to create the drawing entities. In the Modify menu are commands which manipulate the lines, arcs, circles, etc.. When you pick on a menu name, the menu displays all of the commands within that menu category.

COMMAND PROMPT

When you select (pick) a command, you expect the command to operate. To be certain that you have selected the command, you must check the "command prompt" area at the very bottom of the screen. Note the lower left corner of Figure 1.A. If the command prompt does not specify the name of the command you have just picked from the pull down screen, the command will not function and you must reactivate the command.

Operating features within the selected command are displayed in the command prompt area. **You must continuously check the command prompt and follow the instructions displayed**. The

displayed instructions will tell you exactly what steps the soft-ware wants you to follow in order to complete the command. **If you don't follow the command prompt instructions carefully, you will become frustrated!** What you believe to be occurring, and what the software sees may be two different things. Read the command prompt area carefully.

TOOLBARS

If your screen does not look like Figure 1.A, you may need to add (or subtract) toolbars which contain the icons you may want to use. Icons are the small pictures shown near the top and right of the drawing area. The icons are programmed to perform in the same manner as when you activate a menu item.

To activate a toolbar (group of icons) not shown on the screen, **pick the View menu, then Toolbars**. A dialog box will appear and show you what toolbars are already active. If you wish to add additional toolbars, pick the small white square shown next to the toolbar's name. See Figure 1.B.
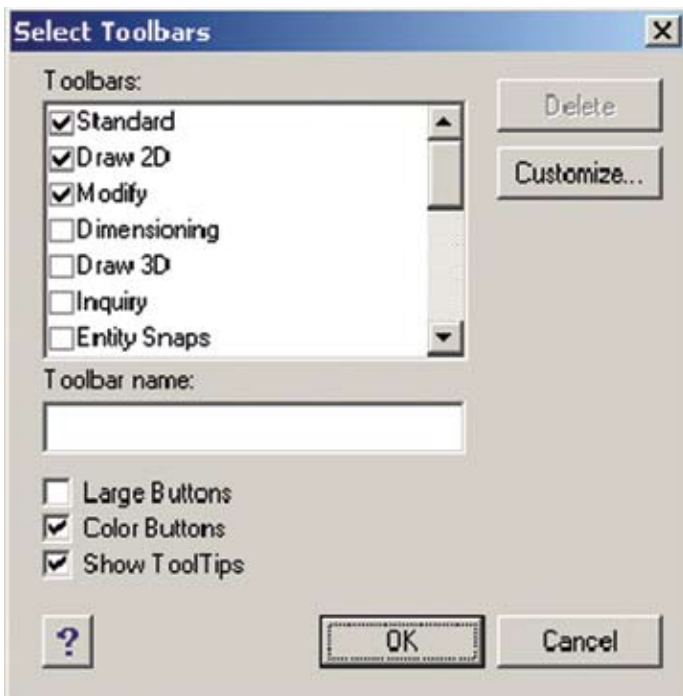

Figure 1.B

To "store" the toolbar so that it is not in the middle of your draw-ing area, pick on the blue bar at the top of the toolbar and then push it into the edge of the screen. Toolbars are amorphous and will take on the shape of the area they are pushed into. If you've never done this before, activate a couple of toolbars and then "push" them into the side or top of your drawing area. To pull

toolbars away from their existing position, put the pointer/cur-sor over the double vertical bar on the left side of the toolbar and slide the toolbar out onto the open space of the monitor.

BEGINNING TO DRAW

Each drawing you create is designed to acquaint you with new commands. Basic functions like drawing lines, erasing what you have drawn, and clearing the screen with the Redraw command will become second nature after only a few minutes of operation.

Do not be afraid to experiment. The charts in the appendix show you the menus you will be using and the commands associated with them. Note what each menu category of commands does. Analyzing and understanding each category will make it easy for you to learn the command structure. If you forget what com-mands are in a category, simply highlight the menu category by placing the pointer over the title and clicking the left button of the mouse. The menus will "pull down" showing you what com-mands are avail¬able in that category.

Remember that repetition is the key to success. Go over each new command several times until you are comfortable with it. Do not be afraid to experiment.

 DRAWING # 1 Happy Face

Objective: This exercise will familiarize you with numerous com-mands in the Insert menu, such as Spline, Arc, Circle, Single Line Text, and Rectangle. It will also acquaint you with commands from the File, Edit, and Modify menus.

Figure 1.1

Each step necessary to construct the drawing is in this exercise. Follow each step carefully and watch how your computer re-sponds to the different commands you give.

CONCEPT

A very important concept to understand in A+CAD 2008 is how to select a menu and then select a command from the menu. To select a menu item, position the tip of the pointer with the mouse over the desired menu title in the top portion of the screen until the name of the desired menu title is highlight¬ed. Click the left button on the mouse to select. Once the menu title is selected, it will display a pull down menu from the title. To select a command under a menu, point to the desired command, until highlighted, then click the left mouse button.

- You may terminate a command or select a new command at any time simply by picking a new menu item or by tapping the ESC key. If you are "in the middle" of the desired command, but wish to start over from the beginning, tap the ESC (top left key on keyboard) or simply repick the desired command from the menu. Now, let's begin our first drawing by starting with the Rectangle command.

1. **Position the pointer** over the menu title **Insert**.

   - Insert becomes highlighted.

2. **Click the left mouse button**.

   - The Insert menu elongates to show the commands in its area.

3. **Position the pointer** over the **Rectangle** command

4. **Click the left mouse button** to activate the Rectangle command.

   - You are now ready to begin drawing a box.

   - The "Rectangle" command should now show in the command prompt area at the bottom of the screen.

(Alternatively, you can pick the Rectangle icon from the Draw 2D toolbar. The rectangle icon is shown at the right.)

5. **Position the crosshairs** near the upper left corner of the screen.

   - The tip of the arrow illustrates where the rectangle will begin.

   - To initiate a starting point, you will place the pointer (crosshairs) where you would like to begin and click the left mouse button.

6. **Click the left mouse button**.

   - This locks in the starting point of the rectangle.

7. **Drag the cursor** to the right to begin forming a box.

   - Move the cursor to form a wide box --- or down to form a big box --- or move to the left to form a tall narrow box.

8. When you have a big box on the screen, **click the left mouse button**.

   - A big rectangle should now be on your screen. (A big rectangle should remain on your screen as the border of your drawing. See Figure 1.1.)

   - Try this several times until you can easily draw a box of any desired shape you want.

   - Note the rectangle icon shown on the side of the previous page. The icon accomplishes the same thing as picking the command from the pull-down menu.

   - When you feel comfortable with the Rectangle command, move on to the next step.

   - Let's clean our screen by erasing unwanted rectangles. The erase procedure will start with the next step.

9. **Select** the **Modify** menu by highlighting and clicking the left mouse button.

10. **Pick** the **Erase** command or pick the pencil eraser icon shown on the left side of the screen.

- A small square box appears. (The small box is your selection cursor.)

11. **Place the small box on a rectangle outline and click**.

- The lines of the box become dashed.

- Tap the enter key.

- The selected box disappears.

12. **Clear the screen of all unwanted boxes**.

- When the screen contains only one rectangle large enough to form the border as shown in Figure 1.1, we're ready to return to drawing.

13. The Spline command will be used to create the shape of the funny face. **Pick Insert** (from the pulldown menu), then the **Spline** command. (Or pick the Spline icon on the Draw 2D toolbar.)

- The Spline command should now be displayed in the command prompt area.

14. **Move the cursor** to the top-middle of the rectangle.

- The Spline command is active and you are ready to pick a start point.

15. **Click the mouse button** in the shape of a diamond and watch a curve form as you pick each point.

16. When you are only one pick away from forming an irregular circle, type "c" at the command prompt (bottom of the screen.) This will close the irregular circle by bringing the end point back to the starting point. **To terminate the Spline** command (after closing), **right click**.

- The Spline command can sometimes be difficult to control or terminate; practice closing and terminating splines.

- Practice forming irregular shapes until you can control the size, shape, and contour as desired.

17. To clear your screen of unwanted contours, **pick** the **Modify** menu, then **Erase** or pick the eraser icon on the Modify toolbar.

18. Move the cursor to a curve you wish to erase.

- A small box appears.

19. **Position the small box on the item to be erased, then click.**

- The item becomes dashed.

- **Tap the Enter key** to delete the unwanted spline.

- Practice erasing items until you have rid your screen of all unwanted items.

- If you erase an item in error, **pick** the **Edit** menu, then **pick Undo Erase**.

HELPFUL HINT

Each time the Undo command is used, A+CAD 2008 backs up in its memory of the drawing, and so the erased item reappears. If you back up too far, you can reverse things with the Redo command. It is wise to not undo more than one command at a time. Redo is under the Edit menu, or can be activated by the right-facing arrow icon on the toolbar.

Now that our screen is cleared of unwanted items, let's continue our happy face by adding eyes. (See Figure 1.1.)

20. **Pick** the **Insert** menu.

21. **Pick Circle**, then **3 points**. Or, you may use the circle icon on the Draw 2D toolbar.

- This selection will require that you pick three points before the circle will be complete.

5

- Try drawing circles by specifying a radius and/or diameter size. You should practice drawing circles using various methods before you continue on.

22. **Position** the pointer where the left eye should go.

23. **Pick two points with the cursor, then drag the circle** outward until you have obtained the desired size, then click.

   - One of the desirable aspects of drawing with software is that once an object is drawn, it can be copied rather than redrawn.

24. **Pick** the **Modify** menu.

25. **Pick Copy** (or pick the Copy icon from the Modify toolbar).

26. **Place the small select box on the edge of the eye** (circle), and click.

   - When the circle becomes dashed, **tap the Enter key**.

   - The machine now asks you to specify a "basepoint." In layman's language, this means "where you want to move the circle from," e.g. the top, bottom, center, etc.

27. **Pick the bottom edge of the circle** with the small select box.

   - The circle changes from a dashed to a solid line as you drag it to the right.

28. **Move the circle** to the right to form a right eye and click.

   - You should now have a face and two eyes.

   - Now lets create a mouth by using the Arc command.

29. **Pick Insert**.

30. **Pick Arc**, then **3 points**. (The Arc icon on the Draw 2D toolbar automatically selects the 3 point option.)

31. **Position the cursor** (or pointer) where the left corner of the mouth should go and click.

32. **Pull the cursor down and to the right** to form the bottom of the mouth and click.

   - A straight line will show until the bottom point is picked.

33. **Move the cursor upwards and to the right** to form the right corner of the mouth, then click.

   - An arc has been created.

   - Did you notice that the line bent after you picked the bottom point of the mouth and you moved your cursor upward to form the right corner of the mouth?

34. Practice drawing arcs until you can form an arc to the desired shape.

Now let's add our name and identification number to the drawing. We will do that through the use of the Text command.

35. **Pick** the **Insert** menu, then Text. (Alternatively, pick the Text icon from the Draw 2D toolbar.)

36. **Position the pointer** anywhere to the right of the face and click.

   - This is where you will begin to write the word SMILE.

   - The command prompt now asks you for the height of the letters you want. Pick a desired height or simply tap the Enter key for the default setting.

   - The software now asks you for a rotation angle. Just tap the Enter key to accept "no" rotation.

37. **Type " SMILE"** just as you would on a typewriter.

   - Be sure to **tap the Enter key twice** when you have finished typing.

   - If the text you have entered looks the way you want it to, but it is too small, you could enlarge the text by scaling it larger. If you wish to try scaling, (text or any drawn object) follow the next few steps.

38. **Pick** the **Modify** menu, then **Scale** --- or pick the Scale icon on the Modify toolbar.

39. **Put the pointer on the word** and click.

    • The text becomes shaded.

    • Tap the Enter key to confirm that the selected item is what you want to scale.

40. When requested for the basepoint, **put the crosshairs at the lower left corner of your text and pick**.

    • Your text will begin to enlarge as you move the cursor to the right.

41. **Click** when your text is as large as you wish for it to become.

    • Enlarge your student identification # until it is the size you desire.

    • If you are pleased with the size and location of the big box around your drawing, create a second and third box to contain your name and student identification number. (See drawing 1, Figure 1.1)

42. Using the text commands illustrated in steps 35 through 37, complete the drawing so that it looks like Figure 1.1.

SAVING DRAWINGS

Objective: This exercise will familiarize you with the commands Save and Save As. under the File menu.

1. Pick the **File** menu.

    • A pull-down screen appears.

CONCEPT

As you create them, drawings are stored in memory. Whatever is in memory is lost when the computer is turned off or when Windows crashes. To avoid this loss, your work should be saved every 10-15 minutes to protect against data loss from power outages or other problems. A+CAD does this automatically for you.

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2. Click on the **Save** command

    • The **Save Drawing As** Dialogue box appears. **(See Figure 1.2)**

Figure 1.2

    • Select an appropriate folder by clicking on the down arrow in the "Save in" box.

    • The file name should now be given. (Note the middle area of the dialog box.)

    • Position the pointer in the box to the right of file name and click.

3   **Type**: DRAW1

    • This names your file as DRAW1.DWG

    • The software automatically adds the .DWG file extension. You do not need to add the file extension as a part of the name.

4   **Pick** the **Save** button.

    • The file is now being saved to the hard drive in your computer.

- Some computers have a light to indicate hard drive activity, so you can see the system placing what is on your screen into the drive.

- Once you have used Save As and assigned a name to your drawing, you can use a quicker and simpler system of saving your file onto the drive. This command is Save. Let's resave our first drawing by using the Save command.

5. **Pick File** menu again.

6. Pick **Save** again.

- No questions are asked. Your machine immediately proceeds to saving the file.

- Each time you save a file, the software overwrites previously saved data and adds unsaved new information. The previous version is given the extension of *.bak*.

SAVING DRAWINGS UNDER ANOTHER NAME

```
CONCEPT

There are times when you want to save a drawing with
the changes you have made, but you  would also like to
keep the original. To do this you use the Save As com-
mand. This is done exactly as the as you did the first
"Save As." Follow the instructions below to save your
drawing to another name.
```

1. **Pick File** menu.

2. Pick **Save As**.

- The "Save Drawing As" dialog box reappears showing the name that the file is currently being saved as.

3. **Position the pointer** in the box to the right of Draw1 and pick.

- The highlighting disappears.

- You may now begin to type.

4. **Type**: DRAW1B

- This saves the drawing to your disk and names it DRAW1B

5. **Move** the pointer to **SAVE**, then click.

- Your file is now being saved.

- Your first file is saved as DRAW1 on the disk. Your second file is saved as DRAW1B on the disk. You could now make changes on DRAW1B without affecting the information saved as DRAW1. You now have two separate drawing files.

6. **Start a new Drawing** by using the **New** command under the **File** menu.

RETRIEVING FILES

Objective: This exercise will familiarize you with the Open command under the File menu.

```
CONCEPT

If you are starting a new session and need to work on
a drawing you have already started, you will need to
retrieve that file. The following instructions will show
you how to retrieve a file.
```

1. **Select the** File **menu**.

- If you have trouble selecting commands in this menu, return to the previous section until you can select a menu and command without any trouble.

- The File menu appears, showing the commands that can be selected in this category.

2. **Select** Open.

- A dialog box (Open Drawing) appears in the middle of the screen (see Figure 1.3.)

3. Pick the down arrow to the right of the "Look in" droplist until you have selected the folder in which files are stored.
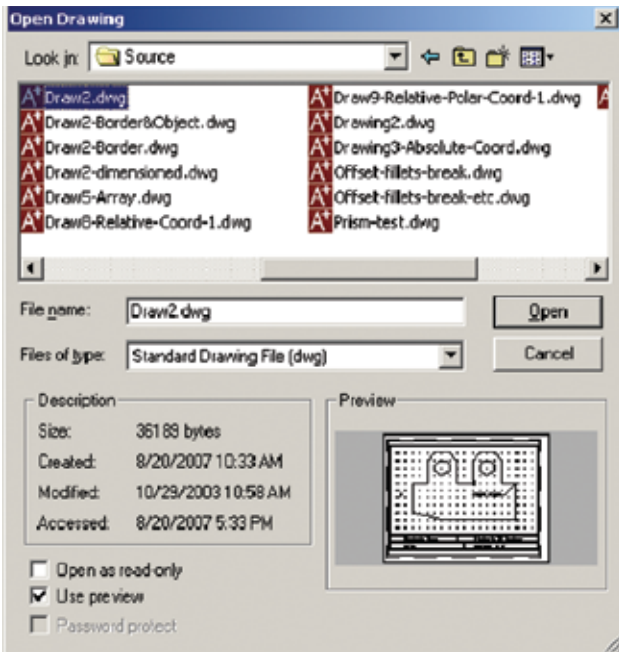   • See Figure 1.3

Figure 1.3

• The dialog box shows names of drawings that already exist on your computer's drivee.

• The computer is displaying the drawings that are saved in the current folder, as named by Look In.

4. **Double click on the name** of the **desired drawing**.

• The selected drawing now appears on the screen.

HELPFUL HINT

If many files exist on the folder, it may be necessary for you to move the slider bar at the bottom of the drawing listing. To move the slider bar, position the pointer on the slider bar and move it to the right while the pick button is depressed. Move the slider bar approximately 1/4th inch to the right and watch the names move to display new files. You may continue to move the box to the right until no more names are displayed.

• Try opening several files until you are comfortable with this command.

PRINTING (PLOTTING) FILES

*Objective: This lesson will familiarize you with the **Plot** command under the File menu.*

Making a hard copy (printing) from A+CAD 2008 has become more difficult due to the many options that have incorporated to satisfy the varied needs of customers. The method shown below is only ONE way to make a print. It is relatively simple and does not incorporate other concepts at this time. Additional methods will be described in following chapters.

Before you begin the printing process, you will want to have the drawing of your smiling face on the screen, and you must make sure the printer is turned on with plenty of paper.

1. **Select the File** pulldown menu.

2. **Select Print Setup**.

• A Print Setup dialogue box appears (see figure 1.4).
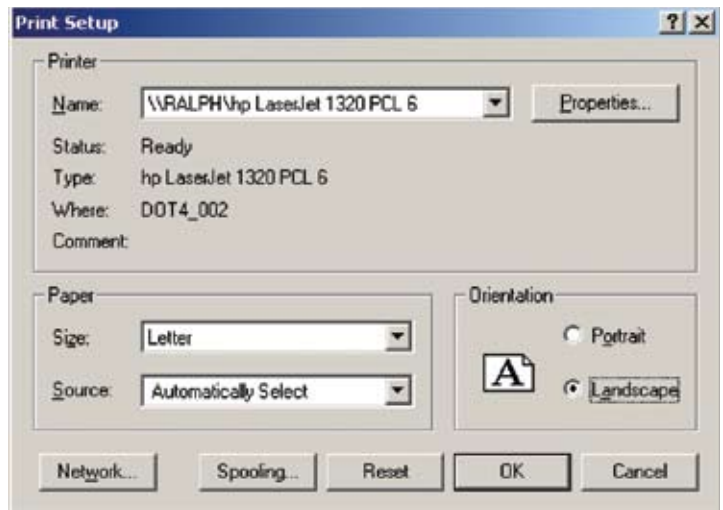

Figure 1.4

3. Using the down arrow at the right of the word "Name," **select the appropriate printer for your location.** (Your instructor should have your machine hooked to the appropriate printer so that all you need to do is check to see that the proper name is displayed in this window.)

4. Change **Orientation** to **Landscape**.

5. Click **OK**.

6. From the **File** menu, select **Print**.

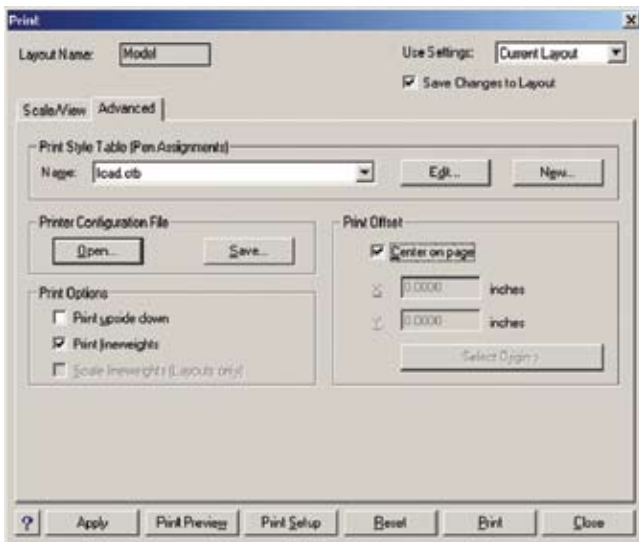   • A Print Setup dialogue box appears (see figure 1.5).

Figure 1.5

7. Click the **Advanced** tab, and then set the **Print Style Table (pen assignments)** to **icad.ctb**.

   • Pick No when asked if you want to assign this Print Style Table to all layouts.

8. Click the small box next to **Center on Page**.

   • The dialog box should now look like Figure 1.5.
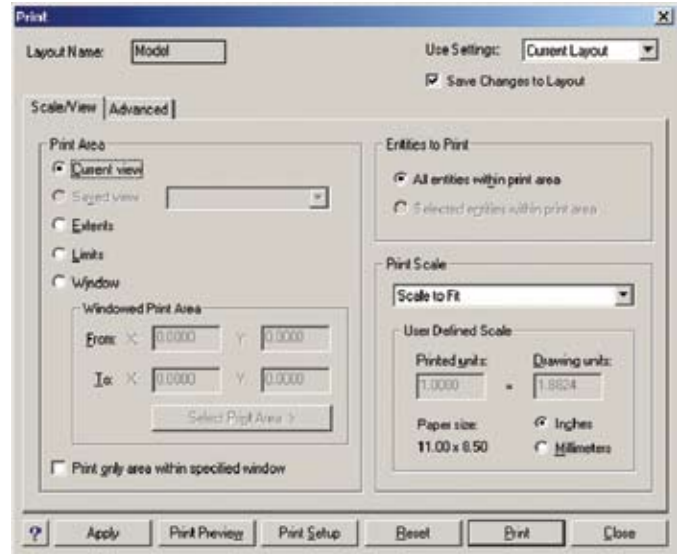
9. Pick the **Scale/View** tab.

Figure 1.6

10. **Pick the settings** to match the Print dialog box shown in Figure 1.6; **then pick Apply**

11. **Pick Print Preview**.

   • A display of your drawing will be shown in a window. It is a good illustration of how your drawing will be located on the paper.

12. **Pick Print**.

   • A drawing that appears the same as the preview should now be printed.

   • A completed/printed drawing should appear in your printer basket in one or two minutes.

CHAPTER ONE ASSIGNMENT

Make sure your drawing contains your name and student identi-
fication number; turn it in for grading. Use the Text command to
enter this data, as shown in Figure 1.1.

Review Chapter 1. You should have MASTERED the following
terms and activities before proceeding:

- Using a mouse.
- Selecting menu categories
- Drawing curves with the Spline command.
- Clearing the screen for a new drawing (New command)
- Drawing a three point arc (Arc command)
- Drawing a circle (Circle command)
- Entering a single line text (Text command)
- Saving a file (Save and SaveAs commands)
- Printing drawing files (Plot command)
- Retrieving a file (Open command)
- Drawing a square or rectangle (Rectangle command)
- Erasing an unwanted item (Erase command)
- Be able to copy one or more items to avoid
  redrawing anything (Copy command)
- Be able to change the size of object larger or
  smaller (Scale command)

If you have not MASTERED the above items, go back to the
begin¬ning of Chapter One and repeat the exercises as necessary.
These skills are basic to your success.

