

CLEARNING OBJECTIVES

After the completion of this chapter, the students have learned the following :

- How to start AutoCAD
- How to start a new drawing
- The user interface and its various sections, including the drawing area, the UCS icon, the menus and toolbars, the command line, and the status bar
- How to start a command from the command line
- How to start a command from the menu
- How to draw lines

- How to save a drawing for the first time
- How to close a drawing
- How to exit AutoCAD

5.1 Introduction to AutoCAD 2016

AutoCAD is a commercial Computer-Aided Design (CAD) and drafting software application. It is developed and marketed by Autodesk, Inc.

AutoCAD software is used by architects, CAD technicians, designers, engineers, project managers, and CAD/ It managers in a variety of industries, including the manufacturing, building, civil, and mapping industries.



Fig. 6.1



5.2 **Starting AutoCAD 2016**

To start AutoCAD 2016, double-click the AutoCAD 2016 - English icon on your Desktop (or) click Start > All Programs > Autodesk > AutoCAD 2016 > AutoCAD 2016-English.

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Fig. 6.2 AutoCAD 2016 -English icon on the Desktop

6.3 **AutoCAD Initial Screen**

When you double-click the AutoCAD 2016 -English icon on the desktop, the AutoCAD 2016 initial screen will appear. To open a new drawing file, click Start Drawing on the Initial Screen.



Fig. 6.4 AutoCAD 2016 initial screen



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6.4 AUTOCAD 2016 INTERFACE

The AutoCAD 2016 interface is based on Ribbons and the Application Menu. The important feature of this interface is that the size of the Graphical Area will be bigger.

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Fig. 6.5 AutoCAD 2016 screen components in AutoCAD Drafting & Annotation workspace

6.4.1 Application Menu

The Application menu appears when you click the red "A" called the Application Button. This menu contains file-related commands such as creating a new file, opening an existing file, saving the current file, saving the current file under a new name and in a different folder, exporting the current file to a different file format, printing and publishing the current file, etc.



Fig. 6.6 Application Button

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Fig. 6.7 Application menu

The Search bar displays at the top of the Application menu. It is used to search for any command. If you type any keyword in the search bar, you can find a list of commands related to it.



Fig. 6.8 Search Bar in the Application Menu

In the Application Menu, you will see the recent files. You can also choose how to display the recent files in the Application Menu using this control :



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You can also choose how to sort the recent files in the Application menu using this control:



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6.4.2 Title bar

The title bar contains the program name (Autodesk AutoCAD 2016) and the title of the current drawing (Drawing1.dwg).

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Autodesk AutoCAD 2016 Drawing1.dwg

Fig. 6.11 Title Bar

6.4.3 Quick Access Toolbar

This toolbar is located at the top left corner of the window next to the red 'A' button. It contains all File commands mentioned in the Application Menu along with Workspace and Undo/Redo.



Fig. 6.12 Quick Access Toolbar

The user can customize this Quick Access toolbar by clicking the arrow at the end, which will bring up the following:

You can add or remove commands by using Customize Quick Access Toolbar. You can also add Menu bar by clicking **Show Menu Bar.**

6.4.4 Ribbon

On the top of the AutoCAD 2016 window, just below the title bar, is a wide area called the Ribbon. The Ribbon consists of two parts: tabs and panels, as shown below:



Fig. 6.13 Customize Quick Access Toolbar

Ribbon Tab

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In the Home tab of the Ribbon, Draw, Modify, Annotation, Layers, etc. panels are displayed.

Some panels such as Draw, Modify have more buttons than shown. These panels can be expanded to display more tools. You can see an arrow to the right of a **Home tab** panel title. When you click on the arrow, it expands the panel to display additional tools and controls. By default, an expanded panel closes automatically when you click or move to another panel. To keep a panel expanded, click the push icon in the bottom-left corner of the expanded panel.



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Fig. 6.15. An expanded Draw Panel

For some commands, there are many options. AutoCAD put all the options in the same button as shown in Fig. You can easily access these options.



Fig. 6.16. Buttons with more options



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The ribbons have a very simple help feature. If you hover the mouse over a button, a small help screen will appear.

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Fig. 6.17. A Small help Screen appears

If you leave the mouse over the button for a longer period of time, AutoCAD will show more detailed help screen.



Fig. 6.18. More Detailed Help Screen

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Panels have two states-either docked or floating. By default all panels in the Ribbon are docked in their respective tab. Drag and drop the panel in the drawing area to make it floating.

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You can send the panel back to its respective tab by clicking the small button at the top right side.



Fig. 6.19. Draw Panel

While the panel is floating you can toggle the orientation.



Fig. 6.20.

It will either extend to the right or down.



Fig. 6.21 Extended to the right



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Fig. 6.22 Extended to the down

Changing the display of the Ribbon

You can change the display of the ribbon by clicking the Minimize Ribbon button located at the top of it. The ribbon can be displayed in three different modes as shown below.

1. When you click the Minimize Ribbon button for the first time, the full ribbon changes to display tabs and panel buttons. Now hover the cursor over the panel buttons. The panel buttons expand to reveal all the tools shown on the full ribbon.



Panel button

Fig. 6.23. Ribbon Minimized to Panels

2. When you click the Minimize Ribbon button for the second time, the panel buttons change into panel titles. Now hover the cursor again over the panel titles to reveal each panel's tools.



