

**Class #1 Lab:**  
**Basic CAD Skills & Standards**

1230- Building Tech II  
NYC College of Technology  
Professor: Daniel Friedman AIA LEED AP  
Fall 2012

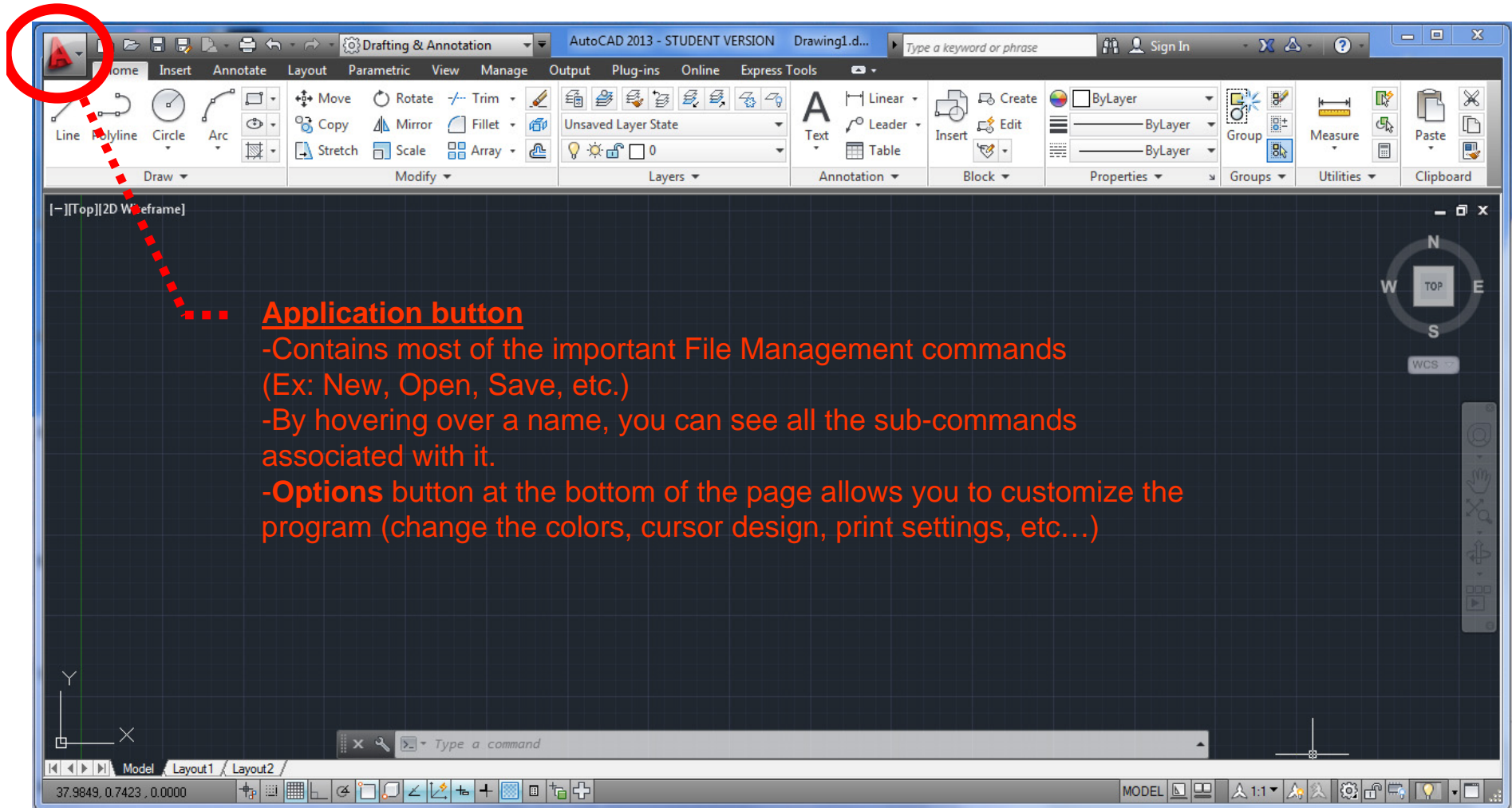
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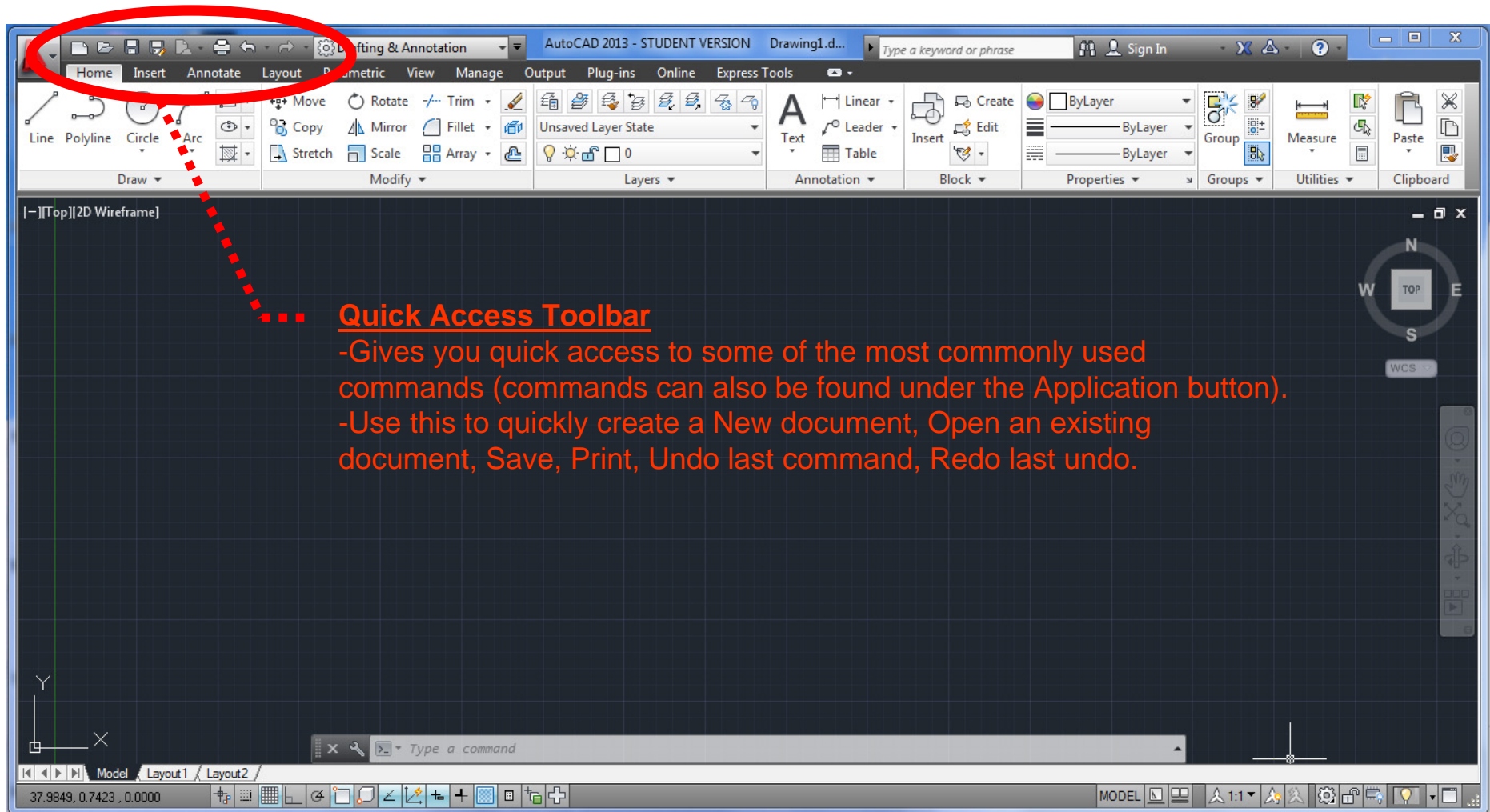
Basic AutoCAD Interface