REMEMBER! Repetition is the key to MASTERING learning.

CHAPTER TWO

DRAWING # 2 – Polyline and Assists

DRAWING # 2 - SET UP

Objective: This exercise will familiarize you with the commands Snap and Grid and how to use these menu items as tools in setting up a drawing area to obtain accuracy.

CONCEPT

> With A+CAD you can use snap and grid to place objects accurately on your drawing. When snap is on, A+CAD will align the coordinates of any point, line, circle, or other entity to the nearest point on the snap grid. Snap defines the smallest increments that A+CAD will recognize when you move the pointer.

If you are just starting a session, perform the necessary startup procedures for A+CAD.

1. **Pick Settings**, then **Drawing Settings.**

   • A dialog box with several tabs appears.

2. **Pick the Coordinate Input tab**, and then select **Snap and Grid** from the **Change Settings For** droplist.

   • The numerical values in the dialog box can be changed by picking to the right of the values shown and re-entering the desired data after "backspacing" to remove the existing data.

• See figure 2.1

3. Turn on Snap by clicking the small box. If necessary, change the snap spacing to 0.5.

   • The Snap option tells the software to lock on to the nearest value. For example, if you set the snap to 0.5, the software will lock your work to the nearest 0.5 value whenever you draw a line.

   • Usually grid marks are set to the same value as snap settings.

4. You can now turn on the Show Grid option; ensure the desired size of the grid points is **0.5.**

   • The X setting is for determining the spacing for horizon grid marks. The Y value determines the spacing in the vertical direction.

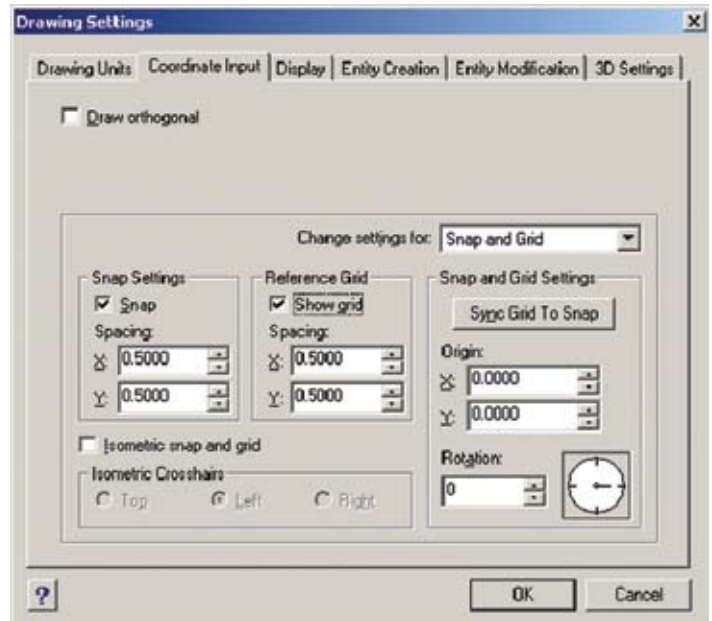   • Grid spacing is usually set equally, but may vary according to the need.

Figure 2.1

   • Note that the Grid Spacing for both X and Y has been set to .5.

5. Pick OK at the bottom of the dialog box.

   • This clears the screen of the dialog box and the values for the snap and grid have been established.

6. Now **select** the **Line** command and draw numerous lines.

   • Notice how each line snaps to the closest grid dot.

   • The Snap/Grid commands allow you to draw gap-free lines.

   • The Snap and Grid functions can be locked together or used independently.

7. **Reactivate** the **Drawing Settings** dialog box.

8. **Delete the existing Snap values and type .25.**

   • This establishes a snap value half way between each grid mark.

9. **Click OK**.

10. **Select the Line** command and draw lines mid-way between the grid marks.

    • Notice you can draw from grid mark to grid mark...or half way between the grid marks.

SNAP and **GRID** settings **may be turned on and off as desired**. If a drawing requires entities to be located at positions other than that established by the **Snap/Grid** settings, you can turn them off by double-clicking the word SNAP and GRID at the very bottom of your monitor screen. "Double-click" means to click the left mouse button twice, quickly. (When the button is grayed out, the command is inactive. When the word is black, the command is active or functioning.)

11. **Double-click** the **SNAP** button.

    • The grid continues to display, but drawing functions are no longer locked to the displayed grid.

12. **Test the Line command** without the grid.

13. **Test the Line command** with the grid displayed but snap off.

When you are comfortable with the drafting aids of Snap and Grid, proceed to the next section where you create the border for the drawing..

DRAWING #2 - THE BORDER

Objective: This exercise will utilize commands used in the first drawing and familiarize you with the Polyline command under the Insert menu. Note the width of the borderlines on "Draw 2" shown below.

Each new step necessary to construct the drawing is given in this exercise. Follow each step carefully and watch how your computer responds to the different commands.

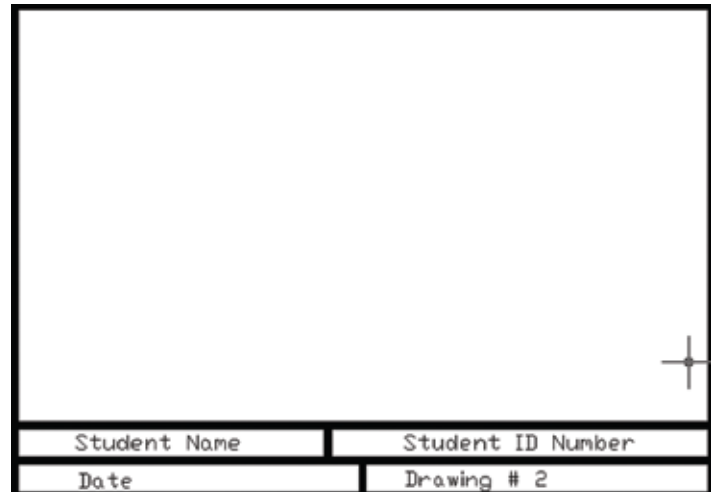Figure 2.2 shows how your border should look when complete.

Figure 2.2

1. Select the Insert menu.

   • Remember, to select a function, you must click the left mouse button on the name of the function you want.

2. **Select** Polyline.

   • The command prompt at the lower left corner of your screen will have the prompt "Polyline, Start of polyline:".

3. **Position the pointer** two grid marks down from the top of your screen, and two grid marks from the left, then click.

   • This starts the beginning of your border line using a polyline.

   • You may now add width to your polyline by entering a **W**. (Then tap the Enter key.)

   • The software is now requesting the width of the polyline at the **start** point. Type **.05** and tap the Enter key. The machine will now request the width for the **end** of the line. Type **.05** and tap the Enter key.

4. **Position the pointer** two grid marks down from the top of your screen, and two grid marks from the right; click the left mouse button.

- Make sure your snap setting is correct and turned on.

- You now have a line across the top of your page and are ready to continue making a rectangular border.

- If there is an error in location, you can terminate the command by tapping the ESCape key and starting over --- or you can erase the beginnings of the rectangle by using the erase command as you did in the first drawing.

5. Now **position the pointer** in the lower right hand corner of your grid area. When you are two grid marks up from the bottom and two to the left of the right edge of the grid area, click. (14 grid marks down)

6. **Continue to draw** a rectangle by picking an appropriate lower left corner.

   - To return to your starting point, you should type C to close the rectangle. (As always, you must tap the Enter key after typing the letter C to make the machine recognize what you have entered into the keyboard.)
   If you return to the starting point by picking, your polyline will have a square or "non-joined" corner. Try drawing several small rectangles and finish by **closing** and by picking until you see the effects of each.

   - If there is an error in the location of your rectangle, ERASE the rectangle and redraw it.

7. **Continue to draw** the title box using the .05-wide Polyline command until it looks like Figure 2.2 or "Draw-2" at the end of the chapter.

8. Complete **the text** for the title box using the **Text** command. (Refer to Chapter 1 if necessary.)

Drawing #3, THE OBJECT

1. Begin to draw the object shown in "Draw 2" by picking **Insert**, then **Line**, or by picking the Line icon.

2. **Position the cursor** at the "Start Point" as shown in "Draw 2." See Figure 2.3. (Pick a point on your screen that is about the same location as the start point shown in the drawing.)
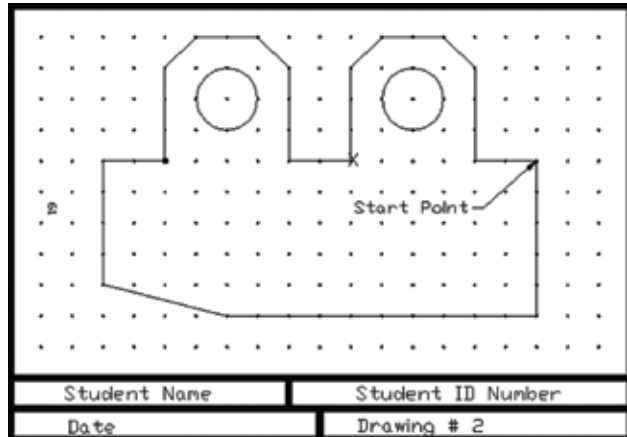

Figure 2.3

3. **Move the cursor** 5 grid dots down and pick. (Note the command prompt is asking you for the second or end point of the line.)

4. To draw the long horizontal line on the bottom, count 10 grid spaces to the left and pick.

5. **Continue** with the **Line** command, and draw the slanted line as shown. Move clockwise around the drawing until you come to the X. Count the grid marks as you go so your drawing comes out as shown.

6. **Select Insert,** then **Circle** or use the Circle icon. (Use the "center, radius" option.)

   - The lower left corner of your screen will have the prompt "Circle, Center Point."

7. **Position the pointer** 2 grid marks down from the top of the tab and two spaces from the left of the tab, and pick.

   - The lower left corner of your screen will now prompt you for the radius of the circle.

   - The command prompt defaults to the radius setting unless you select "diameter."

14

8. **Drag the cursor** one grid mark to the right and pick.
(This determines the radius value.)

• A circle is drawn with a diameter of one.

9. **Select** the **Modify menu** and pick **Copy**,
or pick the Copy icon.

• The lower left corner of your screen will prompt
you to select the items you want to duplicate.

10. **Position your pointer** so that a window is created
around the entire tab and pick. (The second pick
completes the window.)

• (The window should include the vertical line that
begins the tab and includes the last line drawn.)

• Be sure to tap the Enter key to confirm that you
want the dashed items to be copied.

• The prompt line will now ask you to pick a reference
point to be used while copying the selected items.
("Multiple/Vector/<Base point>:")

11. **Pick the point** marked with a black dot.

• The prompt line will now ask you where you
want to move the items that are to be copied.
("Displacement point:")

12. **Drag the copy** of the first tab to the right and pick
the end of the last line drawn.

• A second tab now has been drawn and completes
the drawing as illustrated.

13. **Save this drawing** as **DRAW3**, but do not plot it at this time.

• This drawing should be submitted **after you have
dimensioned it**. Dimensioning is explained in Chapter 4.

• **Grid marks are not plottable!** Grid marks are for
construction use only, you cannot plot them.

CHAPTER 2 ASSIGNMENT

Using the Text command, make sure your name, personal identi-fication number, and drawing 2 is entered on your drawing. (The drawing you submit should look identical to Draw-2 on figure 2.3.) You will be asked to open this drawing in Chapter 4 when you must accurately dimension it.

Review Chapter 2. You should have a basic understanding of the following terms and actions before proceeding:

- Grid: setting up a grid to specific values.
- Snap: setting up snap increments to match a grid.
- Turning on the grid & snap by using both the dialog box and the word switches located below the command prompt line.
- Circle: drawing a circle.
- Line: the drawing of individual lines and connected lines.
- Polyline: drawing lines that are continuously connected, and drawing lines of various widths.

Go back to the beginning and repeat the commands used in the drawing until you can use them without referring to the book. Work until you can create the drawing quickly without any directions from the textbook.

Remember, practice makes perfect

CHAPTER THREE

ENTITY SNAP MODES

We should dimension our drawing to check its accuracy. and to allow others to readily see the size of the object. At this time, however, we have no way to accurately return to the corners of the drawing other than trying to set the Snap and Grid so that the corners (intersections) match the settings. The *entity snap* settings (esnaps) allow us to grab a corners, end points, midpoints, and so on with absolute precision. (Some CAD systems call this feature osnap or object snap. "Entity" is another name for "object.")

Learning to use esnaps is a very major item. It is nearly impossible to create accurate drawings of any type without using esnaps. **Each and every drawing you make from this point on require that you use esnaps**. You will not be directed to use them for each step, but you will not be able to use a computer for drafting until you become very familiar with them. Now, let's try to use them in preparation for dimensioning "Draw2."

1. If "Draw2" is not on your screen, open it.

2. Now **right-click** the **ESNAP** button that is just below the command prompt area.

    •   A small menu appears on your screen.

3. **Left-click** on **Settings**.

    •   The same Drawing Settings dialog box that we used to set Snap and Grid appears, except that it is now displaying options for entity snaps. See Figure 3.1.

    •   Some of the Entity Snap terms are self explanatory, however a listing of each term is listed below.

Endpoint	grabs the very endpoint of a line
Nearest	grabs an entity at any location closest to the cursor. (You cannot pick into space **close** to an entity.)
Perpendicular	draw a line perpendicular to another line, arc, circle, etc.
Quadrant	finds one of four divisions of a circle

|	
Insertion	snaps to the insertion point of a block, shape, text string or attribute
Center	grabs the very center of an arc or circle
Midpoint	grabs the very middle of a line or arc
Point	grabs a point. (Points are not covered in this book.)
Tangent	allows you to draw a line that touches the edge (circumference) of a circle.
Intersection	finds the crossing point for two or more lines or other objects
Apparent	finds the implied intersection of two lines. (Cross your index fingers at 90 degrees holding one about an inch above the other. An Apparent Intersection exits where the two fingers **appear** to cross.)
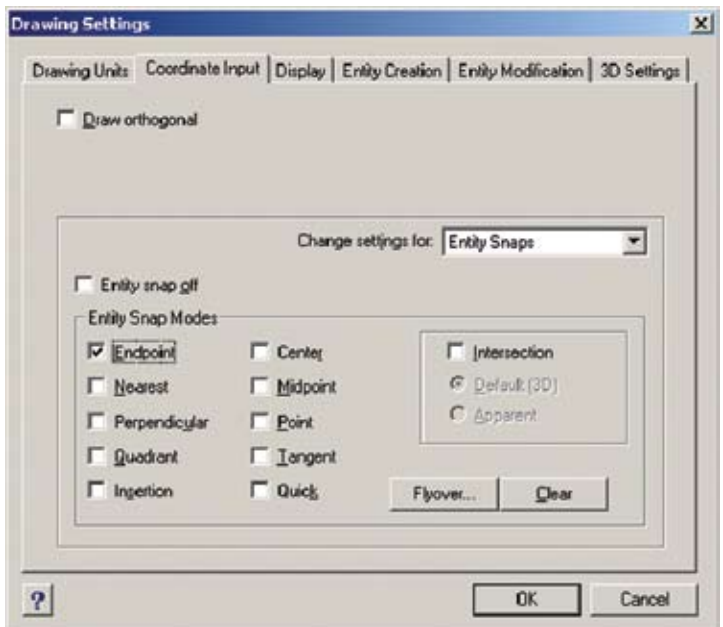
Figure 3.1

5. **Pick** the **Endpoint box**.

    •   A checkmark appears in the box telling us that when the cursor is placed near the end of a line, a small square will appear indicating the perfect end of a line.

6. **Pick OK**.

   • The dialog box goes away and we are ready to
     experiment with our drawing.

7. **Check** the **SNAP** and **GRID** buttons beneath the Command
   Prompt to make sure both are turned off.

8. **Activate** the Line command or pick the Line icon.

9. **Place your cursor** on the bottom line and watch it
   snap to one of the ends.

   • The small yellow box and yellow tooltip "Endpoint"
     tell you that the software has found the perfect endpoint
     of your line, and is ready to begin a new line from the
     endpoint it has just found.

10. **Cancel the command** by pressing the ESC key.

11. **Experiment** several times with the Endpoint esnap
    to make sure you understand how it is working.

12. **Right click** the **ESNAP** tab below the command prompt and
    reactivate the Drawing Settings dialog box.

13. **Activate** the **Midpoint** and **Center** settings.

14. **Close** the **Drawing Settings** dialog box, and then see if you
    can draw a line from the midpoint of any line in Draw2 -- or
    from the center of your circles.

15. Your drawing contains endpoints, intersections, midpoints,
    quadrants, and centers. See if you can draw a line from
    anyone of these locations.

16. Erase all unwanted lines so that you drawing looks like
    Draw2 in the previous chapter. We will now get ready to
    dimension Draw2.

CHAPTER FOUR -- DIMENSIONING

PART I ---DIMENSIONING WITH DEFAULT SETTINGS

In this chapter we wish to use the dimensioning commands to check the accuracy of our drawing and add size information to it. To do that, we will use the "default" settings. Default settings means that we use the numbers, sizes, and format that the software is preset with as it comes from the factory. Because of the varied needs of so many customers, the software has many options for dimensioning and has become quite complex. In this chapter we will learn how to dimension using the simplest settings possible. We will learn to set our software to specific requirements in Chapter Eleven.

Dimensioning is basically a three step process. We must first select the endpoint on the left side of a line, then the endpoint on the right side, and finally pick the location where the dimension line should be placed.

To test the dimensioning procedure, we must first reopen our previous drawing; the drawing that you drew in Chapter Four (Draw-3). If you are continuing on, and Draw-3 is on your screen, you are all set and ready to go.

Let's begin to Dimension

1. Make sure the Dimension toolbar is visible. If it is not, **pick** the pull down "View," then **Toolbars**.

   • The Select Toolbars dialog box appears.

2. Pick the "**Dimension**" box.

3. **Close** the **Select Toolbar** dialog box and slide the toolbar (shown below) to the top or side of your screen.

   • The Dimension toolbar appear on your screen. See Figure4.1.

Figure 4.1

   • Remember to pick and hold the blue titlebar to move the toolbar.

4. Pick the **Insert** menu, then **Dimension**, and then Linear, or simply pick the **Linear** icon.

5. **Depress** (double-click) the **ESNAP button** beneath the command prompt to activate the entity snap settings.

   • The snap and grid functions should be turned off.

6. Dimension the bottom of your drawing by picking the lower left corner of your drawing.

   • Your esnap tooltip should identify the very left corner of your drawing. Pick when Endpoint shows the end of the line.

   • The software now asks you to identify the end (right side) of the drawing. Pick when the endpoint box shows at the end of the line.

   • After picking the lower right corner of your drawing, the software asks you to identify where you want the dimension line to be placed.

7. **Drag your dimension** down approximately one inch below the drawing and pick.

   • A properly drawn dimension of 7.0000 should show. (Note Figure 4.2)

8. Let's see if we can show the horizontal distance of the angled line at the bottom of the drawing.

   • The horizontal distance between the two end points of the angled line will be smaller than the true line length we will measure in a different manner.

9. **Tap the Enter key**.

   • This will reactivate the linear dimension command.

10. **Pick both ends** of the angled line and drag the dimension approximately one-half inch below the drawing.

   • A dimension of 2.0000 should now show.

11. The linear dimensioning command will dimension vertically as well as horizontally. Let's measure the height of the drawing by picking the lower right corner of the drawing, then the top of the vertical line.

- A dimension of 2.5000 should show.

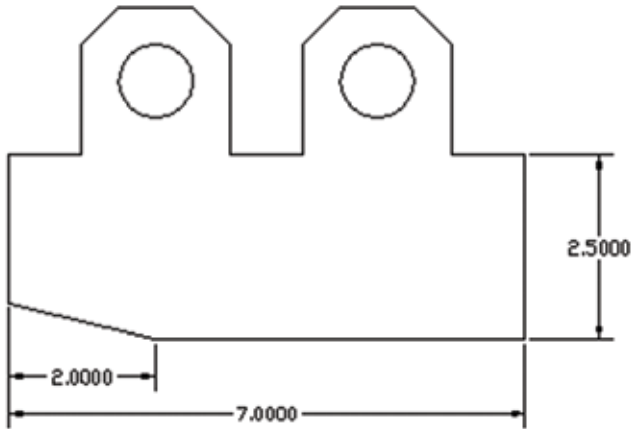- Your monitor should now show a drawing like the one shown below.

Figure 4.2

Now, if you have the concept of "linear" dimensions, let's go to "aligned" dimensions and see what the true length of the angled line is.

12. **Pick Insert**, **Dimension**, and then **Aligned**, or you can use the Aligned icon.

13. Pick the left corner of the angled line.

- Make sure your ESNAP button is activated and set to endpoint.

14. **Pick the right corner** of the angled line.

15. **Drag the dimension line** inside the drawing approximately one-half inch and click.

- You should now have a dimension showing the true length of the line, (2.0616 units) Note Figure 4.3.

- Aligned dimensions can be placed at any angle, and they are always parallel to the line measured.

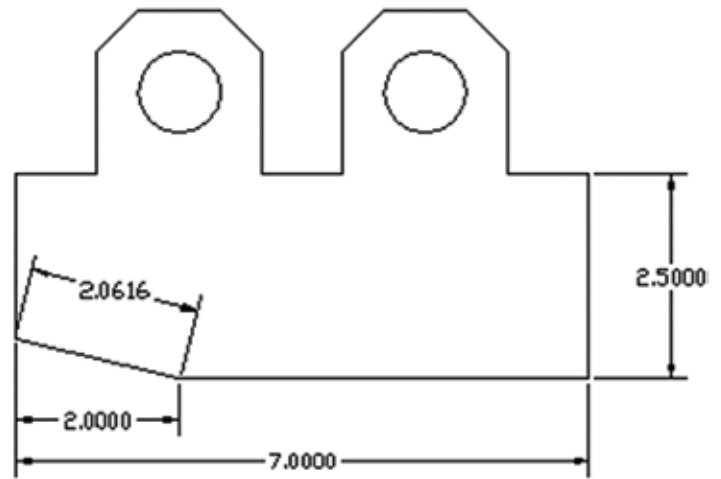- Measure some other angled distances until you are comfortable using the "aligned dimension" command.

Figure 4.3

If you are comfortable with aligned dimensions, let's use the "continue" dimension command to make dimensioning easy across the top of the drawing. Note Figure 4.4.
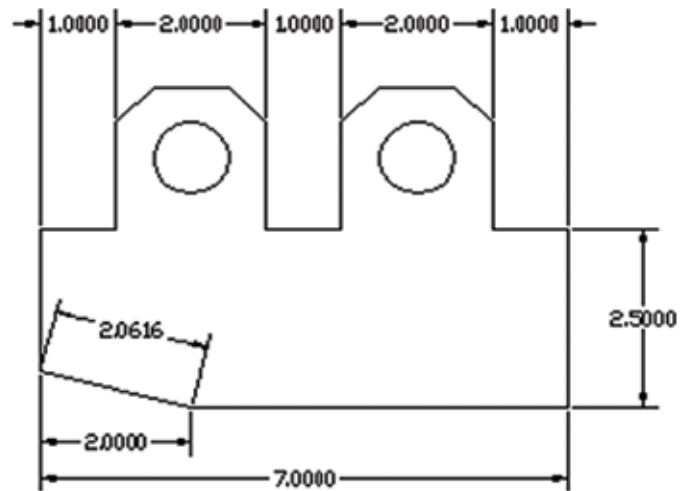

Figure 4.4

To begin the sequence of dimensions across the top, we'll use the "linear" dimension command for the first dimension.

