

# LESSON 9

## LEARNING OBJECTIVES

*After completing this lesson, you will be able to:*

1. Understand the Origin.
2. Draw objects accurately using coordinate input.
3. Input Absolute and Relative coordinates.
4. Input using Direct Distance Entry.
5. Measure the Distance, Angles, and Areas of objects.
6. Identify a Location within the drawing.
7. Create your own Master Border Template.
8. Print from Model Space.

# Coordinate Input

In the previous lessons, you have been using the cursor to place objects. In this lesson, you will learn how to place objects in **specific locations** by entering coordinates. This process is called **coordinate input**. This is not difficult, so do not start to worry.

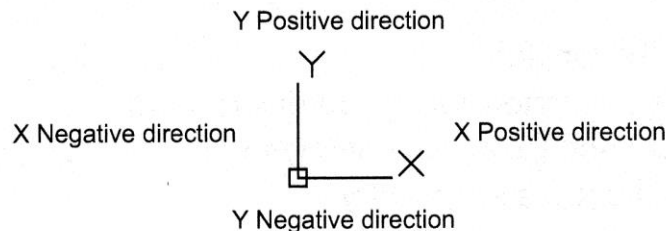
AutoCAD uses the **Cartesian Coordinate System**. The Cartesian Coordinate System has three axes, **X**, **Y**, and **Z**.

The **X** is the horizontal axis. (Right and Left.)

The **Y** is the vertical axis. (Up and Down.)

The **Z** is perpendicular to the X and Y plane.

(The **Z** axis is discussed in the *Advanced AutoCAD® Exercise Workbook* and *AutoCAD® 3D Modeling Exercise Workbook*.)

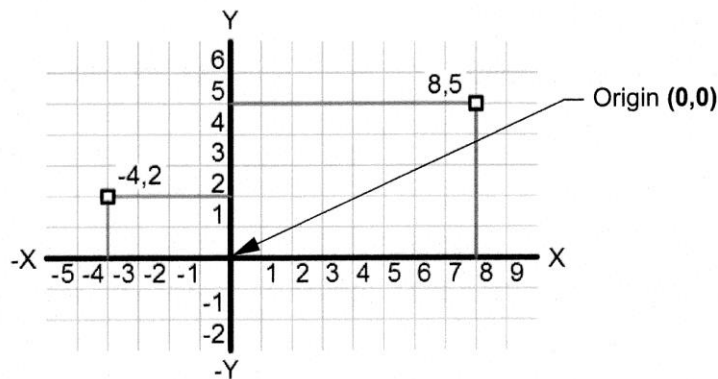


Look at the User Coordinate System (**UCS**) icon in the lower left corner of your screen. The X and Y are pointing in the positive direction.

The location where the X, Y, and Z axes intersect is called the **Origin**. The Origin always has a coordinate value of **X = 0**, **Y = 0**, and **Z = 0 (0,0,0)**.

When you move the **cursor** away from the Origin, in the positive direction, the X and Y coordinates are positive. When you move the **cursor** in the opposite direction, the X and Y coordinates are negative.

Using this system, every point on the screen can be specified using positive or negative X and Y coordinates.



There are three types of Coordinate Input: **absolute**, **relative**, and **Polar**. (Absolute and relative coordinates are discussed in this lesson, and Polar coordinates will be discussed in Lesson 11.)

## Absolute Coordinates

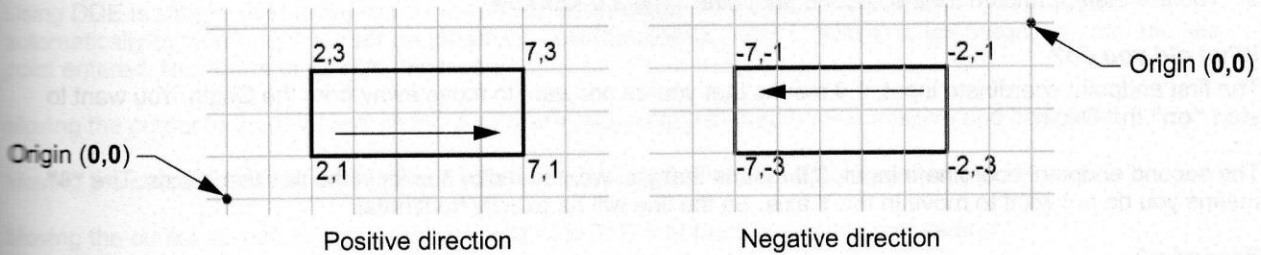
When inputting absolute coordinates, the input format is: **X,Y** (that is: X **comma** Y). Absolute coordinates come **from the Origin** and are typed as follows: **8,5**

The first number (8) represents the **X axis** (horizontal) distance **from the Origin**, and the second number (5) represents the **Y axis** (vertical) distance **from the Origin**. The two numbers must be separated by a **comma**.