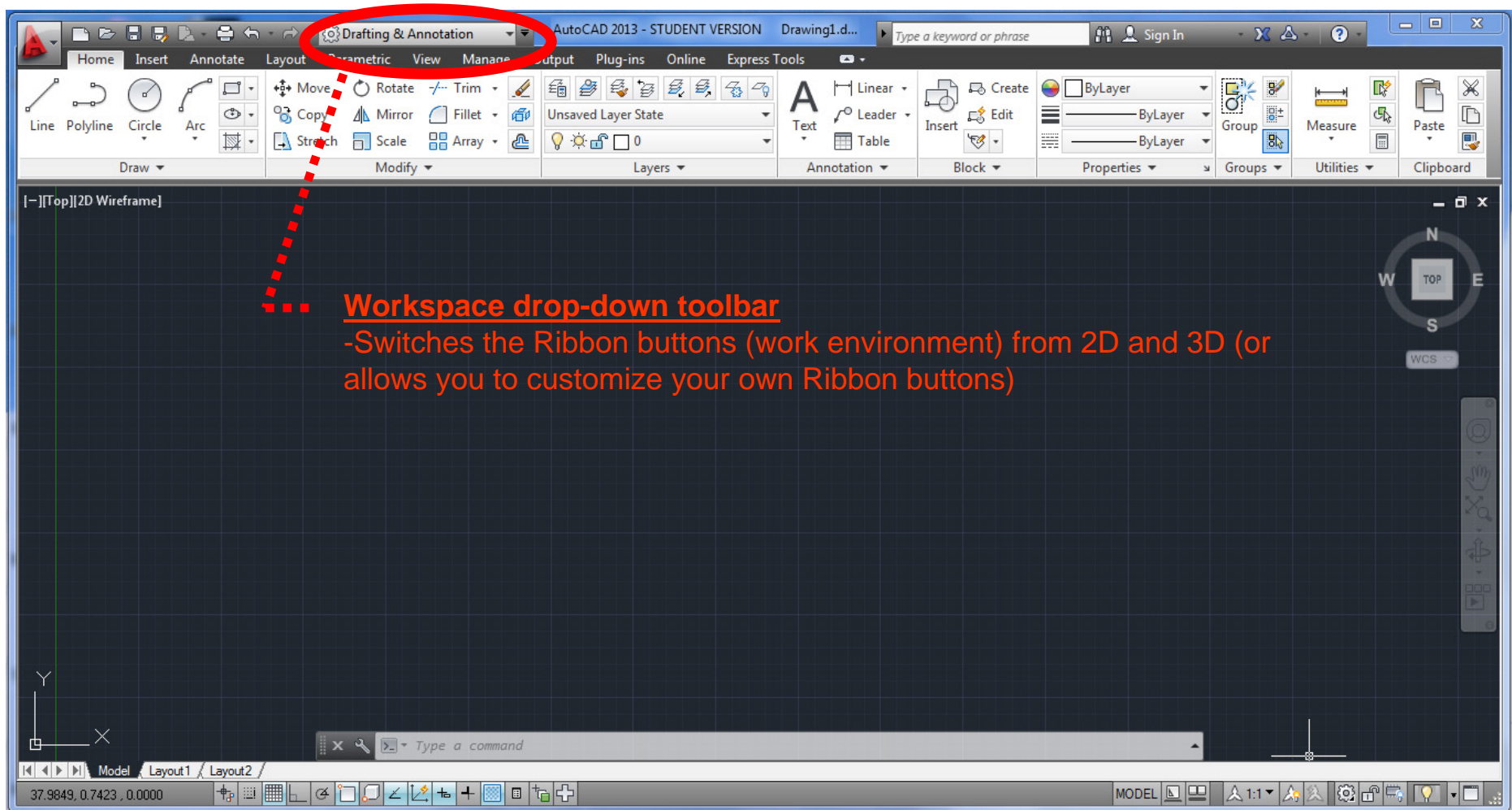
AutoCAD Skills

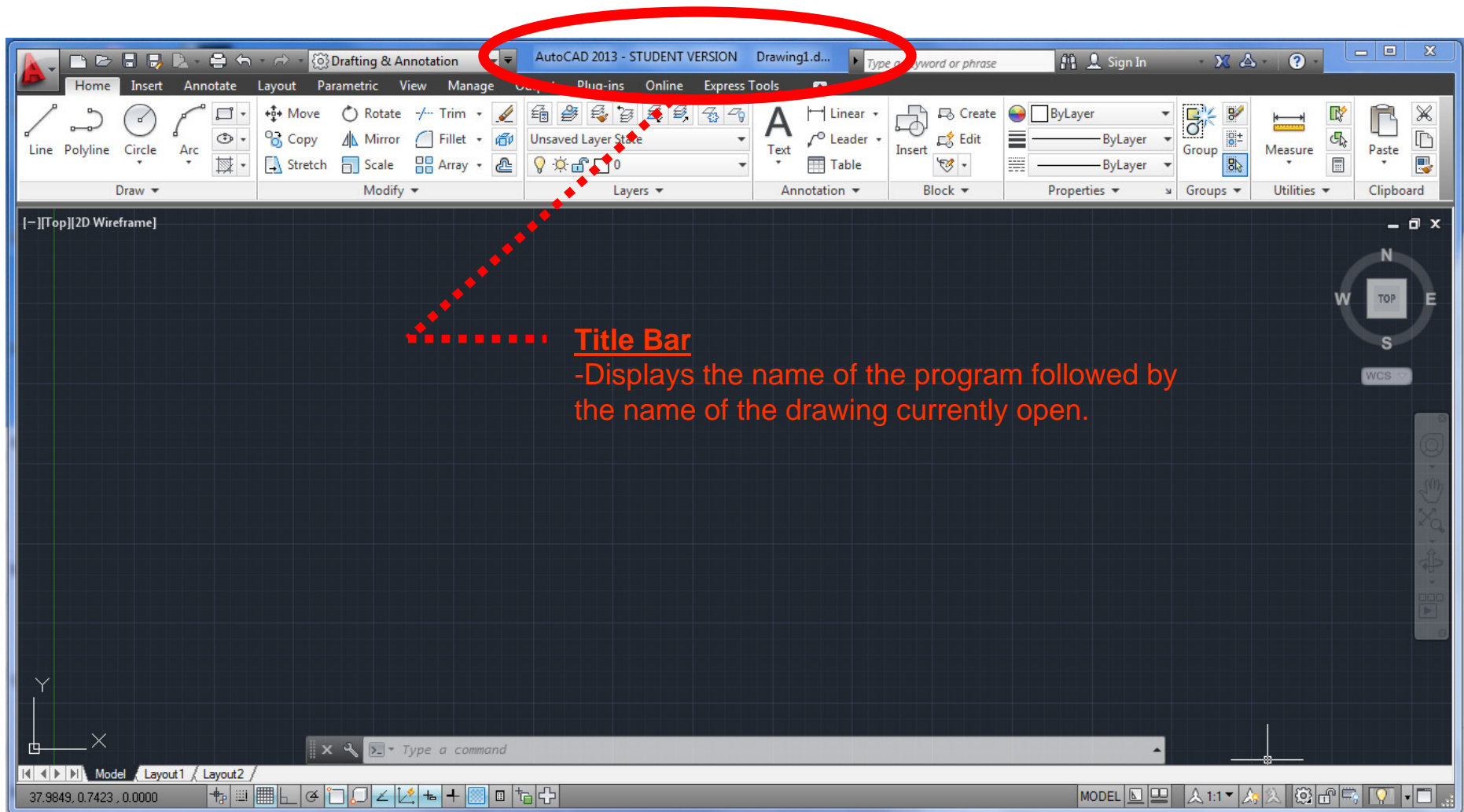
AutoCAD Standards

## Basic AutoCAD Interface

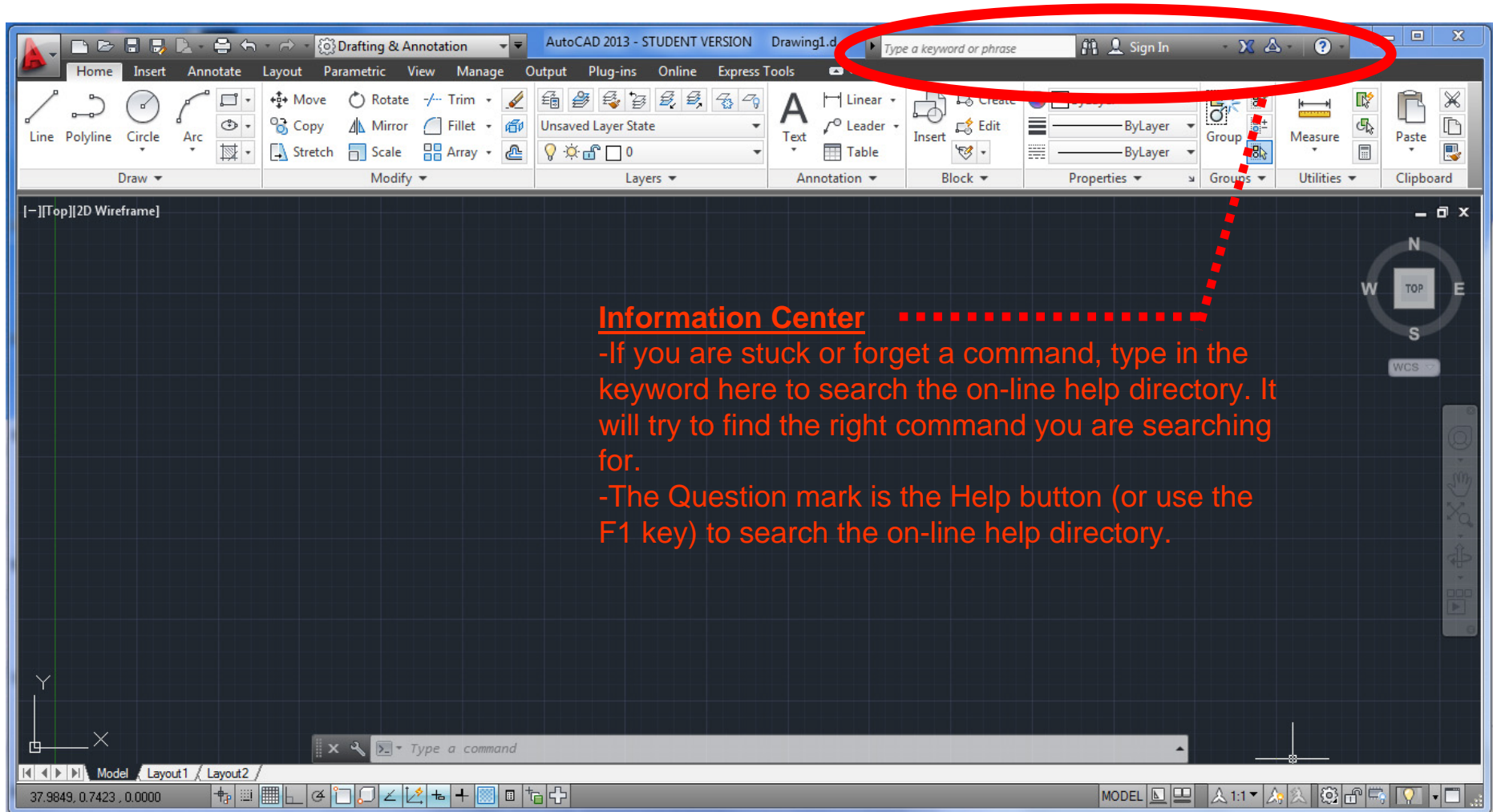


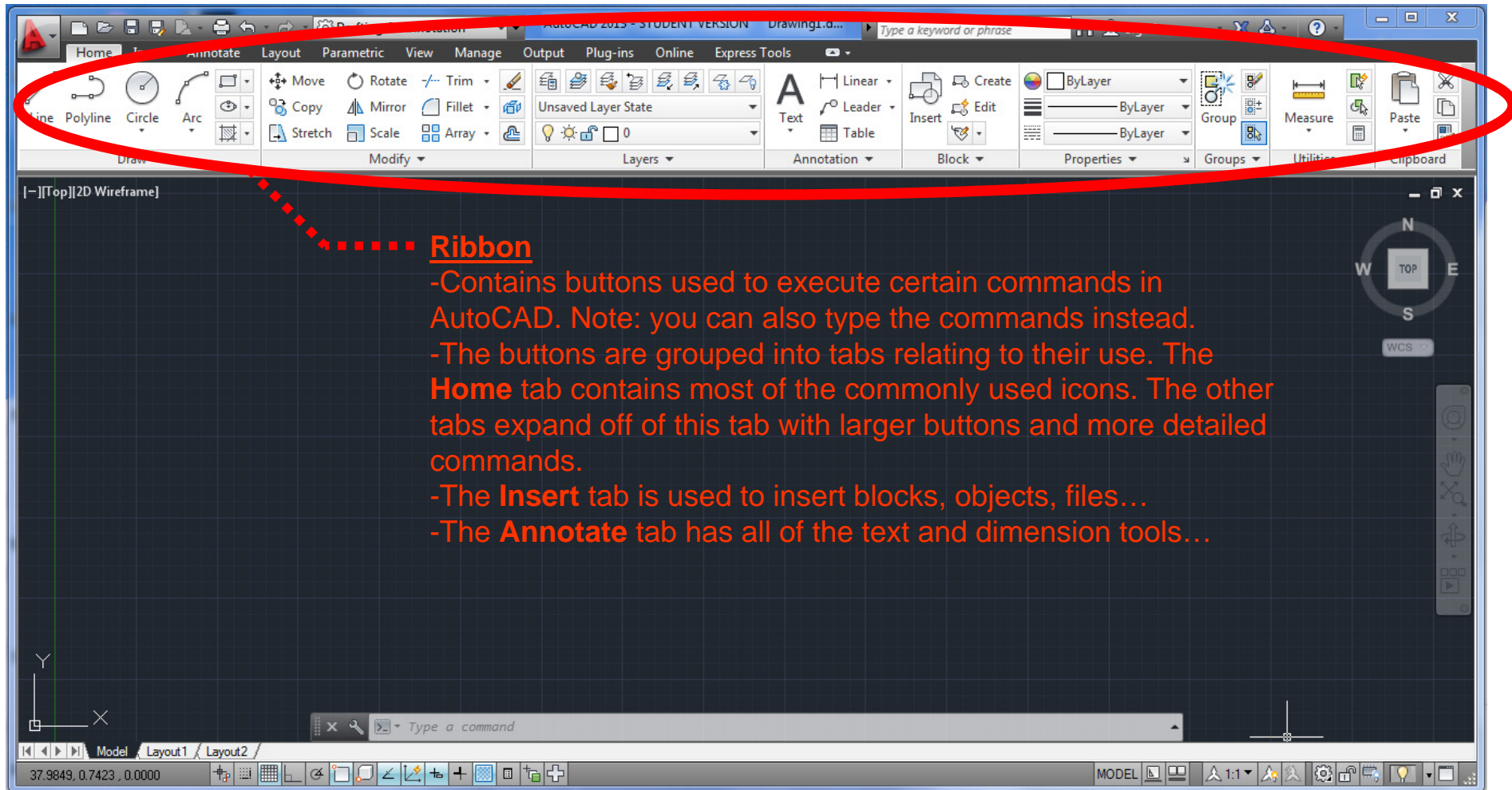




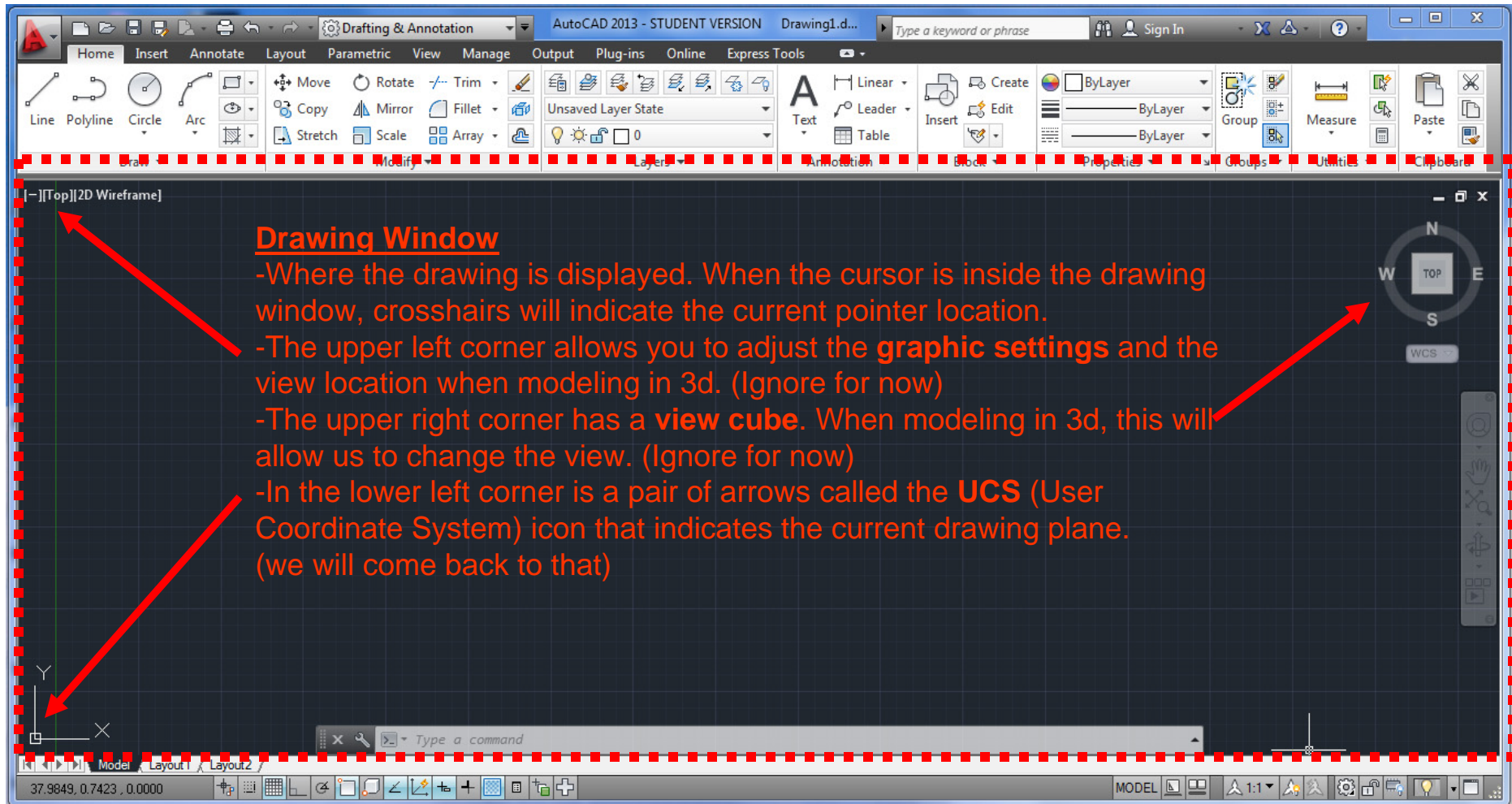




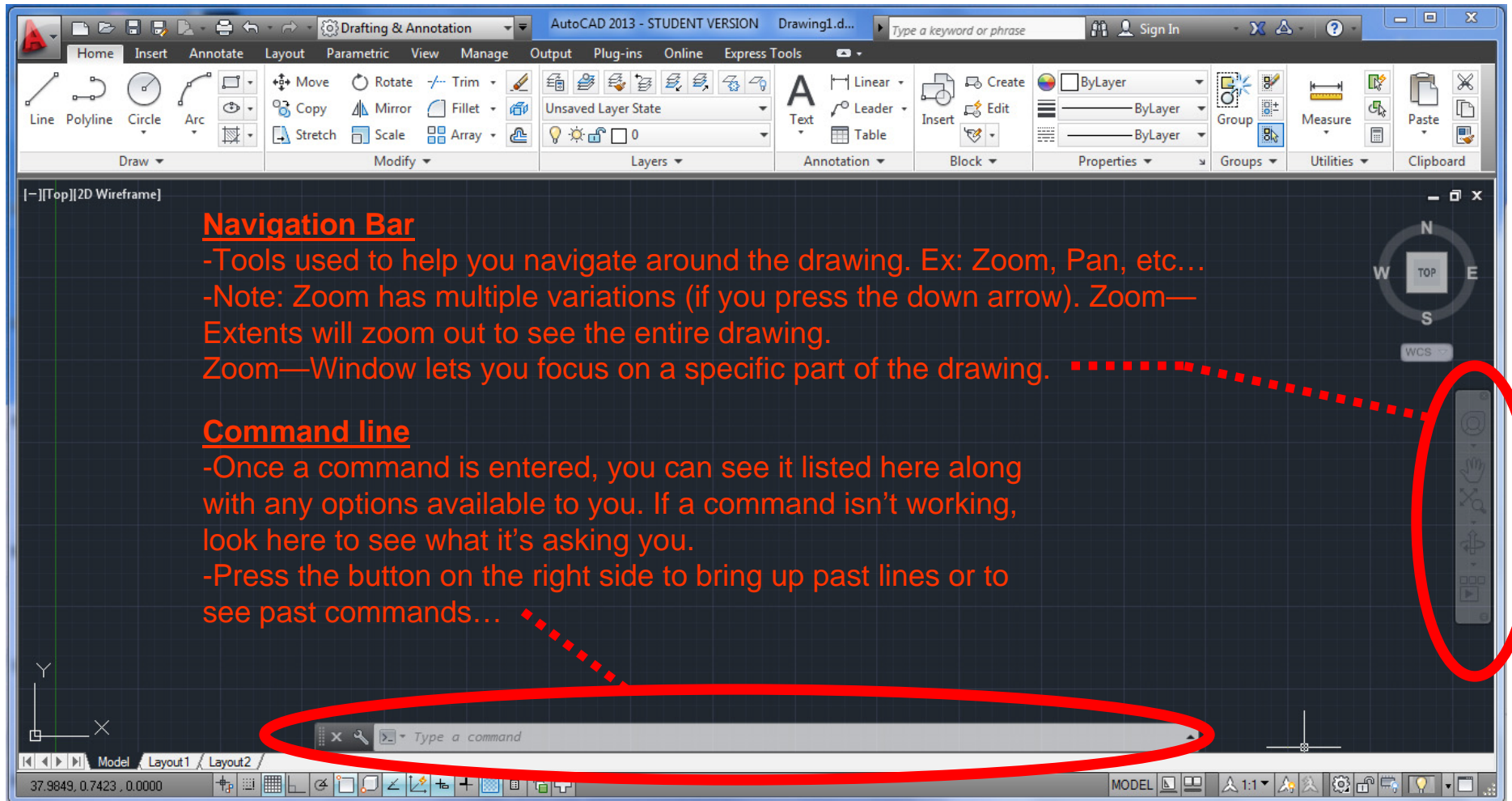


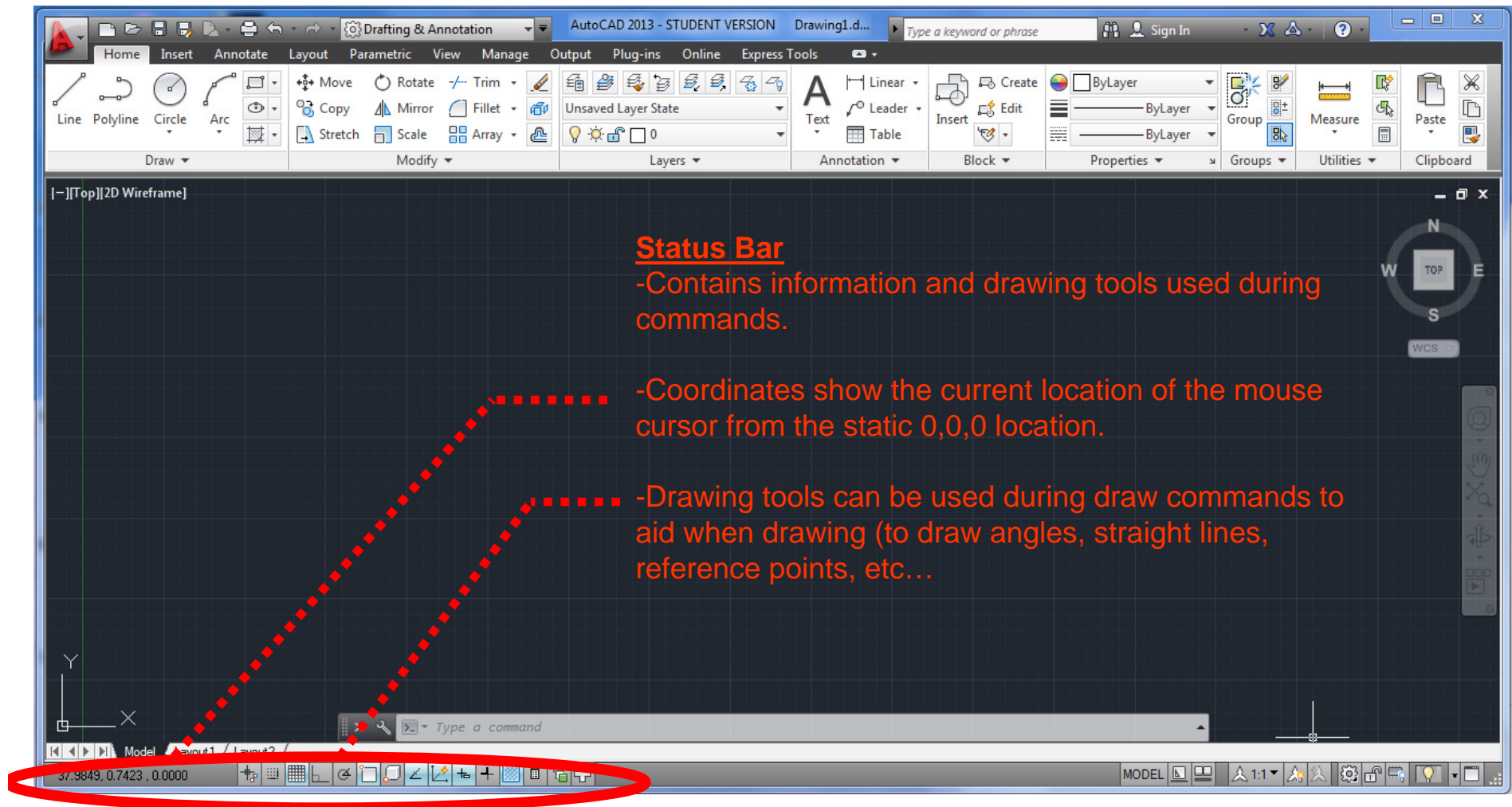


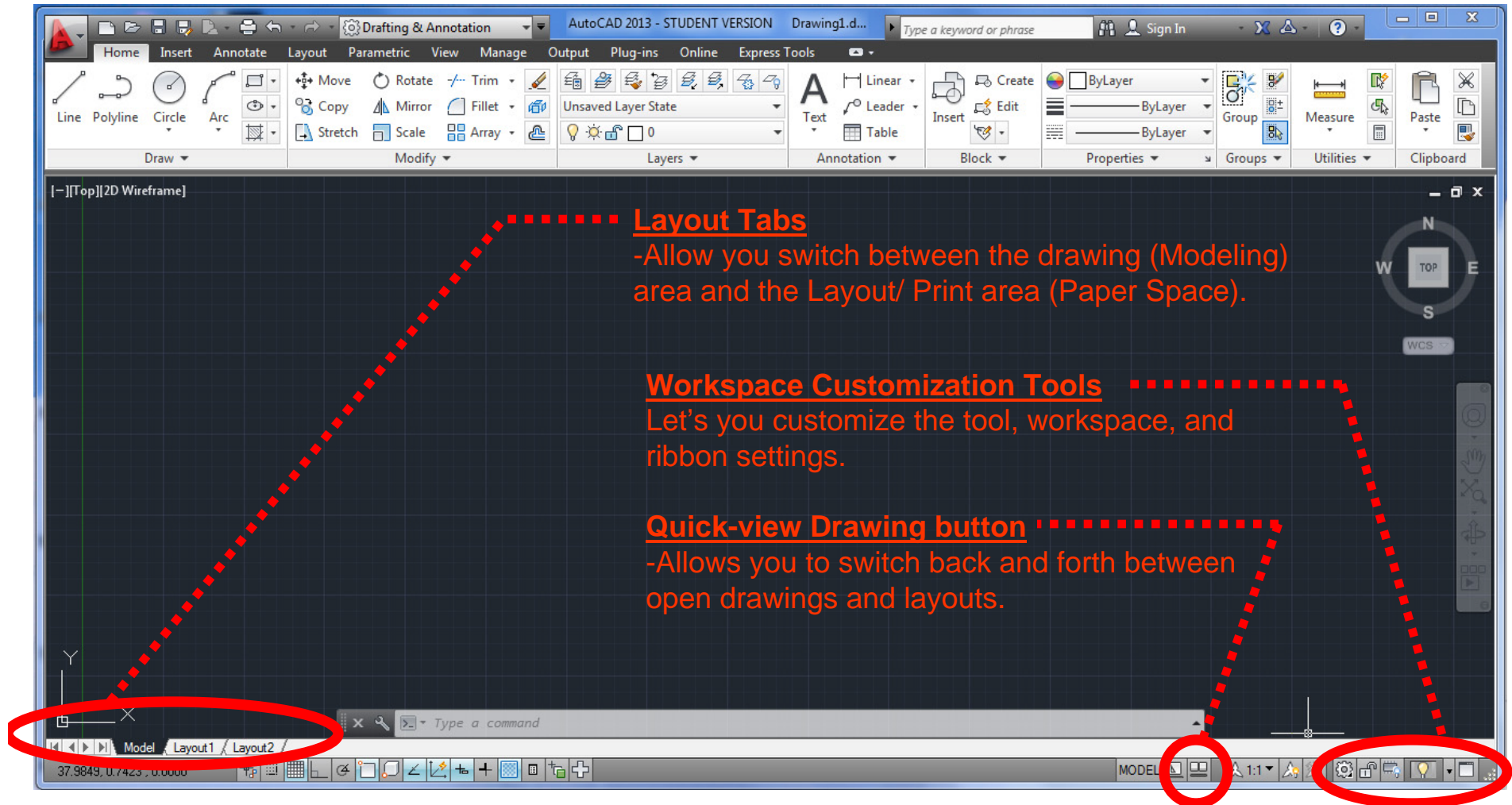
Note: By holding your mouse over a button for a second, a tool-tip will appear showing you what the button does...





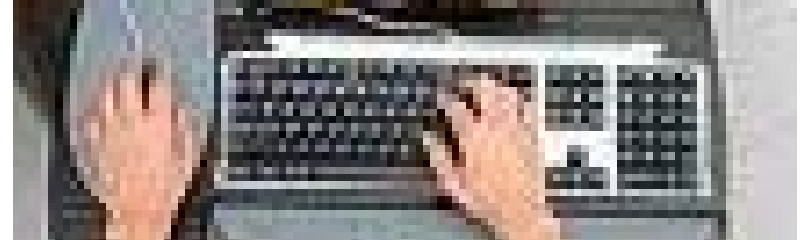






**Keyboard Notes:**

- Body posture- One hand on the keyboard, the other on the mouse.
  - The **space-bar** performs the same function as the Enter key (to start and end commands).
  - The **Escape** key is used to exit a command and return to the blank command prompt...
- Note: You may have to hit it more than once (if you are currently in a subcommand).

**Mouse:**

- Left mouse button- picks commands, points to objects on screen, and selects objects or tools.
- Right mouse button- brings up a **shortcut menu** with commonly used commands (Repeat, undo, redo, pan, zoom, etc...)
- Mouse wheel- roll up to **zoom in**, roll back/down to **zoom out**.