16. **Pick** the top left corner of the drawing,

17. **Pick** the upper left corner of the tab.

18. **Locate the dimension** approximately one-half inch higher than the left tab.

- A typical linear dimension showing 1.000 should appear on your screen.

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To quickly add each of the remaining dimensions, we will now use the "continue" dimension command.

19. **Pick Insert**, **Dimension**, and then **Continue**, (or use the Continue icon.)

20. **Pick** the top of the vertical line on the first tab and watch the machine enter the second dimension.

    • A value of 2.0000 should now show.

21. **Pick** each of the corresponding points shown in Figure 4.4 and watch the machine dimension each area for you.

    • Note that the dimensions are perfectly aligned.

PART II --- DIMENSIONING WITH PRECISION

Our drawing is sufficiently dimensioned for this exercise, however the precision setting of four decimal places is quite excessive for such a simple drawing. We will now learn how to reduce our precision to a more logical scale. (And we will learn to set up the A+CAD software for a drawing the way a CAD system should be set for each drawing!)

1. **Pick Settings** and then **Dimension Settings**.

    • A Dimension Settings dialog box appears. See Figure 4.5 below.

2. **Pick New**

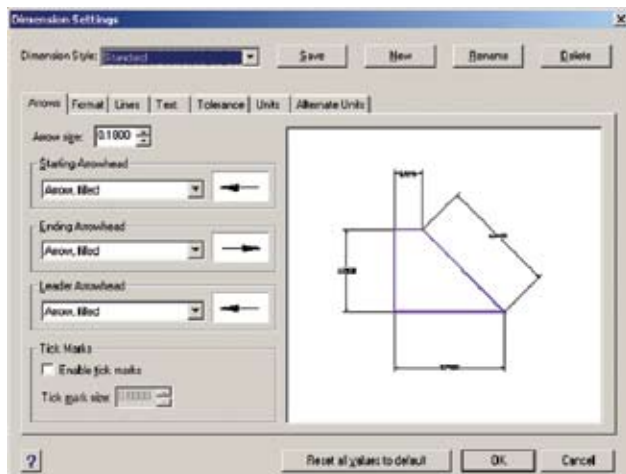   • A "Create New Dimension Style" dialog box appears. See Figure 4.6.

Figure 4.5

3. **Enter a name** for the new style you will be creating.

    • A good suggestion would be to enter the name of the drawing, plus adding xx. The xx represents the accuracy setting of two digits to the right of the decimal place. (Type in Draw2xx.) See Figure 4.6.
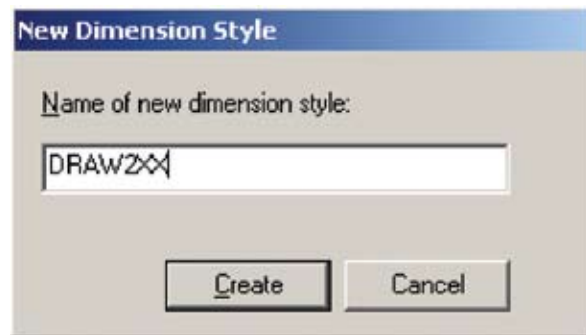

Figure 4.6

    • Giving a new name in the New Dimension Style dialog box creates a duplicate of all dimension settings. This copy is created so that you can make customizations to the dimension characteristics that you want to change without changing the original settings that come from the factory --- which could create dimensioning problems for the next machine user --- or for you as you proceed on.

3. **Pick** Create.

    • The Dimension Settings dialog box returns. See Figure 4.5.

4. **Pick** the **Units** tab to display the Linear Dimension settings.

5. **Pick the down arrow** in the Decimal Places box until "2" appears.

    • This setting will give dimension values displayed with two decimal places to the right of the whole number.

    • The preview illustration in the dialog box changes to show you what your drawing will look like when you make changes to the dimension style. accuracy. (Select different accuracy settings and watch the dialog box change each time you select a different setting.)

6. **Pick the Save button** at the top of the Dimension Settings dialog box.

- Your style with appropriate modifications will now be operating instead of the Standard settings that originally existed.

7. **Pick OK**.

- All of your dimensions now change to two-point accuracy.

- If your dimensions fail to change to two-point accuracy, follow the next few steps.

   a. Pick **Dimension**
   b. Pick **Update**
   c. Select the dimensions that did not update.
   All numbers should now change to two point accuracy.

8. Make sure that your name etc. is entered into the titlebox area you created as a part of the drawing. Save your drawing as Draw4. When you are complete, submit your drawing for grading. If you need help in plotting, refer back to Chapter 2.

If you have any questions regarding the use of the Dimension Style Manager dialog box, experiment over and over until you are comfortable with this procedure. Advanced uses of the manager dialog box will follow in additional chapters, so it is very important that you understand what has occurred so far.

CHAPTER FIVE

ABSOLUTE COORDINATES

Each new step necessary to construct the drawing shown at the end of this chapter is in this exercise. (Commands and procedures covered in earlier chapters will not be repeated --- you should have mastered those already.) Follow each step carefully and watch how your computer responds to the different commands you give it.

For this lesson you will be using the Insert and Modify menus again.

In the previous chapter you drew a line by clicking the left mouse button on the starting point and then the ending point. The method used was ultra simple and somewhat crude. (Remember when we counted grid marks to get a starting point for drawing two?) This lesson teaches you how to locate precise points that are based upon the logic of how all graphic points are found, used, and retained by the computer. We will be learning to use Absolute Coordinates, and how to draw lines by specifying actual coordinates (beginning and ending points) for the line through the keyboard.

If you are just starting a session, perform the necessary start up procedures for A+CAD so that the menu listings are across the top of the screen.

Absolute Coordinates are values that designate a specific location on the drawing based on the lower left corner of the screen being 0,0 (the origin). When the grid is turned on, the bottom left corner represents the origin of the drawing, or 0,0. As you move the cursor (horizontally) you are moving in the X direction. As you move the cursor vertically, you are moving in the Y direction. Coordinate values represent distances away from the origin; the X value is always shown first. For illustration purposes, the data in Figure 5.1 has been moved towards the center of the screen. The figure however, shows the manner in which all data is laid out and organized. Notice the intersection of X and Y is 0,0.
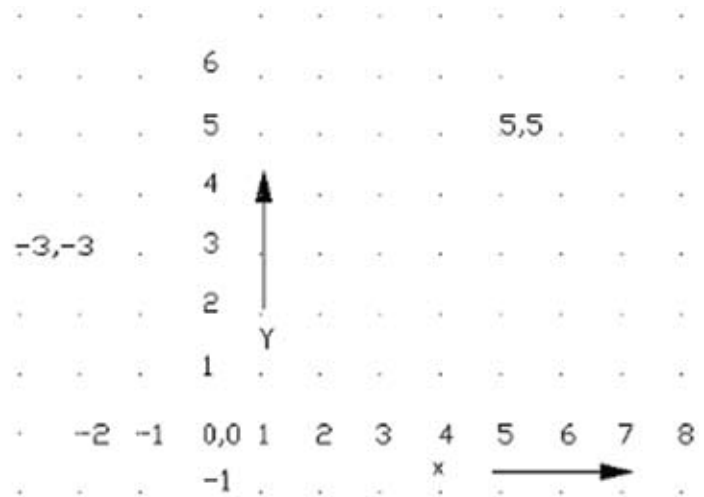

Figure 5.1

A full size drawing of our first object drawn with absolute coordinates" is shown in Figure 5.2.
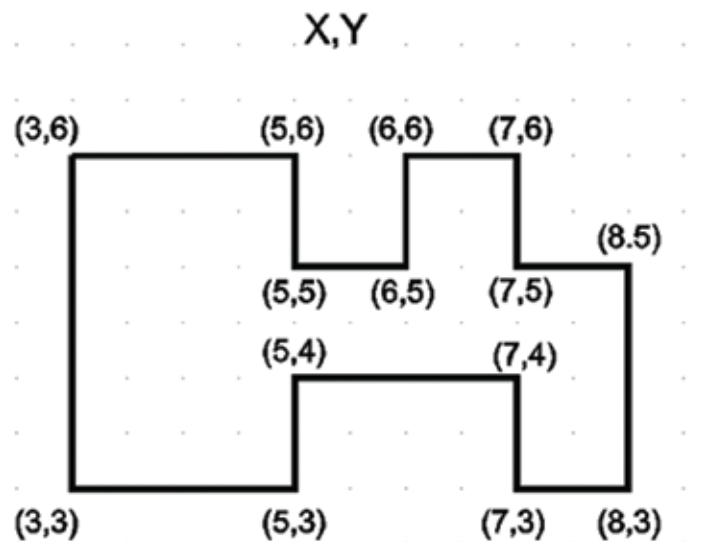

Figure 5.2

Drawing Lines Using Absolute Coordinates

1. **Select TOOLS**, then **DRAFTING SETTINGS**.

    •   Set your Grid value to 1 and turn on.

    •   If you are unable to execute these commands, refer back to Chapter 4.

2. **Select LINE**.

   • The dialog box should now be cleared from the screen and the prompt "Line - from point:" will be in the command prompt area.

3. **Position the pointer** towards the center of the screen, but DO NOT CLICK THE LEFT MOUSE BUTTON.

   • You will now enter the coordinates for the starting point of your line.

   • We will begin the drawing shown in Figure 5.2 by starting in the upper left hand corner.

4. **Type**: **3,6** then Tap the **ENTER** Key.

   • The system only recognizes coordinates input through the Enter Key.

   • These coordinates mark the beginning of the line.

HELPFUL HINT

These coordinates use the Cartesian XY system. The first coordi¬nate is 3 units to the right of the origin along the X axis. The second coordinate is 6 units up from the origin along the Y axis. Where these two lines intersect is your set of coordinates. (See Figure 5.2).

   • You will now type the coordinates for the ending point of the first line.

5. **Type**: **5,6** and **tap** the **ENTER** Key.

   • Notice that the first horizontal line is drawn between the coordinates you specified (see Figure 5.2).

6. **Type 5,5** and **tap** the **Enter** key.

   • Notice that the second line (vertical) connects to the first and is drawn between the coordinates you specified (see Figure 5..3).

   • You will now enter the coordinates for the ending point of the third line.

7. Type: **6,5** and tap the **ENTER** Key.

   • You should now have 3 connecting lines on the screen.

8. Continue to enter the values show in Figure 5.2 until your drawing is complete. If you enter a value in error, you may erase the wrong line and re-enter using the correct values.

9. **Save this drawing** as **DRAW5-Outline. (ABSOLUTE COORDINATES)**

   • If you have trouble saving, refer back to Saving A Drawing in Chapter 1.

DRAW 6 (ORDINATE DIMENSIONS)

Objective: The next drawing will familiarize you with locating circles at precise points based upon absolute coordinate values. The dimension values are all based upon the X and Y values of 0,0 at the lower left corner of the drawing. Such a measuring system would be needed and valued when laying out a template for a machine to make or cut out.

Drawing Objects and Circles with Absolute Coordinates

1. Draw the object shown in Figure 5.5 using the coordinate values specified for each of the six corners.

   • If you have trouble remembering how to draw lines using absolute coordinates, refer back to the beginning of the chapter.

2. Draw the circle in the upper left corner of the drawing by specifying the center point location as **4.205,3.050** when the machine requests the center point of the circle. Figure 5.3 (below) shows the Command Prompt after the circle com mand has been requested, and what your response should be.

```
:circle
2Point/3Point/RadTanTan/TTT/Arc/Multiple/<Center of circle>: 4.205,3.050
```

Figure 5.3

3. Each circle should be entered using the coordinate values shown on the "Circle Locations" drawing shown at the end of this chapter.

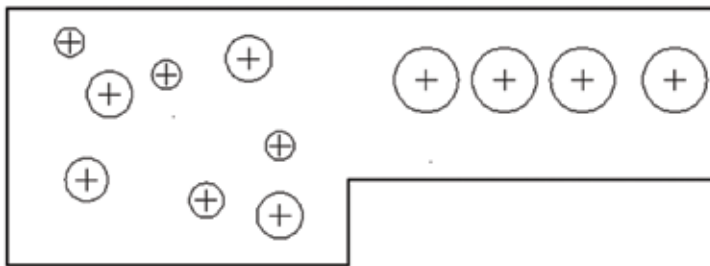• Figure 5.4 shows the drawing with all of the circles entered.

Figure 5.4

After all of the circles are entered, the drawing should be dimensioned using the **Ordinate Dimension** command. Ordinate dimensions measure the perpendicular distance from an origin point (called the datum) to a dimensioned feature, such as the circles used in this example. Ordinate dimensions show the X or Y value with a leader line. Ordinate dimensions measure the distance of a point along the X or Y axis. While the datum point can be changed, in this example, 0,0 remains in the corner of the drawing and the entire drawing is measured relative to the absolute values of 0,0. Using the Ordinate Dimension command, we dimension the upper left corner of the object first.

4. Pick **Insert**, **Dimension**, **Ordinate**, and the intersection of the upper left corner of the object.

• The command prompt asks if you want specific information regarding the X datum, Y, datum, etc. You may respond with a specific directive or you may allow the software to use the automatic feature and provide you with either X Y information depending upon how you move your mouse.

• Move your mouse to the left of the intersection and the software provides the distance that the point is along the Y axis or datum. If you move your mouse below the intersection you will see that the software measures the distance from 0,0 along the X axis or datum.

5. With the Ortho button activated, **drag your cursor** approximately 3/4th inch to the left of the top left intersection and pick. The machine should record 4.500 showing the distance the point is above 0,0. (The 4.5 distance is along the Y axis.)

6. Reactivate the Ordinate dimension command by **tapping the Enter key**, and pick the same upper left corner of the object. Now **drag your cursor** above the intersection and note that the software measures the distance the corner is to the right of 0,0.

• The software should now show the distance is 2.5 units along the X axis or datum.

7. With the ORTHO button activated, **drag your cursor** approximately 3/4th inch above the intersection and pick. The software should now record 2.500, showing the value that the intersection is to the right of 0,0. (The value is measured along the X datum.)

8. Finish dimensioning each circle and each corner of the object until your drawing looks like Figure 5.5 below.

• Positioning the dimensions 3/4th of an inch away from the object is easier said than done. If a construction line is drawn 3/4th away from the object, then you can drag your cursor to the line and align the dimensions. Without a line to guide you, your dimensions will be irregular and look very unprofessional.

• Erase the construction line after all dimensions have been entered.
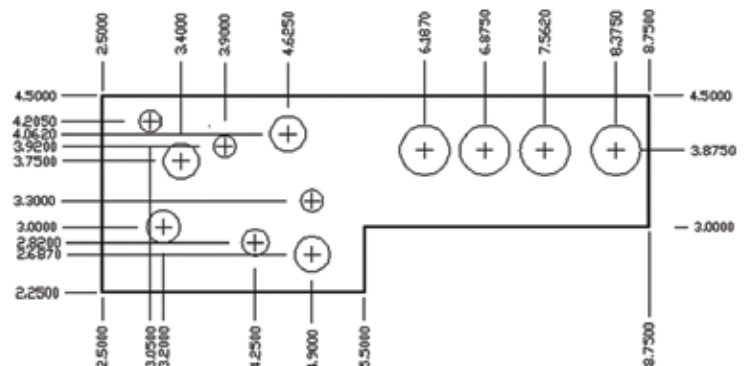

Figure 5.5

9. Add a title box with your name and date.

10. Save the drawing as DRAW6 (or Ordinate Dimensions.)

11. Plot and submit for grading.

DRAWING # 5 ARRAY

Objective: The next drawing uses absolute coordinate values as the basis for learning numerous other commands. In this drawing you learn to use many modify functions. (A modify function changes the data that is **already drawn** *on the screen.) The modify functions used in this drawing are: mirror, array, and extend.*

Each new step necessary to construct the drawing shown at the end of this chapter is in this exercise. (Commands and procedures covered in earlier chapters will not be repeated --- you should have mastered those already.) Follow each step carefully and watch how your computer responds to the different commands you give it.

For this lesson you will be using the Insert and Modify menus again.

In the previous chapter you drew a line by clicking the left mouse button on the starting point and then the ending point. This lesson teaches you to use actual coordinates for the line through the keyboard.

If you are just starting a session, perform the necessary start up procedures for A+CAD so that the menu listings are across the top of the screen.

1. **Activate** the **Line** command.

    •   You will now be able to enter the coordinates for the starting point of your line.

2. **Type: 3,4** then **tap** the **Enter** Key.

    •   The system only recognizes coordinates input through the Enter key.

    •   These coordinates mark the beginning of the line.

    •   You will now type the coordinates for the ending point of the first line.

3. **Type: 3,5** then **tap** the **Enter** key.

    •   Notice that the first line is drawn between the coordinates you specified

4. **Type: 5,7** then **tap** the **Enter** key.

    •   Notice that the second line connects to the first and is drawn between the coordinates you specified.

    •   You will now enter the coordinates for the ending point of the third line.

5. **Type: 6,7** then tap the **Enter** key.

    •   You should now have 3 connecting lines on the screen.

Using the Mirror Command

CONCEPT

The mirror command is used to copy objects that have been drawn, and then place them in reverse on the coordinates you enter.

---

1. Select the **Modify** menu.

2. Select the word **Mirror**, or simply pick the Mirror icon.

    •   You must now select the items to be mirrored.

3. Position the cursor approximately 1/4 inch below and to the left of the first line drawn; **click the left mouse button and enclose the objects with a window**.

4. **Tap** the Enter key to confirm that you want the three lines mirrored.

5. Pick the grid mark directly above the right end of the top line.

    • This marks the first point of the Mirror line.

6. Pick a grid mark six dots straight down from the first point.

    • This marks the second point of the Mirror line.

    • The command prompt now asks if you wish to delete the objects that were selected.

7. Tap the Enter key or enter N to confirm that you do not want to delete the original lines.

    • Your original lines have been mirrored and your screen should now look like Figure 5.6.
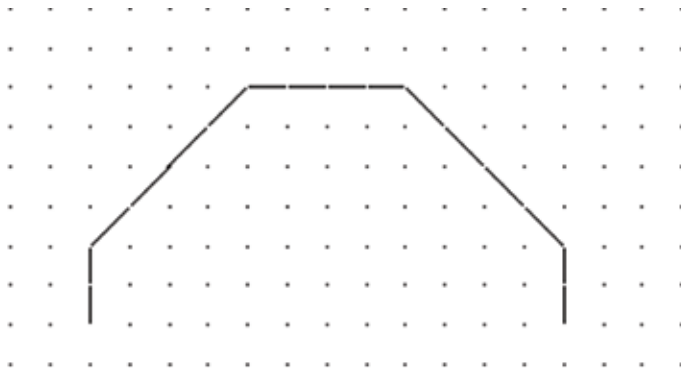
Figure 5.6

    • The first three lines were duplicated into a mirrored object from left to right, using the coordinates you entered.

8. **Tap** the **Enter** key to restore the Mirror command

    • The computer always remembers the last command used and reactivates that command when you tap the Enter key.

9. **Position the cursor** approximately 1/4 inch below and to the left of the first line drawn, click the left mouse button.

    • This marks the first point of the window used to select all of the lines that have been drawn.

10. **Drag the pointer** upward and to the right to enclose the entire object; click the left mouse button.

    • This marks the ending point of the window used to select the objects to Mirror. You should see a box surrounding your drawing, until you click the left mouse button.

11. Tap the Enter key to confirm that you want to mirror the six lines selected.

12. Pick the first point of the mirror line by picking the end point of the lower left line.

13. **Pick the second point** of the mirror line by picking the end point of the lower right line.

    • The command prompt again asks if you wish to delete the original lines.

    • The default setting recommends a "no" response when asked if you wish to delete the old lines. Tapping the enter key activates the default setting.

14. **Tap** the **Enter** key.

    • Your octagon is now complete.

15. **Erase the drawing** by using one of the two methods you have learned (New or Erase). Repeat the sections on drawing a line and using the mirror command until you are comfortable with drawing by using absolute coordinates and mirroring objects.

16. **Save this drawing** as **DRAW5** (or THE ARRAY)

*   If you have trouble saving, refer back to Saving A Drawing in Chapter 3.

You have now learned the Mirror command under the Modify menu. Practice this until you feel comfortable with it, then continue on to the next part.

Continuing on with Arc, Circle, and Array

Objective: This part of the exercise will familiarize you with the commands Arc and Array. You will also work more with setting the coordinates from the keyboard instead of with the mouse.

For this lesson you will be using the **Insert**, **Modify** and **Edit** menus.

To help you get an idea of what you will be drawing in this chapter, study the second drawing located at the end of the Chapter.

Drawing an Arc

1. Open the drawing **DRAW5** (if it is not already on the screen).

    •   If you have trouble doing this, refer back to Retrieving A File in Chapter Three.

2. **Select ARC (3 Point)** under the **Insert** menu, or simply pick the arc icon.

    •   Notice the prompt, "Arc Start Point: " in the command prompt area. You will now enter the starting coordinates for your arc.

3. Type: **5,7** then tap the **Enter** key.

    •   This coordinate denotes the arc's starting point. Remember you are using the Cartesian XY coordinate system. The first coordinate is 5 to the right of the origin on the X axis. The second coordinate is 7 up from the origin on the Y axis. Where those two intersect is the coordinate 5,7.

4. Type: **6,8** then tap the **Enter** key.

    •   This coordinate denotes the midpoint of the arc.

5. Type: **7,7** then tap the **Enter** key.

    •   This coordinate denotes the ending point of the arc.

    •   You should now have an arc attached to the top of your drawing.

Drawing a Circle, Undo and Redo

1. Select **CIRCLE** under the **Insert** menu, (Center, Radius) or pick the Circle icon.

    •   Notice the prompt, "Circle Center Point:," in the lower left hand corner.

2. Type: **6,7.5** then tap the **Enter** key.

    •   This coordinate denotes the center point of the circle.

    •   The command prompt now requests the radius of the circle.

3. Type: **.25** then tap the **Enter** key.

    •   A small circle is drawn inside of your arc.

    •   If you make a mistake and you catch it before you continue on to anything else, you can use the undo command.

4. Select **UNDO** under the **Edit** menu.

    •   The circle will be gone.

    •   If you decide that it was OK, you can put it back by using the redo command.

5. Select **Redo** under the **Edit** menu.

    •   Notice that the circle has reappeared. Practice this a few times until you feel comfortable with the commands Undo and Redo.

Creating an Array

CONCEPT

A polar array is a command that allows you to duplicate and spin (array) selected items around a center point.

1. Select the **Modify** menu and pick **Array** or simply pick the Array icon.

   • Prompts for the array appear in the command line.

      : array

2. **Select the arc and circle**, then press the Enter key.
   Select entities to array: (Select the arc.)
   Entities in set: 1
   Select entities to array: (Select the circle.)
   Entities in set: 1
   Select entities to array: (Press Enter.)

3. Specify Polar array by typing P and then pressing Enter:
   Type of array: Polar/<Rectangular>: **p**

4. **Pick the very center point of the octagon.**
   Base/Center of polar array: (*Pick center of octagon.*)

   • Make sure your snap and grid is on when you pick the center point.

5. **Set the number of items to 4** and the area (angle) to cover to 360 degrees:

   ENTER to specify angle between items/<Number of items to array>: **4**

   Angle to array (+ for ccw, - for cw) <360>: **360**

6. **Have the entities rotated as they are arrayed:**

   Rotate entities around the array? No/<Yes>: (Press Enter.)