An absolute coordinate of **4,2** will be **4** units to the **right** (horizontal) and **2** units **up** (vertical) **from the current location of the Origin**.

An absolute coordinate of **-4, -2** will be **4** units to the **left** (horizontal) and **2** units **down** (vertical) **from the current location of the Origin**.

The following are examples of absolute coordinate input. Notice where the **Origin** is located in each example.



**Very important:**

While working on Lessons 9 and 10 it is best to **turn off** Dynamic Input.

The Dynamic Input button is not displayed by default. To display the button refer to pages 1-12 and 1-13. The button should be gray when switched off.

Refer to Lesson 11 for more information on Dynamic Input.

**Relative Coordinates**

Relative coordinates come **from the last point entered**. (Not from the Origin.)

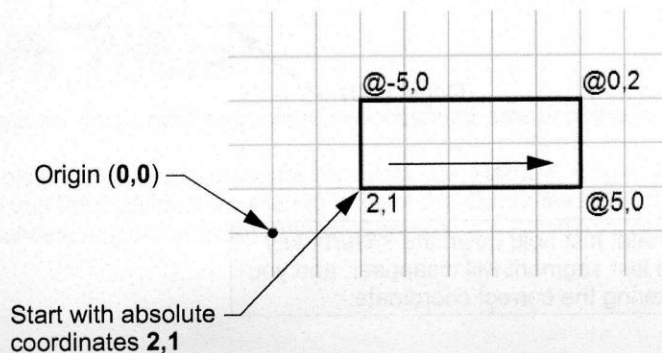
The first number represents the **X axis** (horizontal) and the second number represents the **Y axis** (vertical) just like the absolute coordinates.

To distinguish the relative coordinates from absolute coordinates, the two numbers must be preceded by an **@** symbol in addition to being separated by a **comma**.

A relative coordinate of **@5,2** will go to the **right 5** units and **up 2** units from the last point entered.

A relative coordinate of **@-5, -2** will go to the **left 5** units and **down 2** units from the last point entered.

The following is an example of relative coordinate input.



## Examples of Coordinate Input

### Scenario 1.

If you want to draw a line with the first endpoint "at the Origin" and the second endpoint 3 units in the positive X direction:

1. Select the **Line** command.
2. You are prompted for the first endpoint: Type **0,0 <Enter>**.
3. You are then prompted for the second endpoint: Type **3,0 <Enter>**.

### What did you do?

The first endpoint coordinate input, **0,0** means that you do not want to move away from the Origin. You want to start "on" the Origin.

The second endpoint coordinate input, **3,0** means that you want to move **3** units in the positive X axis. The "0" means you do not want to move in the Y axis. So the line will be exactly horizontal.

### Scenario 2.

If you want to start a line 1 unit to the right of the origin and 1 unit above and the line will be 4 units in length, perfectly vertical:

1. Select the **Line** command.
2. You are prompted for the first endpoint: Type **1,1 <Enter>**.
3. You are prompted for the second endpoint: Type **@0,4 <Enter>**.

### What did you do?

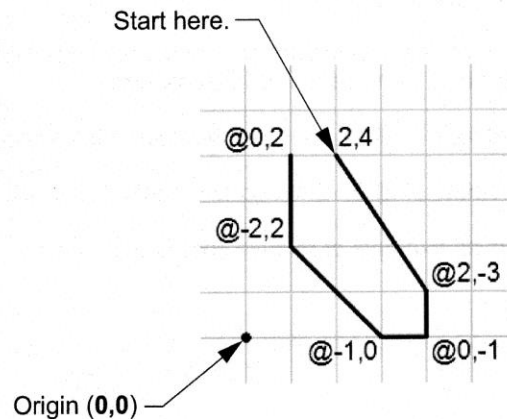
The first endpoint coordinate input, **1,1** means you want to move **1** unit in the X axis direction and **1** unit in the Y axis direction.

The second endpoint coordinate input **@0,4** means you do not want to move in the X axis "from the last point entered". But you do want to move in the Y axis "from the last point entered". (Remember the @ symbol is only necessary if you are not using **Dynamic Input**.)

### Scenario 3.

Now try drawing five connecting line segments. (Watch for the negatives.)

