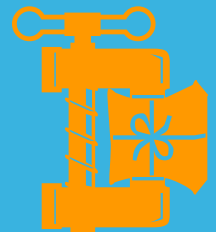# AutoCAD

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Lecture # 2

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INTRODUCTION

❖ **Entities** are the basic building blocks of all AutoCAD drawings. Once drawn, entities can be manipulated and changed in various ways to suit the needs of the draftsman or designer. Various commands are used for that purpose.

❖ Generally, once **AutoCAD's prompting methods** and the function of each command is understood, the operation of each of these commands is fairly self-evident.

❖ There are **extensive help facilities** in AutoCAD (accessed by the command HELP) that can be explored in order to discover more of its features. During the operation of any command, you are able to get help on that specific command by typing 'HELP (the apostrophe is part of the syntax - it means the command is **"transparent"** and can be executed within another command sequence).

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Interacting with AutoCAD

When creating or editing a drawing, a very simple, **cyclical process** is followed. In the most general case, this involves first forcing AutoCAD into a state where it can accept a command (referred to as command mode):

Check that AutoCAD is in Command mode (prompt "Command:") - if not, press Esc key or Ctrl+Z to cancel the current operation and go back to command.

Enter a command - either by typing in the command word or selecting from a menu or tool bar.

this activates Data Entry mode - AutoCAD will prompt for information needed to complete the command.

required by AutoCAD.

AutoCAD will carry out the operation required by the command, update the displayed drawing and return to Command mode.

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Transparent Commands

- Some of the commands have the particular feature that they can be executed while another command is active (as well as at the command prompt). These are referred to as ***transparent commands***.

- To use a command transparently, enter an **apostrophe** (**'**) before entering the command at any prompt. After you complete the transparent command, the original command resumes. For example **'help** command.

Command Aliases

- Command aliases are **shortcut** or **alternative names** for an AutoCAD command that you enter at the keyboard.

- **For example**, L is an alias for Line, CP is an alias for COPY, and Z is an alias for ZOOM.

- The command aliases provided in the standard **acad.pgp** file. You can change or delete these aliases, or you can add some of your own by editing the acad.pgp file.

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Command Entry

From the Keyboard

To enter a command from the keyboard, simply type the command name or alias and press either **enter, spacebar, Tab or Enter key** on pointing device.

Repeated Commands

You can press the **spacebar or enter key** at the command prompt to repeat the previous command (regardless of the method you used to enter the command).

Specifying Points

When AutoCAD asks for a point, it expects you to enter the **coordinates** of a location in the drawing. You can type on the keyboard or pick a point on the screen with pointing device.

World Coordinate System (WCS)

Y
W

X
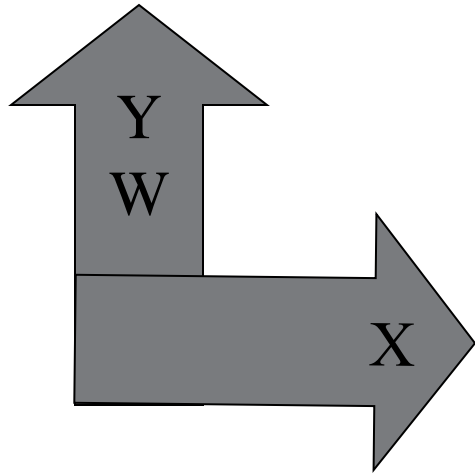
A coordinate system used as the basis for defining all objects and other coordinate systems.

User Coordinate System (UCS)

✵ A user-defined coordinate system (UCS) provides a movable coordinate system for coordinate entry, planes of operation, and viewing in 3D space.

✵ You can locate and orient a UCS anywhere in 3D space, and you can define, save, and recall as many UCS's as you require.

✵ Coordinate input and display are relative to the current UCS.

Y

+   X

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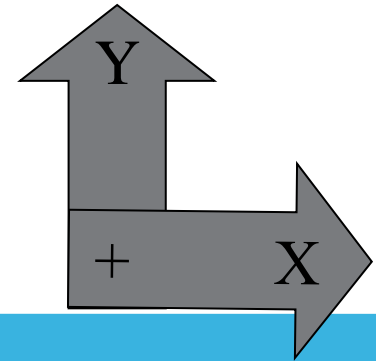
Types of Coordinates

1. Cartesian Coordinates (2D or 3D)

2D (X, Y)   3D (X, Y, Z)

2. Polar Coordinates (2D)

2D (R, θ)

3. Cylindrical Coordinates (3D)

3D (R, θ, Z)

4. Spherical Coordinates (3D)

3D (R, θ, θ)

1. Cartesian Coordinates

2D

- To enter 2D Cartesian (X,Y) coordinates, specify a point by entering its X and Y values in the format X,Y.

- The 8, 5 coordinate indicates a point 8 units in the positive X direction and 5 units in the positive Y direction relative to the origin.