   • Your drawing now has four arcs and circles.

7. At the command prompt, type UNDO, or pick the undo icon.

8. **Re-array the arc and circle** so that each side of the octagon has an arc and circle.

   • A gap exists between the end of the arc and the octagon.

9. Using the OSNAP commands, draw **a line** from the end of the arc perpendicular to the octagon side. (Draw the lines on one arc only.)

   • To draw the lines, it will require that you zoom in so you can carefully see what you are drawing and where the esnap indicators are pointing.

   • You will need to set your ESNAP to endpoint and perpendicular.

10. **Reset your array command** so that you can array the properly drawn extension lines on the gapped arcs only.

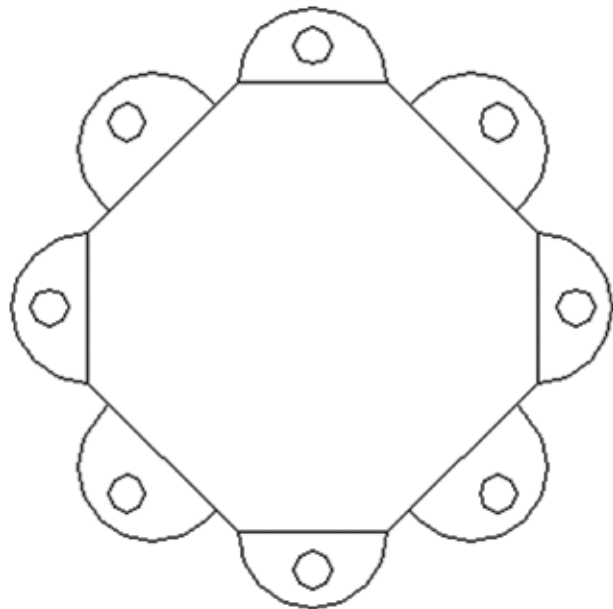Your completed drawing should look like Figure 5.7.

Figure 5.7

CHAPTER FIVE ASSIGNMENT

Prepare to print a hard copy of **DRAW7** by adding a title box
of your own design. (Create a simple title box like you did for
Draw2.) Make sure that your title box contains your name,
personal identification number and Draw7 within the defined title
box area. Submit for grading.

- To plot, refer to figure 1.5 and 1.6 for page and layout
  settings, and review Chapter 1 if necessary.

- You should have a basic understanding of the following
  terms and actions before proceeding:

Line   Drawing a line using keyboard commands

Coordinates   Using the keyboard to enter coordinates for
                    drawing lines, arcs, and circles

Mirror   Making a mirror image of a drawing

Array (Polar)   Arraying a grouped item around another item

If you cannot remember how to operate any of the above func-
tions, go through the chapter again until you are able to do these
without looking. If you save this drawing again, use a different
name. Remember, practice makes perfect.

CHAPTER SIX

RELATIVE COORDINATES

In the previous chapter we learned how A+CAD records information and how data could be added to a drawing while referencing the origin point of 0,0. Referencing the Absolute Coordinates however, is not the only method of entering data. **Relative Coordinates are values based upon the last point entered.** Relative Coordinates can be used when you know the position (or coordinate value) of the last point entered but the only information on the next point is relative to the last point. Entering data is preceded with the @ symbol to indicate that the new position is relative to the last point and not to the absolute coordinate system.

If a line is to begin at 3,3 the beginning point references the absolute coordinates. If the ending point of the line is unknown to the user, but the user knows that the ending point is supposed to be three units to the right and five units above the beginning point, we would enter @3,5 at the command prompt. A line would be shown as in Figure 6.1.
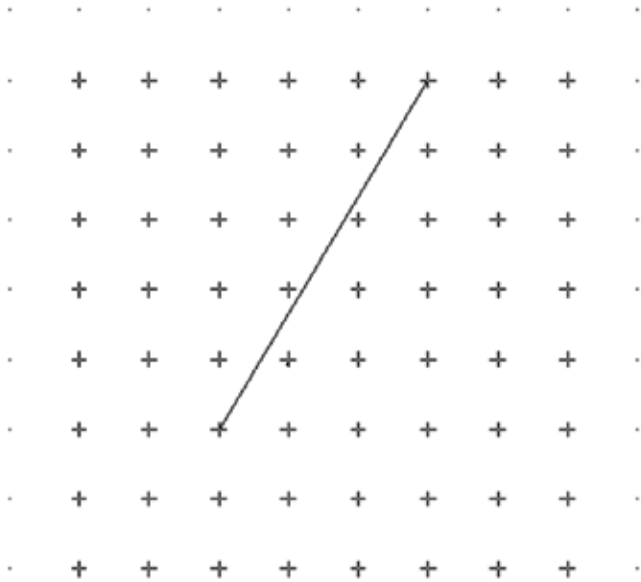
Figure 6.1

The prompt for a Relative Coordinate is always @X,Y

The X value always represents the distance and direction along the X (horizontal) direction from the last point entered.

The Y value always represents the distance and direction along the Y (vertical) direction from the last point entered.

Drawing6 is designed to familiarize you with relative coordinates. Figure 6.2 shows you what we wish to accomplish.
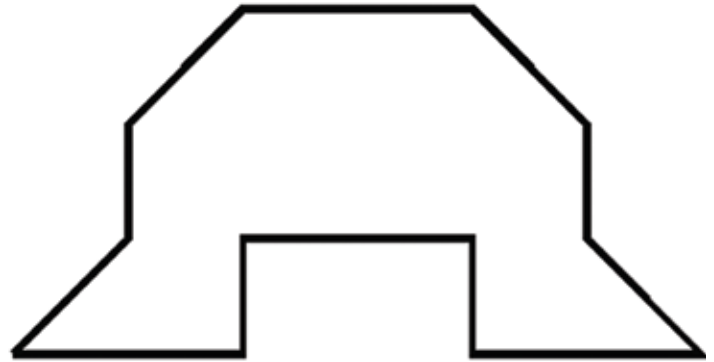
Figure 6.2

1. Begin drawing the object shown above (new drawing) by entering the only known absolute coordinate position. At the command prompt, with Line command entered, enter 3,3 and tap the Enter key.

2. Finish the first horizontal line (bottom left) by entering **@2,0** and tapping the Enter key.

    •   Note that the line goes two units to the right but remains horizontal.

3. Draw the first vertical line by entering @0,1 and tapping the Enter key.

    •   The line value went along the X axis by a zero amount, but climbed vertically one unit.

4. Continue entering the appropriate relative coordinate v alues until the drawing is complete.
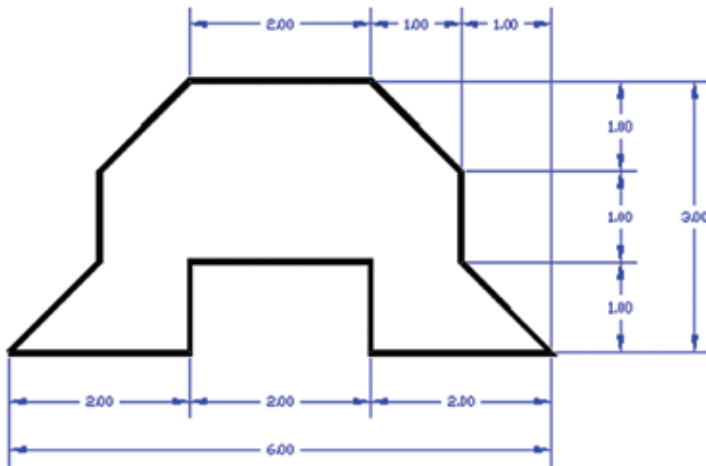
Dimensioning the Object See Figure 6.3

Figure 6.3

You will need to set your software in the same manner you did when dimensioning Draw2. (Chapter 4 – Part II , Dimensioning with Precision.) If you have forgotten how to set the software to a new dimension style, please refer back to Chapter 4.

1. Dimension the drawing as shown, and save. (You may wish to save this as Draw8, or Relative Coordinates.)

2. Add the label and information shown in the drawing at the end of the chapter.

3. Add a title block of your choosing and submit for grading.

CHAPTER SEVEN

RELATIVE POLAR COORDINATES

In the past two chapters we learned how the software records information based on Absolute Coordinates and Relative Coordinates. In this chapter we will learn a new method of adding data at precise angles. polar coordinates allow data to added at angles and not just lengths. Angle Information can be referenced to Absolute Coordinates or Relative Coordinates. For example, if I want to draw a line and enter **2<45** at the command prompt, the software will draw a line two units in length at an angle of 45 degrees. It will locate the line based upon Absolute Coordinate information, (0,0).

If I wish to draw a line based upon the last point, I would enter @2<45 at the command prompt. polar coordinates can be used when you know the position (or coordinate value) of the last point entered, and want to add angular data based upon the last point. Entering data is preceded with the @ symbol to indicate that the new position is relative to the last point and not to the absolute coordinate system. The "less than" sign (<) tells the software that the next numbers mean angular or degree amounts.

Angular or degree information on a computer is traditionally counter clockwise. See Figure 7.1 below.
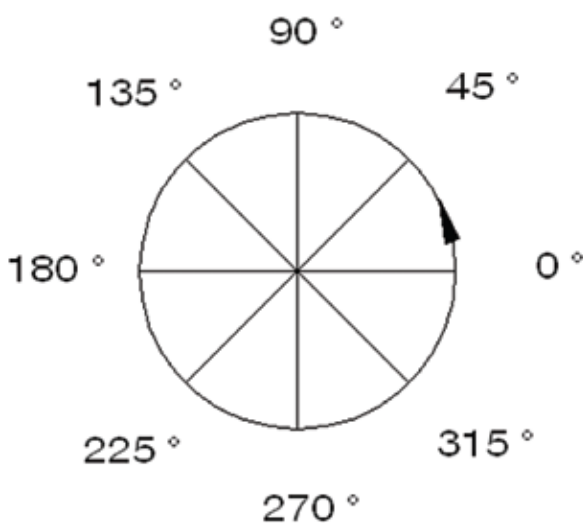
Figure 7.1

The prompt for a polar coordinate is always **@length<angle**.

The information following the @ symbol designates the length of the line from the last point entered.

The information following the < symbol represents the angle from the last point entered. Angle information can go clockwise if a minus symbol precedes the angle information; i.e. **@2<-45** would draw a line down to the 315 degree mark.

Drawing9 is designed to familiarize you with polar coordinates. Figure 7.2 shows the general layout of the drawing created with polar coordinates.
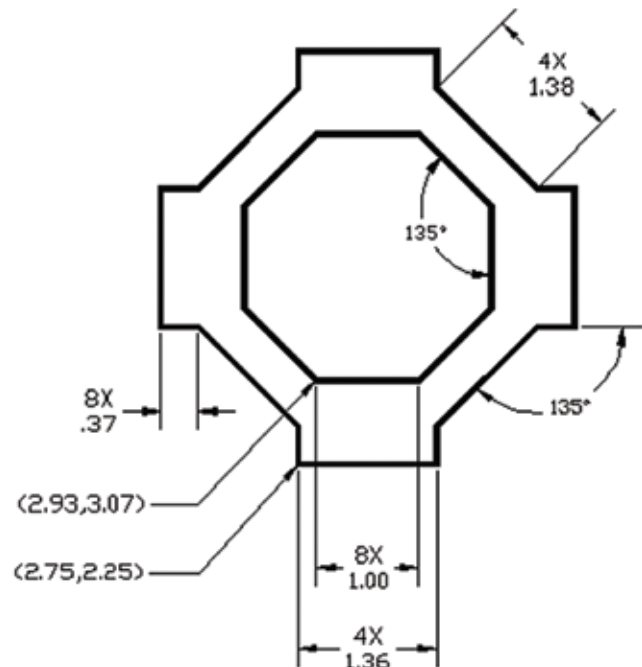

Figure 7.2

Drawing with Relative Polar Coordinates

1. Using the line command, begin drawing the inner octagon at the absolute coordinate value of 2.93,307.

2. To create the end of the first line, type **@1.00<0** and tap the Enter key.

   • The information describing the length of the line and the number of lines is shown in the dimension line for the bottom of the octagon.

   • The direction or angle is determined by examining Figure 7.1.

3. To create the first angled line, type @1.00<45 and tap the Enter key.

4. Continue entering the values necessary to create each line of the octagon until you return to the starting point.

5. Now that you are somewhat familiar with relative polar coordinates, let's draw the outside octagon. At the Line command, begin the first point of the bottom line by entering the absolute coordinate value of **2.75,2.25** and tap the Enter key.

6. Proceed around the outer edge by entering the appropriate length and angle of each line.
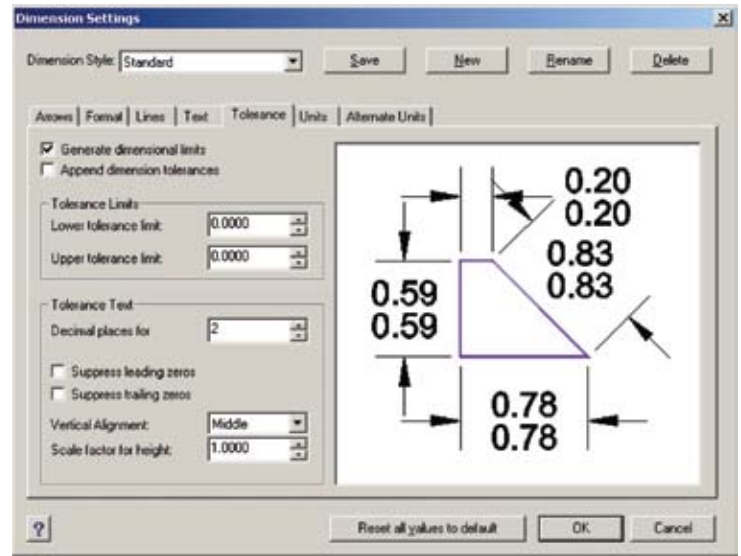
Figure 7.3

Dimensioning the Drawing

At first glance, the drawing appears to be a simple dimensioning process. A closer look shows us that most of the dimension lines have two lines of text. Let's begin this tricky multi-step process by:

1. Pick **Settings, Dimension Settings**, and **New** to create the dimensioning characteristics that we want for this drawing.

   • You should be familiar with process as described in Chapter 4.

2. Make the following settings under the appropriate tabs.

   a. At the **Text tab**, set the text height to **.15**.

   b. At the **Unit tab**, set the decimal places to **0.00**.

   c. Under the **Tolerances tab**, turn on the Generate Dimensional Limits options (a check mark shows). Set the "Decimal Places For" setting to **0.00**.

   • Your dialog screen should look like the one in Figure 7.3.

3. Pick **OK** and save your settings.

4. Dimension the drawing using the Linear command as you have in previous drawings.

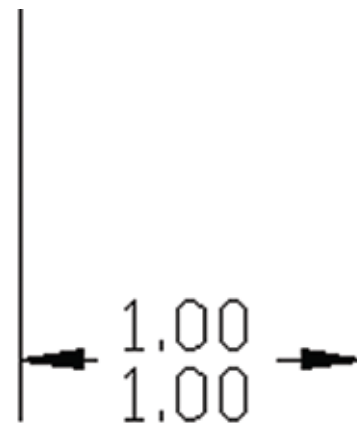   • Note that as you dimension, your dimensions have two identical values. See Figure 7.4.

Figure 7.4

Editing Dimension Text

Since the software is programmed to enter numerical values only, we must edit the dimension text to change the upper value (or number) to what is shown in the drawing.

Dimension editing is normally done with the DimEdit command, but this "two-tier" text needs to be edited in a special manner.

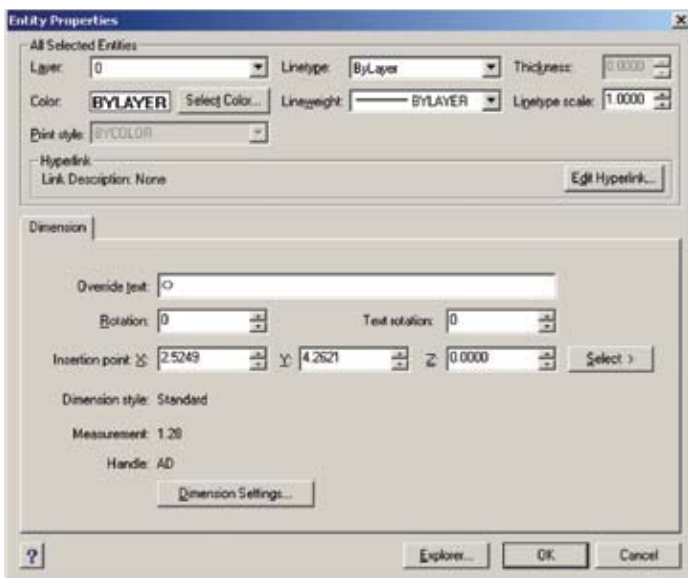1. Double-click the text. Notice the Entity Properties dialog box, as shown in Figure 7.7.

Figure 7.7

2. The **Override Text** box currently reads <>.

    •   The <> is A+CAD's way of indicating the default dimension distance that it calculated based on your pick points.

3. Highlight the <> text, and then replace it with **4X\P1.36**.

    •   The "/P" is a special code that tells the software to split the text into two lines (p is short for "paragraph"). The "P" must be in uppercase.

4. Click **OK**.

    •   Notice that the dimension text has changed. See Figure 7.8.
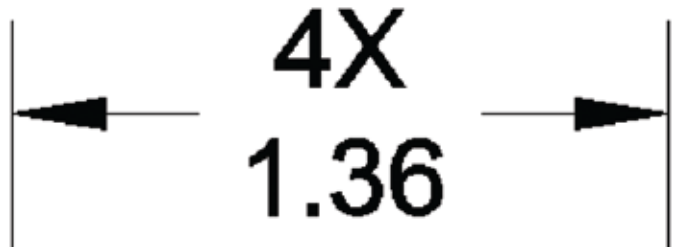
Figure 7.8

6. Continue to edit each of the dimensions so your drawing looks like the drawing at the end of this chapter.

7. Add appropriate labels and titles and submit for grading.

RELATIVE POLAR COORDINATES
@D<A°
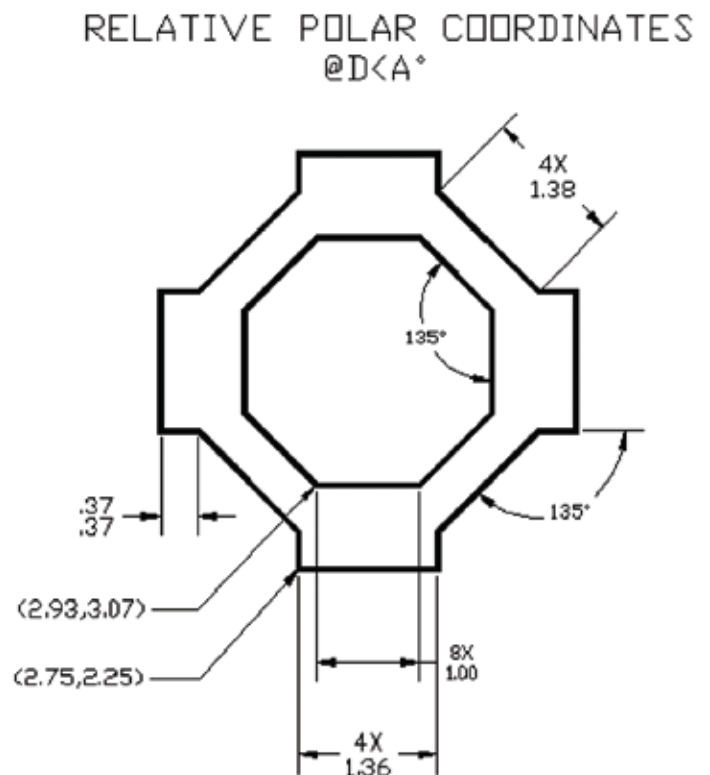
CHAPTER EIGHT -- MODIFY

MULTIPLE COPY and ROTATE with the USER
COORDINATE SYSTEM

This chapter is designed to familiarize you with some of the most
important modify commands in the A+CAD software. The chap-
ter is divided into three parts and three drawings. Each drawing
utilizes some or all of the modify commands listed above, and
of course, the draw commands we have learned in the previous
chapters are repeated.

Part I, Draw 10

The drawing shown in Figure 8.1 is a very simple drawing which
asks you to draw only 12 lines and two circles. The remainder of
the drawing is obtained through the copy and rotate process.
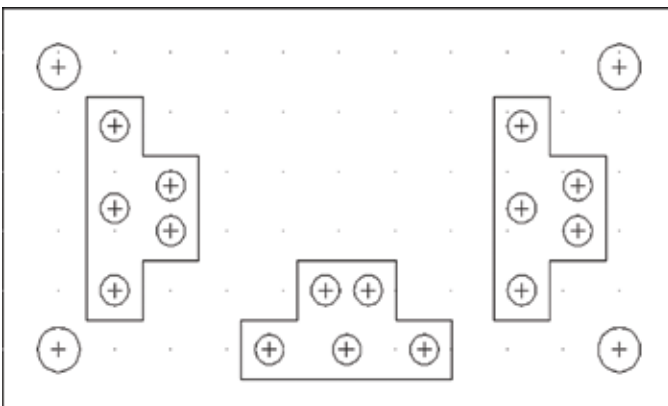
Figure 8.1

1. Begin the drawing by entering the four lines that
    form the large rectangle.

    •   You may begin the drawing by clicking on grid and then
        snap at the lower right hand corner of the screen. Select
        the line command and draw a rectangle as shown 6 or 12
        grid dots wide by 3.5 or 7 grid dots long.

2. Reset the **User Coordinate System (UCS)** to the lower left
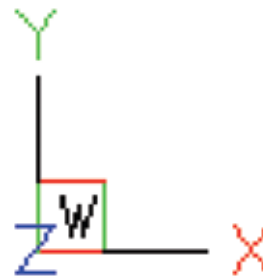   corner of the rectangle. See Figure 8.2.

Figure 8.2

•   The User Coordinate System replicates the World Co-
    ordinate System, but it can be moved so that entry data
    is based upon the location of the UCS and not the lower
    left corner of the screen.

•   When the UCS is moved to a new location, the number-
    ing system begins at the new location.

•   The new UCS location begins the 0,0 system
    all over again.

•   If the origin is not visible on the screen (because the
    drawing is zoomed in), then UCS icon automatically
    relocates itself from the origin to the lower right corner
    of the screen.

3. To move the UCS icon to the new location (lower left corner
    of the rectangle), type the **Ucs** command.

    •   This command prompts you at the command line.

4. With the esnap active, **select the lower left corner** of the
    rectangle **and pick** when the yellow Endpoint cursor shows.

    : ucs
    ?/3point/Delete/Entity/Origin/Previous/Restore/Save/
    View/X/Y/Z/ZAxis/<World>: e

    Select entity for UCS definition: (*Pick the lower corner
    of the rectangle*.)

    •   Your UCS icon moves to the lower left corner
        of the rectangle.