Fig. 6.24. Ribbon Minimized to Panel Titles

3. When you click the Minimize Ribbon button for the third time, the panel titles change into panel tabs. Hovering the cursor over the panel tabs doesn't have any effect. Click the Home tab in the ribbon to reveal the full panel temporarily. It disappears after you move the cursor away.



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4. Verify that Cycle Through All is selected in the Minimize Ribbon button's menu and then click the Minimize Ribbon button for the fourth time. The full ribbon interface is restored.

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Fig. 6.27. Full Ribbon Interface

6.4.5 Start Tab

When you click the Start tab at any moment, you will get the AutoCAD 2016 Initial screen again. Using it, you can start a new drawing, open an existing drawing, etc.



Fig. 6.28. Start Tab

6.4.6 File tabs

File tabs are located beneath the ribbon. For each opened file a tab is created. You can easily switch between different drawing files by using the file tabs.

You can also create a new drawing file by clicking on the (+) sign available at the end of the file tabs.



The File tab bar is located at the bottom of the Ribbon. In the bar, all the tabs added get arranged in the sequence in which the respective drawings are created. Using mouse you can change the sequence of tabs in the File tab bar. To do so, press and hold the left mouse button on any tab and drag it to the desired location on the tab bar.

All File tabs are gray in colour. The current file (tab) will appear in a lighter gray, and the other tabs will appear in a darker gray.

If you hover over one of the file tabs, two things will take place:

- The path of this file will appear above the File tab.
- The model space and the layouts of this file will appear beneath the tab.





A star beside the name of the file in the file tab means this file has changed and you need to save changes.

- You can also close the File tab by clicking on the (x) sign beside the name.
- The user can customize the File tabs by switching them off. To do so, press the View tab in the ribbon and locate the Interface panel. Click on the Files tab button to close the File tab bar.

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Fig. 6.30. File Tab Button

6.4.7 Drawing Area

The drawing area covers the major portion of the screen. You can easily draw objects and create 3D graphics in this area.

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6.4.8 Command Window

The command window is normally located at the bottom of the application window, just above the status bar. This window normally contains three lines of text and the first two lines list the immediate command history. The bottom line is the command line. If you do not see the command window, press Ctrl + 9 to make it appear.

You can enter a command manually at the command line. You can type at the cursor position on the command line, that is, the Command: prompt.

If you just type the first letter of a command, it will list all the commands starting with that letter. Note: Always press ENTER after you type values on the command line.

You can drag this window to a different place on the screen and resize it.



Fig. 6.32. Command Window

When you enter a command, AutoCAD doesn't care if you use UPPERCASE or lowercase characters, or a combination of either. If you make a mistake typing on the command line, press the BACKSPACE key to correct.

You can press ESC at any time. If you press ESC while an operation is in progress, it terminates the command.

To repeat the command you previously entered in AutoCAD, press ENTER (or the spacebar) at the 'Command:' prompt. As an alternative, right-click to display the cursor menu, and then select the Repeat option.

Recent Input

AutoCAD remembers the last twenty commands and options you enter at the 'Command:' prompt, or select from a menu or toolbar. Autodesk calls this "Recent Input."

If you prefer to see a list of the command history, right-click, and then select Recent Input from the shortcut menu. AutoCAD lists the previous commands and/or coordinate inputs in a submenu.



Fig. 6.33. Recent Input and its Submenu



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6.4.9 UCS Icon

You can see an L-shaped line in the lowerleft corner of the drawing area. It is called the UCS icon; UCS is short for "User Coordinate System."

- The UCS icon is useful primarily for drawing in three dimensions.
- The icon is not needed for 2D drafting, and you can turn it off with the UCSICON command. Type the command name, and then enter the Off option, as follows:
- Command: ucsicon (Press ENTER.)
- Enter an option [ON/OFF/All/Noorigin/ ORigin/Properties] <ON>: off (Press ENTER.)



Fig. 6.34. UCS Icon

6.4.10 Navigation Bar

The Navigation Bar is displayed in the drawing area and contains navigation tools.



Fig. 35. Navigation Bar

6.4.11 Status Bar

The Status Bar which is located below the command line, and docked in the lowerright corner of the window is called Application Status Bar.

It contains so many buttons which help you to create a drawing very easily. You can easily turn ON or OFF these buttons just by clicking on them.

Some buttons are hidden by default. You can also display more buttons on the status bar by clicking the Customization button at the bottom right corner and selecting the options from the menu.

Tip. When in AutoCAD 2016, the bottom status bar is not displaying, Type in STATUSBAR on the command line, and hit enter. Change the value from 0 to 1. Now the Status Bar appears on the bottom of the window.

Command: STATUSBAR → Enter new value for STATUSBAR <0>: 1 →

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Application **Status Bar Status Bar** Fig. 6.36. AutoCAD 2016 - Status Bar Customization Drawing Coordinates button **Dynamic Input DYNMODE Restrict cursor orthogonally** orthomode (F8) **Restrict cursor to specified** angles Polar Tracking (F10) **Isometric Drafting ISODRAFT** Workspace Switching 2331.0652, 699.5313, 0.0000 MODEL 1:1 • O Drafting & Annotation • • t= L @ • \ • Z 2 2 Snap mode Clean **SNAPMODE(F9)** screen **Display drawing Grid GRIDMODE (F7)** Model or Paper space

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Fig. 6.37. AutoCAD 2016 - Application

Drawing Coordinates

By default this button is hidden in AutoCAD 2016. Using the Customization menu you can show it. It displays the drawing coordinates when you move the pointer in the drawing area. You can also turn OFF this button by clicking on it.

