

AutoCAD 2D

Module 4

Drawing Lines Using Cartesian Coordinates

Learning Outcomes:

When you have completed this module, you will be able to:

- 1 Describe the Cartesian Coordinate System using absolute and relative coordinates.
- 2 Apply the LINE command to draw lines using the Cartesian Coordinate System with both absolute and relative coordinates.

The Cartesian Coordinate System

To accurately draw an AutoCAD 2-Dimensional (2D) drawing, coordinate locations must be entered as XY coordinates. These XY coordinates are based on the Cartesian Coordinate System.

The *Cartesian Coordinate System* consists of two numbered lines crossing perpendicular to one another at their zero values. The horizontal axis is called the X-axis and the vertical axis is called the Y-axis. See Figure 4-1. A coordinate value is assigned to each location on the plane. Each coordinate value consists of a pair of numbers, the first of which is the X-coordinate and the second is the Y-coordinate, written X,Y. For example, X2,Y4 is a location 2 units to the right and 4 units up from X0,Y0 or 0,0.

Cartesian coordinates can be entered into AutoCAD as either absolute or relative coordinates.

Absolute Cartesian Coordinates

Absolute Cartesian Coordinates are always referenced to the absolute origin 0,0. For example: 3,4.

Relative Cartesian Coordinates

Relative Cartesian Coordinates are incremental to the *lastpoint*. To indicate to AutoCAD that the coordinate being entered is relative, an @ is entered before the coordinate value. For example: @2,6 which means "from the lastpoint go 2 units in the positive X and 6 units in the positive Y".

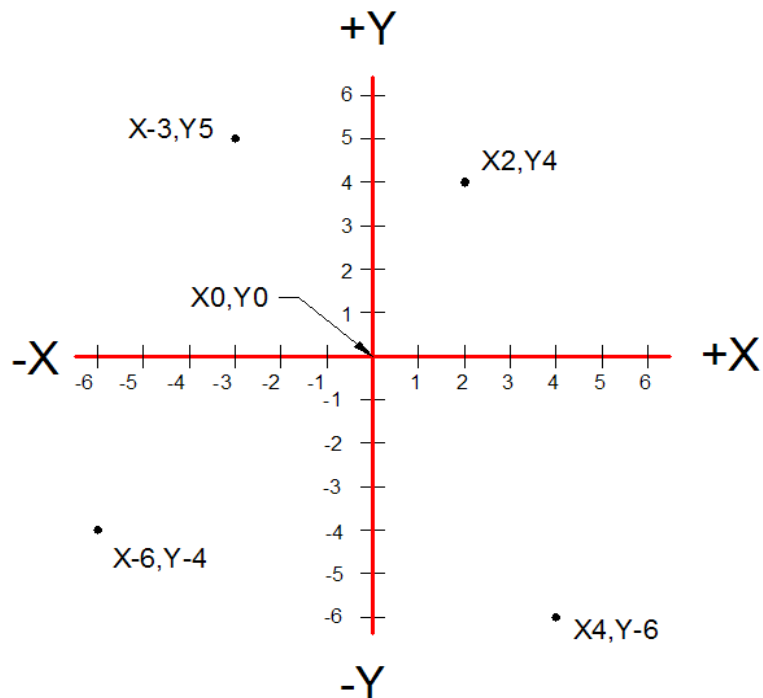
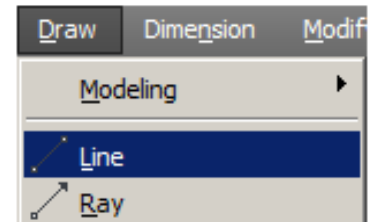


Figure 4-1
The Cartesian Coordinate System

AutoCAD Command: LINE

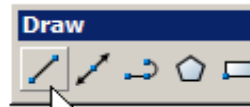
The LINE command is used to draw lines.

Shortcut: **L**



Line

2009-2011



Line

2007 - 2008

**WORK
ALONG**

Drawing Lines Using Cartesian Coordinates - Part 1

Step 1 Using the NEW command, start a new drawing using the template 2D English.

Step 2 Save and name the drawing AutoCAD 2D Workalong 04-1. Save it in the folder: CAD Courses/AutoCAD 2D/Lab Exercises

Step 3 Enter the LINE command as shown below to draw the object shown in the dimensioned drawing. Keep in mind that you enter what is bolded, the italics are the Author's Comments and the remainder are AutoCAD prompts.

Command: **LINE**

Specify first point: **1.75,4**

(Always start with an absolute coordinate. It must be an X then Y with a comma between them.)

Specify next point or [Undo]: **@5,0**

(Then change to relative coordinates. Note the @ first, then X and Y.)

Specify next point or [Undo]: **@0,2**

Specify next point or [Close/Undo]: **@-2.5,0**

(A negative coordinate is used since the line is going in the negative X direction.)