- Middle mouse button- (Wheel button) Hold down to **pan** around the screen.





**File Management:**

-Use the Application button to access the New, Open, Save, Print, and Close buttons.

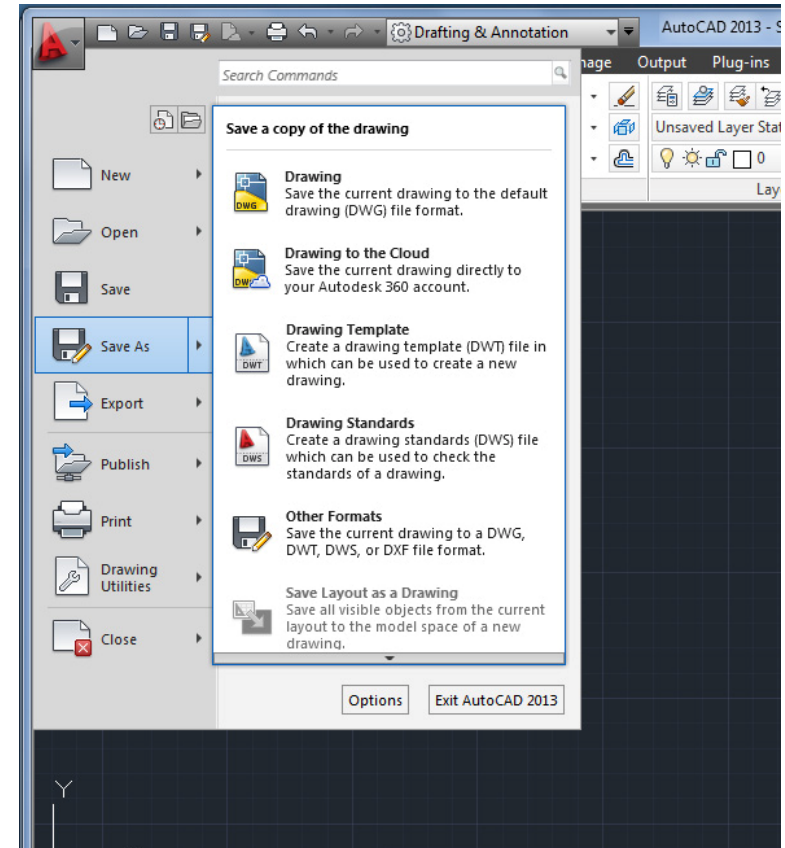
-**New**- use to open a new drawing or type “NEW”.  
A window will open asking you to select a template. Select “acad” template (the default selection) and click Open.

-**Open**- use to open an existing drawing (or type “OPEN”).  
A “Select file” window will open. Select the file you want to open and click Open.

-**Save As**- use to save a file for the first time/ before it has been named or to save the drawing under a new name/file (or type “SAVE AS”). A window will appear asking you for a file name and a location (where you want the file to be saved).

-**Save**- (also known as Quick Save) use to save a file that you’ve already named/ saved before (or type “SAVE”). If you haven’t saved the file before, then it defaults to “Save As”.

-**Close**- use to close a file that is currently open (or type “CLOSE”). If the drawing has changed since it was last saved, then it will ask you to “Save changes to the drawing?” before it closes...