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MODEL

The MODEL button is chosen by default because you are working in the model space to create drawings.

GRIDMODE (F7)

If the GRIDMODE button is chosen, the Display drawing grid will turn ON and the grid lines are displayed on the screen. The F7 function key can be used to turn the grid display on or off.

SNAPMODE (F9)

If the SNAPMODE button is chosen, the snap mode will turn ON. When snap is on, the cursor under mouse control can only be moved in jumps from one snap point to another. The **F9** key acts as a toggle key to turn the snap off or on.

Dynamic Input (F12)

The Dynamic Input button in the status bar is used to turn the Dynamic Input on or off. If the Dynamic Input mode is turned on, the **x**,**y** coordinates and prompts show when the cursor hairs are moved. Using the **F12** key, you can turn the Dynamic Input on or off.

Ortho Mode (F8)

You can turn ON or OFF the Ortho Mode just by clicking on it. If the ORTHOMODE button is chosen, you can draw lines at right angles only i.e., lines can only be drawn vertically or horizontally. You can also use the **F8** function key to turn ortho on or off.

Polar Tracking (F10)

You can turn ON or OFF the Polar Tracking just by clicking on it. When you turn ON the Polar Tracking, a small tip appears showing the direction and length of lines etc. in degrees and units. You can draw lines easily at regular angular increments, such as 5, 10, 15, 23, 30, 45, or 90 degrees. You can also use the **F10** function key to turn on this option.

Workspace

A workspace is a complete user interface, which includes the location and appearance of the drawing area and all menus, buttons, and groupings of buttons. Think of a workspace as a unique, specific arrangement of AutoCAD's features and capabilities that can be retrieved at any time. It is easy to switch between workspaces, modify workspaces, and create custom workspaces to match the specific requirements of a user or a particular task.

Workspace Switching

In AutoCAD 2016, you can switch between different workspaces by using the **Workspace Switching button** that is available at the right of the Status Bar. On clicking the Workspace Switching button, a flyout will be displayed with the list of all available workspace. You can select the required workspace to invoke.



Fig. 6.38. Workspace Switching button

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There are three workspaces available in AutoCAD 2016: Drafting & Annotation, 3D Basics, and 3D Modeling. By default, the Drafting & Annotation workspace is activated in AutoCAD 2016. You can easily create 2D drawings in this workspace.

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Drafting & Annotation

Display Workspace Label

Fig. 6.40. Three Types of Workspaces

You can also easily switch between workspaces by using the Workspace dropdown on the top-left corner.

Tip: If the Workspace drop-down is not displayed at the top left corner, then click the down arrow next to Quick Access Toolbar. Next, select Workspace from the drop-down; the Workspace drop-down will be visible on the Quick Access Toolbar.



Fig. 6.41. Down Arrow Next To Quick Access Toolbar



Fig. 6.42. Workspace Drop-down List Box



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Clean Screen

The Clean Screen button hides most interface elements such as the Ribbon, and maximizes the drawing area to focus on the current drawing. This button is at the lower right corner of the screen. Choose the Clean Screen button again to restore the previous display state of the screen.





Customization

In AutoCAD 2016, you can customize which buttons appear on the status bar at the bottom of the AutoCAD application window. When you click on the Customization button, It opens a menu. In it, select the items you want displayed in the status bar.



Fig. 6.44. Customization menu

6.4.12 Menu Bar

Menu Bar is not displayed by default. To display the menu bar, Click on the arrow in the **Quick Access Toolbar**; a flyout is displayed. Select the **Show Menu Bar** option from it. The menu bar will be displayed. You can select commands from the menu bar.

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Fig. 6.45. Show Menu Bar Option

Fig. 6.46. Menu Bar

6.4.13 Toolbar

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Toolbars are not displayed by default. To display a toolbar, choose **Tools** > **Toolbars** > **AutoCAD** from it; a list of toolbars will be displayed.

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Fig. 6.47. A List of Toolbar

Select the required toolbar. The following Figure shows the **Draw** toolbar invoked.

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Fig. 6.48. The Draw Toolbar

6.5 Function Keys

AutoCAD 2016 provides a set of function keys for quick access to certain commands. Listed below are the function keys defined for AutoCAD 2016.

Function Key	Function Defined in AutoCAD 2016
F1	Online Help
F2	Toggles between Command window On and OFF
F3	Toggles between OSNAP On and OFF
F4	Toggles between Tablet On and OFF
F5	Toggles between Isoplanes Right, Left, and Top
F6	Toggles between Dynamic UCS On and OFF
F7	Toggles between Grid On and OFF
F8	Toggles between Ortho Mode On and OFF
F9	Toggles between Snap Mode On and OFF
F10	Toggles between Polar Tracking On and OFF
F11	Toggles between Objects Snap Tracking On and OFF
F12	Toggles between Dynamic Input On and OFF

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Working in the Command-Line Interface 6.6

The command-line interface is docked by default along the bottom edge of the drawing area. It serves as your primary method of interacting with AutoCAD. You use this interface to tell the software what you would like it to do for you. The AutoCAD software uses this interface to communicate the information it needs from you.