Specify next point or [Close/Undo]: **@0,1.5**

Specify next point or [Close/Undo]: **@-1,1**

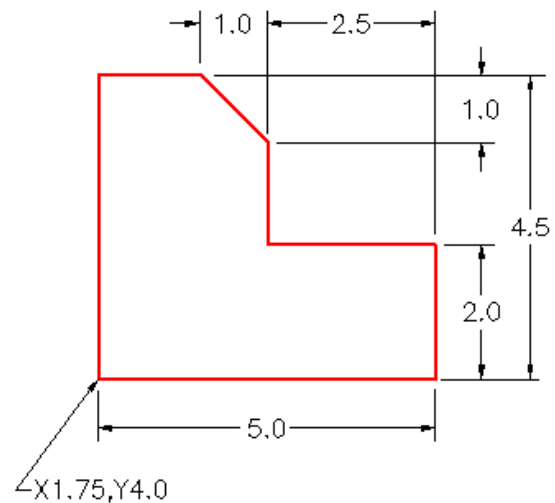
(When both the X and Y coordinates have a value other than zero, the line will be inclined.)

Specify next point or [Close/Undo]: **@-1.5,0**

Specify next point or [Close/Undo]: **C**

You can use a C or 1.75,4 to close the last line and return to the first point.)

Command:



Dimensioned Drawing

Author's Comments: Rather than just entering the coordinate values, try to understand the values you are entering by studying the dimensioned drawing.

Step 4 Your drawing should match the figure. (Figure Step 4)

Author's Comments: If you have trouble drawing this object the first try, do not be concerned. Start it over again, from scratch, until you can complete it. The more practice you get drawing, the easier it will get.

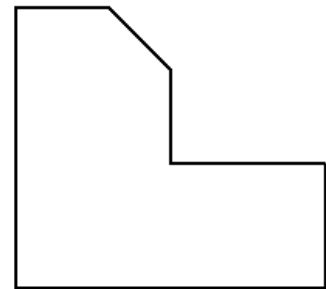


Figure Step 4

Step 5 Save and close the drawing.

USER TIP

When you start a drawing, the first XY location is always specified using an absolute coordinate. After that, relative coordinates are used. It would be too difficult to calculate all coordinates as absolute.

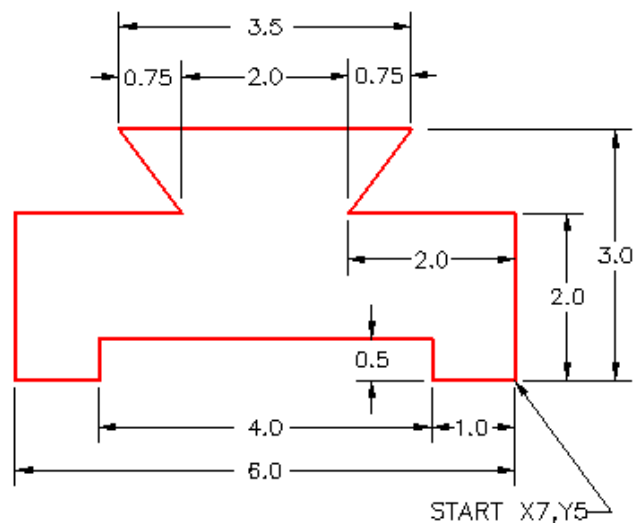
WORK ALONG

Drawing Lines Using Cartesian Coordinates - Part 2

Step 1 Using the NEW command, start a new drawing using the template 2D English.

Step 2 Save and name the drawing AutoCAD 2D Workalong 04-2. Save it in the folder CAD Courses/AutoCAD 2D/Lab Exercises

Step 3 Enter the LINE command, as shown on the next page, to draw the object shown in the dimensioned drawing.



Dimensioned Drawing

Command: **L**

(L is the shortcut for the LINE command)

Specify first point: **7,5**

Specify next point or [Undo]: **@0,2**

Specify next point or [Undo]: **@-2,0**

Specify next point or [Close/Undo]: **@.75,1**

(You can draw an inclined line by entering a number other than zero for both the X and Y.)

Specify next point or [Close/Undo]: **@-3.5,0**

Specify next point or [Close/Undo]: **@-.75,-1**

Specify next point or [Close/Undo]: **U**

(When you make an input error, enter a U to go back one step. More than one U can be entered to step back further. Ensure that you press the ENTER or SPACE after each one.)

Specify next point or [Close/Undo]: **@.75,-1**

Specify next point or [Close/Undo]: **@-2,0**

Specify next point or [Close/Undo]: **@0,-2**

Specify next point or [Close/Undo]: **@1,0**

Specify next point or [Close/Undo]: **@0,.5**

Specify next point or [Close/Undo]: **@4,0**

Specify next point or [Close/Undo]: **@0,-.5**

Specify next point or [Close/Undo]: **7,5**

(The object was closed by entering the absolute coordinate.)