**Cartesian Workspace:**

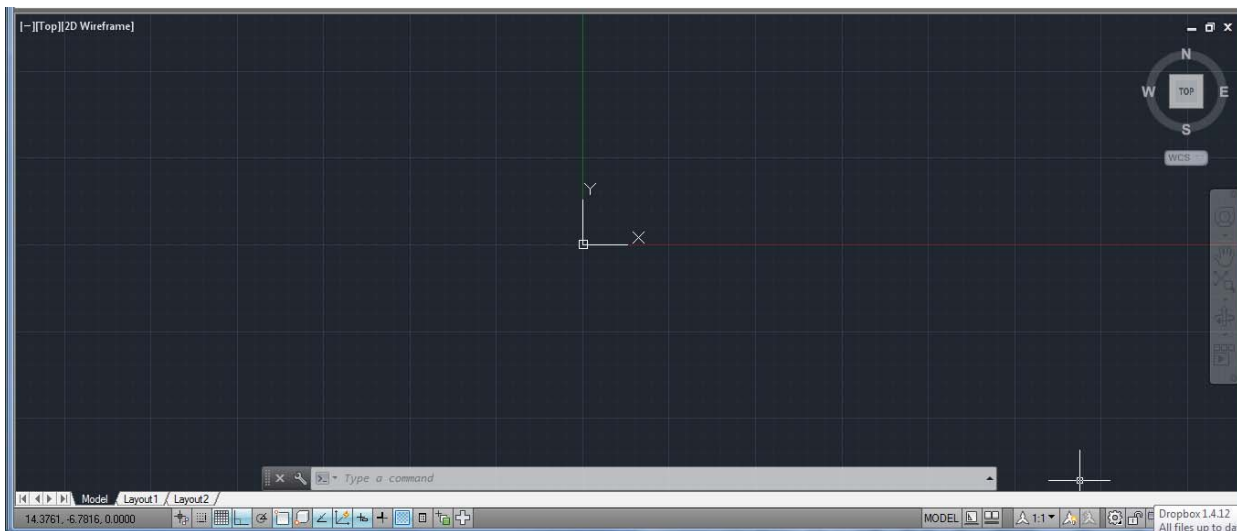
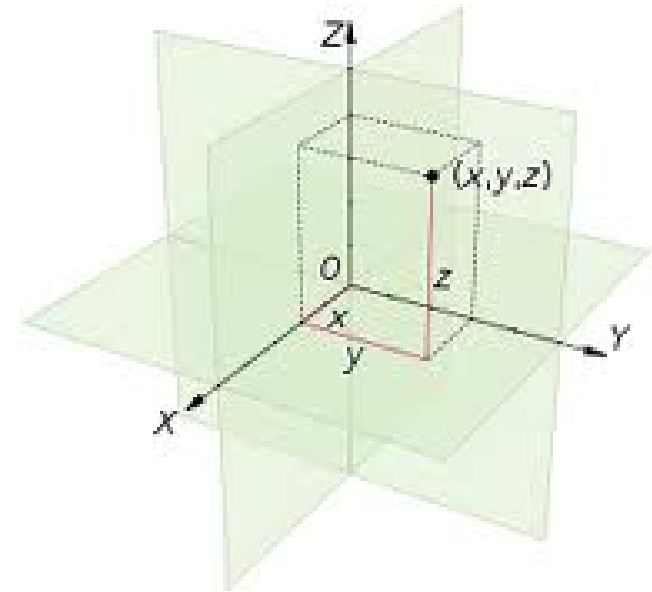
-AutoCAD is a drawing program organized along the “Cartesian coordinate system”. Space is organized among a **3 axis grid** specified **X,Y, and Z**. All points can be described by its position on this grid.

-The UCS (User Coordinate System) button in the lower left corner shows the direction of the X axis and the Y axis. Everything we draw in 2D is taken off of the XY axis.

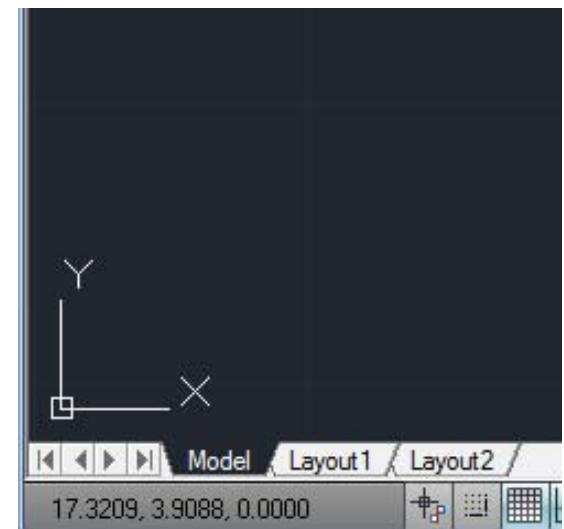
-In AutoCAD, you can zoom in to detail a nail in the floor or out to the scale of a city...

There is **only 1 fixed point** in AutoCAD space (0,0,0).

When the point is on the screen it is represented by the UCS icon.



Basic AutoCAD Interface

**AutoCAD Skills**

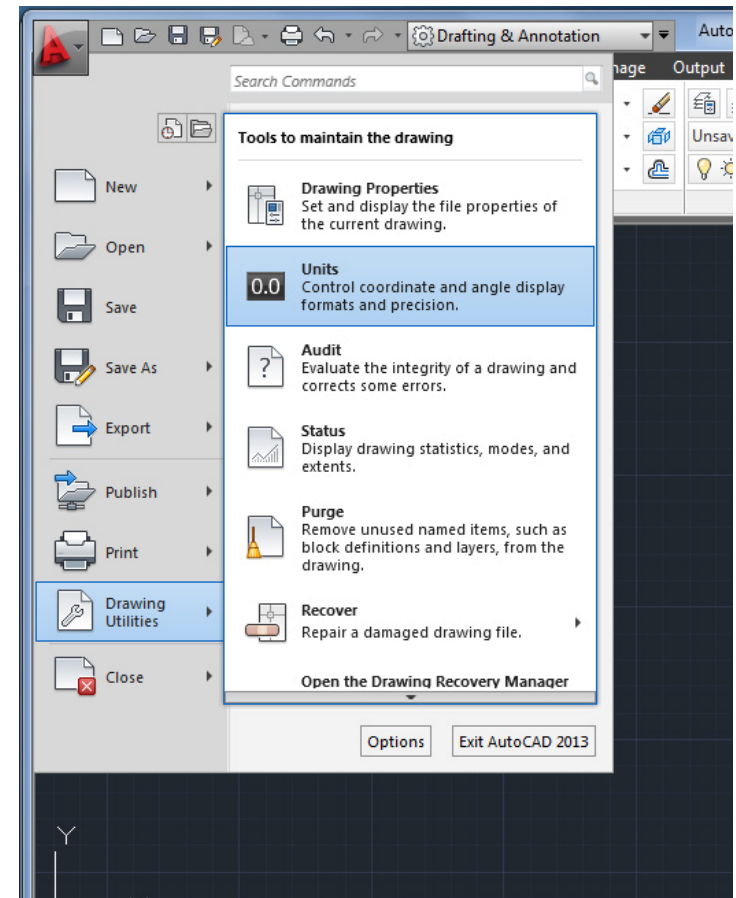
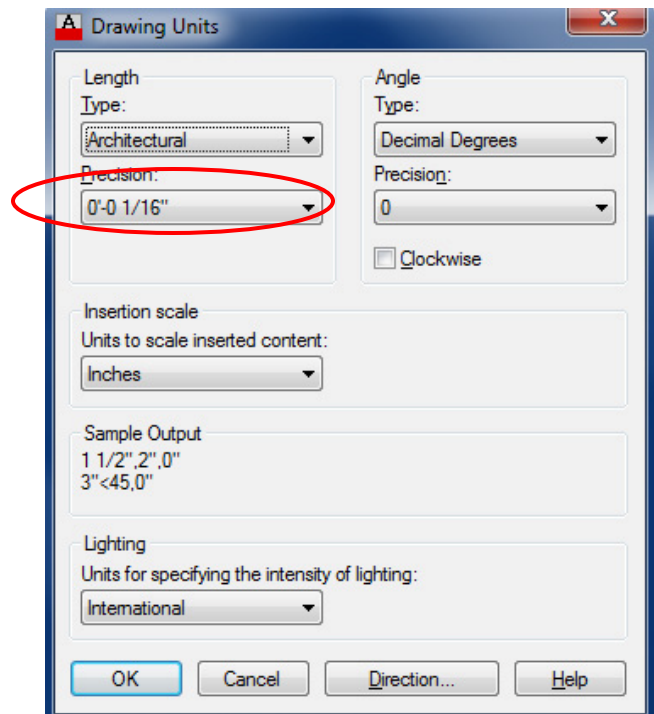
AutoCAD Standards

**Units:**

-The **first step when opening a drawing** is to **change the Units**. The default units are set to decimal and must be changed to feet/inches.

-Type **"UNITS"** <Enter> to bring up the prompt (or go to the Application Button and under Drawing Utilities is a Units button).

-**Change Length: Type to Architectural.** Leave everything else alone. OK



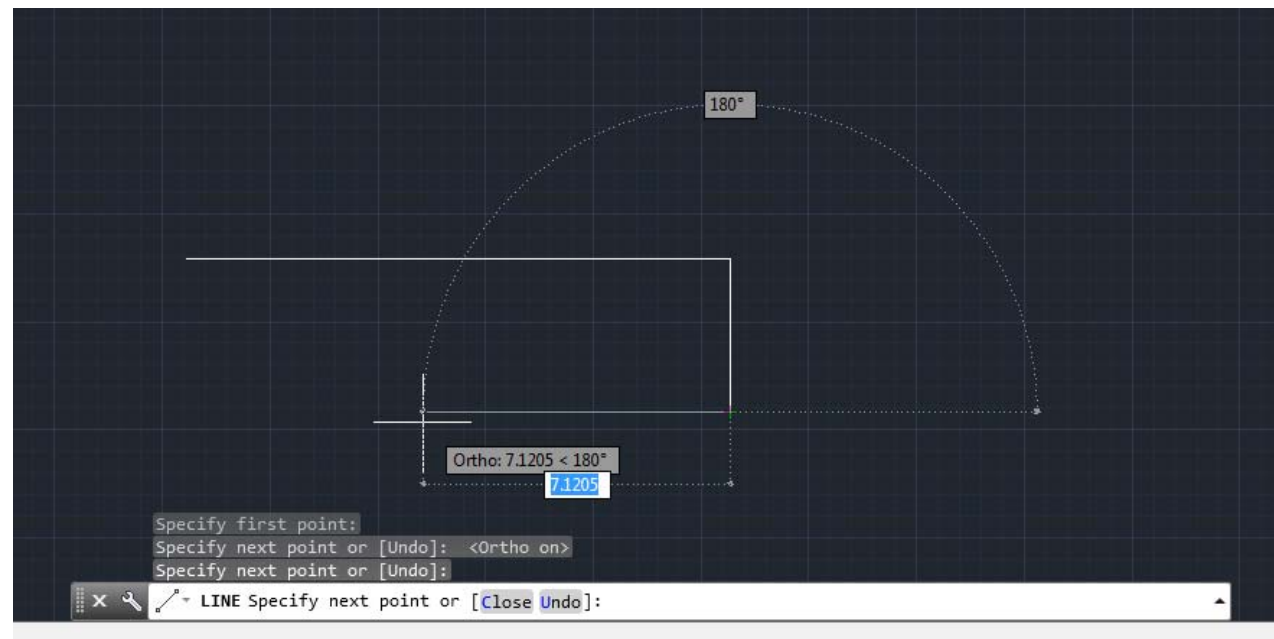
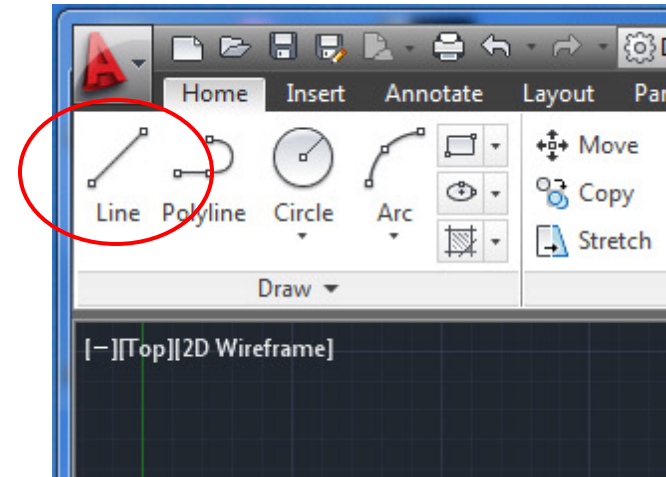
Check: The coordinates in the bottom left corner of the screen should have changed to feet and inches.

**Line Command:**

-use to draw straight line segments.  
-Type in "LINE" or "L" for short, <Enter>  
Or use the Ribbon--- Home Tab--- Line button.

-Once you are in the command, the command line is asking you to "Specify first point" so pick a point on the screen (or type in an exact point like (0,0).

-CAD then asks you to "Specify next point" so click on another point to draw the line. The command stays active until you hit <Enter> or <Escape>.



**Line Command:**

-While in the command, besides “Specifying next point”, you also have some Sub-commands available.

[**Sub-commands** are found within the brackets on the Command line. They each have one upper case letter.] Type the upper case letter and hit <Enter> to activate the sub-command.

-In the line command are two options: [**Close, Undo**]. Use **Close** to connect the line back to it's starting point. Use **Undo** to undo the last segment drawn (without exiting the command).



**Distance & Direction Method:**

- The simplest and most commonly used method for drawing lines in AutoCAD.
- Enter the Line command and click a start point (or type 0,0 to place to start the line at the reference point).
- Use the mouse to point the cursor in a certain direction (a green dashed “magnetic” line will aid you when drawing a 90 degree straight line). So the **mouse chooses the direction**.
- Type in the distance** using the keyboard... (Ex: 5'-0"). This lets you quickly and accurately draw line segments.

Note: You can type 5' as (CAD will understand):

5'-0"

5'-0

5'0"

5'0

5'

60"

60

Note: **Inches is default.**

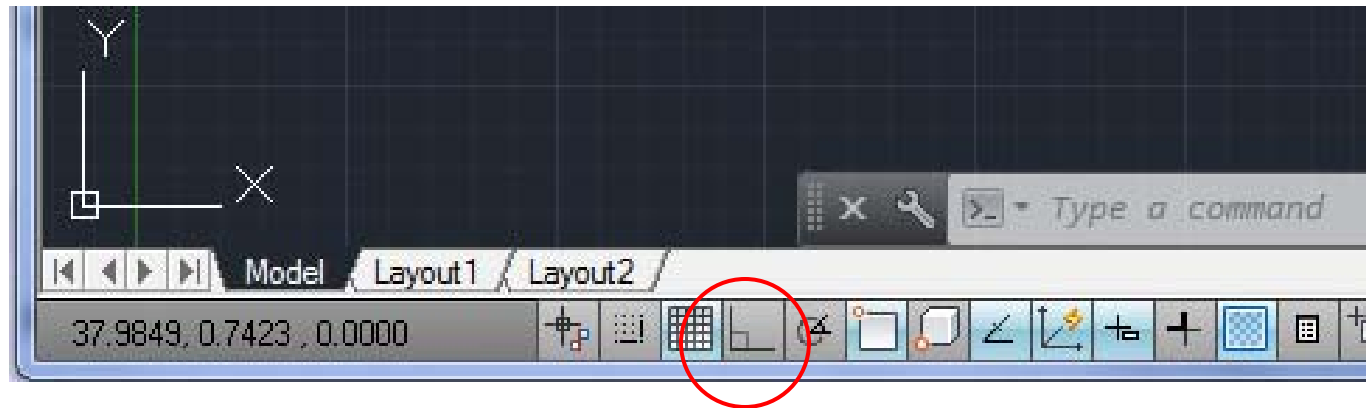
So if you forget the apostrophe,  
CAD will assume you mean inches.





