Computer Aided Design

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AutoCAD 2010

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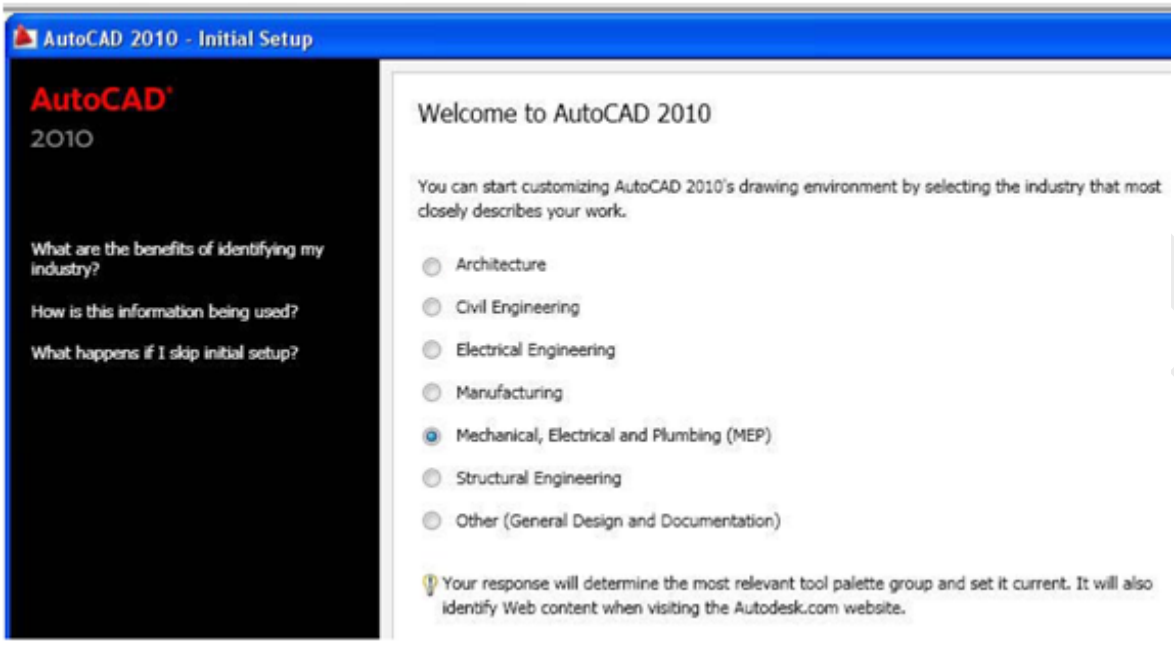
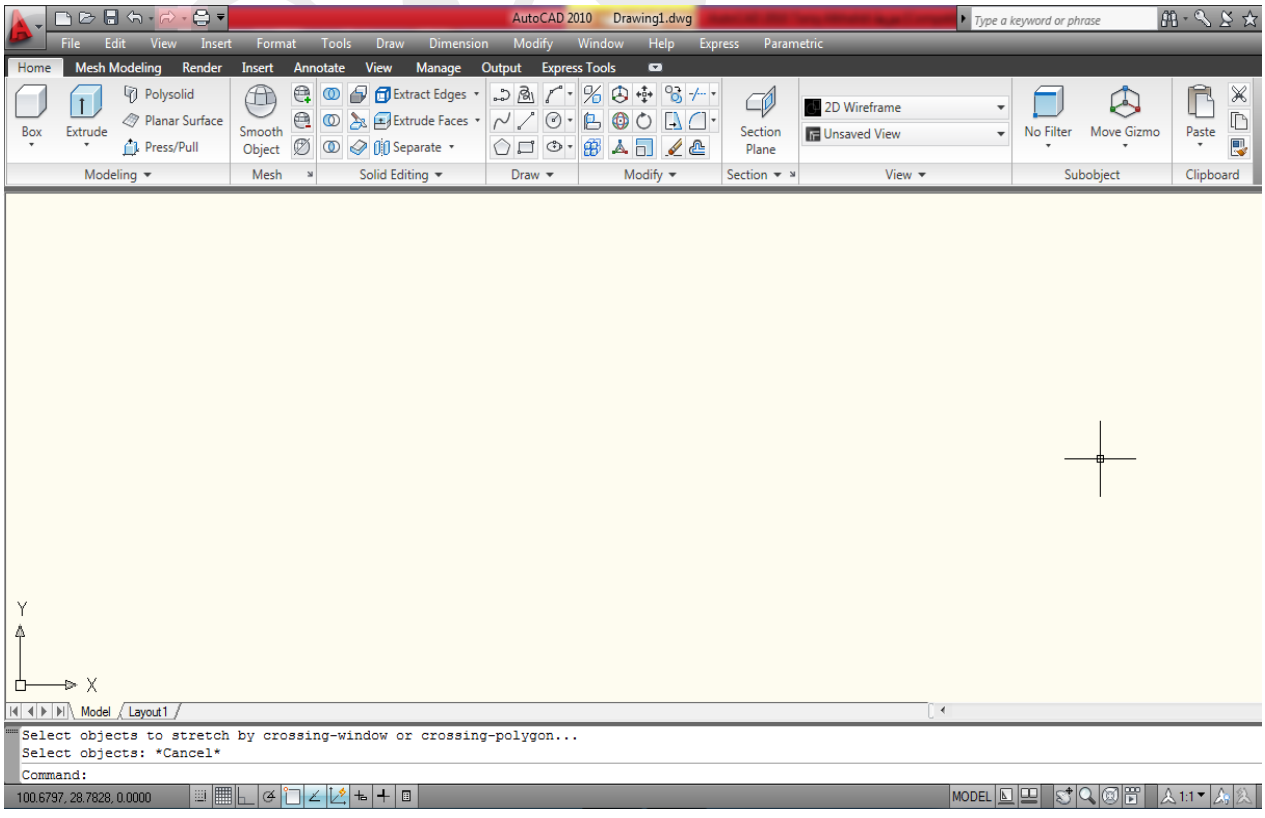
CAD: The acronym[1] stands for[2] Computer-Aided Drafting, Computer-Aided Design, or both, depending on whom you talk to.