Specify next point or [Close/Undo]:

Command:

Step 4 Your drawing should match the figure.
(Figure Step 4)

Author's Comments: If you have trouble drawing this object the first try, do not be concerned. Start it over again, from scratch, until you can complete it. The more practice you get drawing, the easier it will get.

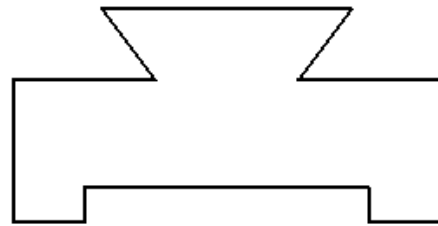


Figure Step 4

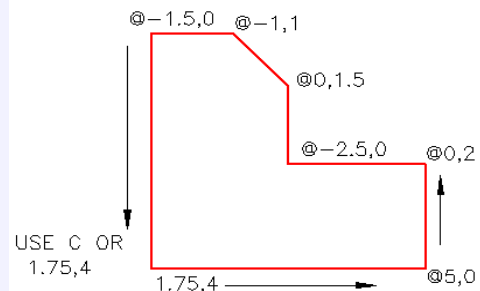
Step 5 Save and close the drawing.

**MUST
KNOW**

To ensure that your drawing is 100% accurate, how the final line, of a series of lines, is drawn is important. On the object shown on the right, there are two correct ways to draw the last line.

1. **C** (to close) or
2. The absolute coordinate **1.75,4**.

A relative coordinate should never be used since you can not be positive the end of the line will be located at the exact coordinates as the start point.



**USER
TIP**

When entering decimal numbers and the number ends in a zero, for example 4.0, enter the number up to the zero. In this case, 4. If the number to be entered is 3.6700, all that has to be entered is 3.67. AutoCAD will automatically enter the zeros to the value.

Deleting Objects

To delete existing drawing objects, either use the ERASE command or the Delete key on the keyboard.

Using the ERASE Command

When deleting drawing objects using the ERASE command, the drawing objects can either be selected before or after the command is entered. If the command is entered before selecting the objects, they are selected when prompted by the Select Object prompt as shown below. If the objects are selected before entering the ERASE command, there is not prompt.

Command: **ERASE**

Select Object:

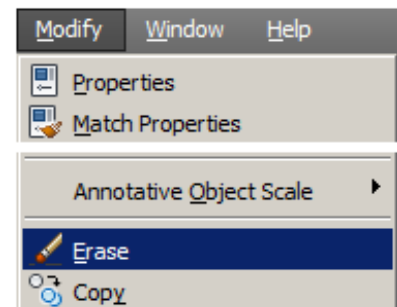
Using the Delete Key

When deleting objects using the Delete key, select the object or objects before pressing the key.

AutoCAD Command: ERASE

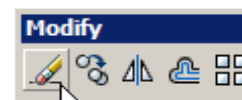
The ERASE command is used to permanently remove drawing objects from the drawing.

Shortcut: **E**



Erase

2009-2011



Erase

2007-2008

**WORK
ALONG**

Deleting Drawing Objects

Step 1 Open the drawing AutoCAD 2D Workalong 04-1.

Step 2 Using the SAVEAS command, save the drawing with the name AutoCAD 2D Workalong 04-3. (Figure Step 2)