**ORTHO:**

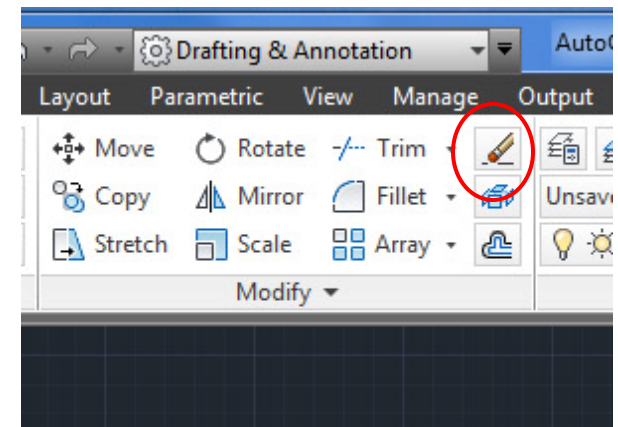
-The Ortho button found at the bottom left corner of the screen (or hit F8) locks the draw command in 90 degree lines (orthographic) to ensure straight accurate lines.

**Erase**

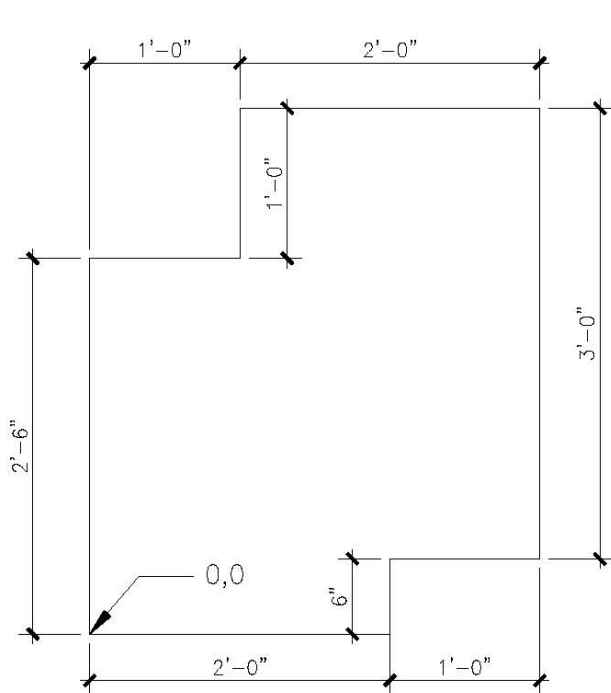
-To erase the lines drawn type ERASE or E or use the Erase button Ribbon--- Modify Tab--- Erase.

-After entering the command, click on the objects to erase and hit <Enter>

-Note: You can also select the objects first and then hit the DELETE key (without entering the Erase command).



-Try the next few examples...

Drawing Exercise #1

Try this example:

1. Enter the line command.

2. Start at point 0,0.

3. Enter the next point as (2',0).

[Note: Make sure you add the ' symbol to designate feet or else it will record inches.]

4. Continue around the polygon until you close the shape.

Alternative:

[Instead of typing in XY Coordinates, you can use the line command to enter distances directly. Notice however, that the line is drawn at whatever direction the cursor is facing. If you press the F8 command (Ortho), CAD will restrict the lines to 90 degree angles. This is a much faster way of working on this drawing.]

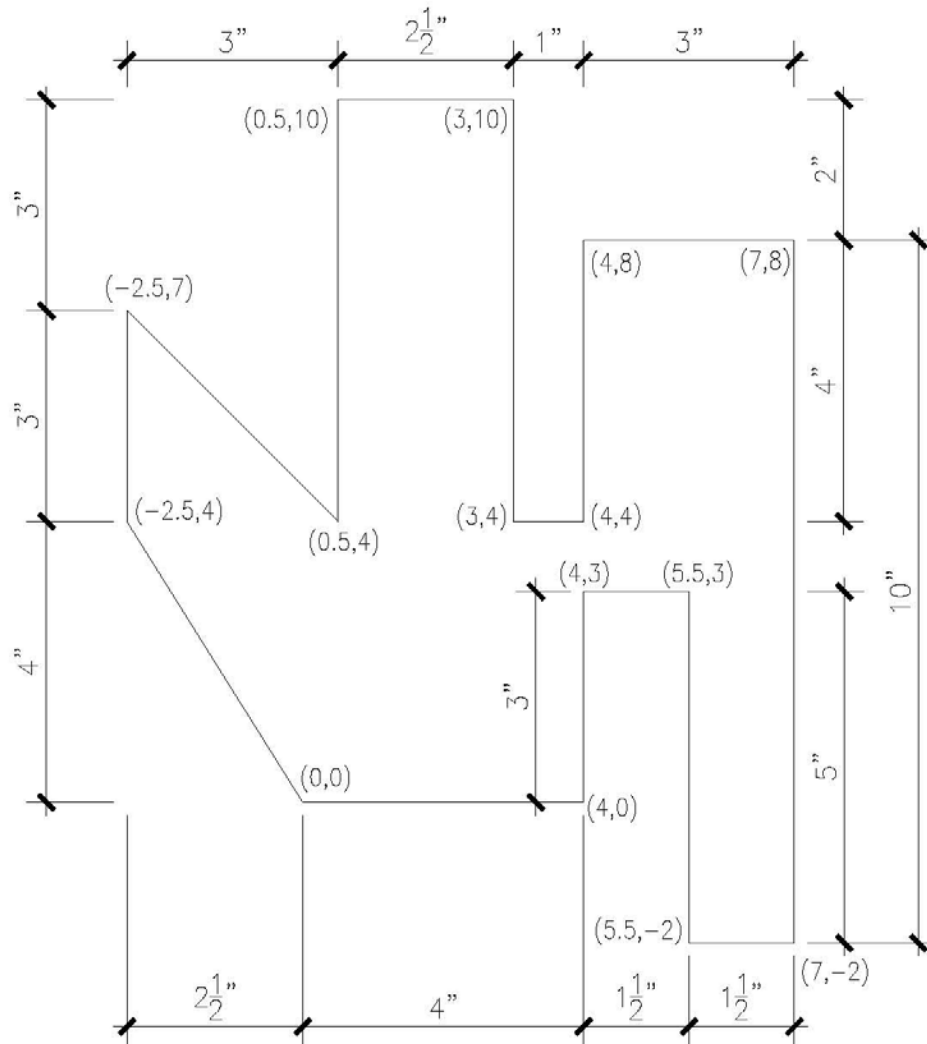
1. Enter the line command. (Press F8)

2. Start at point 0,0.

3. Face the cursor towards the right side of the screen to indicate direction.

4. Type in the distance 2'. Notice that the 2' segment is drawn.

5. Continue around the polygon until you close the shape.

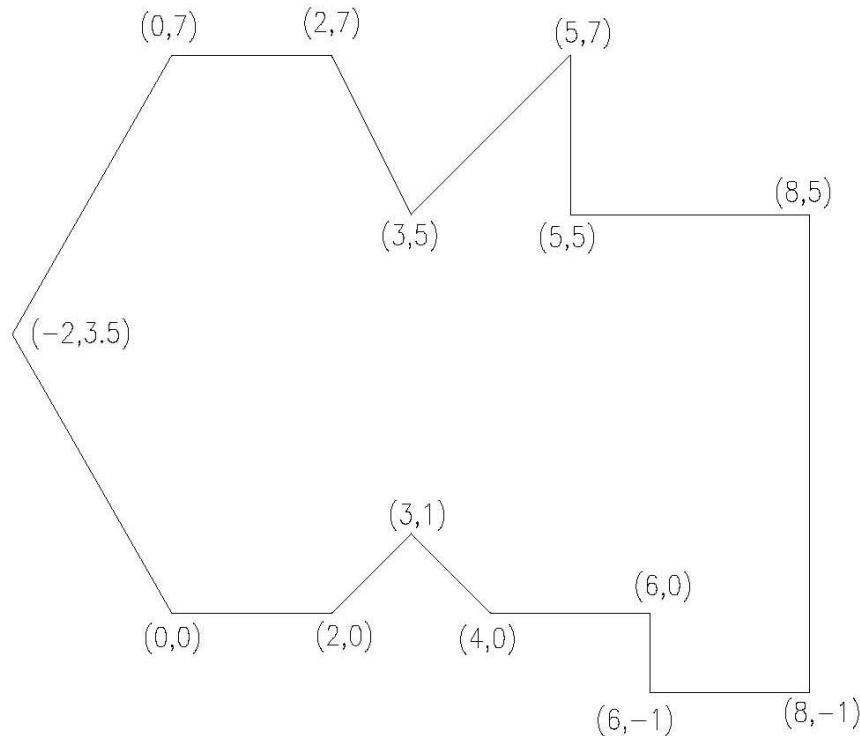
Drawing Exercise #2

Try this example: (Relative points)

1. Enter the line command.
2. Start at point 0,0.
3. Enter the next point as (4,0).  
[Note: The next coordinate is "relative" to the last coordinate, so you have to calculate.]
4. To get to point (4,3) you need to enter 0,3 (Press ENTER)  
[since the point is +0 units on the X axis and +3 units on the Y axis away from the last point drawn.]
5. To get to point (5.5,3) you need to enter 1.5,0 (Press ENTER)  
[since the point is +1.5 units on the X axis and 0 units on the Y axis away from the last point drawn.]
6. Continue around the polygon until you close the shape.

Alternative:

- [Instead of calculating the distances relative to the last coordinate, you can use the "World or Absolute" Coordinate scale, you just have to enter the # button before entering the next coordinate.]
1. Enter the line command.
  2. Start at point 0,0.
  3. Enter the next point as (4,0). [You don't need to add the # since your last point was at 0,0 therefore, your next point will be both relative to the last point and to the world scale.]
  4. [Press # followed by the next "world" coordinate.] In this case you would enter #4,3 (Press ENTER).
  5. To get to the next point you enter #5.5,3 (Press ENTER).
  6. Continue around the polygon until you close the shape.

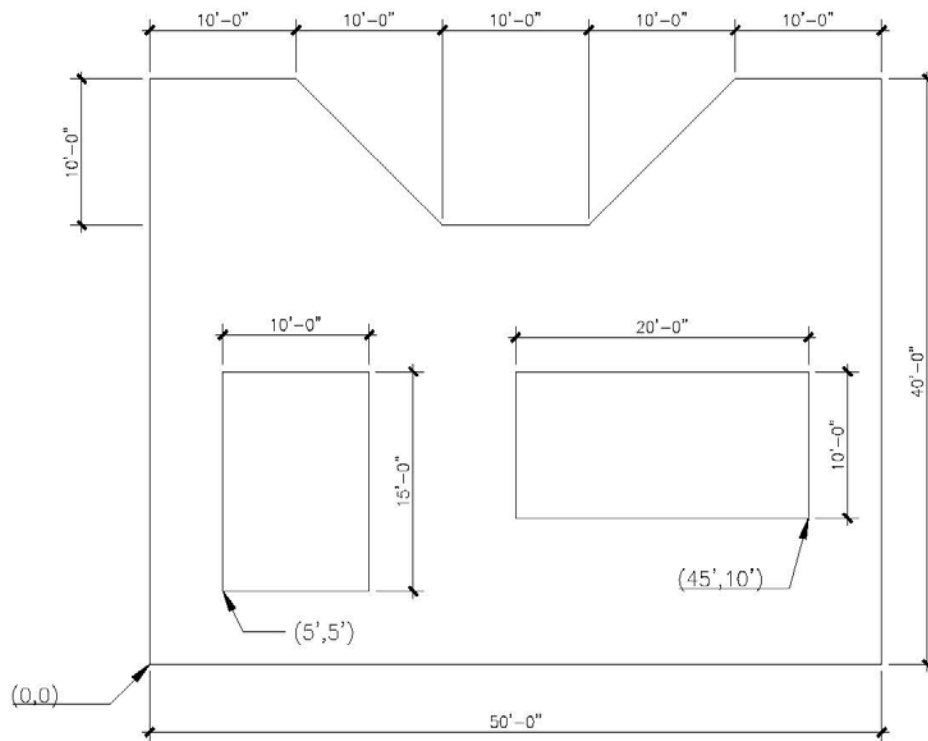
Drawing Exercise #3

Try this example: (Relative points)

1. Enter the line command.
2. Start at point 0,0.
3. Enter the next point as (2,0).  
[Note: The next coordinate is "relative" to the last coordinate, so you have to calculate.]
4. To get to point (3,1) you need to enter 1,1 (Press ENTER)  
[since the point is +1 unit on the X axis and +1 unit on the Y axis away from the last point drawn.]
5. To get to point (4,0) you need to enter 1,-1 (Press ENTER)  
[since the point is +1 unit on the X axis and -1 unit on the Y axis away from the last point drawn.]
6. Continue around the polygon until you close the shape.

Alternative:

- [Instead of calculating the distances relative to the last coordinate, you can use the "World or Absolute" Coordinate scale, you just have to enter the # button before entering the next coordinate.]
1. Enter the line command.
  2. Start at point 0,0.
  3. Enter the next point as (2,0). [You don't need to add the # since your last point was at 0,0 therefore, your next point will be both relative to the last point and to the world scale.]
  4. [Press # followed by the next "world" coordinate.] In this case you would enter #3,1 (Press ENTER).
  5. To get to the next point you enter #4,0 (Press ENTER).
  6. Continue around the polygon until you close the shape.

Drawing Exercise #4Border Shape

Try this example:

1. Enter the line command.
2. Start at point 0,0.
3. Enter the next point as (50',0).
- [Note: Make sure you add the ' symbol to designate feet or else it will record inches.]
4. Continue around the polygon until you close the shape.