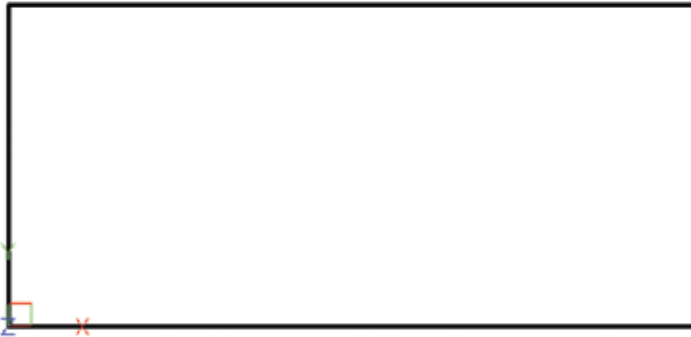   •   Your drawing should now look like Figure 8.3.

Figure 8.3

5. You can now draw your first circle. Using the Circle command, enter the values of .5,.5 when asked for the center point location and .25 for the radius. This will locate the circle in the lower left corner of the drawing.

6. Enter the remaining three circles in top left corner, the upper right corner, and the lower right corner by using the Copy command.

7. **Select copy and identify the circle in the lower left corner.** At the command prompt, **type M** for multiple copies. When prompt for the base point, **enter .5,.5. and then place a circle one grid dot in from each corner of the rectangle.**

- All four circles should now be around the edge of the rectangle.

- Your drawing should now look like Figure 8.4.
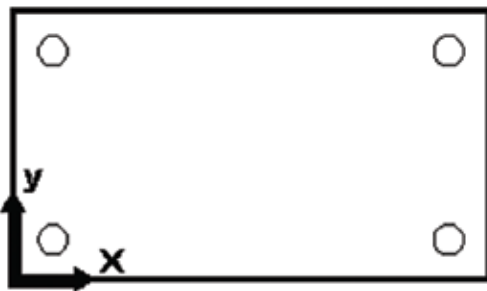
Figure 8.4

Using the same logic we used to create the rectangle and the four circles, we will now build the T part.

11. Begin drawing the T shape by beginning approximately the center of the drawing. Select line and draw one grid dot or .5 over to the left and then continue down 4 grid dots or 2. Go to the right .5. Continue with line up or 90 degrees .5

and then to the right .5. Continue with line going up or 90 degrees 1 and then over to the left .5. and press enter.

12. **Move the UCS to the lower left corner** of the T shape.
- Moving the UCS to the new T-shape location will allow you to use absolute coordinates to enter the bottom circle.

  Right click on SNAP at the lower right hand corner of the screen and change the snap setting to .125. Start a circle at the location shown. The radius of the circle will be .125.
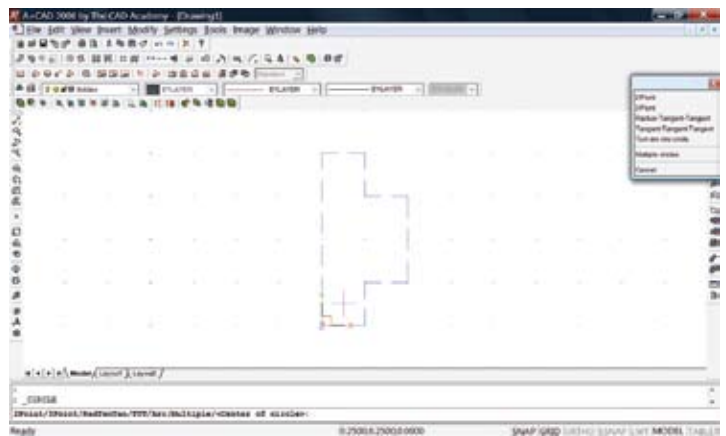
13. After drawing the bottom circle to the proper size, **copy the circle using the "multiple" option**, and locate each of the .1,25 circles at their proper locations using Absolute Coordinate values.

- Your T part should look like Figure 8.5.

Figure 8.5

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14. **Relocate (move) the UCS icon** back to the lower left corner of your rectangle again.

   • Relocating the UCS allows you to copy the T-piece that you have just drawn to the two ends of the rectangle.

15. Using the Copy "multiple" command again, **window the entire T-piece** when requested to select the items to be copied.

16. Using your **esnap** feature, **pick the lower left corner** of the T-piece when prompted for the **base point**.

17. When the Command prompt asks you to specify the second point of displacement, **type .75,.75 and tap the Enter key**.

   • A copy of the entire T-piece should now be positioned at the left side of your drawing.

18. Since the "multiple" feature is active, the command prompt will immediately ask you to specify another point of displacement. **Type 4.38,.75 and tap the Enter key**.

   • A second T-piece should be inside the rectangle and near the right side of the drawing.

The bottom T-piece will require us to use the **Rotate command** before moving the T-piece into position.

19. **Copy the T-piece a third time and place the T-piece inside the rectangle**, near but not touching the T-piece on the right side of the drawing.

20. Using the Rotate command, (**pick the Modify menu, then Rotate, or simply pick the Rotate icon**.)

21. **Place a window around the center T-piece** when asked to select the items to be rotated.

22. Using your esnap feature, **select the lower left corner of the T-piece** when requested to pick the base point.

23. When the command prompt requests the rotation angle, **type 90 and tap the Enter key**.

   • The angle direction on a computer runs counter clockwise; hence our T-piece is now horizontal and ready to be moved into its proper position.

24. To move the T-piece into its proper location, activate the **Move** command.

25. **Pick the Modify menu, then Move, or simply pick the Move icon**.

26. **Place a window** around the entire horizontal T-piece when selecting the items to be move.

27. When requested to enter the base point for the items, **pick the lower left corner of T-piece**.

28. When requested for the "second point of displacement," **type 2.13, .25 and tap the Enter key**.

   • The horizontal T-piece should now be sitting in its proper position.

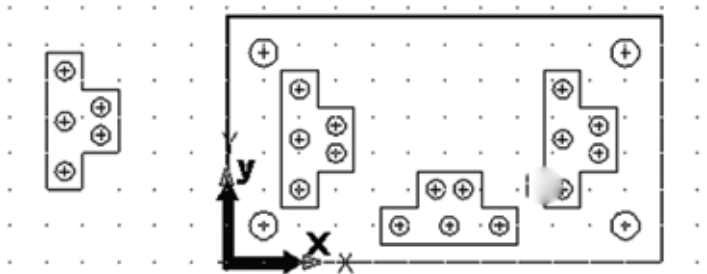   • Your drawing should now look like Figure 8.6.

Figure 8.6

Using the ordinate dimensioning feature, you should now **dimension the drawing** so it looks like the full-size drawing at the end of this chapter. If you have forgotten how to use ordinate dimensions, refer back to Chapter 5. (Ordinate dimensions were used to dimension the second drawing in absolute coordinates.)

Save your drawing as Draw 10 or as Multiple Copy.

Resave, add a titlebox, plot, and submit your drawing for grading.

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CHAPTER NINE

MODIFY COMMANDS: Break, Fillet, Parallel, and Trim

This drawing uses more "modify" commands in its construction than "draw" commands. The drawing, a simple gasket, is most easily constructed by laying out a template from two simple lines. Begin a new drawing in the customary manner.

1. **Pick** the **Insert** pull-down menu and **select Infinite Line**.

   • In other software, infinite lines are also known as "construction lines."

2. **Draw a vertical line** several inches to the right of your left border.

   • Use snap and grid to ensure that your line is vertical, or activate the ORTHO button at bottom of your screen.

   • The exact location of your drawing is not important at this time as the drawing can be moved to ensure you have sufficient drawing space.

   • Infinite construction lines run across the entire length/ width of the screen.

Since the construction line is a solid line covering the entire length/width of the screen, we will now learn how to activate a new line type so the centerline can be distinguished from the solid line.

3. **Pick Settings**, then **Explore Linetypes**.

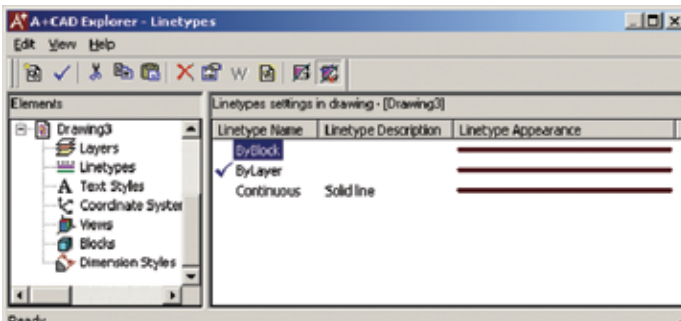   • The A+CAD Explorer dialog box displays. See Figure 9.1.

Figure 9.1

4. **Pick the New Item button** in the upper left corner.

   • The New Linetypes dialog box overlays the Explorer. See Figure 9.2.
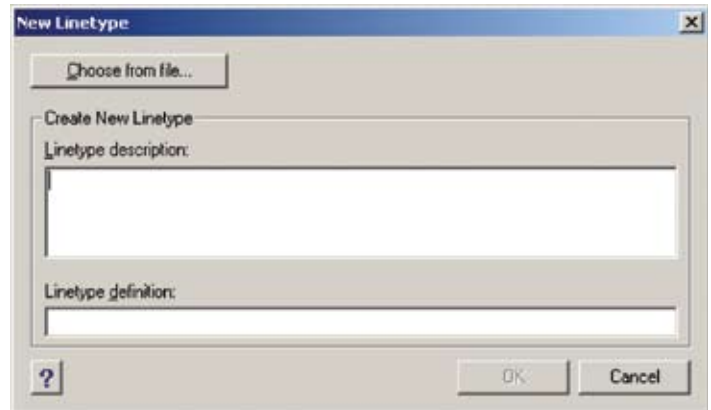

Figure 9.2

5, Click the **Choose From File** button.

   • The Select Linetype File dialog box appears. If necessary, change **Look In** to A+CAD's Support folder. Select icad.lin, and then click **Open**. See figure 9.3.
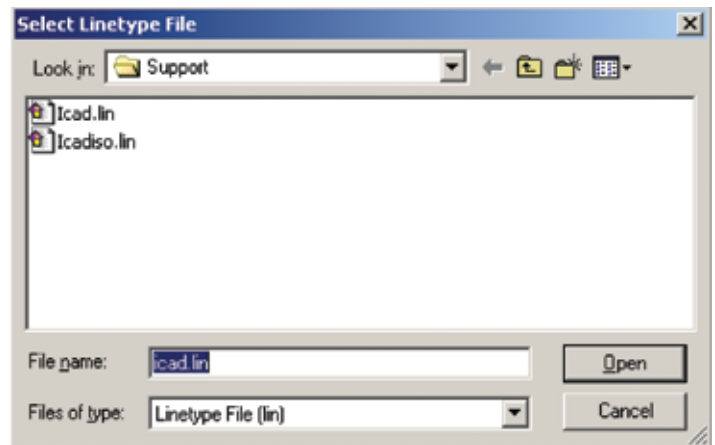

Figure 9.3

- The Linetype dialog box appears. See Figure 9.4.
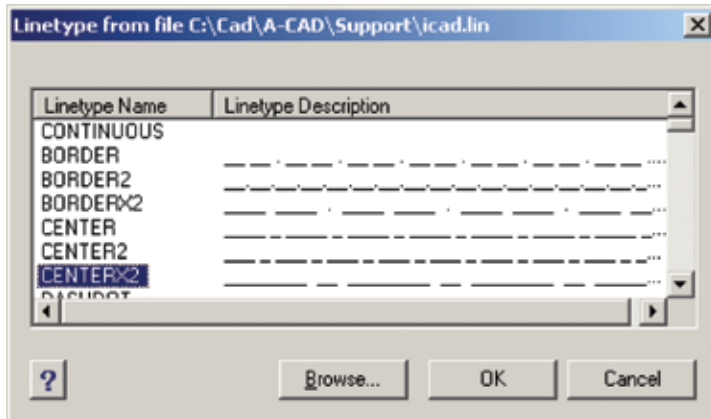

Figure 9.4

6. **Slide the slider bar down** until Center2X linetype displays, then pick Center2X and the **OK** button.

   - When the **OK** button is picked, the Linetypes dialog box disappears and the selected linetype is added to the Explorer dialog box.

   - Center2X was chosen for this drawing because it is most proportionate for this small size of the object being drawn.

7. **Pick on the Center2X linetype** to highlight it, then select the Current button. See Figure 9.5. Exit the Explorer by clicking the X button in the upper right corner.

   - Since the Center2X linetype has been selected, that will be the only type of line the software will draw until another linetype is selected.
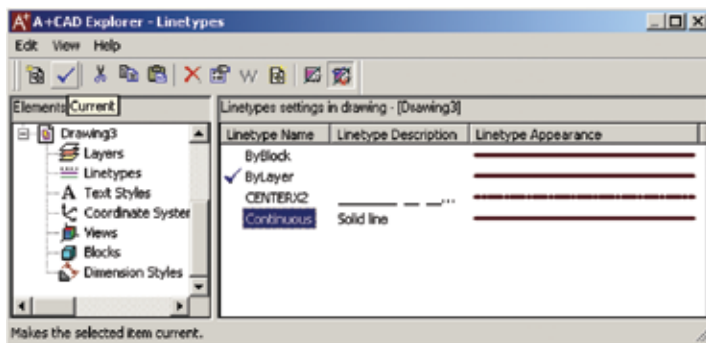

Figure 9.5

8. **Draw a horizontal line** of about five inches long near the middle of your screen.

   - The construction line on the left and the centerline in the middle of your screen will allow you to develop a location point for each of the circles.

If you view the construction line as the left edge of our drawing, you can now use the Parallel command to establish a vertical boundary for each of the circles that needs to be drawn. (This command is known as "Offset" in some other software pro grams.) Be certain to read the dimensions carefully so proper offset values are obtained.

9. **Pick Modify**, then **Parallel**.

   - The command prompt will immediately request an offset Distance.

10. **Type .75 and tap the enter key**.

    - The software then asks you to select the entity to be offset.

    - After you have selected the line to be offset, the software asks on which side it should make the parallel copy.

11. **Pick any part of your screen** to the right of the vertical line, and then tap the Enter key to exit the command.

    - A second construction line is displayed on your monitor.

    - If you did not tap the Enter key, the software would continue to prompt you for parallel lines to the right of the last line.

12. **Continue to offset** the original construction line until a vertical boundary for each circle and the right side of the drawing is placed on the screen. See Figure 9.6.
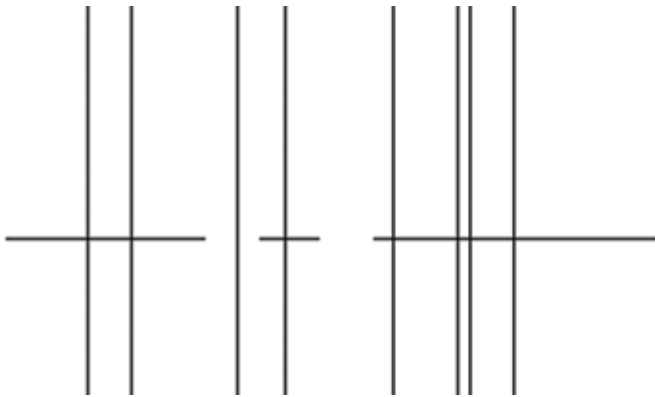
40

Figure 9.6

Figure 9.8

13. **Offset the Center2X line** both upwards and downwards until the centerlines and the construction lines intersect, giving the center point for each requested circle.

    • If you offset the centerline the distance specified to create an intersection for each circle, your drawing should look like Figure 9.7.
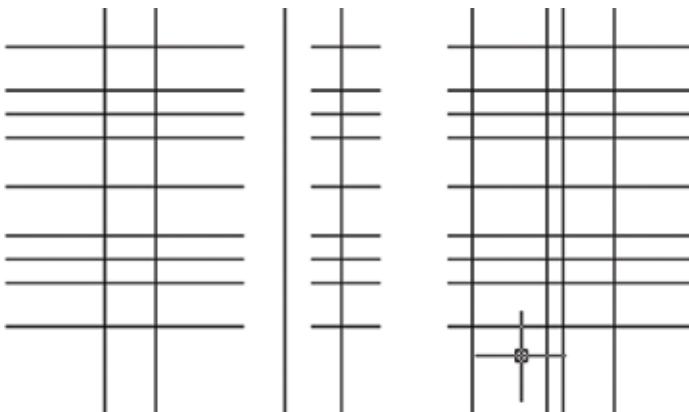

Figure 9.7

14. **Carefully locate the centerpoint** of your first circle, and create the first circle with a diameter of .319.

15. Using multiple copy, **duplicate your first circle** so your drawing looks like Figure 9.8.
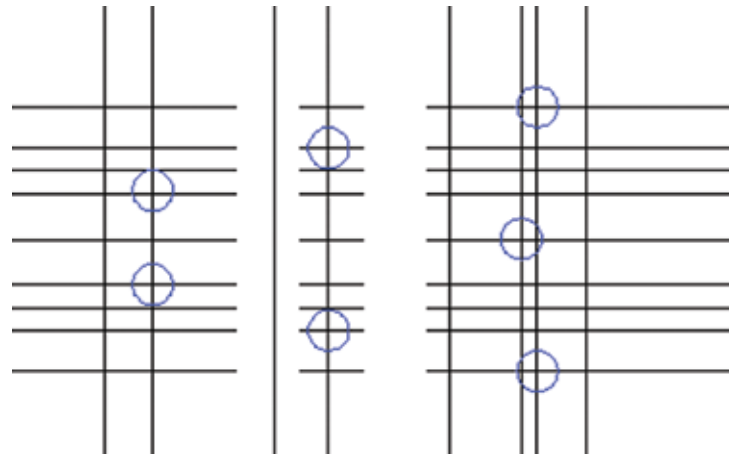
16. **Carefully locate the center point** of the large circle on the left and draw it in.

17. **Carefully locate the center point** of the large circle near the top right corner of the drawing and craw it in.

18. **Copy the large right circle** and place it into position directly below.

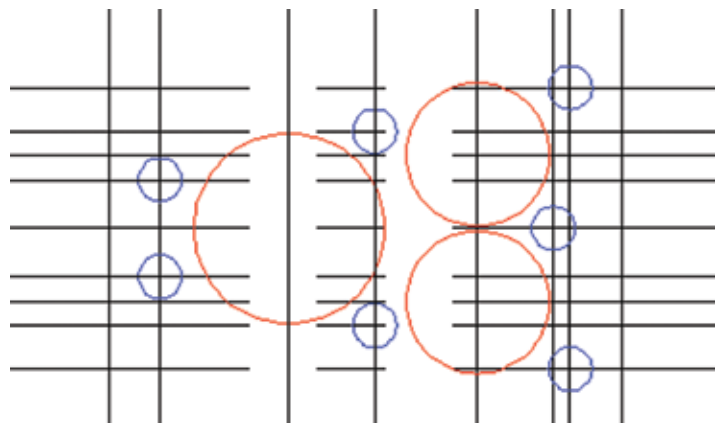   • *. Your drawing should now look like Figure 9.9.

Figure 9.9

Figure 9.9 shows the drawing nearly constructed. We need to modify the three large circles so that they become one large curved entity. To do that we will use the **Fillet** command. The fillet command "rounds" the corners on straight lines or circles. In effect we will be drawing something like an arc around the designated circles. Figure 9.10 shows what lines will be drawn after the circles are filleted.
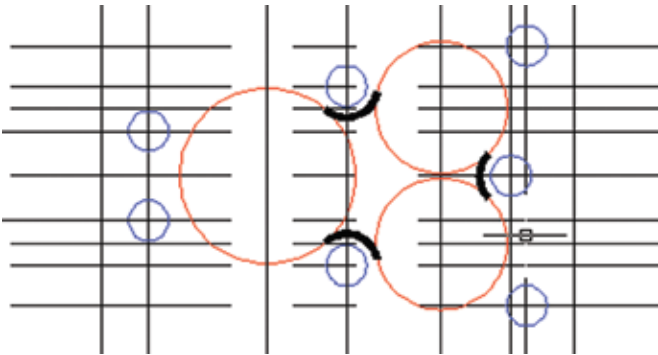
41

Figure 9.10

To create the fillets shown in Figure 9.10, follow the procedure below.

19. **Pick** the **Modify** menu, then **Fillet**.

   • The command line now asks what you wish to do.

20. **Type R** (for radius) and type the Enter key.

21. **Enter the radius value at this time**, (.250) and **tap the Enter key**.

   • Command line now asks you to select the first entity, the first of the two circles between which you wish establish a fillet.

22. **Pick upper right circle** in the upper left corner.

   • Since computer action is always counterclockwise, the upper right circle should be picked near the upper left quarter of the circle.

23. **Pick the big circle** directly below the small center circle.

   • Keep the counterclockwise rotation of the software in mind when selecting the second circle.

   • A fillet now appears below the small center circle and between the two big circles.

24. **Fillet the remaining circles** so that your drawing looks like Figure 9.10.

The line between the fillets now needs to be removed. To do that we will use the Break command. Break is another Modify command.

25. **Pick** the **Modify** menu, then **Break**.

   • The command prompt asks you to identify the entity you want broken.

26. **Pick the upper right circle** in the lower left corner.

   • The software now requests you to select a second point or pick a new first point.

27. **Type F and tap the Enter key**.

   • If you simply pick a second point on the circle, the software will "break" out a section between the two pick points.

28. With your esnaps turned on, use the Int(ersection) option and **select the point where the fillet and the circle meet**.

   • This will be the first point identified for removal of part of the circle.

29. Using your esnaps again, **pick the top right circle** in the low right quadrant where the top of the rightmost fillet and circle intersect.

   • The lower left corner of the circle will disappear.

30. Using esnaps, and with the counterclockwise rotation in mind, **remove the appropriate portion of the remaining two circles**. (Use Break and Erase.)

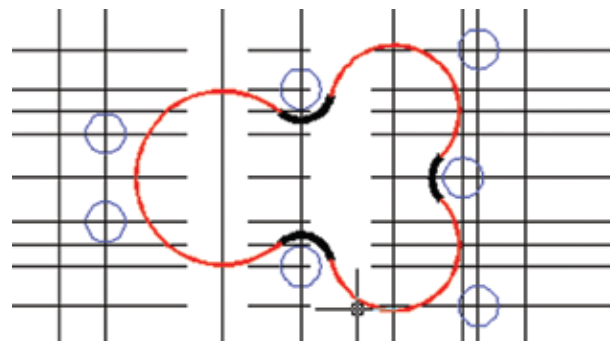   • Your drawing should now look like Figure 9.11.

Figure 9.11

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The drawing nears completion. All we need to do now is to draw the outside border. To draw the border we will first need to establish points at each corner from which we can connect lines. Perhaps the easiest method of beginning is to draw a circle of the proper size (notice the radius size of .375 on the drawing) around each existing corner circle.

31. **Draw a circle** (radius of .375) around each existing corner circle. See Figure 9.12.
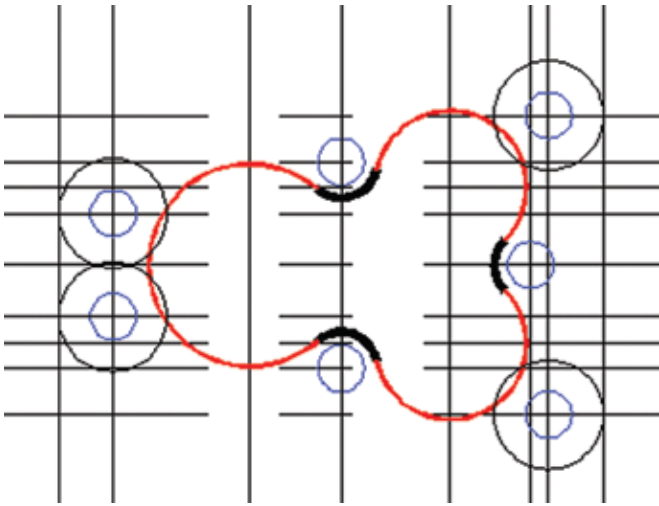
Figure 9.12

32. With the Tan(gent) esnap setting activated, **draw a line** from the top of the upper right circle to the top of the big circle on the left.