- The –4, 2 coordinate represents a point 4 units in the negative X direction and 2 units in the positive Y direction.

3D

- Entering **3D Cartesian coordinates** (X,Y,Z) is similar to entering 2D coordinates (X,Y). In addition to specifying X and Y values, you specify a Z value.

- The coordinate 3,2,5 indicates a point 3 units along the positive X axis, 2 units along the positive Y axis, and 5 units along the positive Z axis.

2. Polar Coordinate

- To enter a polar coordinate, enter a distance and an angle, separated by a **left angle bracket** (<).

- **For example**, to specify a point at a distance of 1 unit from the origin and at an angle of 45 degrees, enter 1<45.

- By default, **angles increase** in the **counterclockwise** and **decrease** in the **clockwise direction**. To move clockwise, enter a negative value for the angle. For example, entering 1<–45 is the same as entering 1<315.

- You can change the angle direction and set the base angle on the Units Control dialog box. See "**Format Units**."

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3. Cylindrical Coordinate

- **Cylindrical coordinate** entry is similar to 2D polar coordinate entry, but with an additional distance from the polar coordinate perpendicular to the XY plane.

- You **locate** a point by specifying its distance along an angle relative to the UCS X axis and its Z value perpendicular to the XY plane.

- The coordinate **5<60,6** indicates a point 5 units from the origin of the current UCS, 60 degrees from the X axis in the XY plane, and 6 units along the Z axis.

4. Spherical Coordinate

- **Spherical coordinate** entry in 3D is also similar to polar coordinate entry in 2D.

- You can **locate** a point by specifying its distance from the origin, its angle from the X axis (in the XY plane), and its angle from the XY plane, each separated by an open angle bracket (<).

- The **coordinate 8<60<30** indicates a point 8 units from the origin, 60 degrees from the X axis in the XY plane, and 30 degrees up from the XY plane.

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Coordinate Systems

Absolute Coordinates

They are based on the origin either WCS or UCS.

Relative Coordinates

They are based not on the origin, but on the previous coordinates of the last point. The symbol @ is used for entering relative coordinates.
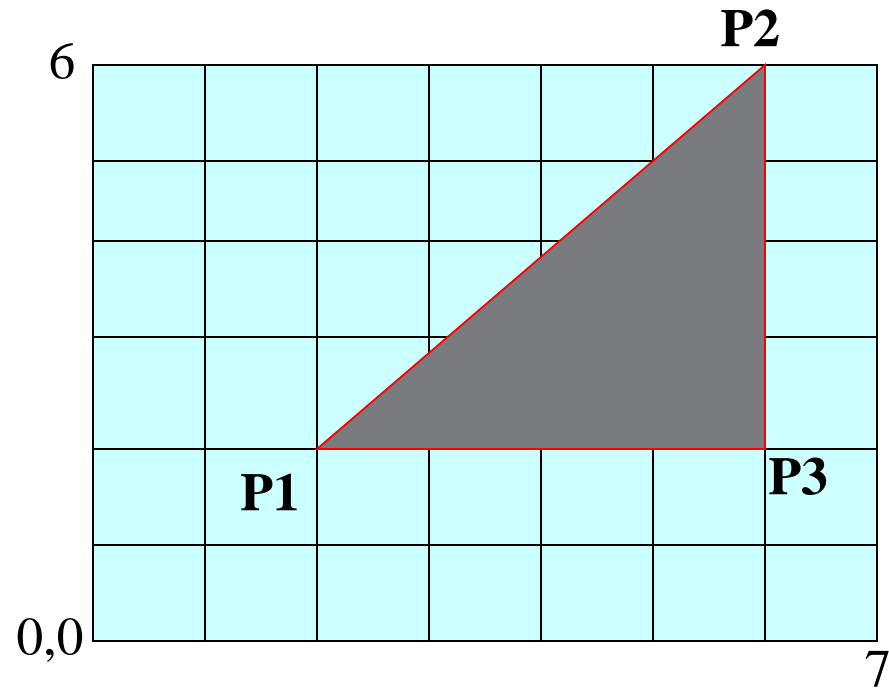
Types	Absolute	Relative
Cartesian (2D or 3D)	X,Y,Z	@X, Y, Z
Polar (2D)	$R < \theta$	$@R < \theta$

Draw a Triangle

Cartesian Coordinates 2D

Point	Absolute	Relative
P1	2, 2	**2,2**
P2	6, 6	@4,4
P3	6, 2	@0,-4

- Absolute Coordinates require no sequence
- Relative Coordinates require sequence
- Relative first entry will be absolute.

Command: **line [Enter]**

LINE Specify first point: **2,2**

Specify next point or [Undo]: **6,6**

Specify next point or [Undo]:**6,2**

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

Command:

Polar Coordinates 2D

Point	Absolute	Relative
P1	2.82<45	2.82<45
P2	8.48<45	@5.65<45
P3	6.32<18.43	@4<-90

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