Alternative:

[Instead of typing in XY Coordinates, you can use the line command to enter distances directly. Notice however, that the line is drawn at whatever direction the cursor is facing. If you press the F8 command (Ortho), CAD will restrict the lines to 90 degree angles. This is a much faster way of working on this drawing.]

1. Enter the line command. (Press F8)
2. Start at point 0,0.
3. Face the cursor towards the right side of the screen to indicate direction.
4. Type in the distance 50'. Notice that the 50' segment is drawn.
5. Continue around the polygon until you close the shape.

INTERIOR RECTANGLES

Try this example:

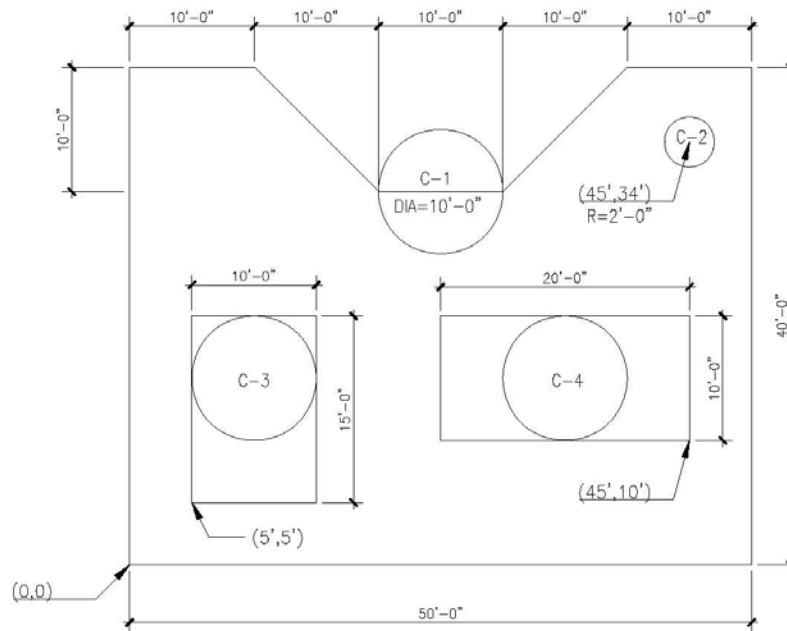
1. Enter the line command.
2. Start at point 5,5.
3. Draw the rectangle using lines either by calculating the points or by using the distance method alternative listed above.
4. Continue around the rectangle using either of the methods mentioned above, until you close the shape.
5. Repeat to draw the other rectangle using the reference point given.

Alternative:

[Try drawing the shapes using the rectangle command REC.]

1. Enter the REC command.
2. Start at origin point 5,5. (Press ENTER)
3. Specify the other corner point at 10',15' (Press ENTER)
- [OR you can use the World scale and specify #15'20' (Press ENTER)
4. Repeat this process for the other rectangle.



Drawing Exercise #5CIRCLESCircle #1:

1. Enter the circle command.
2. Start at midpoint of line.
3. Draw the circle with 10' diameter.

Circle #2:

1. Same as #1 but use Radius 2'-0".
2. Start at point (45',34') on absolute coordinates.

Circle #3:

1. Enter the "tan, tan, tan" circle command.
2. Click on all 3 bordering lines
3. The circle should appear inside the rectangle.

Circle #4:

1. Enter the "2 point" circle command.
2. Click on the center points of the top and bottom of the rectangle.
3. The circle should appear inside the rectangle.

BORDER SHAPE (SAME AS DRAWING #4)Try this example:

1. Enter the line command.
2. Start at point 0,0.
3. Enter the next point as (50',0).
- [Note: Make sure you add the ' symbol to designate feet or else it will record inches.]
4. Continue around the polygon until you close the shape.

Alternative:

[Instead of typing in XY Coordinates, you can use the line command to enter distances directly. Notice however, that the line is drawn at whatever direction the cursor is facing. If you press the F8 command (Ortho), CAD will restrict the lines to 90 degree angles. This is a much faster way of working on this drawing.]

1. Enter the line command. (Press F8)
2. Start at point 0,0.
3. Face the cursor towards the right side of the screen to indicate direction.
4. Type in the distance 50'. Notice that the 50' segment is drawn.
5. Continue around the polygon until you close the shape.

INTERIOR RECTANGLES (SAME AS DRAWING #4)Try this example:

1. Enter the line command.
2. Start at point 5,5.
3. Draw the rectangle using lines either by calculating the points or by using the distance method alternative listed above.
4. Continue around the rectangle using either of the methods mentioned above, until you close the shape.
5. Repeat to draw the other rectangle using the reference point given.

Alternative:

[Try drawing the shapes using the rectangle command REC.]

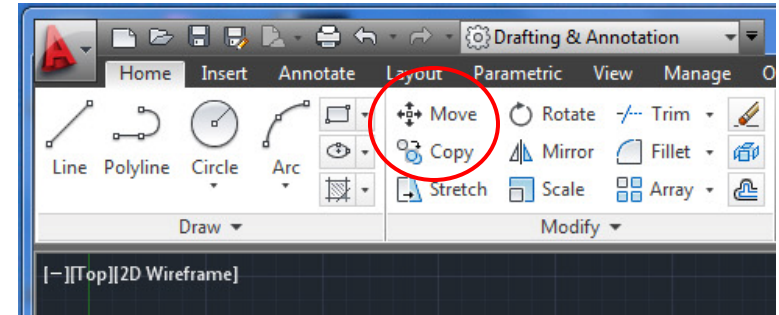
1. Enter the REC command.
2. Start at origin point 5,5. (Press ENTER)
3. Specify the other corner point at 10',15' (Press ENTER)
- [OR you can use the World scale and specify #15'20' (Press ENTER)]
4. Repeat this process for the other rectangle.

**Move Command**

-Use this command to Move objects.

-Type **MOVE** or **M** or go to the Ribbon--- Home Tab---Modify Panel--- Move

- Once in the command, **Select the objects** that you want to move.
- Choose a **base/ reference point** (it can be any point on the screen.
- From the base point, use your **mouse to point in a direction** and **type in a distance** with the keyboard.

**Copy Command**

-Use this command to Copy objects.

-Type **COPY** or **CO** or **CP** or go to the Ribbon--- Home Tab--- Modify Panel--- Copy

Note: The copy command works just like the Move command with **2 exceptions:**

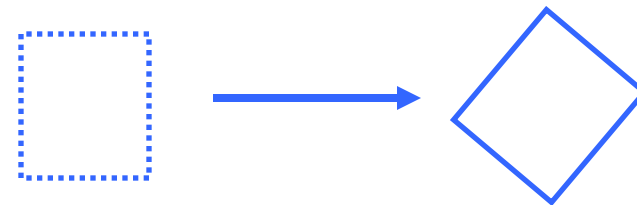
1. It **leaves the original object** intact and **Moves the copied object**
2. The command is left active after the object is copied allowing you to make more copies...

**Rotate Command**

-Use this command to Rotate objects

-Type **ROTATE** or **RO** or go to the Ribbon--- Home Tab--- Modify Panel--- Copy

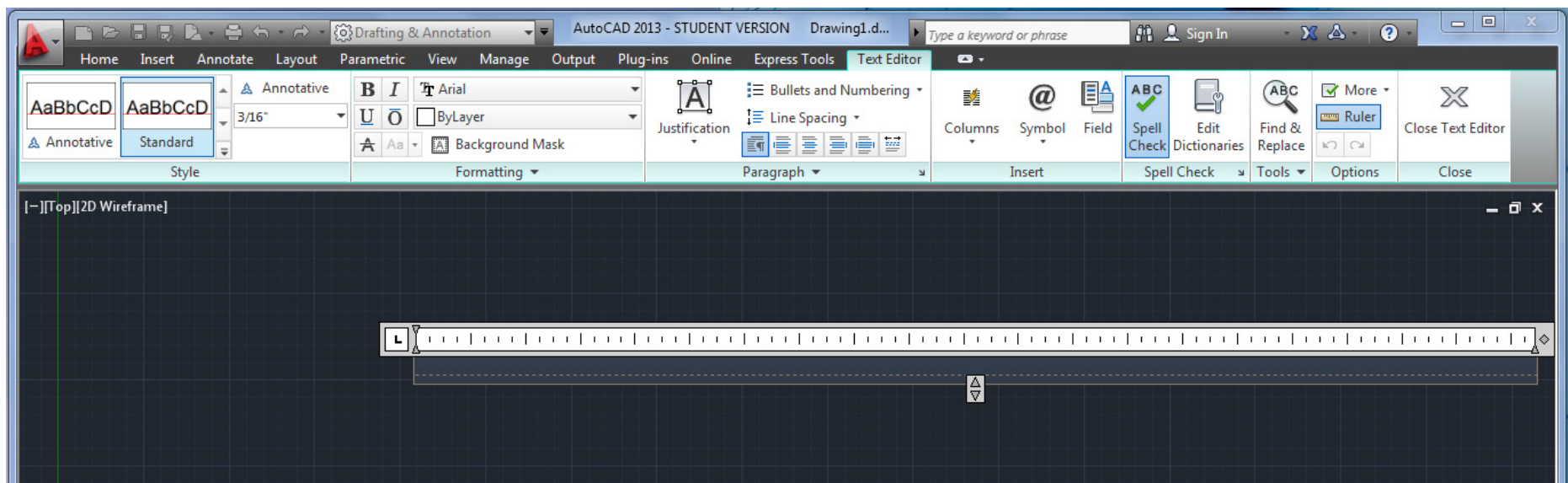
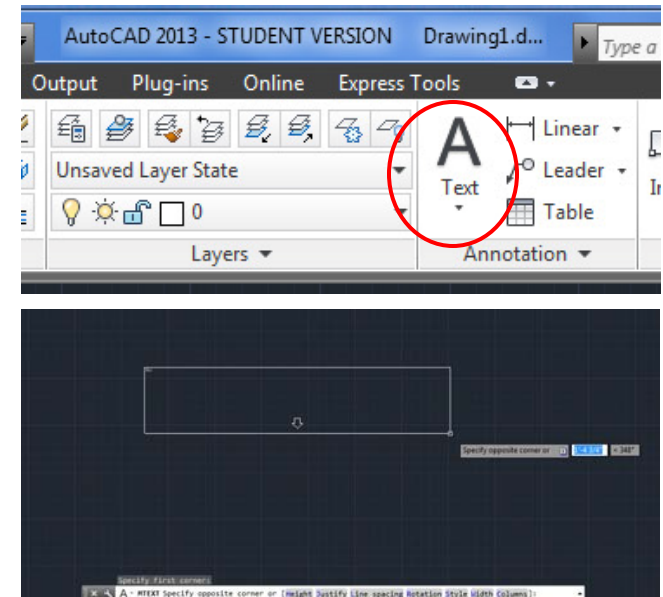
-**Select the objects, choose a base/ pivot point** and **enter an angle** with your mouse or keyboard.



**Text Command**

-Type MTEXT or use the Text button found on the Ribbon--- Home Tab--- Annotation Panel--- Multi-line Text

- Specify a rectangle where you want the text to go.
- Choose a standard font (Arial).
- The text size has to be scaled. [See Chart on next page]



Text Command

-The text size has to be scaled depending on what scale your final print will be.

Drawing Scale	Code	Scale Factor	LT Scale	Standard Drawing Text	Drawing Title Text
				3/32" Text	1/8" Text
1"=1" (Full Scale)]	1	1.0	0.5	3/32"	1/8"
1/32" = 1'-0"	3	384	192	36"	48"
1/16"	6	192	96	18"	24"
1/8"	8	96	48	9"	12"
1/4"	4	48	24	4 1/2"	6"
1/2"	2	24	12	2 1/4"	3"
3/4"	E	16	8	1 1/2"	2"
1"	D	12	6	1 1/8"	1 1/2"
1-1/2"	C	8	4	3/4"	1"
3"	B	4	2	3/8"	1/2"
6"	A	2	1	3/16"	1/4"
3/64" = 1'-0"	M	256	128	24"	32"
3/32"	H	128	64	12"	16"
3/16"	G	64	32	6"	8"
3/8"	F	32	16	3"	4"
1/10" = 1'-0"	N	120	60	11 1/4"	15"
1/20"	P	240	120	22 1/2"	30"
1/30"	Q	360	180	33 3/4"	45"
1/40"	R	480	240	45"	60"
1/50"	S	600	300	56 1/4"	75"
1/100"	T	1200	600	112 1/2"	150"
1/200"	U	2400	1200	225"	300"

### Dimension Command

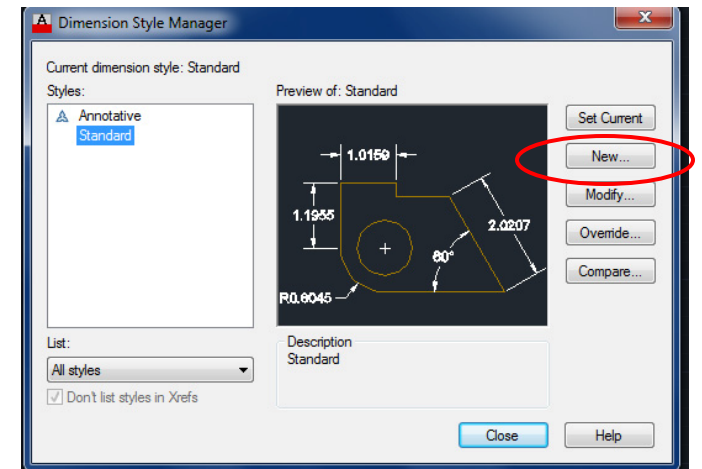
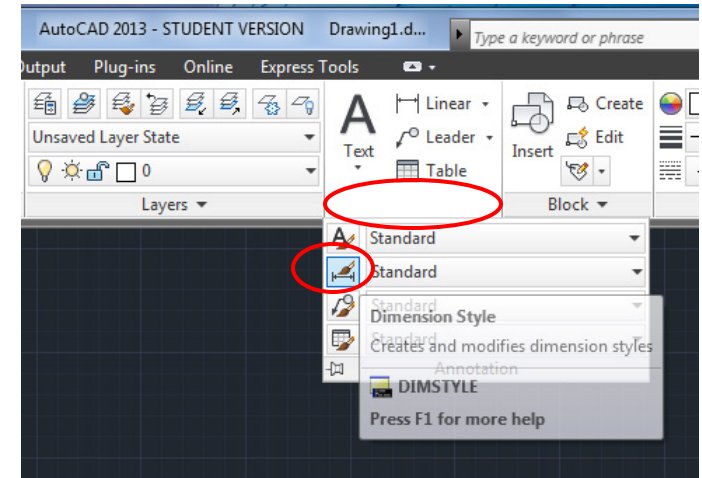
-Dimensions are easy to use but they **must be set-up first!**

Type DIMSTYLE or use the Text button found on the Ribbon--- Home Tab--- Annotation Panel---(Down arrow at bottom of panel to expand panel--- Dimension Style button.