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× Command: Command:	
92 - Type a command	
Fig. 6.49. The Comm	nand - Line Interface
 6.7 Starting a new AutoCAD drawing 6.7.1 Drawing with the line tool 1. Click the New button in the Quick Access toolbar. 	 3. The LINE command can be activated: a) by selecting the icon from the Draw panel b) from the menu bar with Draw >Line c) by entering the command at the prompt line, e.g. LINE <r></r>
 Fig. 6.50. The New button in the Quick Access toolbar AutoCAD displays the Select Template dialog box. Select a template file acad.dwt, and then click Open. 	Fig. 6.52. The Line tool in the Draw panel



Fig. 6.53. The Command Line

Fig. 6.51. Select Template Dialog Box

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4. The following AutoCAD prompts will appear:

Specify first point: (Using the mouse, left-click anywhere on the screen to specify the first point.)

Specify next point or [Undo]: (Move the cursor elsewhere on the screen and leftclick again to specify the second point.)

Specify next point or [Undo]: (Specify the third point.)

Specify next point or [Close/Undo]: (Press ENTER to exit the Line tool.)

Now you can see a line appears in the drawing area as shown in fig.



Fig. 6.54. Drawing lines using the Line tool

Note

When you specify the start point of the line by pressing the left mouse button, a rubber band line stretches between the selected point and the current position of the cursor.

Note that in the Command prompt the **Close** and **Undo** options will be displayed while creating lines using the Line tool.

The Undo Option

While drawing a line, if you specify a wrong endpoint, then you can undo the last specified point and go back to the previous stage by using the Undo option of the Line tool. You can use this option multiple times. To use this option, type Undo (or just U) at the Specify next point or [Undo] prompt. You can also right-click to display the shortcut menu and then choose the Undo option from it.

The Close Option

After drawing two continuous lines by using the Line tool, you will notice that the Close option is displayed at the Command prompt. (This option does not appear until you have picked three points, because a

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minimum of two line segments are needed before a polygon can be created by the third closing segment.)

The Close option is used to join the current point to the start point of the first line when two or more continuous lines are drawn. If you specify the endpoint by using the mouse, then click at the start point of the first line or enter C at the Command prompt, as given in the Command prompt below.

Command: LINE

Specify first point: Pick the first point. **Specify next point or [Undo]:** Pick the second point.

Specify next point or [Undo]: Pick the third point.

Specify next point or [Close/Undo]: C (The fourth point joins with the first point).



Fig. 6.55 Drawing lines using Close option

The drawing seen on the screen is a triangle of arbitrary size. To prepare the correct dimensional engineering drawings, the Coordinate systems is used.

6.7.2 COORDINATE SYSTEMS

In AutoCAD, the location of a point is specified in terms of Cartesian coordinates. In this system, each point in a plane is specified by a pair of numerical coordinates. To specify a point in a plane, take two mutually perpendicular lines as references. The horizontal line is called the X axis, and the vertical line is called the Y axis. The X and Y axes divide the XY plane into four parts, generally known as quadrants. The point of intersection of these two axes is called the origin and the plane is called the XY plane.

The origin has the coordinate values of X = 0, Y = 0. The origin is taken as the reference for locating a point on the XY plane. Now, to locate a point, say P, draw a vertical line intersecting the X axis. The horizontal distance between the origin and the intersection point will be called the X coordinate of P. It will be denoted as P(x). The X coordinate specifies how far the point is to the left or right from the origin along the X axis. Now, draw a horizontal line intersecting the Y axis.



The vertical distance between the origin and the intersection point will be the Y coordinate of P. It will be denoted as P(y). The Y coordinate specifies how far the point is to the top or bottom from the origin along the Y axis. The intersection point of the horizontal and vertical lines is the coordinate of the point and is denoted as P(x,y). The X coordinate is positive, if measured from the right of the origin and is negative, if measured from the left of the origin. The Y coordinate is positive, if measured above the origin and is negative, if measured below the origin, refer to Figure 6.56.



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In AutoCAD, the default origin is located at the lower left corner of the drawing area.

AutoCAD uses the following coordinate systems to locate a point in the XY plane.

- 1. Absolute coordinates
- 2. Relative coordinates
- 3. Polar coordinates
- 4. Direct distance entry

If you are specifying a point by entering its location at the Command prompt then you need to use any one of the coordinate systems.

Absolute Coordinate System

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In the Absolute Coordinate System, points are located with respect to the origin (0,0). For example, a point with X = 4 and Y = 3 is measured 4 units horizontally (distance along the X axis) and 3 units vertically (distance along the Y axis) from the origin, as shown in Figure 6.57. In AutoCAD, the absolute coordinates are specified at the Command prompt by entering X and Y coordinates, separated by a comma.



Fig. 6.57. Absolute Coordinate System

Draw a line on the points (50,50) and (150,50) using Absolute Co-ordinate System.

Command: LINE ↓

Specify first point: 50,50 ↓

Specify next point or [Undo]: 150,50 →

Specify next point or [Undo]: → (Press Enter Key.)

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Fig. 6.58. Drawing a figure using the absolute coordinates

Using Line command, draw a triangle for the given points on the points (50,50), (150,50), (100,100).(AbsoluteCo-ordinate System)

Command: LINE ↓

Specify first point: 50,50 ↓

Specify next point or [Undo]: 150,50 →

Specify next point or [Undo]: 100,100 →

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



coordinates

Draw a figure using the Absolute system. Coordinate The absolute coordinate of the points are given in the following table.