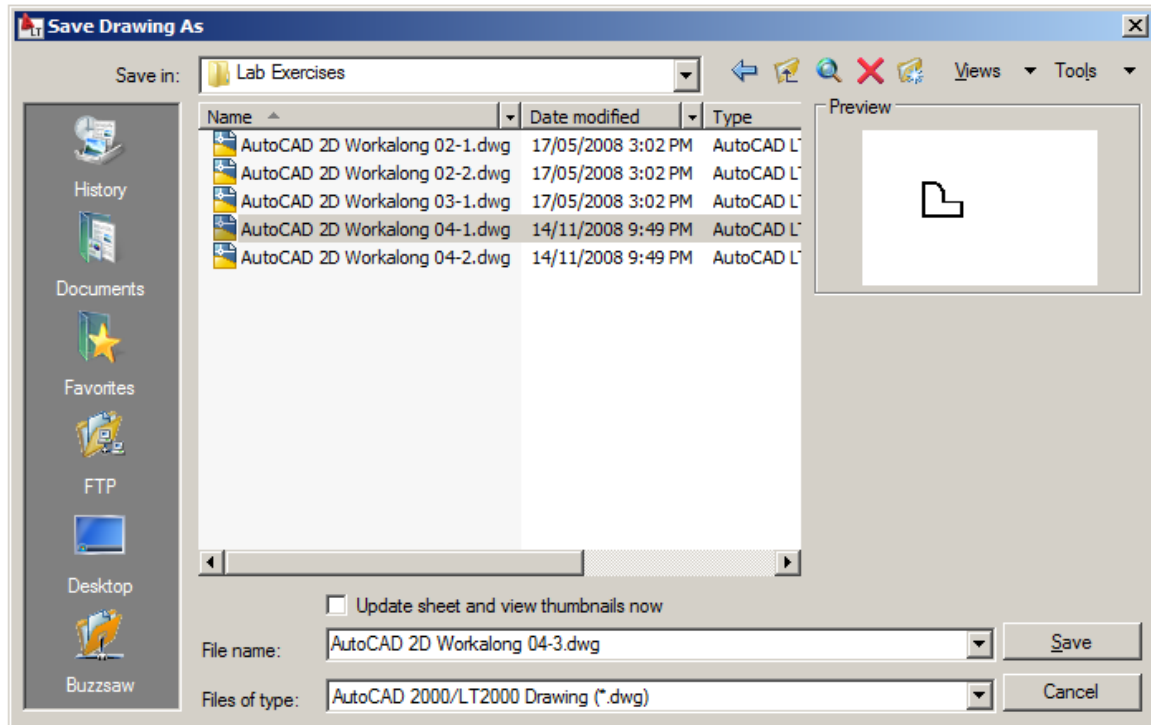


Figure Step 2

Step 3 Enter the ERASE command as shown below. Move the pickbox onto the horizontal line and select it. Move the cursor onto the vertical line and select it. Press the Enter key to execute the command. (Figure Step 3A, 3B and 3C)

Command: **ERASE**
 Select objects: 1 found
 Select objects: 1 found, 2 total
 Select objects:
 Command:

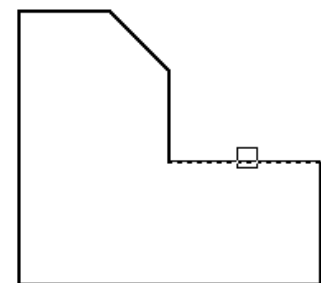


Figure Step 3A

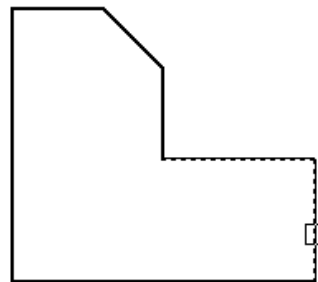
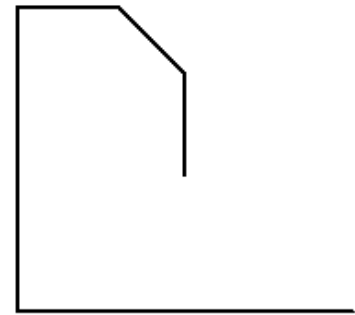
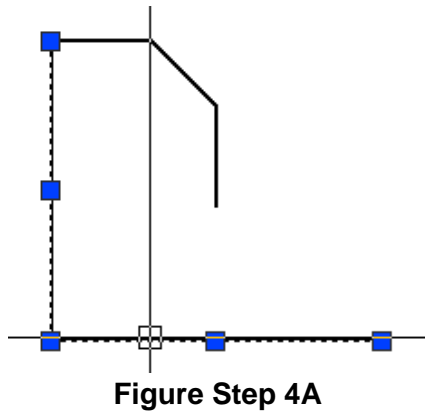


Figure Step 3B

Author's Comments: When you are selecting objects in a command, the cursor will appear as a small square, called a pickbox.

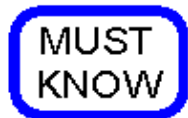
Step 4 To delete drawing objects without entering a command, move the pickbox onto the lines, as shown in the figures, and select them by clicking the left mouse button. They will highlight and appear dashed with small blue squares on them. When the lines display as shown in figure, press the Delete key. (Figure Step 4A and 4B)



Author's Comments: The small blue squares on a selected object are called grips. You will learn more about them later in the AutoCAD 2D Modules.

Author's Comments: If you want to unselect an drawing object, press the Esc key. Sometime you have to press it twice to totally unselect a selected object.

Step 5 Save and close the drawing.



If you are entering a positive number in AutoCAD, enter the number only. Positive is the AutoCAD default. If the number is negative, you must enter the - sign before the number. For example, if the number is 4.0, enter 4. If the number is -4.0, enter -4.