-Dimension Style Manager-- Click New (or Modify).

-2 main settings to adjust here:

1. Primary Units--- Change Unit Format to Architectural (Ft/ inches)
2. Fit --- Scale for Dimension features--- Use Overall Scale of:  
[Use Chart]

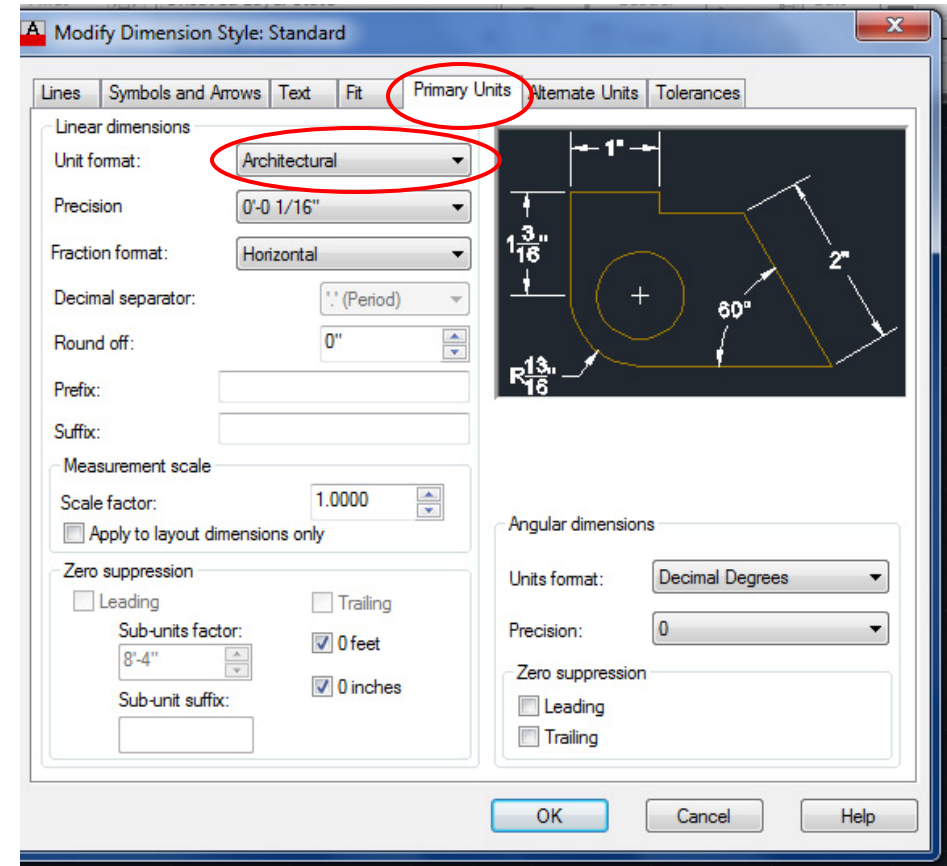
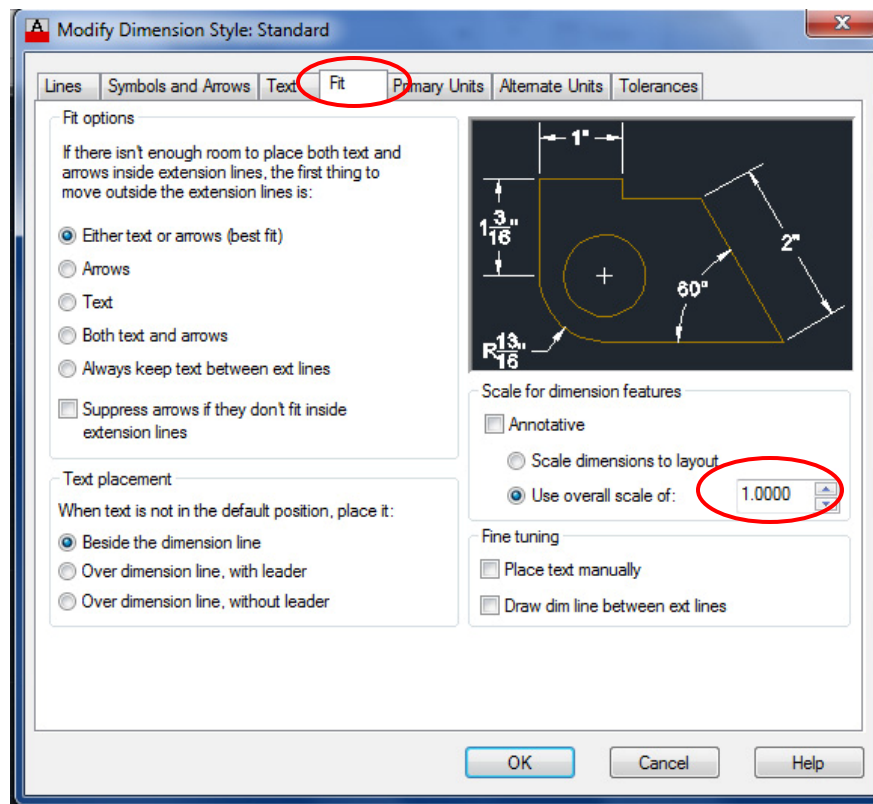




**Dimension Command**

-2 main settings to adjust here:

1. Primary Units--- Change Unit Format to Architectural (Ft/ inches)
2. Fit --- Scale for Dimension features--- Use Overall Scale of:  
[Use Chart on next page]



Dimension Command

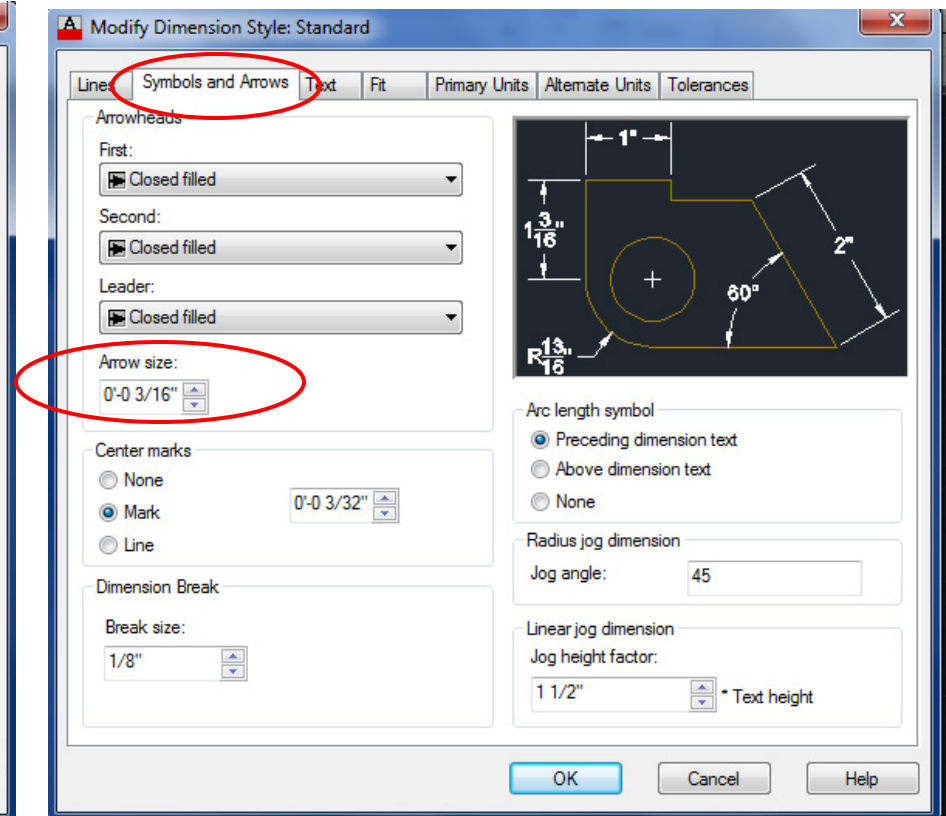
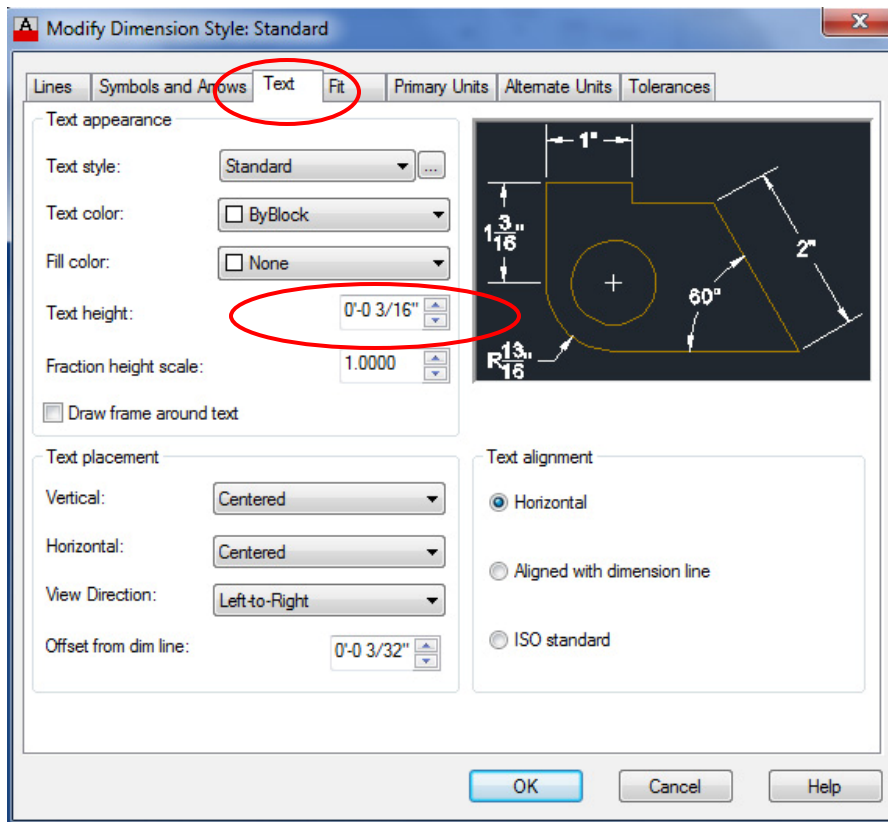
-The dimension size has to be scaled depending on what scale your final print will be.

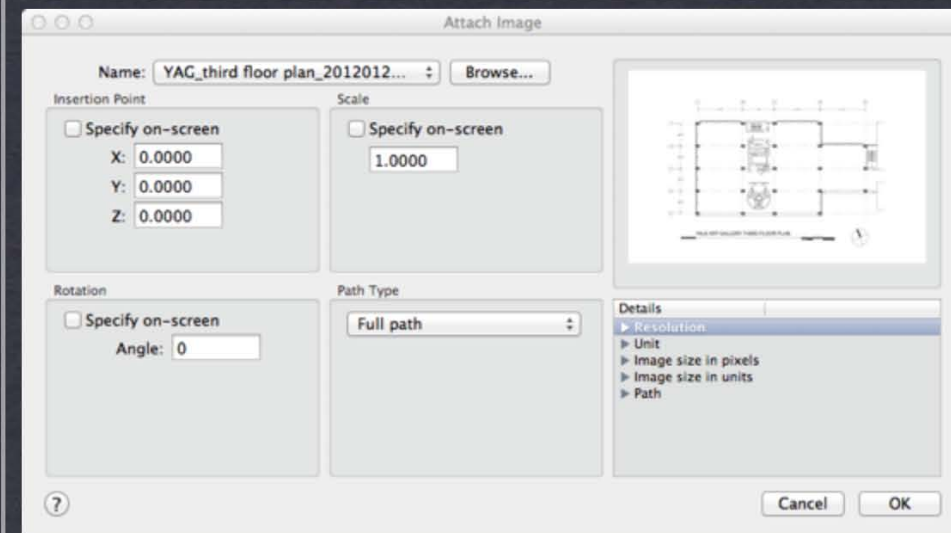
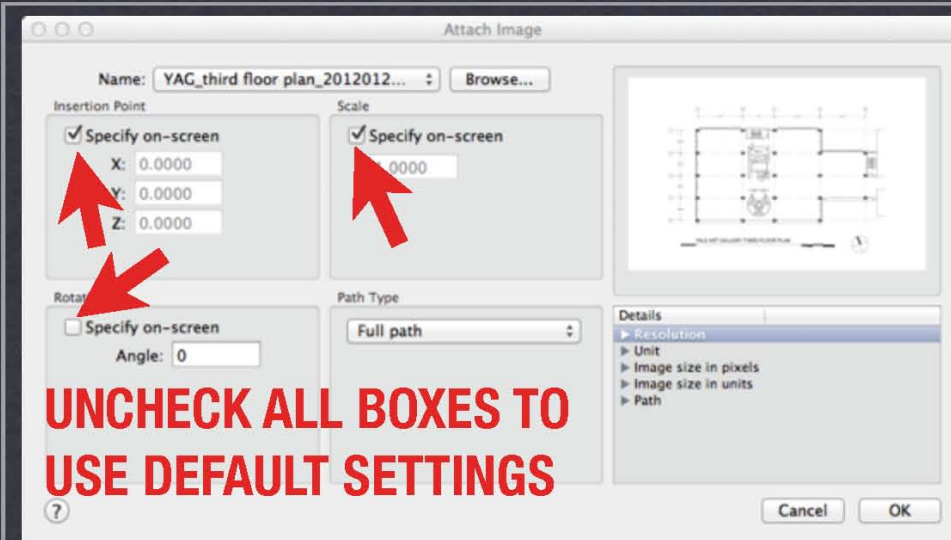
Drawing Scale	Code	Scale Factor	LT Scale	3/32" Text	1/8" Text
1"=1" (Full Scale)]	1	1.0	0.5	3/32"	1/8"
1/32" = 1'-0"	3	384	192	36"	48"
1/16"	6	192	96	18"	24"
1/8"	8	96	48	9"	12"
1/4"	4	48	24	4 1/2"	6"
1/2"	2	24	12	2 1/4"	3"
3/4"	E	16	8	1 1/2"	2"
1"	D	12	6	1 1/8"	1 1/2"
1-1/2"	C	8	4	3/4"	1"
3"	B	4	2	3/8"	1/2"
6"	A	2	1	3/16"	1/4"
3/64" = 1'-0"	M	256	128	24"	32"
3/32"	H	128	64	12"	16"
3/16"	G	64	32	6"	8"
3/8"	F	32	16	3"	4"
1/10" = 1'-0"	N	120	60	11 1/4"	15"
1/20"	P	240	120	22 1/2"	30"
1/30"	Q	360	180	33 3/4"	45"
1/40"	R	480	240	45"	60"
1/50"	S	600	300	56 1/4"	75"
1/100"	T	1200	600	112 1/2"	150"
1/200"	U	2400	1200	225"	300"

**Dimension Command**

-2 more settings that may improve the aesthetics of your dimensions.