1. Select the **Line** command.
2. First endpoint: **2,4 <Enter>**.
3. Second endpoint: **@ 2, -3 <Enter>**.
4. Second endpoint: **@ 0, -1 <Enter>**.
5. Second endpoint: **@ -1,0 <Enter>**.
6. Second endpoint: **@ -2,2 <Enter>**.
7. Second endpoint: **@ 0,2 <Enter> <Enter>**.



If you enter an incorrect coordinate, just hold down the **<Shift>** key and press **U** then **<Enter>**. The last segment will disappear, and you will have another chance at entering the correct coordinate.

## Direct Distance Entry (DDE)

**Direct Distance Entry** is a combination of keyboard entry and cursor movement. **DDE** is used to specify distances in the horizontal or vertical axes from the **last point entered**. DDE is a **Relative Input**. Since it is used for horizontal and vertical movements, **Orthomode** must be **on**.

**Note:** To specify distances on an angle, refer to **Polar Coordinate Input** in Lesson 11.

Using DDE is simple. Just move the cursor and type the distance. Negative and positive is understood automatically by moving the cursor up (positive), down (negative), right (positive) or left (negative) from the last point entered. No **minus** or **@** sign necessary.

Moving the cursor to the right and typing **5 <Enter>** tells AutoCAD that the **5** is positive and horizontal.

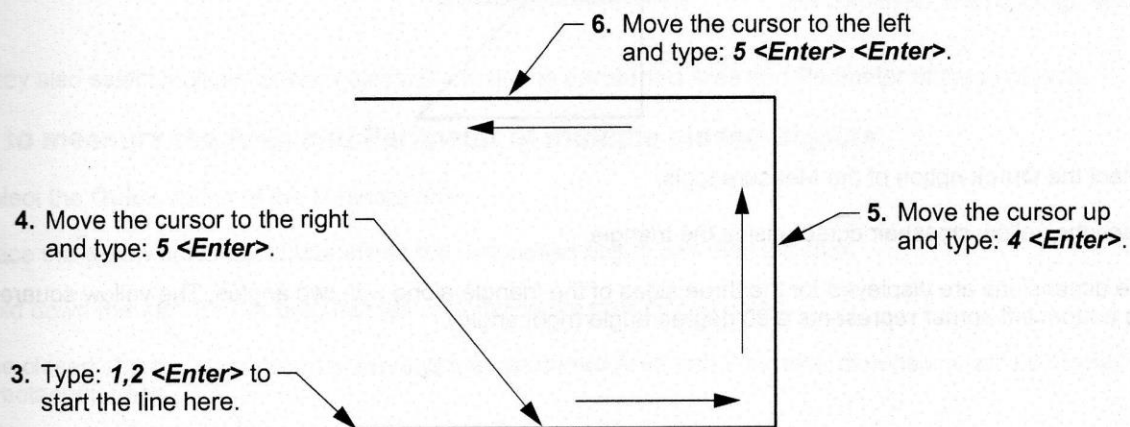
Moving the cursor to the left and typing **5 <Enter>** tells AutoCAD that the **5** is negative and horizontal.

Moving the cursor up and typing **5 <Enter>** tells AutoCAD that the **5** is positive and vertical.

Moving the cursor down and typing **5 <Enter>** tells AutoCAD that the **5** is negative and vertical.

### Example:

1. **Orthomode** must be **on**. Grid **off**.
2. Select the **Line** command.
3. Type: **1,2 <Enter>** to enter the first endpoint using absolute coordinates.
4. Now move your cursor to the right and type: **5 <Enter>**.
5. Now move your cursor up and type: **4 <Enter>**.
6. Now move your cursor to the left and type: **5 <Enter> <Enter>** (the second **<Enter>** ends the Line command).



## Measure Tools

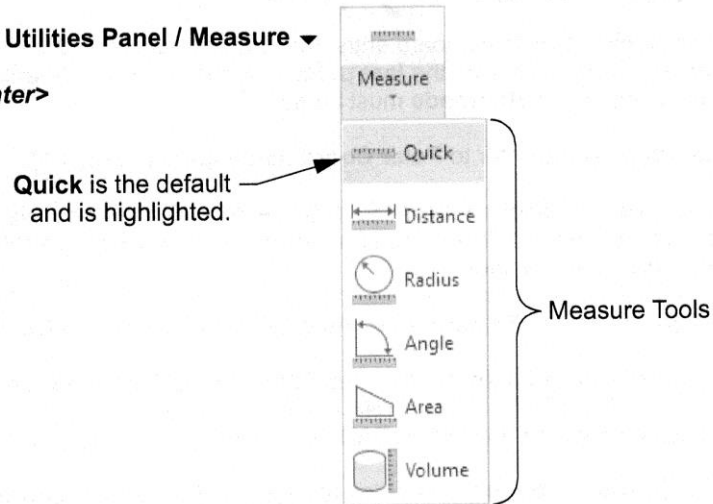
The following tools are very useful to confirm the location or size of objects.