- 1. Start a new file with acad.dwt template in the Drafting & Annotation workspace.
- **2.** Type **LINE** in the Command Line. The prompt sequence is given below. Command: LINE

Specify first point: 3,1 ↓

Specify next point or [Undo]: 3,6 → Specify next point or [Undo]: 4,6 →



Specify next point or [Close/Undo]: 4,2 , Specify next point or [Close/Undo]: 5,2 , Specify next point or [Close/Undo]: 6,3 , Specify next point or [Close/Undo]: 7,3 , Specify next point or [Close/Undo]: 7,1 , Specify next point or [Close/Undo]: C ,



Fig. 6.60. Drawing a figure using the absolute coordinates

Relative Coordinate System

There are two types of relative coordinates: relative rectangular and relative polar.

Relative Rectangular Coordinates (@ X distance, Y distance)

In the Relative Rectangular Coordinate system, the location of a point is specified with respect to the previous point, not with respect to the origin. To enter coordinate values in terms of the Relative Rectangular Coordinate system, check whether the Dynamic Input is on or not. If the Dynamic Input is turned on, then by default the profile will be drawn using the Relative Rectangular Coordinate system. Therefore, in this case, enter the X coordinate, type comma (,), and then enter the Y coordinate. However, if the Dynamic Input is turned off, the coordinate values have to be prefixed by the @ symbol, so that the profile will be drawn using the Relative Rectangular Coordinate system. For example, to draw a rectangle, refer to Figure 6.61 of length 4

units and width 3 units and the lower left corner at the point (1,1) using the Relative Rectangular Coordinate system, you need to use the following prompt sequence:



Fig. 6.61. Drawing lines using the relative rectangular coordinates

Command: LINE ↓

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Specify first point: 1,1 ↓

Specify next point or [Undo]: @4,0 ↓

Specify next point or [Undo]: @0,3 ↓

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

Specify next point or [Close/Undo]: @0,-3 ↓

Specify next point or [Close/Undo]: ↓





Fig. 6.62. Drawing lines using the relative rectangular coordinates

Note:

Distance is measured +ve towards up and right.

It is measured -ve towards down and left.

Draw a square of side 100 units using Relative Rectangular Co-ordinate System.

Command: LINE →

Specify first point: 70,70 ↓

Specify next point or [Undo]: @100,0 ↓

Specify next point or [Undo]: @0,100 ↓

Specify next point or [Close/Undo]: @-100,0 ~

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





Fig. 6.63. Drawing a square using the relative rectangular coordinates



Draw a figure using Relative Rectangular Coordinates. The coordinates of the points are given in the table below.

Point	Coordinates
1	3, 1
2	@4,0
3	@0,1
4	@-1,0
5	@1,1
6	@0,2
7	@-1,0
8	@-1,-1
9	@-1,1
10	@-1,0
11	@0,-2
12	@1,-1
13	@-1,0
14	@0,-1



- Start a new file with acad.dwt template in the Drafting & Annotation workspace.
- 2. Type LINE in the Command Line. The prompt sequence is given below. Command: LINE → Specify first point: 3,1 → Specify next point or [Undo]: @4,0 ↓ Specify next point or [Undo]: @0,1 ↓ Specify next point or [Close/Undo]: @-1,0 ↓

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

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

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

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

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

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

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

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

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

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

Specify next point or [Close/Undo]: →



Fig. 6.64. Drawing a figure using the relative rectangular coordinates

Relative Polar Coordinates (@distance < angle)

In the relative polar coordinate system, the location of a point is specified by defining the distance of the point from the current point and the angle between the two points with respect to the positive X axis.

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Draw a line of length 5 units whose start point is at 1,1 and inclined at an angle of 30 degrees to the X axis using Relative Polar Coordinates. ۲

Command: LINE ↓

Specify first point: 1,1 ↓

Specify next point or [Undo]: @5<30 ↓

Specify next point or [Undo]: ↓(Press ENTER to complete the drawing)



Fig. 6.65. Drawing a line by using Relative Polar Coordinates

Note : By default, in the relative polar coordinate system, the angle is measured from the horizontal axis as the zero degree. Also, the angle is positive if measured in counter clockwise direction and is negative if measured in clockwise direction.



Draw a figure using Relative Polar Co ordinates. The coordinates of the points are given in the table below.



- Start a new file with acad.dwt template in the Drafting & Annotation workspace.
- 2. Type LINE in the Command Line. The prompt sequence is given below. Command: LINE ↓
 Specify first point: 2,3 ↓
 Specify next point or [Undo]: @100<0 ↓
 Specify next point or [Undo]: @25<120 ↓
 Specify next point or [Close/Undo]: @25<90 ↓

Specify next point or [Close/Undo]: @15<180 ↓

Specify next point or [Close/Undo]: @25<270 ↓

Specify next point or [Close/Undo]: @45<180 ↓

Specify next point or [Close/Undo]: @25<90 ↓

Specify next point or [Close/Undo]: @15<180 ↓

Specify next point or [Close/Undo]: @25<270 ↓

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



Fig. 6.67. Drawing a Figure by using relative polar coordinates

Direct Distance Entry

The easiest way to draw a line in AutoCAD is by using the Direct Distance Entry method. Before drawing a line by using this method, ensure that the Dynamic Input button is chosen in the Status Bar. Next, choose the Line tool; you will be prompted to specify the start point. Enter the coordinate values in the text box and press ENTER; you will be prompted to specify the next point. Now, enter the absolute length of the line and its angle with respect to the current position of the cursor in the corresponding text boxes, as shown in Figure 6.68.