The Key Principles in Module 4

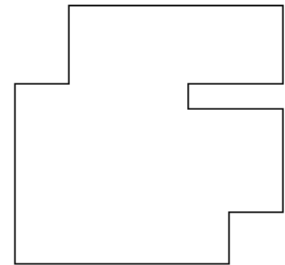
- 1 The @ symbol means "The last absolute coordinate location" or sometimes called the lastpoint.
- 2 To close the last line of a series of lines, use either C (Close) or the absolute coordinate of the first point.
- 3 To delete existing drawing objects, you can either use the ERASE command or the Delete key on the keyboard.
- 4 Objects can either be selected before or after a command is entered.
- 5 To unselect an drawing object, press the Esc key. Sometimes you have to press it twice.

Lab Exercise 4-1**Time Allowed: 30 Min.**

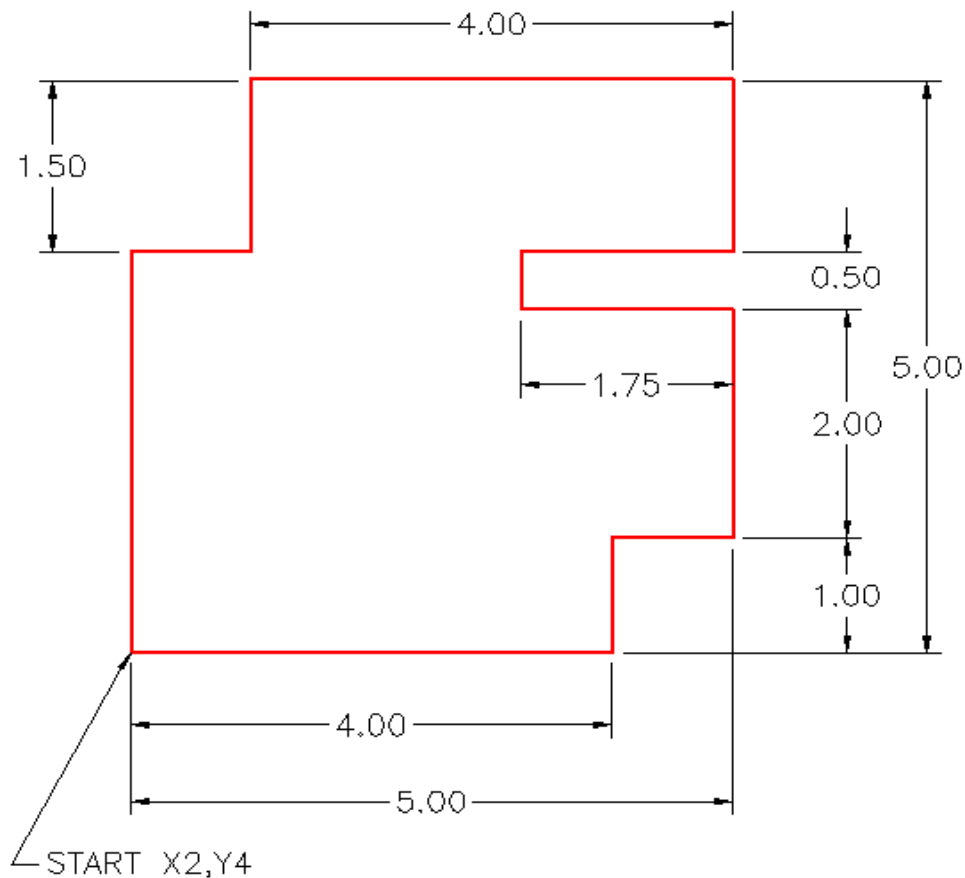
Name	Template	Units
AutoCAD 2D Lab 04-1	2D English	Inches

Instructions:

- Step 1** Start a new drawing using the template shown above.
- Step 2** Save and name the drawing AutoCAD 2D Lab 04-1 in the folder:
CAD Courses/AutoCAD 2D/Lab Exercises
- Step 3** Using the LINE command, draw the object shown in the dimensioned drawing.



Completed Drawing



Dimensioned Drawing

Step 4 Enter the UNITS command. In the Drawing Units dialogue box, set the Insertion Units to Inches. (Figure Step 4)

Author's Comments: You can find the Insertion scale in the Units column in the lab exercise title. See page 4-8.