The **Measure** tools enables you to measure the **Distance**, **Radius**, **Angle**, **Area**, or **Volume** of a selected object. You may wish to use the individual measuring tools or the **Quick Measure** tool, which allows you to measure the dimensions, distances, angles, radii, and areas of objects in a 2-dimensional drawing. The default option is **Quick**.

Continued on the next page...

1. Select the **Measure** tools using one of the following:

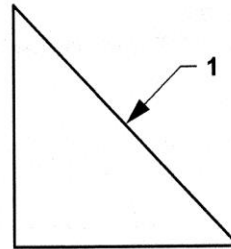
**Ribbon = Home Tab / Utilities Panel / Measure ▾**  
 or  
**Keyboard = MEA <Enter>**



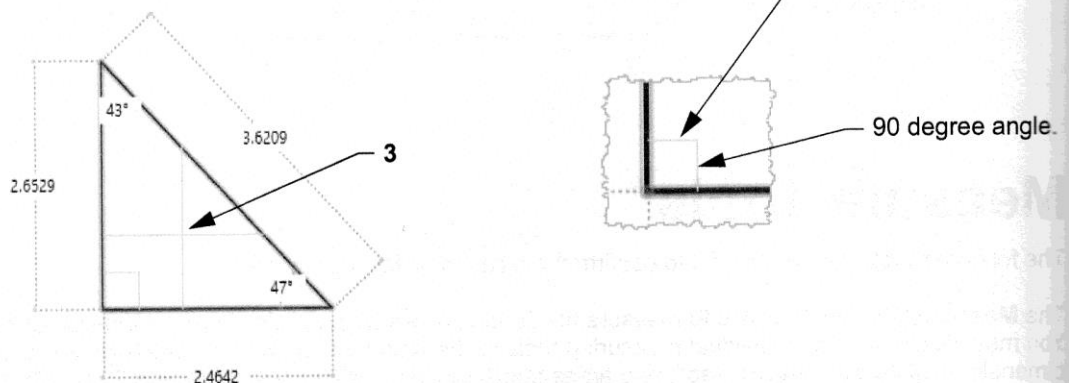
2. Select one of the tools and follow the instructions on the Command Line.

#### Example using the Quick Measure tool:

1. Create a right-angled triangle as shown.

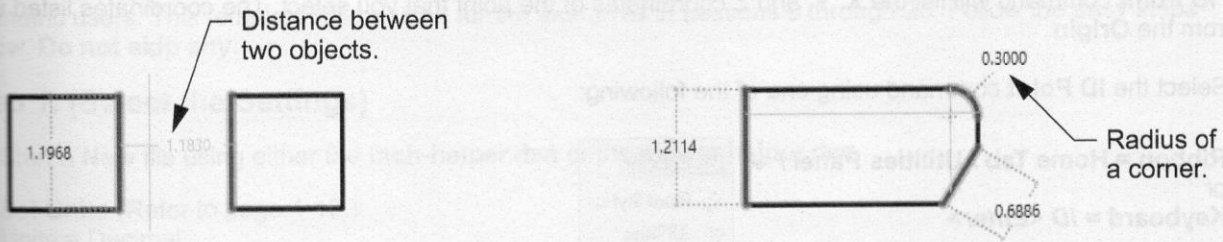


2. Select the **Quick** option of the Measure tools.
3. Place the yellow crosshair cursor inside the triangle.
4. The dimensions are displayed for the three sides of the triangle along with two angles. The yellow square in the bottom left corner represents a 90 degree angle (right angle).



5. To close the **Quick Measure** option of the Measure tools, press the **<Esc>** key.

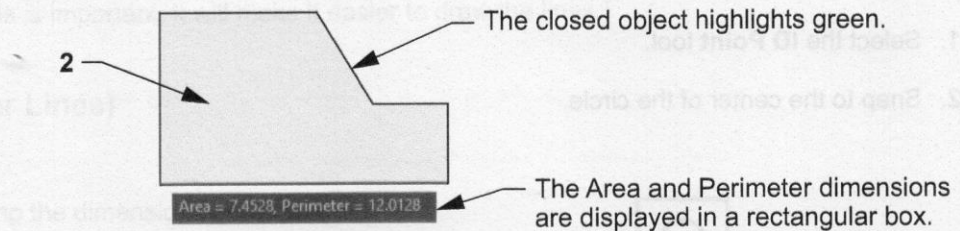
The **Quick Measure** option of the Measure tools can also measure the distance between two objects or the radius of a corner.