Note that you can use the TAB key to toggle between the text boxes. If the Ortho mode is on while drawing lines using this method, you can position the cursor only along the X or Y axis. If the Dynamic Input button is not chosen, then you need to enter the length of the line at the Command prompt. Therefore, position the cursor at the desired angle, type the length at the Command prompt, and then press ENTER, refer to Figure 6.68.



Entry method

LINE Specify first point: Start point.

Specify next point or [Undo]: Position the cursor and then enter distance.

Specify next point or [Undo]: Position the cursor and then enter distance.

6.7.3 DRAWING A CIRCLE

Ribbon: Home > Draw > Circle drop-down > Center, Radius

Toolbar: Draw > Circle

Menu Bar: Draw > Circle

Command: CIRCLE or C

A circle is drawn by using the Circle tool. In AutoCAD, you can draw a circle by using six different tools. All these tools are grouped together in the Draw panel of the Ribbon. To view these tools, choose the down arrow next to the circle tool in the Draw panel, as shown in Figure 6.69; all tools will be listed in the drop-down. Note that the name of the tool chosen last will be displayed in the Draw panel. You can also invoke the Circle tool from the Draw toolbar, or by entering C in the command prompt.

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Drawing a Circle by Specifying Center and Diameter

- 1. Click Home > Draw > Circle > Center, Radius on the ribbon.
- 2. Select an arbitrary point in the graphics window to specify the center point.
- 3. Type a value as the radius and press ENTER.

Draw a circle with centre (100, 100) and radius 20 units.

Command: CIRCLE

Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: 100,100 →

Specify radius of circle or [Diameter]: 20 ↓



Fig. 6.70. The Circle with Centre (100, 100) and Radius 20 units

Drawing a Circle by Specifying Center and Diameter

- 1. Click Home > Draw > Circle > Center, Diameter on the ribbon. (or) Type CIRCLE or C in the Command line.
- 2. The following message appears in the command line.

Specify center point for circle or [3P/2P/ Ttr (tan tan radius)]:

Left-click with the mouse anywhere on the screen. (or) Type a Value.

Specify radius of circle or [Diameter] : Enter D for Diameter option.

Specify diameter of circle : Enter the value of Diameter.

Draw a circle with centre (20,20) and diameter 40 units.

Command: CIRCLE

Specify center point for circle or [3P/2P/Ttr (tan tan radius)]: 20,20 →

Specify radius of circle or [Diameter] <20.0000>: D ,

Specify diameter of circle <40.0000>: 40 ↓



Fig. 6.71. The Circle with Centre (20, 20) and **Diameter 40 units**



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6.7.4 **Drawing a Rectangle**

One of the most basic shapes used by drafters and designers is the rectangle. You can create a rectangle using the LINE command, but doing so has some disadvantages. For example, you would have to take the time to make sure that the corner angles are exactly 90°. Also, each line segment would be a separate object. Therefore, AutoCAD 2016 provides the RECTANG command, which allows you to create a rectangle with perfect corners and as a single object. Clicking anywhere on a rectangle created with the RECTANG command selects the entire rectangle.

To draw a Rectangle using the cursor to select the corners :

- 1. Command : RECTANGLE (or) REC (Press Enter Key)
- 2. The following will appear on the command line:

RECTANGLE

Specify first corner point or [Chamfer/Elevation/Fillet/ Thickness/Width]:

Specify the location of the first corner by moving the cursor to a location (P1) and then press the left mouse button.

3. The following will appear on the command line:

Specify other corner point or [Area / **Dimensions / Rotation]:**

Specify the location of the diagonal corner (P2) by moving the cursor diagonally away from the first corner (P1) and pressing the left mouse button. Now a rectangle will appear.



Fig. 6.74. A Rectangle

Draw a rectangle defined by diagonal points (20,30) and (150, 160).

Command: RECTANGLE →

Specify first corner point or [Chamfer/ Elevation/Fillet/Thickness/Width]: 20,30 →

Specify other corner point or [Area/ Dimensions/Rotation]: 150,160 →



Fig. 6.73. A Rectangle defined by diagonal points (20,30) and (150, 160)

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5.7.5 **Drawings Arcs**

Ribbon: Home > Draw > Arc drop-down

(or)

Command: ARC or A

An arc is defined as a section of a circle. In AutoCAD 2016, an arc is drawn by using the tools available in the Arc drop-down list box. There are eleven different arc tools to draw an arc.

The tools to draw an arc are grouped together in the Arc drop-down of the Draw panel in the Ribbon. You can choose the appropriate tool and then draw the arc.

The tool that was used last to create an arc will be displayed in the Draw panel of the Home tab.



Fig. 6.74. Eleven Different Arc Tools



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Drawing an Arc by Specifying **Three Points**

Draw an arc using three point P1, P2, and P3.

Command: ARC ⊣

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Specify start point of arc or [Center]: (Pick P1) \downarrow

Specify second point of arc or [Center/ End]: (Pick P2) ↓

Specify end point of arc: (Pick P3) \dashv





6.8 **Erasing objects**

Sometimes, you may need to erase the unwanted objects from the objects drawn. You can do so by using the Erase tool. This tool is used exactly the same way as an eraser is used in manual drafting to delete the unwanted lines.