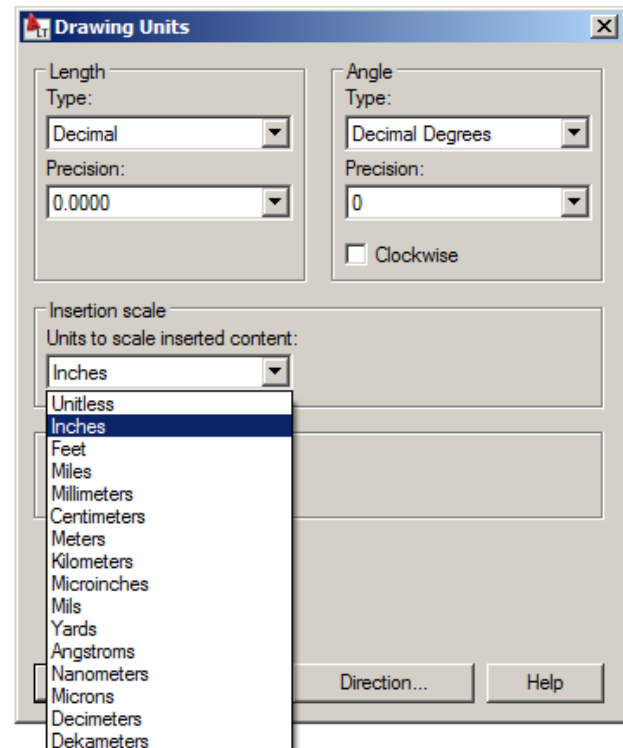


Figure Step 4

Step 5 Check your drawing with the key. The key name is the same as the drawing name. (Figure Step 5)

Author's Comments: If you have trouble doing this, redo Module 3.

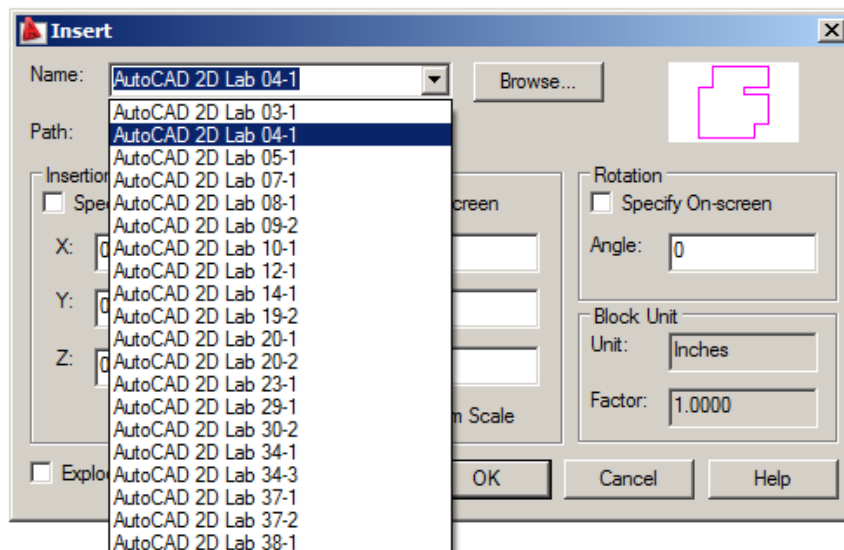


Figure Step 5

Step 6 Your drawing should match the figure.
(Figure Step 6)

Author's Comments: Step 5 will insert a magenta colored overlay key on your drawing. If you see double objects or places where your objects and the magenta objects do not match, your drawing is inaccurate. If you only see one object, even though it may share the colors magenta and red, your drawing is accurate.

Author's Comments: If you have trouble completing this drawing the first try, do not be concerned. Start it over again, from scratch, until you can complete it. The more practice you get drawing, the easier it will get. When you get to Module 8, you will be taught how to fix a drawing so that you do not have to start over.

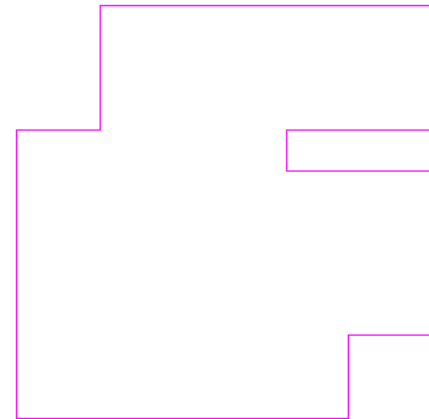


Figure Step 6

Step 7 Save and close the drawing.

Author's Construction Hints: Do your best to complete the lab exercise drawing without using the following hint. If you get stuck and can not complete it on your own, use the following hint to help you.

Hint 1

See Figure Hint 1.