1. The text height--- change to 3/32"
2. The arrow size--- change to 3/32"





**COMMAND:  
ATTACH (RASTER IMAGE  
REFERENCE)**

**BROWSE TO JPEG FILE TO  
SELECT FILE (IF PDF-MUST  
CONVERT TO JPEG FIRST)**

**UNCHECK ALL BOXES IN THE  
ATTACH IMAGE DIALOG BOX  
TO USE DEFAULT SETTINGS  
FOR INSERTION POINT,  
SCALE, AND ROTATION  
(SEE ILLUSTRATIONS TO LEFT)**

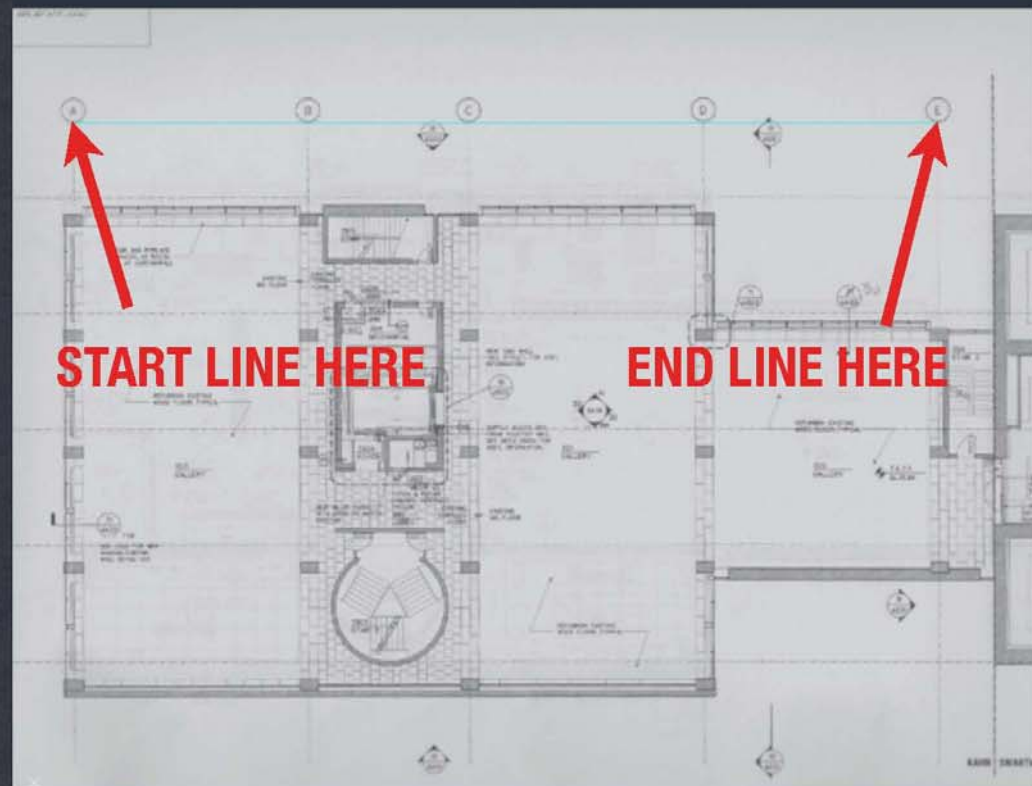
**RASTER IMAGE**

**attach the raster image**



1. THE RASTER IMAGE IS NOW INSERTED WITH THE LOWER LEFT CORNER INSERTED AT THE 0,0,0 COORDINATE

2. NEXT CAREFULLY DRAW THE REFERENCE LINE FROM GRID LINE A TO GRID LINE E

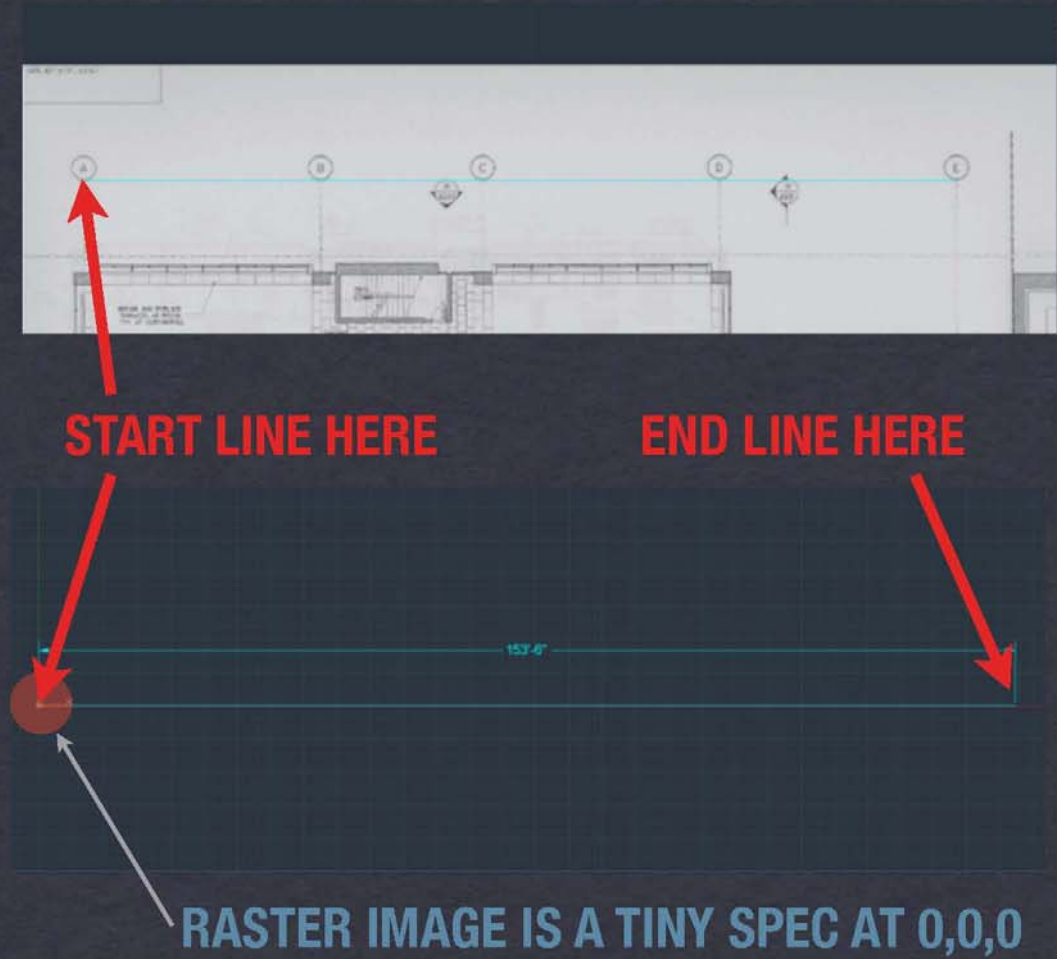


**SCALING A RASTER IMAGE**

**draw reference line**

2. DRAW NEW LINE FROM GRID LINE A (ON TOP OF REFERENCE LINE) TO THE KNOWN DIMENSION FOR THE LENGTH FROM A TO E (153'-6 IN THIS CASE)

3. ZOOM EXTENTS TO SEE FULL LENGTH OF KNOWN DIMENSION LINE



RASTER IMAGE IS A TINY SPEC AT 0,0,0

# SCALING A RASTER IMAGE draw line of known dimension

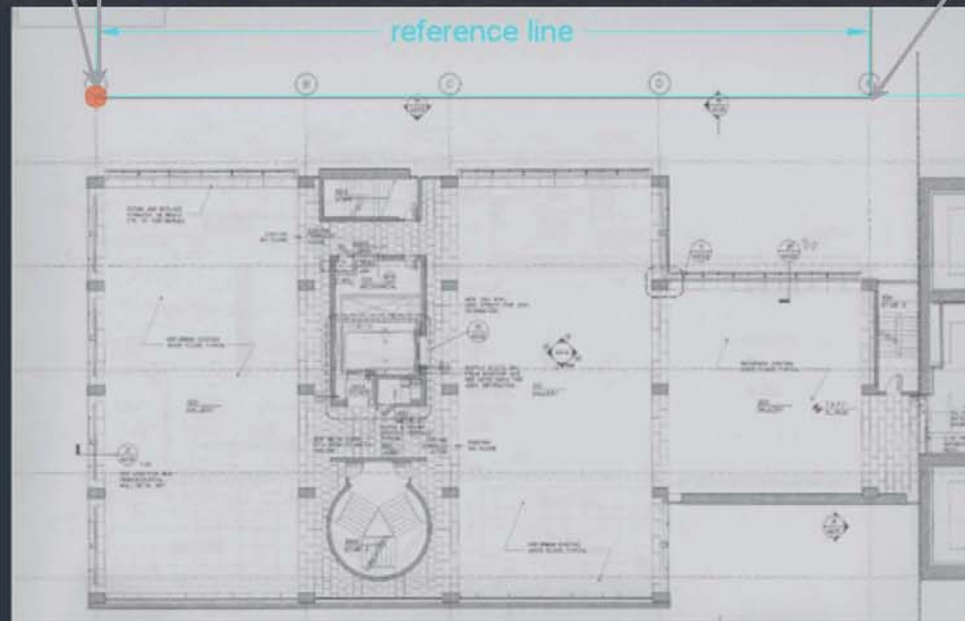


1. START SCALE COMMAND
2. SELECT RASTER IMAGE
3. HIT ENTER TO END OBJECT SELECTION
4. SELECT (CLICK ON) A-GRID END OF REFERENCE LINE AS BASE POINT
5. NEXT PROMPT ASKS YOU: SPECIFY SCALE FACTOR OR [COPY/REFERENCE] - **TYPE R FOR REFERENCE, HIT ENTER**
6. SELECT SAME POINT AS FIRST POINT OF REFERENCE LINE
7. SELECT E-GRID END AS SECOND POINT OF REFERENCE LINE

**CHOOSE THIS POINT AS THE BASE POINT**

**CHOOSE THE SAME POINT AGAIN AS THE FIRST POINT OF THE REFERENCE LINE**

**CHOOSE THE OTHER END OF THE REFERENCE LINE AS POINT #2**



**SCALING A RASTER IMAGE**

**scale command**

8. NEXT PROMPT:  
SPECIFY NEW LENGTH  
OR [POINTS] - EITHER  
TYPE 153'-6 OR CLICK  
ON FAR END OF  
KNOWN DIMENSION  
LINE

9. THE RASTER IMAGE  
SHOULD NOW BE  
SCALED UP TO FULL  
SIZE

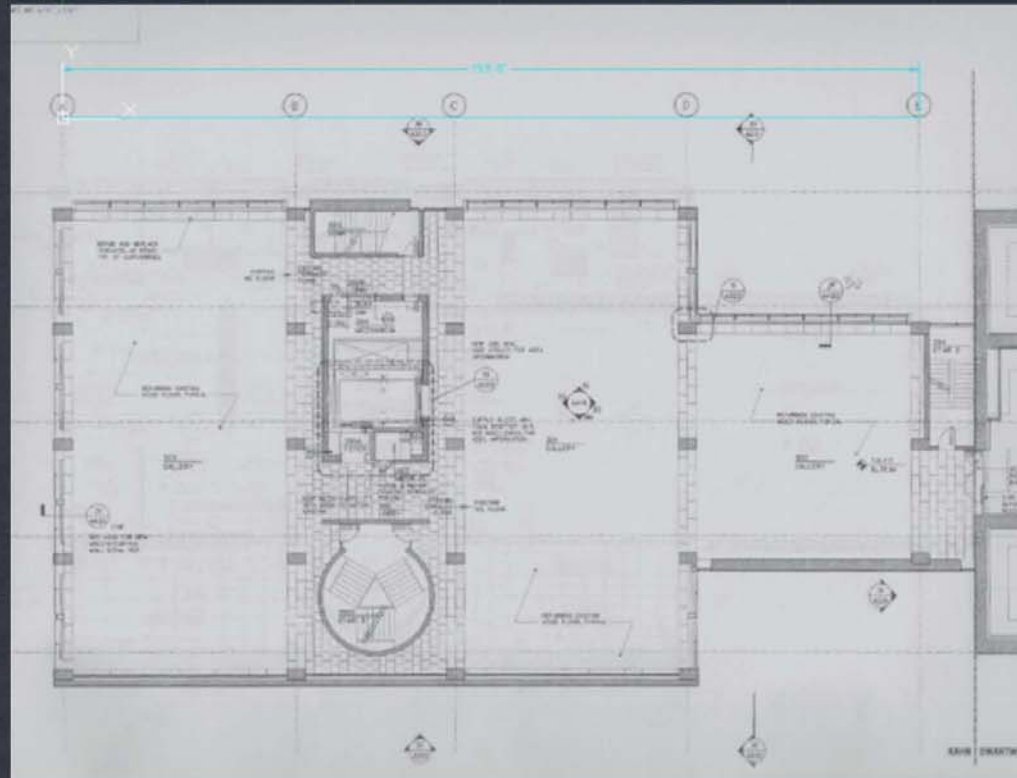
CHOOSE THE OTHER END OF THE  
KNOWN DIMENSION LINE AT  
LAST PROMPT (OR TYPE  
KNOWN LENGTH: 153'-6)



**SCALING A RASTER IMAGE**

**scale command**

**ARCHITECTURAL  
DRAWINGS IN AUTOCAD  
ARE EXECUTED AT FULL  
SCALE. NOW THAT THE  
RASTER IS FULL  
SCALE, WE CAN USE IT  
AS A REFERENCE TO  
DEVELOP AN AUTOCAD  
VERSION OF THE  
DRAWING.**



**RASTER IMAGE SCALED TO FULL SIZE**

**ready to use**