The Erase command removes objects from the drawing file.

To erase an object,

 Start the ERASE command by choosing Home tab > Modify panel > Erase tool. (or) Type ERASE (or) E in the Command line.

Now the cursor changes from the crosshairs to **a little square**. This is called the **pickbox**. Its appearance indicates that AutoCAD is ready for you to select objects on the screen. Also note the command line; it's prompting you to select objects.

- 2. Place the pickbox on one of the objects, and click that object to be erased, and the object is faded in a light gray line weight.
- 3. Continue selecting all of the objects to be erased. The erased objects remain in a light gray line weight until the command is completed.
- **4.** Press **<Enter>** or **right-click** to erase the objects. The objects are erased, and the ERASE command ends.



Fig. 6.76. Erasing objects

Three Types of Erasing Methods

There are three methods to erase (delete) objects from the drawing.

Method 1

Select the **Erase command** first and then select the objects to be erased.

Press **Enter** Key and the objects selected will disappear.

Method 2

Select the object to be erased.

Press the **Delete** Key.



Fig. 6.77. Erasing objects - Using Delete Key

Method 3

A

- 1. Select the object to be erased.
- 2. Press the right Mouse button.
- **3.** Select Erase from the Shortcut Menu using the left mouse button.

Note: If you want the erased objects to return, select the Undo tool from the Quick Access Toolbar. This will Undo the last command.





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Plotting (Printing) the Drawing

Printing the drawing is done with the PLOT command.

- 1. Click the big red A, and then choose Print.
- 2. From the options lists, choose Plot. AutoCAD displays the Plot dialog box with its many options.



Fig. 6.79. Application Menu



Fig. 6.80. Plot Dialog box

- 3. In the Printer/plotter area, select a printer from the Name droplist.
- 4. In the **Plot Area** section, select Extents from the What to Plot droplist. This option ensures the entire drawing is plotted.

- 5. In the Plot Offset section, select Center the plot to center the drawing on the paper.
- 6. In the Plot Scale area, select Fit to Paper. This ensures the drawing fits the paper, no matter the size of paper or drawing.
- 7. At this point, the dialog box's options should look like those illustrated below.

To ensure the plot will work out correctly, click the Preview button. This lets you check for errors before committing (or wasting) paper.

- 8. Press ESC to exit the print preview mode. (or) Click on the Close(X) button.
- 9. Back in the Plot dialog box, choose **OK** to start the plot.

6.10 Saving the Drawing

To save your work and remain in AutoCAD:

- 1. Click the Save button in the Quick Access toolbar.
- 2. If the drawing has not yet been named, the Save Drawing As dialog box appears.
- 3. Name the drawing in the File name text box, and then choose Save.



Fig. 6.81. Save Button in the Quick Access Toolbar



Fig. 6.82. Save Drawing As Dialog box

AutoCAD 2016 - File types

All saved drawings are called files. AutoCAD 2016 supports different file formats, including:

.dwg: AutoCAD 2016 drawing

.dws: AutoCAD 2016 Drawing Standard

.dwt: AutoCAD 2016 Template Drawing template file.

AutoCAD 2016 drawings can be saved in other formats as well as in pre-AutoCAD 2016 formats.

6.11 Closing Drawing Files

You can close the current drawing file without actually quitting AutoCAD by choosing **Close>Current Drawing** from the **Application Menu** or by entering **CLOSE** at the Command prompt.

To close the current opened file or all opened files,

- Click on the Application button. Now Application menu appears.
- Move the mouse to the **Close** button, then select either **Current Drawing** to close the current file, or **All Drawings**

to close all the opened files in single command.

_	Stanch Commands
20	Close the drawing
New •	Corrent Drawing Close the current drawing.
📄 Open 🔸	Cose all currently open drawings.
Save As	
Export +	
🖢 nalah 🕠	
Print ·	
Drawing +	
Close 🔒 '	
	Options Exit Autodesk AutoCAD 201/

Fig. 6.83. Close Button

If any of the open files are modified, AutoCAD will ask if you want to save or close without saving, as in the following dialog box.



Fig. 6.84.

6.12 Exiting AUTOCAD

To save your work and exit AutoCAD:

1. Click the X button found in the upper right corner of the AutoCAD window.



Fig. 6.85. The X button in the Right Corner of the AutoCAD window

2. If any of the open files are modified, AutoCAD will ask if you want to save or close without saving, as in the following dialog box. Choose Yes to save your work.

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Sav	e changes to Drawing I	Ldwg?
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3. AutoCAD displays the Save Drawing As dialog box — if this is a new drawing that has not be saved previously. AutoCAD saves your work, and then exits to the Windows desktop.



Fig. 6.87. Save Drawing As Dialog box

To discard the drawing and exit AutoCAD:

- 1. Click the X button.
- 2. Notice that AutoCAD displays a dialog box to confirm whether you want to save the drawing — it's your last chance! Move the cursor to choose the No button to exit without saving your work. AutoCAD does not record your work to disk, and exits to the Windows desktop.

Autodesk, Inc. is an American multinational software corporation. It makes software services for the architecture, engineering, construction, manufacturing, media, and entertainment industries. Autodesk is headquartered in San Rafael, California.

In AutoCAD, a panel is a grouping of buttons for similar commands.