Initial Setup

Easily tailor[4] the AutoCAD environment to meet your needs using Initial Setup, which is displayed the first time you launch AutoCAD. With Initial Setup you can choose your industry as well as workspace and drawing template[5] preferences[6]. The choices you make in the Initial Setup affect the default settings of various AutoCAD functionality[7].

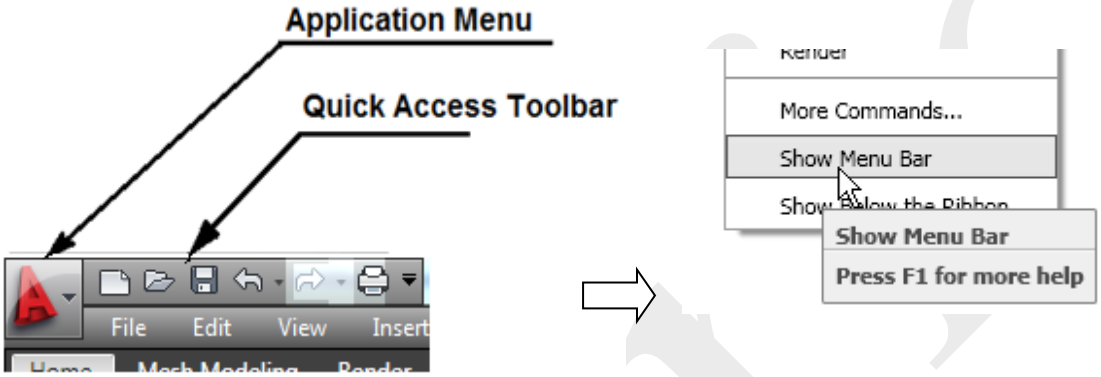




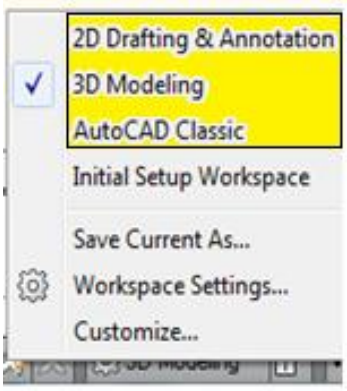
Menu Bar: The Menu Bar[8] provides access[9] to all AutoCAD commands. It consists of: File, Edit, View, Insert, Format, Tools, Draw, Dimension, Modify, Window, Help, Express, and Parametric*.