   • If the tangent setting is on, the software will draw a tangent line between the two circles.

33. **Continue drawing** tangent lines around the outside circles until your drawing looks like Figure 9.13.
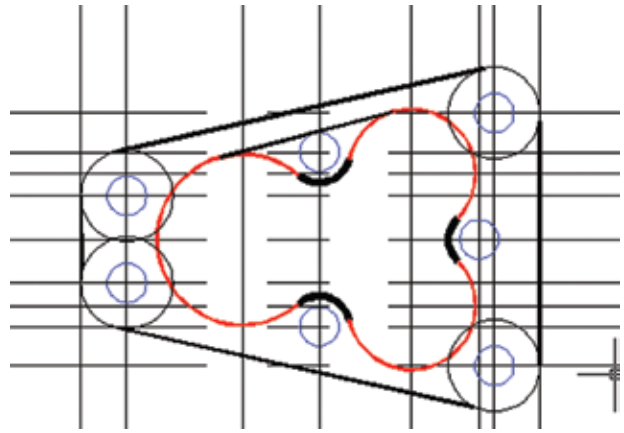
Figure 9.13

34. The unwanted portion of the outer circle now needs to be removed. Using the Break command, **remove the inner portion of the outer circles** that gave us the basis for drawing the border lines.

   • If you need assistance using the Break command, refer back to step 24 in this chapter.

   • Your drawing should now look like the drawing in Figure 9.14.
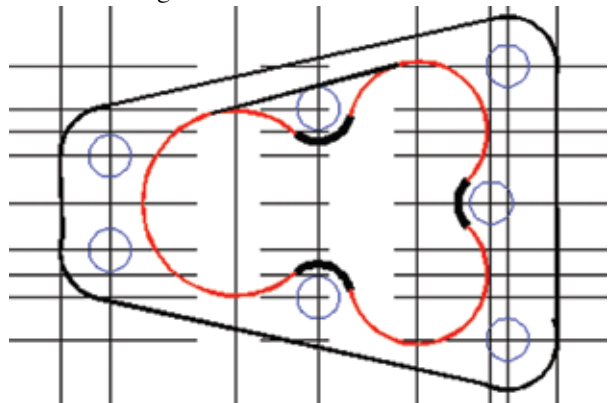
Figure 9.14

35. Dimension the drawing.

36. **Erase** all construction lines, and all but the
    Center2X line, and submit for grading.

    • Your drawing should now look like the one in Figure 9.15.
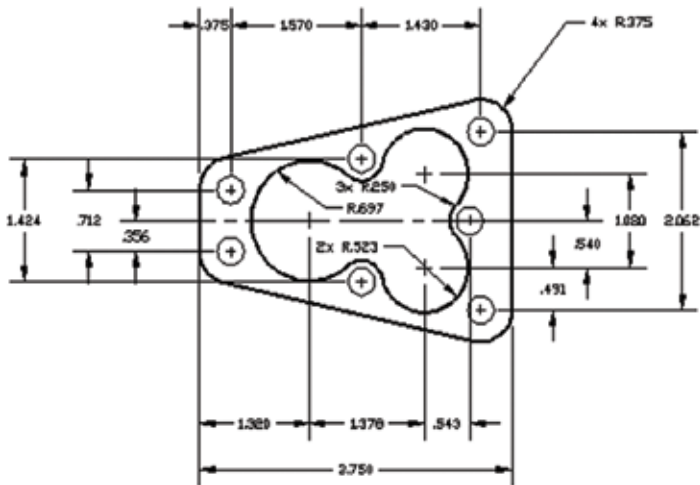

Figure 9.15

37. Add the Gasket label and a title block of your choosing.

38. Save your drawing as Draw11 (or Gasket.)

39. Plot and submit for grading.

CHAPTER TEN

POLYGONS

Drawing with a computer has many advantages over hand draw-
ing. One advantage is that shapes like polygons have the geom-
etry already created. All the user has to do is specify the size and
shape desired. In the following drawing, we will learn to use the
Polygon command along with the modify command, Rotate.

Construction of this drawing will also give us a chance to refresh
our memory on use of the Parallel command, and the changing/
selection of a different style of linetypes.

1. Begin a new drawing in the customary manner.

2. Using relative coordinates, draw a rectangle with the Line
    command. Begin it in the lower left corner of the screen,
    and draw a 4-inch long line.

3. Using relative coordinates, complete the border or r
    ectangle of the drawing.

4. Use the Parallel command to offset the bottom line so
    you have a horizontal line at the centerline markings
    for the polygons, and the bottom edge of the large polygon.
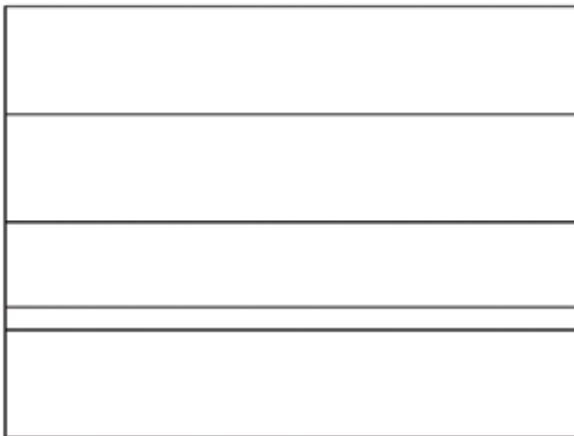   Your drawing should now look like Figure 10.1.

Figure 10.1

5. Offset the left border of the rectangle so you obtain
    intersections for each small polygon you need to draw, and
    lines designating the edge of the large polygon. Your drawing
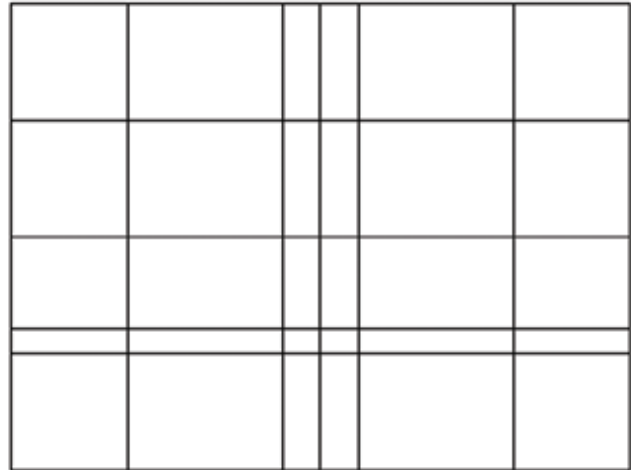   should now look like Figure 10.2.

Figure 10.2

6. Pick the Insert menu, then Polygon, or simply
    pick the Polygon icon.

    •   The command prompt now asks you to enter the
        number of sides you want your polygon to be.
        Type 6, and tap the Enter key.

    •   The command prompt now asks you to locate the center
        of the polygon. **Pick the upper right intersection**.

    •   The command prompt now asks you to select the vertex
        point (corner point). **Type .50 and tap the Enter key**.

    •   A polygon should now be in the upper right corner of
        your rectangle. (Ignore the rotation factor, we will rotate
        the two right polygons after all polygons are entered and
        on the screen.)

7. Continue to draw the two polygons on the left side of
    the drawing.

8. To draw the large polygon in the center of the drawing,
    activate the polygon command.

    •   Notice the large polygon is an octagon (8 sides).

- When prompt for the center of the polygon, **type E** for Edge and **tap the Enter key**.
- The command prompt now requests you indicate how long one of the eight sides of the polygon should be. **Pick the two appropriate intersections** obtained by offsetting the bottom and left sides of the rectangle when starting the drawing.

- As soon as the second edge point is picked, the polygon appears on the screen. Your drawing should now look like Figure 10.3.
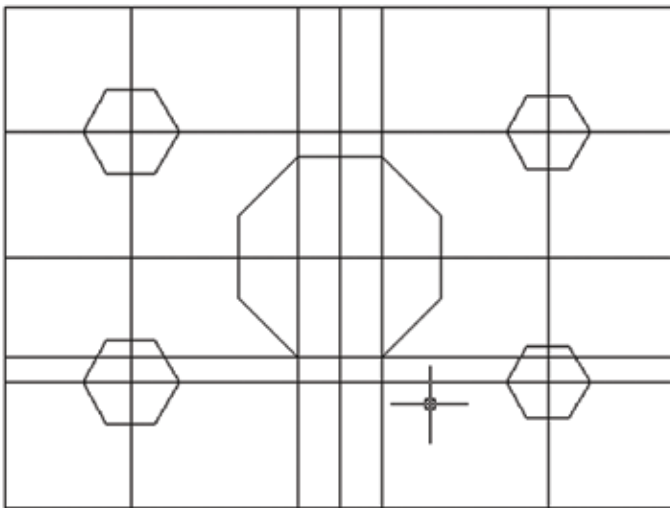

Figure 10.3

Now that all the polygons have been drawn, let's rotate the two polygons on the right so they look like the drawing at the end of the chapter.

9. Pick Modify, then Rotate, or simply pick the Rotate icon.

- Identify the upper right polygon in the usual manner.

10. Select center of the polygon for the base point.

- Selecting the center of the polygon will allow the polygon to rotate without moving in position.

- As soon as the base point is selected, the command prompt will ask for the rotation angle.

11. Move the cursor above the base point and towards the top right corner of the polygon.

- You will see the polygon move as you swing your cursor from right to left.

12. With your esnap activated, pick the vertical line above the base point when the X from the esnap intersection flashes.

- The point from the polygon should now be upward.

13. Repeat the rotation process on the lower right polygon.

Figure 10.4

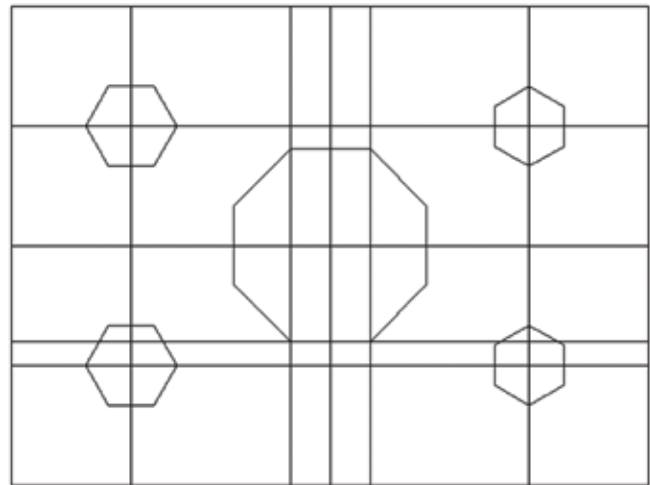14. Once again we wish to show the centerline location of the polygons. Refer to Chapter 9 on how to load the Center2 linetype.

15. **Draw** the **centerlines** as shown on the drawing at the end of your chapter.

- You can draw right over the lines you used as construction lines. The Center2 will remain after you erase the construction lines and "redraw."

- Your drawing should now look like Figure 10.5.

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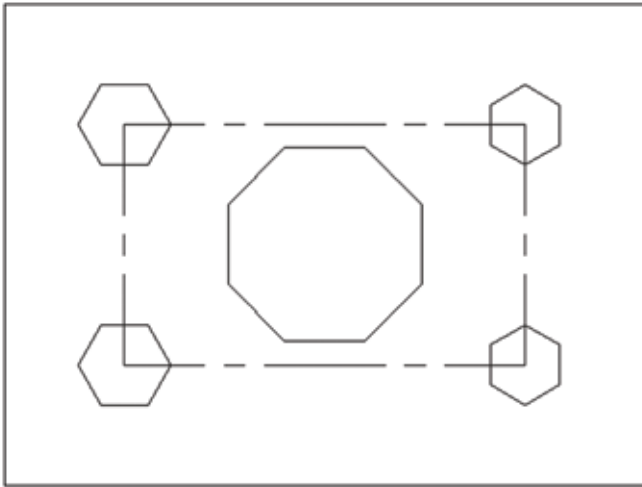
Figure 10.5

16. **Add the illustrations** shown on the left side of the drawing.

   - You will need to make the "continuous" linetype current again.

   - Use a radius of .25 inches for the polygon illustrated, and a .5 inch long line for the Edge option.

17. **Dimension** the drawing as shown.

   - You will need to use the "Aligned" option when dimensioning the polygons.

18. **Label** the drawing and polygon illustrations, plot and submit for grading.

Figure 10.6

CHAPTER EVEVEN

MODIFY COMMAND: CHAMFER

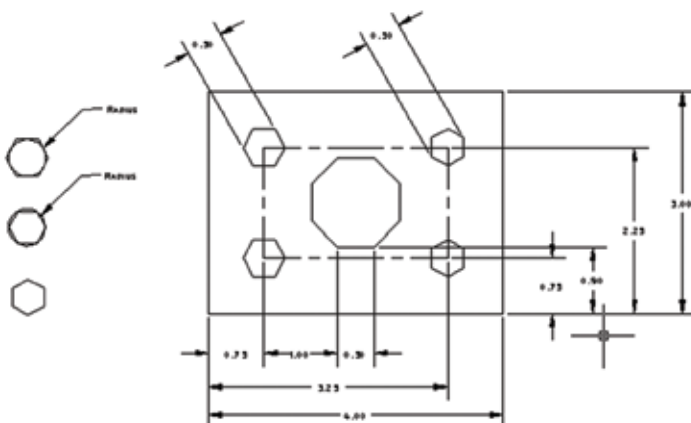This drawing uses another commonly used modify command, "Chamfer." The Chamfer command has the option of modifying corners similar to the Fillet command, but makes angled lines instead of arcs. An "equal distance" chamfer setting would modify the corner with a 45-degree straight line cut. (See Figure 11.1)
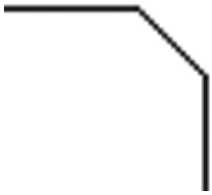

Figure 11.1

A chamfer cut with unequal distances might look similar to the one shown in Figure 11.2.
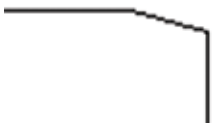

Figure 11.2

The drawing shown in Figure 11.3 is created by using only a few **Insert** commands: circle, construction line, line, and polygon. Most of the creating was done by use of the following Modify commands: chamfer, offset, and rotate.
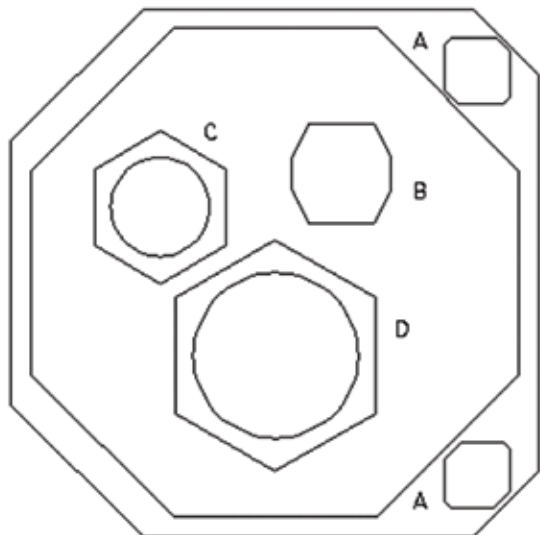

Figure 11.3

Let's begin the drawing.

1. Using the Line command, **create a box** nine units (inches) long and eight units tall.

2. Using the **Infinite Line** command (**Insert** menu), **pick the top left corner** of your square and then the **lower left corner** of the square.

    *   An endless vertical line goes across your screen.

3. Use the Parallel command to establish vertical offset lines for the circles and the uneven sided polygon (marked "B" in the figure above)

    *   Do not draw any construction lines for the "A" polygons at this time.

    *   Be sure your offset dimensions are correct. Check the drawing at the end of this chapter frequently.

    *   Your drawing should look like Figure 11.4 at this time.
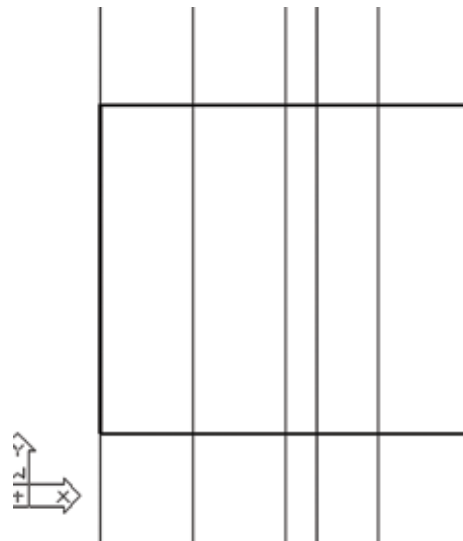

Figure 11.4

Now let's create horizontal offset lines by following the same procedure just used above. The intersections of the construction lines will serve as our circle and polygon center points.

4. Using the Infinite Line command, pick the top left corner of your square, then the top right corner.

    *   An endless horizontal line should now be across the top of your screen.

5. Offset the top horizontal construction line 2.5 inches to locate the center of polygon B.

6. With the Parallel command, offset the top horizontal construction line by 3 inches to locate the intersection for polygon C on the left.

7. Offset the top horizontal construction 5.5 inches to locate the intersection for polygon D.

    •   You should now have an intersection for all of the polygons with exception of the big polygon that will go near the edge of your 8 x 9 rectangle.

8. Offset both the vertical and horizontal construction lines to locate the center point for the **big** polygon.

    •   You should now have a drawing like that shown in Figure 11.5.
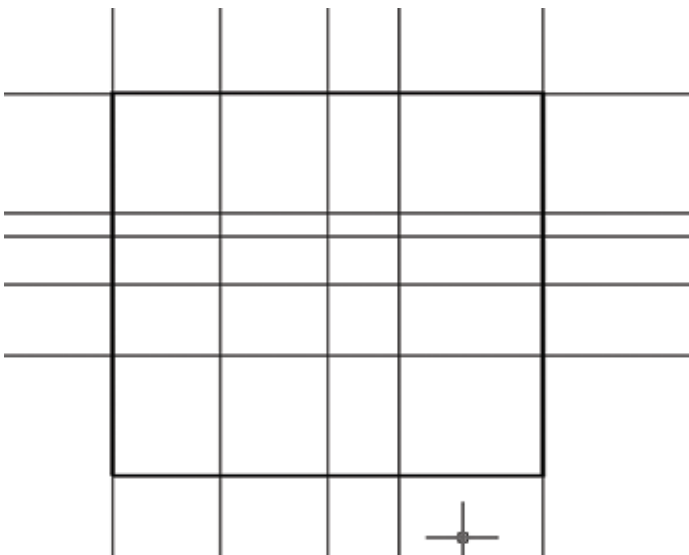
Figure 11.5

Now that we have intersections for the circles, let's begin by adding them.

9. For the big polygon, draw a circle with a diameter of 8 inches and then draw the polygon.

10. Add the circles for polygons B, C, and D.

    •   Your drawing should now look like Figure 11.6.
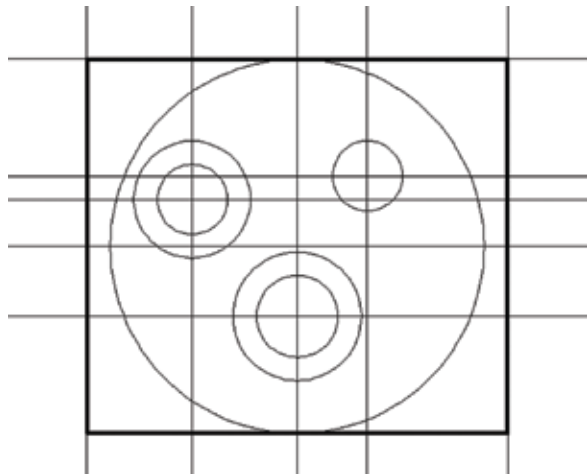
Figure 11.6

11. Add the appropriate size polygons for each circle.

    •   Check the drawing for appropriate sizes.

    •   Your drawing should now look like Figure 11.7
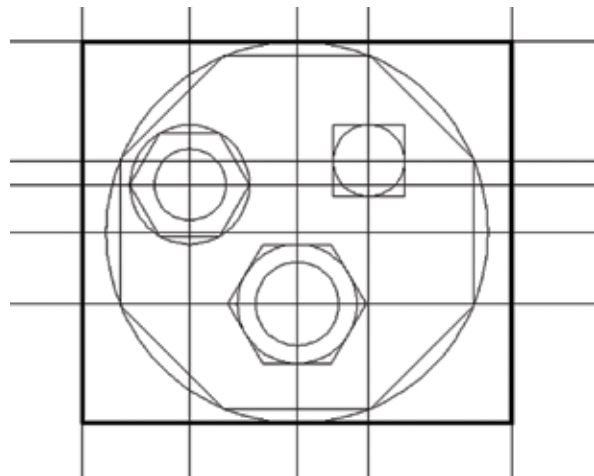
Figure 11.7

12. Let's rotate the polygon on the left (C) so it looks l ike the polygon on the drawing.

    •   If you've forgotten the Rotate command, please refer back to the last chapter.

13. And now that we are almost finished constructing the drawing, let's erase some of the lines and circles we will no longer need.

    •   See Figure 11.8.
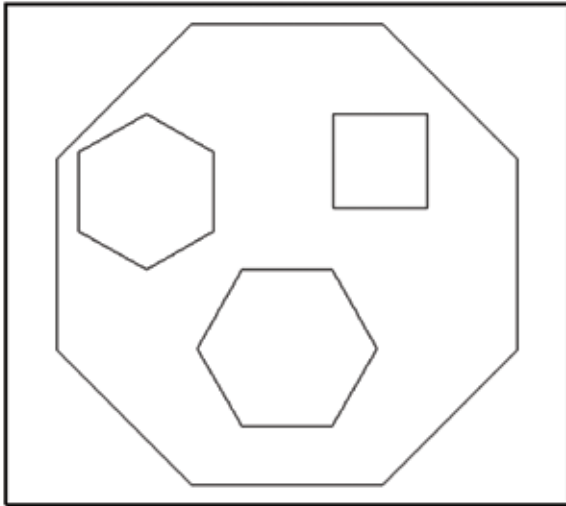
Figure 11.8

Figure 11.9

14. Select **Chamfer** command (**Modify** menu), or simply pick the Chamfer icon.

- The command prompt asks what function we wish to perform.

15. **Type D** (for distance) and **tap the enter key**.

* The command prompt asks for the chamfer distance on the first entity. **Enter 1** and **tap the Enter key**.

- The command prompt then requests the distance for the chamfer distance on the second entity. Enter 1 and tap the enter key.

16. Press the Enter key to repeat the command. The command prompt asks you to select the first entity.

- On the top-most line of your rectangle, **pick the line** near (but not on) the right corner; then **pick** near the **top corner** of the right side of your rectangle.

- The corner is cut off at a 45-degree angle between the top and side of your rectangle.

17. **Chamfer the bottom right corner** of your rectangle with the same setting of 1.