A pull-down menu is a vertical list of commands that appears when a button or menu item is selected. This pull-down menu is called the Menu Browser.



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POINTSTOREMEMBER

• AutoCAD is a commercial computer-aided design (CAD) and drafting software application. It is developed and marketed by Autodesk.

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- The drawing area covers the major portion of the screen. In this area, you can draw the objects.
- The command window at the bottom of the drawing area has the Command prompt where you can enter the commands.
- A workspace is defined as a customized arrangement of Ribbon, toolbars, menus, and window palettes in the AutoCAD environment.
- The LINE draw commands can be activated:
 - a) by selecting the icon from the Draw panel
 - **b**) from the menu bar with Draw >Line
 - c) by entering the command at the prompt line, e.g. LINE $\langle R \rangle$
- After drawing two continuous lines by using the Line tool, the Close option is displayed at the Command prompt. The Close option is used to join the current point to the start point of the first line when two or more continuous lines are drawn. To choose the Close option, type the letter C at the Command prompt and press ENTER.
- While drawing a line, if you specify a wrong endpoint, then you can undo the last specified point and go back to the previous stage by using the Undo option of the Line tool. To use this option, enter U at the Command prompt and press ENTER.
- To cancel or exit a command, press the ESC (Escape) key on the keyboard.
- The ERASE command can be activated:
 - **a** with the ERASE icon from the Modify toolbar
 - **b**) from the menu bar with Modify >Erase
 - c) by entering ERASE <R> at the command line.

Left-click	Press the left-hand button of the mouse.
Click	Same meaning as left-click .
Double-click	Press the left-hand button of the mouse twice.
Right-click	Press the Right-hand button of the mouse – has the same result as pressing the Return key of the keyboard.
Drag	Move the cursor on to an object and, holding down the right- hand button of the mouse, pull the object to a new position.

GLOSSARY

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Enter	Type the letters or numbers which follow at the keyboard.
Pick	Move the cursor on to an item on screen and press the left-hand button of the mouse.
Return	Press the Enter key of the keyboard. This key may also marked with a left facing arrow (,-). In most cases (but not always) has the same result as a right-click.
Dialog box	A window appearing in the AutoCAD window in which settings may be made.
Drop-down menu	A menu appearing when one of the names in the menu bars is clicked.
Tooltip	The name of a tool appearing when the cursor is placed over a tool icon from a toolbar.
Prompts	Text appearing in the command window when a tool is selected which advise the operator as to which operation is required.
Object	A part of a drawing which can be treated as a single object. For example a line constructed with the Line tool is an object; a rectangle constructed with the Polyline tool is an object; an arc constructed with the Arc tool is an object.

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EVALUATION



Part - I

Choose the correct answer.

- 1. AutoCAD is a _____software application.
 - (a) DTP
 - (b) computer-aided design (CAD) and drafting
 - (c) Text Editing
 - (d) Video Editing
- 2. AutoCAD 2016 is developed and marketed by ___
 - (a) Microsoft Corporation
 - (b) Adobe Inc.
 - (c) Autodesk, Inc.
 - (d) Sun Microsystems, Inc
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- 3. The _____ menu appears when you click the red "A" Button.
 - (a) Application
 - (b) Edit
 - (c) Layout
 - (d) Window
- 4. The _____bar displays at the top of the Application menu.
 - (a) Menu
 - (b) Search
 - (c) Toolbar
 - (d) Title

- 5. If you do not see the command window, press ______to make it appear.
 - (a) Ctrl +1
 - (b) Ctrl + 9
 - (c) Ctrl + 8
 - (d) Ctrl + 7
- 6. UCS is short for
 - (a) User Coordinate System
 - (b) User Currency System
 - (c) User Control System
 - (d) User Computer System
- 7. The ______function key can be used to turn the grid display on or off.
 - (a) F1
 - (b) F2
 - (c) F3
 - (d) F7

Part - II

Answer the following Questions

(2 Marks)

- **1.** How do you start AutoCAD?
- **2.** How do you hide all the buttons on the Ribbon?
- **3.** What appears when you rest the pointer on a button on the Ribbon?
- 4. How do you get rid of the UCS icon?
- 5 Which Function key turns the OSNAP feature on and off?
- 6. What is a fast method of closing a polygon when you are using the LINE command?
- 7. What are the practical differences between creating a rectangle using the LINE command and creating it

using the RECTANG command? Why might you choose one command instead of the other?

- **8.** How do you terminate a command in progress in AutoCAD?
- **9.** In which Ribbon control panel are the Arc and Circle buttons found?
- **10.** After you enter the ERASE command, what does AutoCAD ask you to do?
- 11. When a file has not yet been saved for the first time, what appears when you pick either Save or Save As... from the Application Menu bar?
- **12.** What is the quickest way to open a file in AutoCAD?
- 13. How do you exit AutoCAD?

Part - III

Answer the following Questions

(3 Marks)

- **1.** List the three Create Objects commands.
- 2. How can you enter commands such as LINE, CIRCLE, and ERASE quickly at the keyboard?
- **3.** Explain the use of the LINE Undo option.
- **4.** Briefly describe the following methods of producing circles.
 - a. centre and radius
 - b. centre and diameter

Part - IV

Answer the following Questions

(5 Marks)

- 1. Write about AutoCAD Interface.
- 2. Write briefly about Command window.
- **3.** Write about the rectangle object and the steps to draw a rectangle in AutoCAD.

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