How to show the Menu Bar

Click on the down-arrow[10] in the Quick Access bar[11] brings down a pop-up list. Then select **Show Menu Bar** to display the **AutoCAD Menu Bar**.



AutoCAD Work Spaces



A *workspace* is a collection of menus, palettes, toolbars, and ribbons tailored for specific tasks, such as 3D modeling or 2D drafting.*

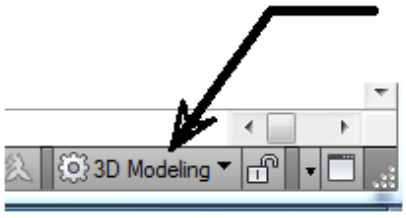
There are three work spaces in AutoCAD 2010:

1- 2D Drafting and Annotation,
2- 3D Modeling,
3- AutoCAD Classic.

The workspaces are accessible[12] from the status bar and docked[13] at the lower right corner of the screen.

workspaces

How to call workspaces



The work space can be called and changed by:
1-Right-click any toolbar and pick the toolbar.
2- From Menu bar ⇨Tools ⇨work spaces
3- Docked at the Status bar (lower left corner of screen).

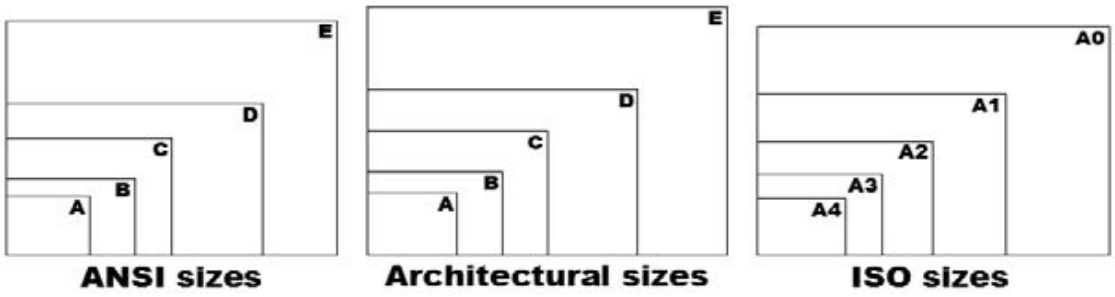
Sheet size

Most industries use a small range of standard sheet sizes. Three common sets of sizes exist, as shown in Figure 1-1 and Table 1-1:

1- **ANSI** (American National Standards Institute)

2- **Architectural**

3- **ISO** (International Organization for Standardization)



Relationships among standard paper sizes.