18. **Chamfer the left side** of your rectangle to a setting of 2.
- Your drawing should now look like Figure 11.9.
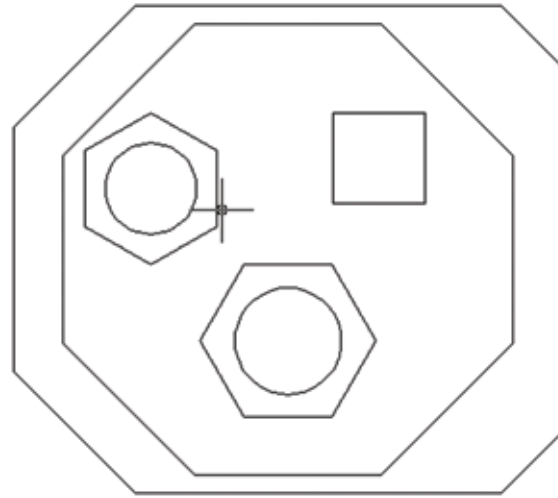
19. Chamfer the small four-sided polygon with distance settings of .25 and .5.

- The .25 distance has been set to the first line picked. The .5 distance will be applied to the second line.

- If you pick the wrong lines and the chamfer does not look like it does in the drawing, just pick the undo command to restore the polygon so that you can pick opposite lines the second time. Experiment until you can readily apply the Chamfer command with different distance settings.

We are now ready to construct the final two polygons and finish our drawing.

20. Offset the upper and lower right corner lines by .825 with the Parallel command. (The 45-degree lines were created by the Chamfer command.)

- This offset line provides the center point for the circle we need prior to entering the desired polygon.

21. Using the Circle command, **draw a circle** (diameter of .75) at the midpoint of the offset line.

- A .75 diameter circle should be drawn at both the top and bottom of the drawing. (Right side only.)

22. **Draw a four-sided polygon** (square) around the circle.

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23. Chamfer the points of both squares that are closest to the big polygon and the box chamfer line. (Use a distance setting of .25.)

24. Erase the offset lines and the construction circles from the last two polygons.

- Your drawing should now look like Figure 11.10.

Figure 11.10

25. Dimension your drawing so it looks like the drawing in Figure 11.11.
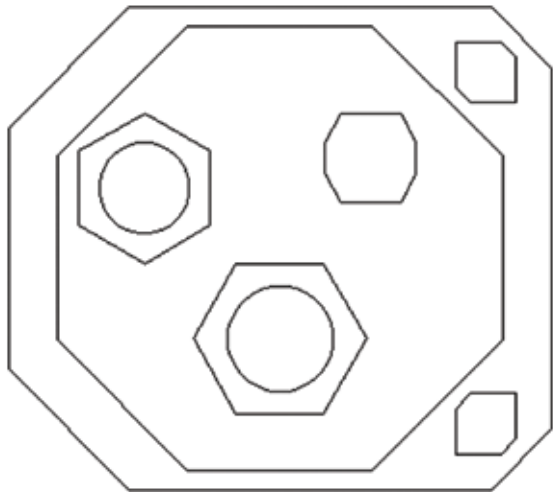
Figure 11.11

26. Add the circle and polygon construction information shown in Figure 11.12.

	CIRCLE	POLYGON
A	DIA = 1	4 SIDES (C)
B	DIA = 1.5	4 SIDES (C)
C	DIA = 2	6 SIDES (C)
D	DIA = 2.5	6 SIDES (C)
E	DIA = 4	8 SIDES (I)

Figure 11.12

27. Save as usual, plot, and submit for grading
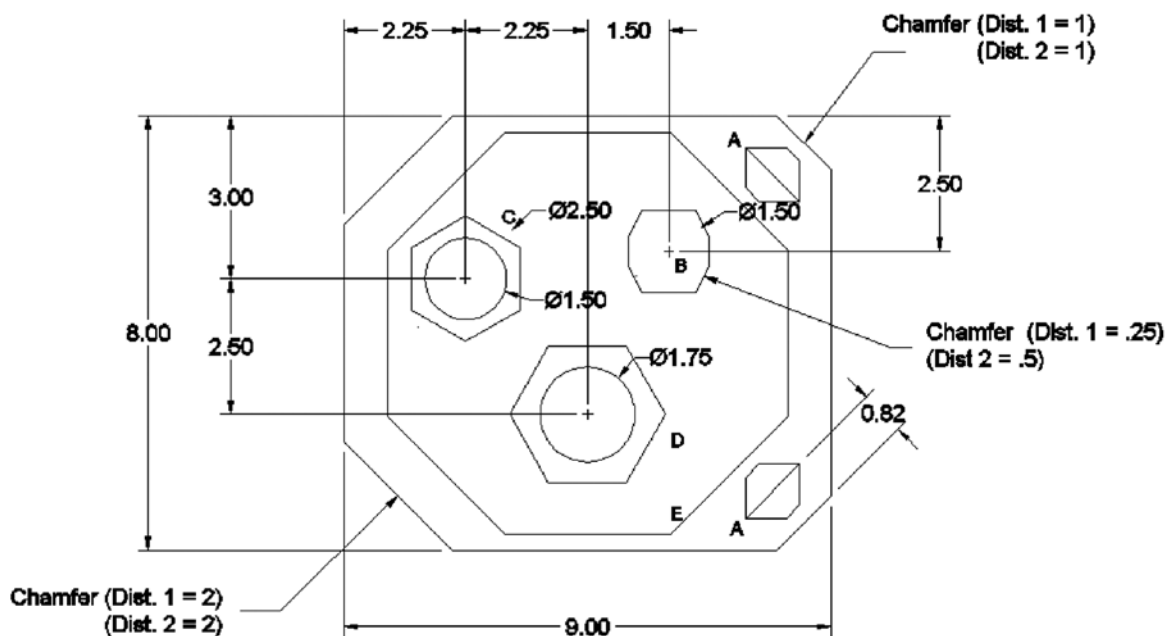
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CABIN FLOOR PLAN

Objective: This exercise will familiarize you with the commands Units, Insert, Zoom All, Fillet, Parallel, Dist, Break, Hatch, DimLinear (horizontal and vertical dimensions), and relative coordinates. For this lesson you will be using the Insert, Modify, View, and Tools menus.

You will use many of the commands you have learned from previous chapters, and will be entering coordinates by positioning the mouse and by using the keyboard.

To draw the outline of the house, we will again use Polar Coordinates as we did when making the title block (Chapter 2). In review, polar coordinates are best described as being able to draw lines of precise length and angles -- all in one command. In Figure 12.1 it shows that the point of departure remains the same regardless of which direction you draw.
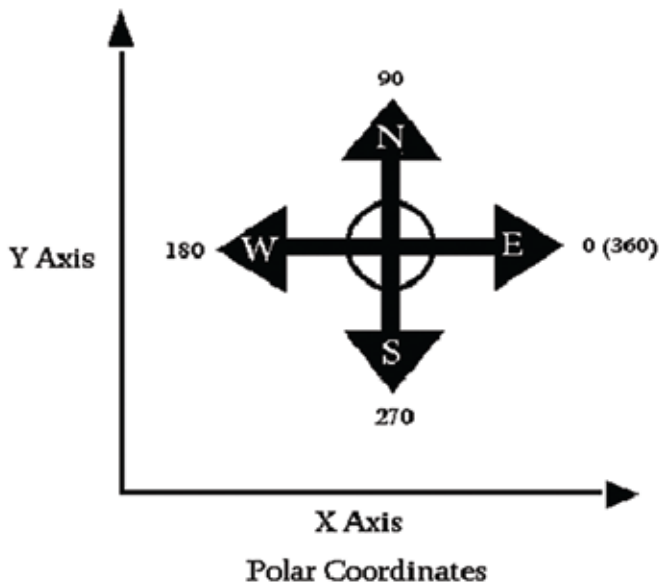
Figure 12.1

You will be drawing a floor plan of a small cabin. There are three floor plans to choose from. If you choose the version C, you will earn a C for this drawing. If you choose version B, you will earn a B, and if you choose version A you will earn an A. Every version builds on the last, with C being the most simple and version A the most complex. It is important to study the drawing you choose before beginning. This will give you an idea of what you need to accomplish.

Refer to the drawing often so that you know you are on track. Each step is necessary to construct the drawing shown in the following exercises. Follow each step carefully and watch how your computer responds to the different commands you give it.

Selecting the Settings

You will now select the settings for your drawing. It is important to select the settings before you begin drawing a floor plan, since you draw in actual dimensions.

1. **Select** the **Settings** menu, then **Drawing Settings**.

    •   A Drawing Settings dialog box appears.

    •   Choose the **Drawing Units** tab, and then "Linear Units" from the **Change Setting For** droplist, as shown in Figure 12.2.

Figure 12.2

2. Under the Unit Type heading, change to **Architectural**.

    •   The text in the preview rectangle changes from decimal to feet/inches/fractions.

    •   Architectural measurements of feet and inches are customarily used for floor plan drawings instead of decimals.

3. **Change the Display Precision to 3**.

- This sets the display accuracy of your drawing to 1/16th inch. While you can still specify values that are small, A+CAD will display the maximum accuracy to 1/16th inch.

4. **Pick** the **Coordinate Input** tab, then change Change Settings For to "Limits."
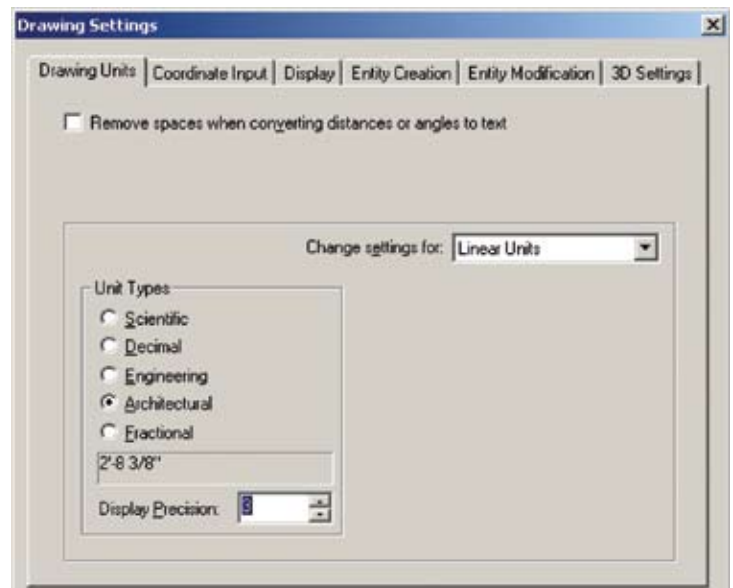
- The **Lower Left** is at 0,0. This is a very good place to draw from and we will not be changing that value.

- The upper right value needs to be changed. A common formula for determining the size of the drawing limits is to take the width of the drawing you are about to create, and add 50% additional space for dimensions, notes, details, etc.

- Since our cabin measures 34' x 24,' drawing width (X value) should be set for 34' + 17' or 51'. Our height or Y value should be 24' + 12' or 36'.

- To determine exact limits, we must first determine what size paper the drawing will be plotted on. In this case we will plot on 8.5" X 11" paper.

- Common scales used for architectural drawings are:

Scale			Scale Factor
½"	= 1'-0"	or	24
¼"	= 1'-0"	or	48
1/8"	= 1'-0"	or	96
1/16"	= 1'-0"	or	192

- **If we divide our X value**, 51' (612 inches) by the 11 inch paper width, we determine our scale factor is 96. (The scale factor of 48 is seemingly too small but let's check further.)

51'(object length) X **12" = 612"**
(total inches of object + 50%)

612" / 11" (paper length) = **55.6 or 56** (Scale factor)

Our necessary 56 exceeds 48; therefore, we need to move up to the next commonly used scale, which is 96.

- **If we divide our Y value**, 36' (432") by the 8.5 inch length, we determine our scale factor is 96. (Again scale factor of 48 seems too small so we jump to the next scale factor large enough to work and that is 96.)

36'(object length) X **12" = 432"** (total inches of object)

432"/ 8.5" (paper length) **= 50.82 or 51** (Scale factor)

Again 51 still exceeds the scale factor of 48, and we select 96. (The next available common scale.)

- The addition of 50% working area beyond the object size is only a guideline, however a scale factor of 96 is chosen to allow for the multiple dimensions that will need to be spaced quite a distance from the outline of the cabin.

- Our exact limits are then determined to be:

96 X 11" or **1056"** (88') -- X axis

96 X 8.5" or **816"** (68') -- Y axis

5. **Enter 88', 68'** to establish the upper right boundary limit. See Figure 12-3.
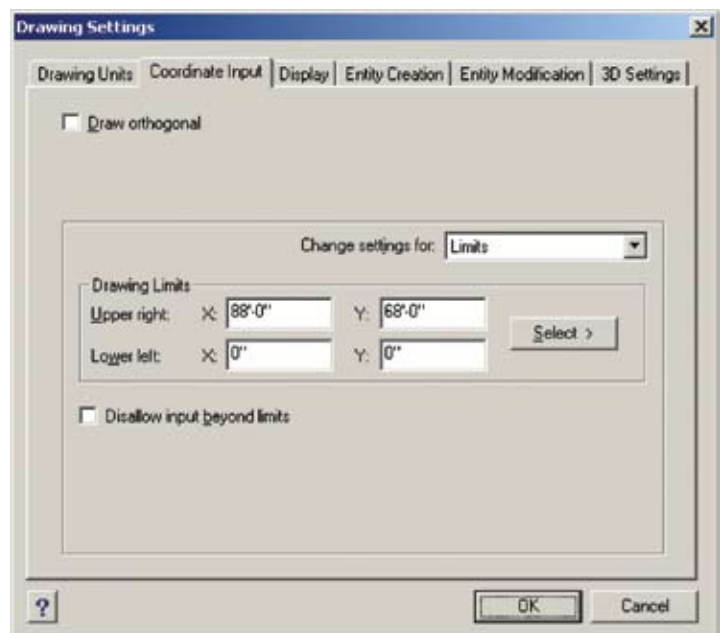

Figure 12-3

- You must add the apostrophe behind each number, and the comma must separate each number. Otherwise, the software reads the numbers as inches.

- Nothing appears to happen. We must tell the software to view the much larger drawing area before anything can be drawn.

- Note the numbers in the center of A+CAD's status bar. These are the x,y coordinates. Move your cursor around and watch as the numbers register the absolute values of the cursor. Move it to the far right and then to top right to see the maximum default sizes.

9. Pick the View menu, then Zoom, then All.

- The coordinates for the cursor location in the very right corner of your screen change. (Move your cursor around and note how large the numbers are now.)

- You should now have a large drawing screen and be ready to draw.

Drawing the Exterior Walls

Objective: You will now draw the exterior walls of your floor plan, using a combination of selecting points with the pointer and entering polar coordinates on the keyboard. Remember that it is important for you to look at the drawing that you have selected to ensure accuracy. If you make a mistake use Erase or Undo to fix it.

1. **Select Line** under the **Insert** menu, or pick the **Line** icon.

- You will now mark the starting point of the first line by positioning the pointer and clicking.

2. **Position the pointer** approximately 3 to 4 inches to the right of the origin along the X axis, and about 2 to 3 inches above the origin along the Y axis. Click the left mouse button.

- This marks the lower left corner of the Greatroom.

- You will now mark the ending point of your first line by entering the polar coordinates listed below.

3. **Type: @34'<0** then **tap** the **Enter** key. Be sure to use the apostrophe (') mark after 34. (The apostrophe tells the software you want feet, not inches.)

- The polar notation tells the software that you want to draw a line from your origin point 34' in the zero direction (East).

4. When the "End point" prompt displays at the command prompt, type: @24'<90 and tap the Enter key.

- This means you are drawing a line from an existing point 24' in the 90-degree direction (North).

- You are now ready to draw another horizontal line marking the northern side of bedroom #1 and the bathroom.

- Continue to go around the house adding the values listed below. If you should make an error, simply tap the Enter key to finish that line. You may then erase a wrong line. Using the entity snap "endpoint" you may restart from wherever you stopped. Use the coordinate values listed below to continue.

5. **Type: @34'<180** and tap the **Enter** key.

- Next we will close the outer rectangle to finish the perimeter of the cabin.

6. **Type: @24'<270** and tap the **Enter** key.

- This means you are drawing a line from an existing point 24' in the 270 degree polar direction (South).

- An alternate method for finishing out this exterior cabin boundary is to "close" after three of the lines are drawn. To activate the "close" command, simply type the letter "c", for close, to finish the cabin rectangle. (You cannot "close" the rectangle if you stopped and restarted while drawing the four lines.)

- The outline (exterior wall) of the cabin is now complete.

You are now finished with the exterior walls. Check Figure 12.3 to make sure that your drawing is correct. If you feel comfortable with the accuracy of your drawing, continue on to the next section.

Figure 12.3

Modifying the Exterior Walls

Objective: You will modify the exterior walls by giving them thickness. We will use the Offset and Fillet commands under the Modify menu.

1. If all of your exterior wall lines are not showing, **pick** the **View menu**, then **Zoom**, and All.

   • You will now add thickness to the walls by copying the exterior wall line segments.

2. **Pick** the **Modify menu**, then **Parallel**, or simply pick the Parallel icon.

   • The command prompt requests the distance that the second line should be placed from the first line.

3. **Type 6** and **tap** the **Enter** key.

   • This causes our interior wall line to be six inches in from the exterior walls.

   • The six inch setting is standard for log pole construction walls, although some cabins are built of thicker stock materials.
   • The command prompt now asks which line will be made parallel.

4. **Pick the line on the left**.

   • The command prompt now asks which side to place the parallel line.

• **Pick to the right** or inside of the rectangle.

• A line identical to the first is created six inches inside the exterior wall outline.

• **Continue** to go around all of the exterior walls **with** the **offset** command.

You should now have two complete outlines of the cabin. Unfortunately the interior lines overlap on the corners. We will fix those by means of the Fillet command.

1. **Pick the Modify menu**, then **Fillet**, or simply pick the Fillet icon.

   • The radius must be set on the Fillet command before it will be useful to us. For a sharp smooth corner, a radius of **0"** must be set.

2. **Type R** for radius, and tap Enter.

3. **Type 0**, and **tap** the **Enter** key.

4. The Fillet command asks you to "Select first entity."

5. **Pick near** but not on **the endpoint** of the first line that you want filleted.

   • The entity snap "endpoint" should now be turned off.

6. **Pick the second line** that should come to a sharp point -- near but not at the end of the line.

   • Notice the perfect right angle corner that has been formed.

   • If you're having trouble seeing or grabbing the correct lines, zoom in so you can see better.

7. **Select another corner** that needs to have the corners filleted. **Tap** the **Enter** key to reactivate the Fillet command filleting each corner.

8. Go around your drawing and fillet all of the interior lines. Continue until all the corners are no longer crossed or gapped.

You have now completed the second part of this drawing by modifying the exterior walls to signify wall thickness. (See Figure 12.4). If you feel comfortable with this then go on to the next section.
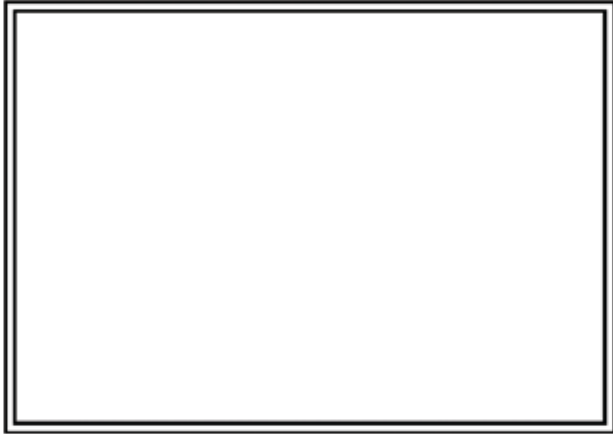

Figure 12.4

Drawing the Interior Walls

Objective: You will now draw the interior walls of the floor plan using the Line, Copy, Move, Parallel, and Dist commands under the Draw, Modify, and Edit menus. This exercise will teach you how to determine where your walls are placed by having the computer measure specified distances for you.

CONCEPT

There are two methods used for measuring. The Dist command reports the length of a line between two pick points without recording any information on the screen. The DimLinear command draws Horizontal or Vertical dimension lines, complete with extension lines, arrowheads and length of a line of the two points picked on the screen. The Dist command is located in the pull-down menu through Tools, Inquiry, Distance. To use the Dist command, pick two points to obtain the distance between them. This is much quicker to use than the official dimension command, because no entities are left on the drawing screen. All information is shown in the command prompt area.

To draw the interior walls it will be necessary for you to zoom into a designated area first. Draw the interior walls as similar as to Figure 12.5 as possible, so that your room sizes are approximately the same as the example. Inside walls should have a 4" thickness. Study the example often for accuracy.

1. **Reset the grid** to **4"**.

   • If a message appears, " The grid spacing is too small to display in this view," then zoom closer into an area you wish to work on. The grid should now become visible. You may use the **GRID button** shown at the very bottom of your monitor to toggle the grid off and on. (If the button is "gray," the grid is not active.)

   • Your wall lines will probably not align to the grid marks. That's alright, because we are using the grid for **approximate** values. (You'll want snap turned off.)

   • You can now begin by drawing in the interior lines of the bedroom #1.

2. Using the Dist command, **determine the approximate location of the first line**.

* At the command prompt, type in Dist and tap the Enter key, or use the pull-down menu Tools, Inquiry, and Distance.

   • Follow the command prompt and pick a second location.

   • The command prompt gives the distance between the two points you picked.

   • Remember we are using the DISTance command to obtain a general perspective of where the room lines should go. Once you have a general location, it is easiest to use polar coordinates to draw a line of exact length. Note the next two steps.

3. Starting from the inside of the exterior walls, and by using your esnaps and the polar command, **draw a line** of the length specified for the room size.

4. **Draw a second line** (from the inside of the exterior walls) at a perpendicular angle to the last line drawn.

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- This will allow you to obtain room sizes very close to those specified in the book.

- This procedure will require that you "break" some lines and trim out portions that you don't want, but drawing lines of the required length is an easy way of getting the room sizes established before adding more detail.

5. **Offset your wall lines** by 4" with the Parallel command to obtain thickness. Complete all interior walls.

6. To break lines so that doors, windows, hallways, etc. can be shown, it will be necessary to use the **Break** command and to cut out portions of lines where appropriate.

7. To break a line, we must **pick** the **Modify menu**, then **Break**, or pick the Break icon.

- The command prompt instructs us to pick the object to be broken. (Note the prompt, "Select entity to break.")

- **Pick the line to be broken**.

- The command prompt now asks us if the point we have picked is where we want it to be, or if we want to enter a new first point. It is generally best to type F and reselect the beginning point of the area we want cut out.

8. **Type F** and **tap** the **Enter** key.

9. Accurately **reselect the beginning point** of the area you want removed.

- The command prompt now instructs you to pick the second point, thus determining the amount of line to be removed.

10. **Pick the second point** and watch the line disappear between the two points you have picked.

11. Using the distance command, continue to go from room to room "breaking" lines for doors, windows, hallways, etc.

12. After you have broken the lines, it will be necessary to connect the parallel lines with a short junction line. If you complete this process properly, your drawing will look like the drawing in Figure 12.5

NOTE

It is important for you to check your drawing several times as you go along to make sure you are on track. The rooms don't have to measure exactly to the dimensions shown on the drawing at the end of the chapter, but they should
be close.

Hallways and walkways should be a minimum of 3'-0" wide, and today most rooms are built with 3'-0" doorways to meet the needs of the handicapped. Closets should have a 2'-0" minimum interior measurement. Kitchen counters are usually 2'-0" deep.