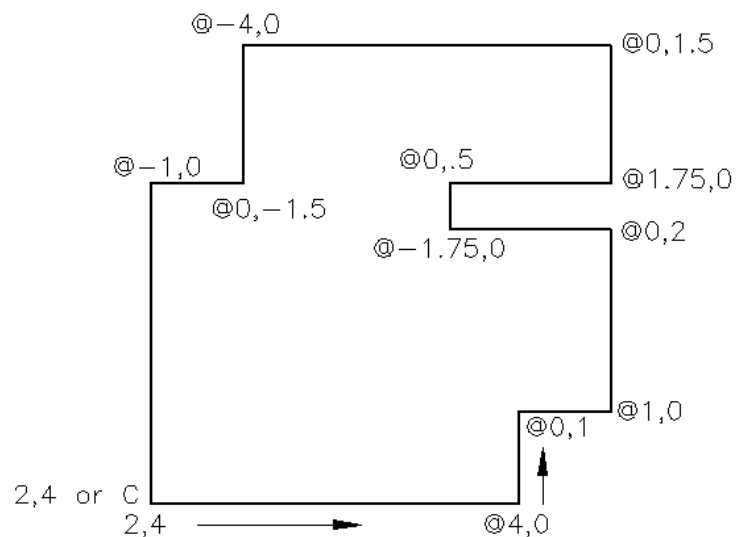


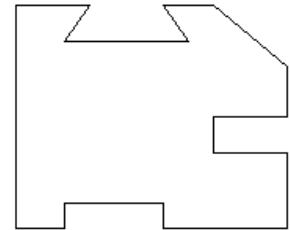
Figure Hint 1

Lab Exercise 4-2**Time Allowed: 30 Min.**

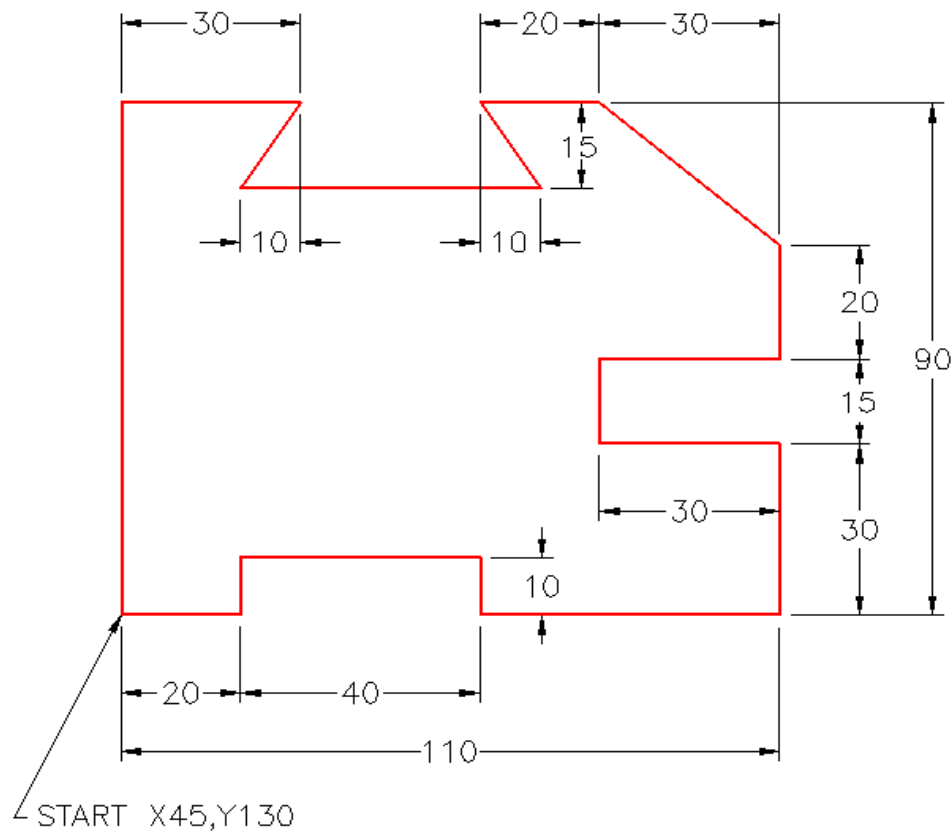
Name	Template	Units
AutoCAD 2D Lab 04-2	2D Metric	Millimeters

Instructions:

- Step 1** Start a new drawing using the template shown above.
- Step 2** Save and name the drawing AutoCAD 2D Lab 04-2 in the folder:
CAD Courses/AutoCAD 2D/Lab Exercises
- Step 3** Using the LINE command, draw the object shown in the dimensioned drawing.



Completed Drawing



Dimensioned Drawing

Step 4 Enter the UNITS command. In the Drawing Units dialogue box, set the Insertion Units to Millimeters. (Figure Step 4)

Author's Comments: You can find the Insertion scale in the Units column in the lab exercise title. See page 4-11.