The **Quick Measure** option of the Measure tools can also measure the **Area** and **Perimeter** of a closed object.

### How to measure the Area and Perimeter of a closed object using Quick Measure

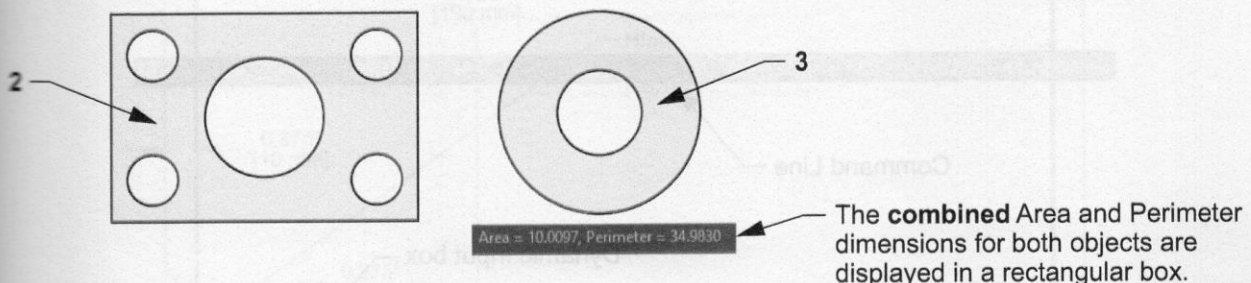
1. Select the **Quick** option of the Measure tools.
2. Place the yellow crosshair cursor inside the closed object and then left click.
3. The closed object will highlight green and the Area and Perimeter dimensions will be displayed in a rectangular box.



You may also select multiple closed objects to obtain the **combined** Area and Perimeter of those objects.

### How to measure the Area and Perimeter of multiple closed objects

1. Select the **Quick** option of the Measure tools.
2. Place the yellow crosshair cursor inside the first closed object and then left click.
3. Hold down the **<Shift>** key and then left click inside the next closed object.
4. The closed objects will highlight green and the **combined** Area and Perimeter dimensions will be displayed in a rectangular box.




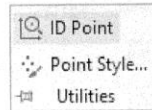
To improve performance or to prevent any confusion when using the **Quick** option of the Measure tools, zoom into complex areas or objects.

# ID Point

The **ID Point** command will list the **X**, **Y**, and **Z** coordinates of the point that you select. The coordinates listed will be from the **Origin**.

1. Select the **ID Point** command using one of the following:

Ribbon = Home Tab / Utilities Panel /  ID Point  
or  
Keyboard = **ID** <Enter>



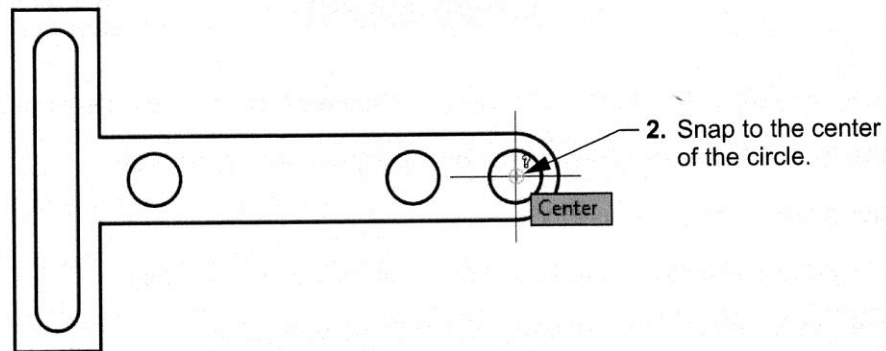
The following will appear on the Command Line:



2. Select a location point, such as the center of a circle.
3. The **X**, **Y**, and **Z** location coordinates for the center of the circle will be displayed above the Command Line and in the Dynamic Input box.

### Example using the ID Point tool:

1. Select the **ID Point** tool.
2. Snap to the center of the circle.



3. Coordinates, from the **Origin**, are displayed above the Command Line and in the Dynamic Input box.

Command: '\_id Specify point: X = 83.9488 Y = 20.2084 Z = 0.0000

Command Line

Dynamic Input box

X = 83.9488 Y = 20.2084 Z = 0.0000