Figure 12.5

Once you have all the interior walls drawn, check figure 12.5 to make sure that they are correct; then go on to the next part. (If you're on a roll with the Break command, you may want to cut out areas for the windows at this time. Note Figure 12.6.)

Labeling the Rooms

Objective: This exercise deals with labeling each of the rooms with their name and size labels. You will be using the Text command under the Insert menu.

To type the text, it is easiest to zoom into a designated area first. After you have zoomed into a room, use the Text command to type the name and dimensions of the room.

1. **Pick** the **Insert** menu, then **Text**.

   • The command prompt will ask you to pick a start point.

2. **Pick a start point** that looks look a good place to locate the text.

   • The software now asks you for the height of the text. (The command prompt will probably show a default value of 1/4th inch.)

   • A proper size for the text must be determined. The default value was fine when we were creating and plotting drawings on an 11 x 8.5 inch sheet of paper. At that time our limits were set by default for 12 x 9 inches. Remember we reset our limits to 88' X 68.' If we used the text default size of 1/4th inch, our text would be so tiny most people would declare that the command had failed to work. Therefore, we must reset our text to a more reasonable size -- or at least a size proportional to the rest of the drawing.

   • If we assume we would like our text to be 1/8th inch when we plot our drawing on an 11" X 8.5" sheet of paper, we need to calculate our text size. If we multiply our desired text height (1/8 or .125) times our scale factor of 96, we obtain a value of 12. Twelve inch letters on a theoretical sheet of paper 88' wide seems much more reasonable.

3. **Enter a height value of l2**.

4. **Enter a rotation value of zero**.

5. **Type the appropriate label for the room**.

6. **Continue labeling** each room and entering the room sizes until your drawing looks like the drawing as illustrated in Figure 12.6.
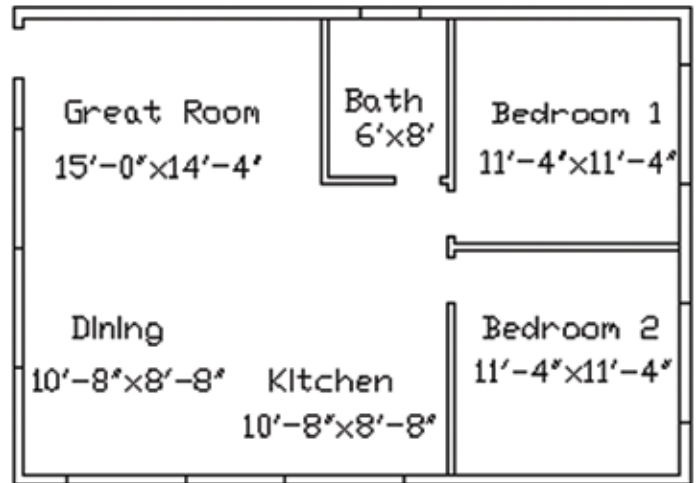

Figure 12.6
Setting Up the Drawing For Dimensioning

Before we can dimension our drawing, we must make many changes to the dimension settings due to the fact that our drawing is much larger than the defaults given automatically by the software. Remember how we had to set our text much larger than the 1/4" setting which the software gave us by default.

To begin making changes to the dimensioning settings, we must carefully follow the steps below. Such settings should be made before dimensioning every drawing.

1. **Pick** the **Settings menu**, then **Dimension Settings**.

   • A Dimension Settings dialog box appears.

   • The dialog box shown is the same one used when we dimensioned our second drawing, Draw2.

2. **Pick** the "**New**" button at the top.

   • A "New Dimension Style" dialog box appears.

   • Type in the name **CABIN**. Click **Create**.

3. **Pick the Arrows tab**, then **the down arrow**, in the lower right, in the "Starting Arrowhead" category.

   • A droplist appears with many options for the ends of the dimension lines.

4. **Pick "Architectural Tick."**

- Repeat for Ending Arrowhead.

- Note the default size setting of 1/4-inch, **change to 1/8- inch**.

- Now, just as we had to increase the ¼" inch text height, we must also increase the 1/8-inch "architectural tick" by a multiplying by our scale factor. (We will do this by adjustments to the Dimensioning Settings dialog box.)

5. Next **pick** the **Units** tab at the top of the of this same "Dimension Settings" dialog box.

- **Pick** the down arrow next Format, and select the word "**Architectural**."

- **Pick the down arrow** (right side of the white rectangle) in the **Decimal Places** droplist.

- Change it to 3 (1/8 inches).

- Note the scale of 1.000 in the rectangle "Comprehensive Scale Factor."

- Enter the value of 96.

- By entering the value of 96 in the overall scale window, we have multiplied all dimensioning default values by 96. Hence the architectural tick that was listed as 1/8th inch in size is now 96 X .125 or 12 inches in size.

6. Next **pick** the **Text tab** within this same dialog box.

- Note the "Text Alignment" area in the lower left corner of the dialog box.

- Pick the down arrow next to **Vertical**.

- **Pick** the "**Above Extension Lines**."

7. **Pick Save**.

- All of the settings that you have made in all of the tab boxes have been saved under the name of Cabin. If you had not entered a name and saved the settings under some name other than Standard, all default set-

tings would have been changed. The next time you or someone else used your software, the default settings would have been those that you established under the tab boxes. Soon you would not know what sizes or values were industry standards, and your dimensioning procedures can become complex and operate inconsistently.

- Next to Dimension Style (top left), notice that Cabin in now the current dimensions style.

8. **Pick OK.**

- The Dimension Settings dialog box disappears.

- You must pick Close as you leave the dimensioning dialog boxes. If you pick the cancel button, all values and settings that you have just made will be canceled and the default values will return.

- You should now be ready to begin dimensioning. Only one more setting to make.

9. **Activate "Endpoint"** option under entity snap settings.

Entering Dimensions

1. Select the **Insert** menu, pick **Dimension** and **Linear** or simply pick the Linear icon.

- The DimLinear command allows you to dimension horizontally or vertically without having to select separate settings. After you have picked the first point, the software senses whether to enter vertical or horizontal depending upon where you pick the second point.

- The command prompt will now ask you to pick the beginning of the dimension line. ("Origin of first extension line.")

2. **Pick the lower left corner** (outermost line) of Dining area.

- The command prompt will now ask you pick the "Origin of second extension line."

3. **Pick the innermost corner** of the Kitchen immediately to the right of Dining area.

- The software now waits for you to indicate where you want the dimension to be located.

4. **Drag your cursor down** until the location is similar to the one shown in Figure 12.7, then **pick**.

- A dimension should appear which looks very similar to the one in Figure 12.7.

5. **Pick** the **Insert** and **Dimension menus**, then **Continue**.

- The command prompt now requests a " Origin of second extension line."

6. **Pick the outermost line** at the lower right corner of the house.

- The software automatically enters the proper value of the new dimension, and places it directly to the right of the first dimension.

Continue dimensioning the remaining dimensions as shown in Figure 12.7.

You have now completed drawing C, which is worth 60 points. If you want to draw either drawing B (80 points) or A (100 points), study the drawing carefully and add the necessary features.
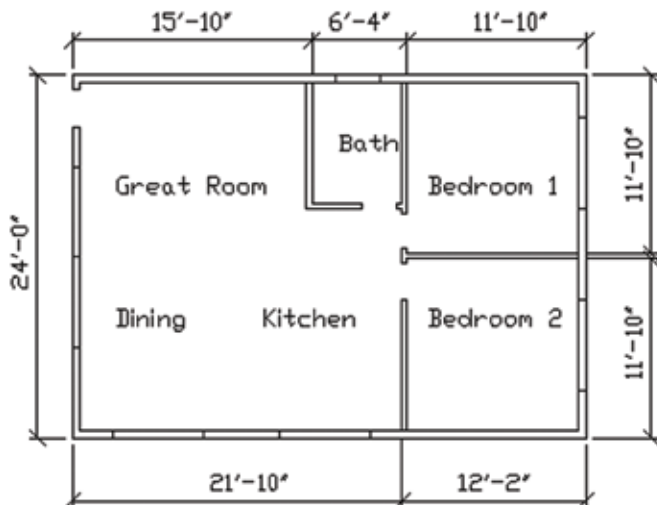

Figure 12.7

Saving and Printing The Floor plan

Objective: In this exercise you will save and print your drawing. You will be using the Save and Print commands under the File menu. The plotting exercise will be similar to that used for the Titleblock drawing. The main difference is that we plotted 1=1 for the Titleblock, and this time we must plot at a scale factor of 96=1.

If you plan to terminate your drawing at this point, **add a simple title box** that displays your name and student identification number and make a hard copy to submit for grading. Instructions for plotting this scaled drawing are listed below. If you plan to continue on for a grade of B or A, save your drawing and continue on to the "B" drawing instructions.

1. **Save** this drawing as CabinC.

- You will now print your drawing. Since you drew this in architectural scale and to true size, you must set the plotting area in accordance with the size of your drawing.

2. **Type Zoom**, then **E for "extents."**

- We will prepare this drawing for plotting in the same manner that we have prepared all other drawings.

3. **Activate the Print command**. When the plot dialog box appears, make the following settings.

4. Click **Print** Setup.

- Next to **Name**, select "**HP Laser III**" (or another plotter your instructor has made available.)

- Ensure **Orientation** is set to "Landscape."

- Under **Paper**, select "**Letter**."

5. Click **OK**.

6. Under the **Advanced** tab, under **Print Style Table**, select "icad.ctb" or any other print style table (pen assignment) you want.

- Under **Print Offset**, select the "**Center on Page**" box.

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7. Under the **Scale/View** tab, under **Print Area**: select "**Extents**"

   • Under **Print Scale**:, change the droplist from "Scale to Fit" to "Custom."

      a. The Printed Units shows a value of 1". This entry is correct.

      b. The Drawing Units must be changed to our scale factor value of 96". Change the Drawing Units to 96. (This establishes a value of 1" of plotting paper space equals 96 units of drawing area.)

8. Perform a "**Print Preview**" to determine how your drawing will appear.

   • Pick **Print** to actually start the plotter.

9. Turn in CabinC to be graded or go on to the next section for a higher grade.

Drawing B & A -- Continuing On

To receive a B (80 points) or an A (100 points) for this drawing, you will need to add to CabinC. Study the B drawing. You will be using many of the skills you have already learned. You will be adding some labels and new areas (i.e. linetypes, solid fill, etc.) as shown in Figure 12.10.
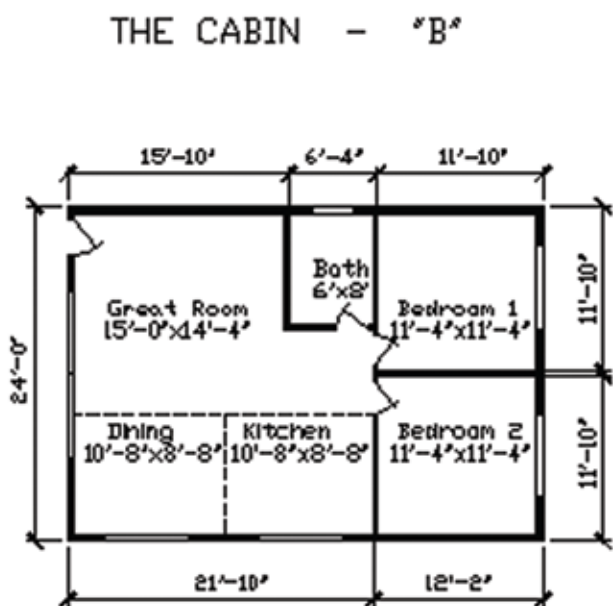
THE CABIN — "B"

Figure 12.10

Creating Solid Walls between the Doors and Windows

Objective: In this exercise you will fill in the walls, creating doors and windows. You will be using the Hatch command under the Insert menu.

HELPFUL HINT

After you have drawn exterior and interior walls, you fill them in to denote solid walls. You will use lines to close off the areas where there are doors and windows. You will leave open (unfilled) areas for doors and windows to denote areas that can be opened or closed. Before an area can be hatched (filled with lines or solid coloring) the area must be completely closed. Lines MUST be drawn using the entity snap settings to prevent leakage of the hatch pattern. The area to be hatched must be completely sealed like a container that holds water; the tiniest gap will prevent the hatch (fill) function from working. Study Figure 12.10 carefully for the placement of doors and windows, then make sure that each area of wall between the doors and/or windows is completely sealed. Zoom in very closely to check each area if necessary. Exterior lines will need to be broken (use the Break command) in order to create separate containers for the walls in order for the Hatch command to work.

---

1. Examine Figure 12.10 to determine the areas where the doors and windows are to be placed. Draw lines for the sides of the openings making sure the lines touch the wall lines. (You should have this completed by now.)

2. **Zoom into the lower left corner of Bedroom #2**. (When zooming, zoom by window and place the window slightly to the left of the bedroom window. The other corner of the zoom window should go just below the lower window and only a small amount to the right of the left corner of the window.

   • Zooming this small area will enlarge the lower left corner of the drawing so much that you should be able to see if there are any gaps in the lines. If any gaps exist, you must close the gaps using the endpoint setting of Object Snaps, or redraw the entire line. All intersections must close perfectly. (You may be able to use the Extend command under the Modify menu.)

3. If the L shaped wall segment appears to be "water tight," **pick** the **Insert** menu, then **Hatch**, or simply pick the hatch icon.

- The Boundary Hatch dialog box appears.

4. **Pick** the "**Pattern**" tab.

- The Pattern tab lists the names of all available hatch patterns shown on the left, and pictures of the patterns shown on the right.

5. **Pick** the "**Solid**" pattern, then **pick the Boundary tab**.

6. **Pick** the "**Select Area**" button.

- The command prompt now asks you to select a point inside the area you want to become solid.

7. **Pick a point inside the area to be hatched**.

- The boundary lines become dashed.

- If A+CAD reports that "The area you selected is not valid," it generally means your intersections are not gap free. An option that sometimes works when the "pick points" function won't, is the "Select Entities" button. Pick the Select Entities button and then pick each individual line of the area to be hatched. (If a window will work when selecting the lines, go for it!)

8. **Tap** the **Enter** key.

- The Boundary Hatch dialog box reappears.

9. **Pick** the **OK** button.

- Your drawing screen returns with the solid fill hatch pattern in the defined area.

10. **Zoom to another area** to be filled and practice steps 3 - 11 again.

- Continue to fill the exterior walls, leaving room for windows and doors. Continue with each area of the drawing until your drawing looks like the drawing

shown in Figure 12.10.

- It's very important to leave openings for the windows and doors before pattern filling an area because you cannot come back later and erase an area for a door or window without erasing the total pattern fill.

11. **Fill in all the walls**.

12. Save your drawing as **CabinB**.

Below are some additional commands you will need to know for Drawings B (Figure 12.10) and A (Figure 12.11):

Add the dashed lines as shown in the drawing. The instructions for setting the software to dashed lines is illustrated below.

Line Type Scale:

If your linetype appears to be a solid line, you must change the linetype scale. To change your linetype scale, simply type in LtScale.

Copy Command:

Remember, when having to make several objects the same, use the copy command under the **Modify** menu.

Rotate Command:
Once an object is drawn and grouped (made into a block), it can be rotated. You should be quite comfortable with command after the Schematics drawing.

Break Command:

If you want to move an object over an area already drawn, you can erase whatever is under the new drawing by using the **Break** command found under the **Modify** menu. Turn off the snap command. Select the line, box, etc. you wish to erase part of by clicking on it. Click at the first point you wish to erase. Click at the end of the area you want to erase. It will be gone.

To receive a B (80 points) or an A (100 points), you must make the drawing look similar to the drawing selected. (Drawing 6B or 6A) The drawing does not have to be exact, but it must be very close to the drawings as shown. Experiment with the commands as you continue; this is a good way to learn the program.

If you decide to go on for the "A" grade you will need to do some additional drawing and add additional dimensions to your drawing. Both the B and A drawings require that you insert your title box drawing (created as Draw4) into your Cabin drawing. You must finish the "Inserting a Title Box" if you want a "B" grade. Note the following steps.
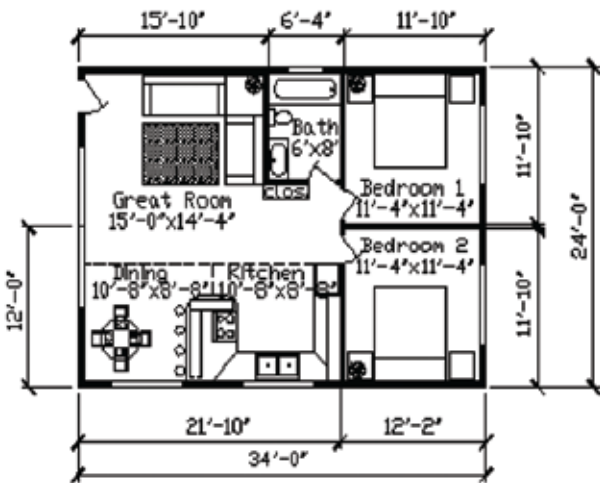

Figure 12.11

Inserting a Title Box

Title blocks are usually plotted from paper space. You must therefore, use the same settings or preparations that we used when we prepared for Plotting Drawing Four (Chapter Seven). Listed below are the procedural steps you need to plot the house drawing using Paper Space. If you need additional detail or explanation, please refer back to the chapter on "Plotting to A Precise Scale."

1. **Pick** the **VIEW** menu, **then Zoom, Extents**.

   • The display will zoom out showing your house at the largest possible size.

2. Pick the "**Layout 1**" tab, as shown in Figure 12.12.

• Notice that the screen goes blank. Don't worry! We'll bring back your drawing soon.

Figure 12.12

3. From the **Insert** menu, choose **Insert Block**. We are going to insert a title block from the drawing you created in an earlier chapter.

   • Click **From File**, and then click **Browse**.

   • In the Insert Block dialog box, choose the folder that stores your drawings.

   • Select "Draw2-Border.dwg," and then click **Open**.

4. Back in the first dialog box, turn off the **Position Block When Inserting** option, because the default values of the options are just fine. We want the drawing to be inserted full-size, because it fits standard 8.5 x 11" paper just fine.

   • Leave **Insertion Point** at 0,0,0.

   • Leave **Scale Factor** at 1, 1, and 1.

   • Leave **Rotation Angle** at 0.

5. Turn on the option **Explode Block Upon Insertion**, so that it can be edited. See Figure 12.13.
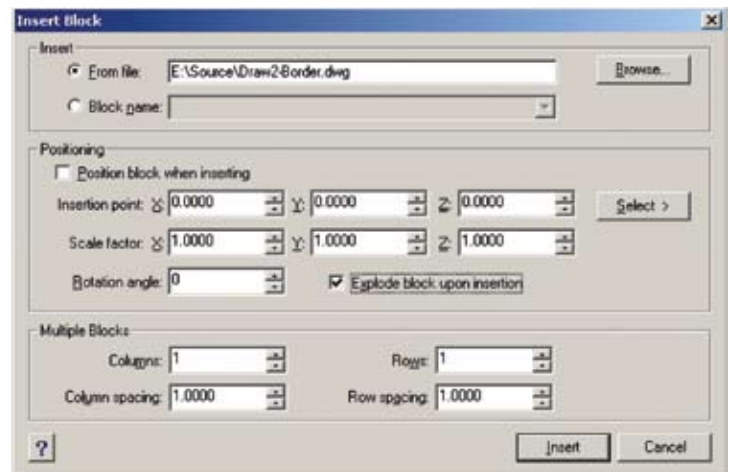

Figure 12.13

6. Click **OK**. The title block is inserted in the drawing.

    • Zoom the drawing so that the title block fills the window.

7. The next step is to create a viewport. This lets us see the cabin drawing inside the title block. First, though, thaw layer VpLayer (short for "viewport layer"), and then make it current.

    • On the Entity Properties toolbar, click the down arrow next to the layer names.

    • Next to Vplayer, click the snowflake icon. It turns to a sun icon. This thaws the frozen layer and makes it visible. See Figure 12.14.

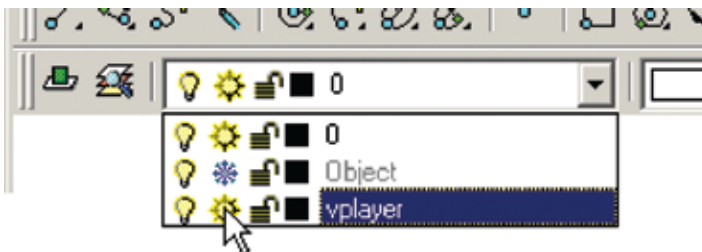   • Select the layer name. The Vplayer layer is now current.

Figure 12.14

8. To create the viewport, choose **View** and then **Layout Viewports**.

    • The software prompt you, "First point." Pick a point in the upper left corner, inside the drawing border.

    • The next prompt is, "Opposite corner." Pick a point in the lower right corner, also inside the border. See Figure 12.15. The cabin reappears!
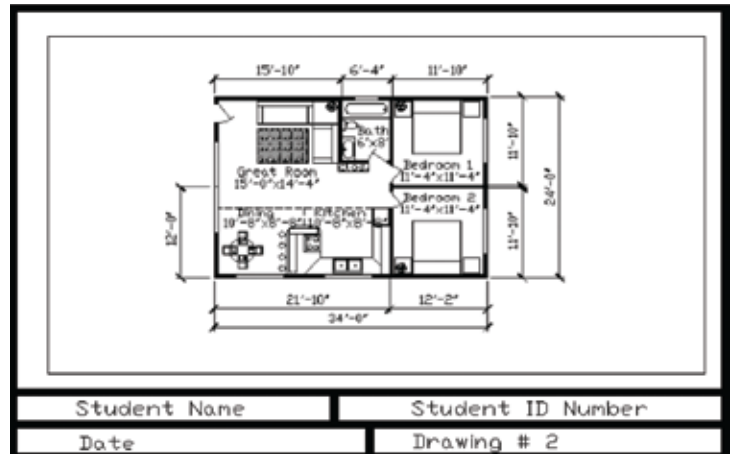

Figure 12.15

9. To make the viewport border go away, make layer 0 current, and then freeze layer Vplayer.

10. Return to model space inside of paper space" by double-clicking **P:Layout1** on the status bar.

11. **Zoom to 1/96XP**.

    • Your cabin drawing is now properly scaled inside your title block drawing.

    • If necessary, move your drawing so that it is equally margined. Use the arrow keys on your keyboard to move the drawing. Moving the drawing once it is properly scaled will not affect the accuracy of the drawing.

11. Return to paper space by double-clicking **M:Layout1** on the status bar.

    • Remember that you must plot from paper space if you want to plot accurately

CHAPTER 12 ASSIGNMENT

Once you have added all the necessary items, save the drawing as either Draw6A or Draw6B.

Make certain that your name, personal identification number, etc. is on your drawing and submit it for grading.

Label the drawing with the grade expectation you attempted.

See drawings C, B, and A. Make your drawing look like one of these drawings.

CONGRATULATIONS! You have just completed the course requirements for this Computer Aided Drafting/Design course - Introduction to Computer Aided Drafting.

At this time you should:

1. Be confident that you can construct a drawing of your own design, without help from a procedure manual.

2. Be knowledgeable of A+CAD software.

If you are not confident in the items listed above, review and repeat those areas that have given you trouble or concern.

If you wish to continue drafting on the computer, please inquire about other computer-aided drafting courses that are offered by The CAD Academy.

Any comments you have will be gratefully accepted. They will help improve the book for those who follow you.