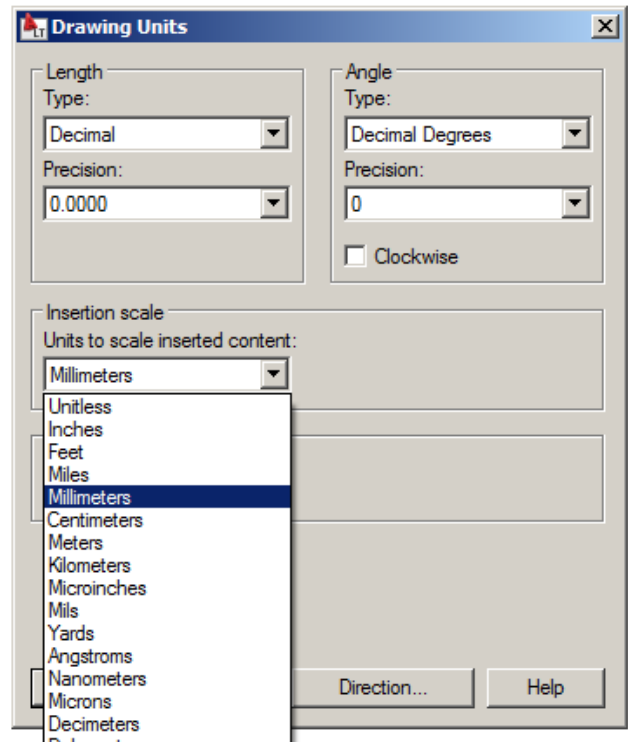


Figure Step 4

Step 5 Check your drawing with the key. The key name is the same as the drawing name. (Figure Step 5)

Author's Comments: If you have trouble doing this, redo Module 3.

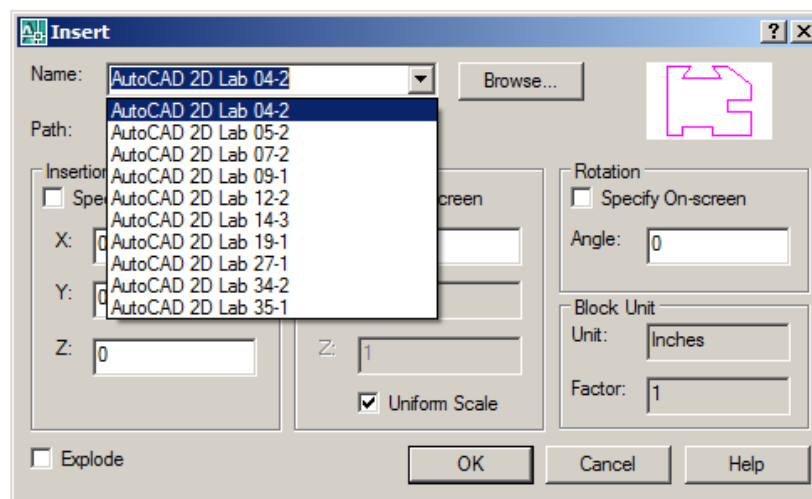


Figure Step 5

Step 6 Your drawing should match the figure. (Figure Step 6)

Author's Comments: Step 5 will insert a magenta colored overlay key on your drawing. If you see double objects or places where your objects and the magenta objects do not match, your drawing is inaccurate. If you only see one object, even though it may share the colors magenta and red, your drawing is accurate.

Author's Comments: If you have trouble completing this drawing the first try, do not be concerned. Start it over again, from scratch, until you can complete it. The more practice you get drawing, the easier it will get. When you get to Module 8, you will be taught how to fix a drawing so you do not have to start over.

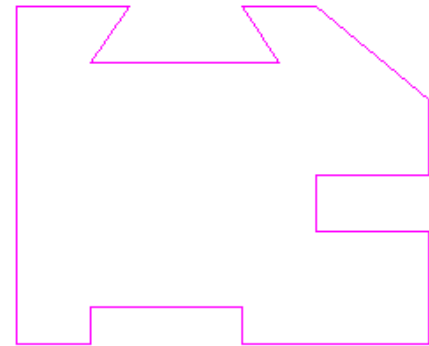


Figure Step 6

Step 7 Save and close the drawing.

Author's Construction Hints: Do your best to complete the lab exercise drawing without using the following hint. If you get stuck and can not complete it on your own, use the following hint to help you.

Hint 1

See Figure Hint 1.

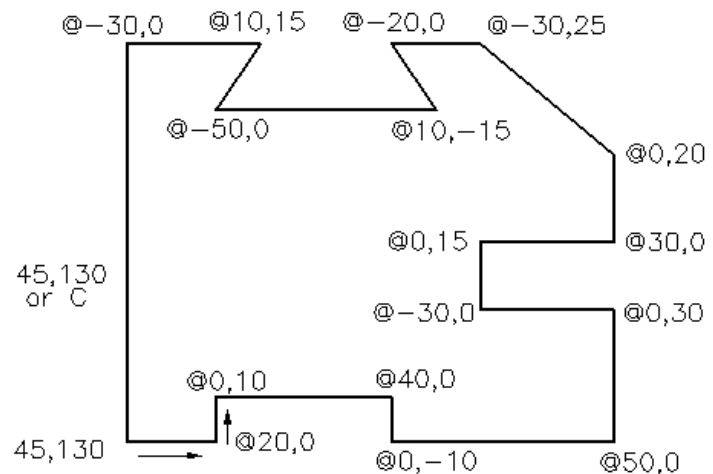


Figure Hint 1