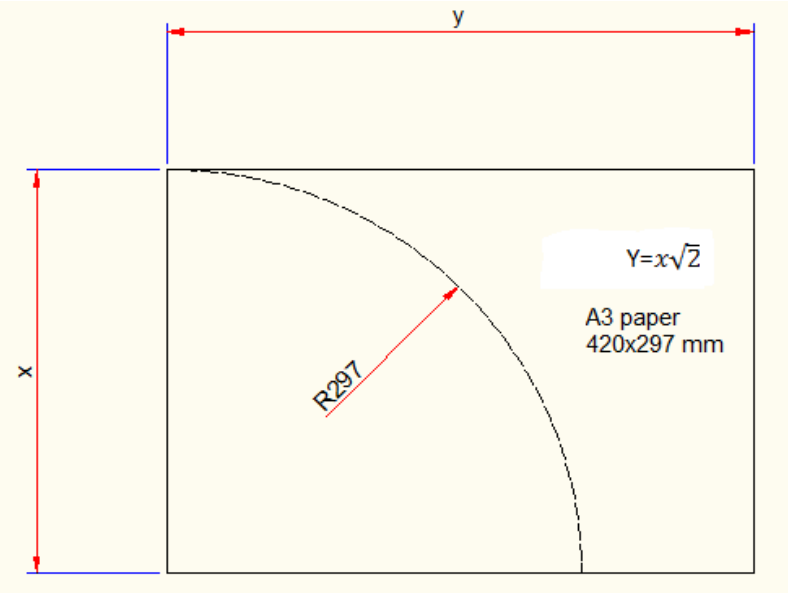
Common Plot Sheet Sizes

Sheet Size	Dimensions	Comment
ANSI E	34 x 44"	
ANSI D	22 x 34"	E sheet folded in half
ANSI C	17 x 22"	D sheet folded in half
ANSI B	11 x 17"	C sheet folded in half
ANSI A	81⁄2 x 11"	B sheet folded in half
Architectural Large E	36 x 48"	
Architectural E	30 x 42"	
Architectural D	24 x 36"	Large E sheet folded in half
Architectural C	18 x 24"	D sheet folded in half
Architectural B	12 x 18"	C sheet folded in half
Architectural A	9 x 12"	B sheet folded in half
ISO A0	841 x 1189 mm	= 1 m^2
ISO A1	594 x 841 mm	A0 sheet folded in half
ISO A2	420 x 594 mm	A1 sheet folded in half
ISO A3	297 x 420 mm	A2 sheet folded in half
ISO A4	210 x 297 mm	A3 sheet folded in half

You select a particular set of sheet sizes based on the common practices in your industry. You then narrow down your choice based on the area required by what you're going to draw. For example, most imperial-units architectural plans are plotted on Architectural D- or E-size sheets, and most metric architectural plans go on ISO A1 or A0 sheets.

ISO Sheet

The A3 sheet has been chosen to show the relation between the Length Y and the Width X.



$Y = X\sqrt[2]{2}$

$Y = 297\sqrt[2]{2} = 420$

A ***template***: is simply a drawing whose name ends in the letters dwt, which you use as the starting point for another drawing. When you create a new drawing from a template, AutoCAD makes a copy of the template file and opens the copy in a new drawing editor window. The first time you save the file, you're prompted for a new filename to save to; the original template file stays unchanged. Using a suitable template can save your time and worry because many of the setup options are already set correctly for you. You know the drawing will print correctly.

AutoCAD creates a new, blank drawing with the settings in acad.dwt or acadiso.dwt. acad.dwt is AutoCAD's default, drawing template for drawings in *imperial units* (that is, units expressed in inches and/ or feet). acadiso.dwt is the corresponding drawing template for drawings created in metric units.

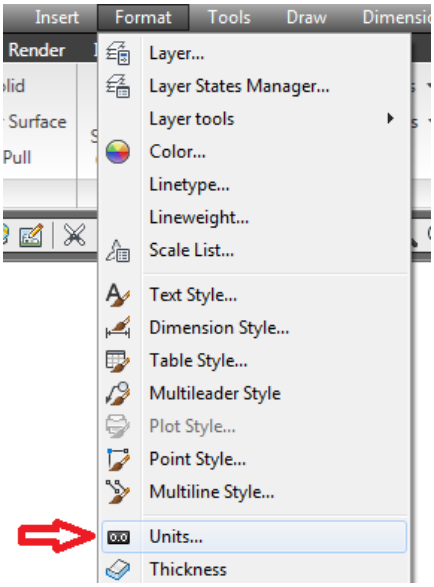
Drawing Units Setup

Every object we construct in an AutoCAD system is measured in units. We should determine the system of units within the AutoCAD system before creating the first geometric entities.

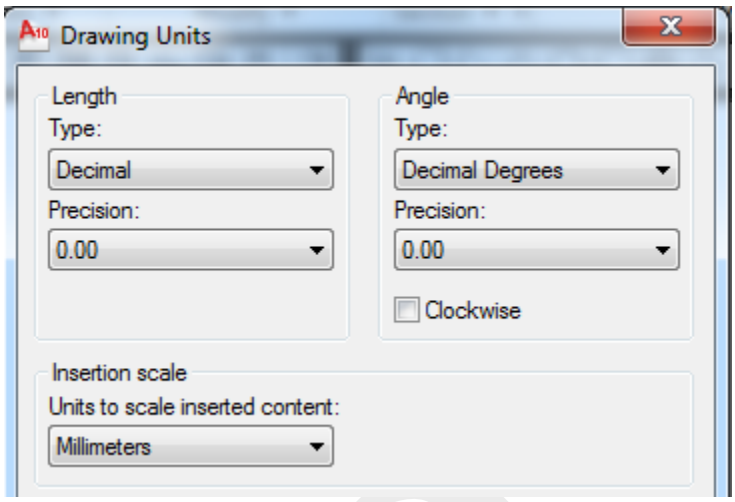
1. In the Menu Bar select:

Format ➪ Units

2. Click on the Length Type option to display the different types of length units available. Confirm the length type is set to Decimal.



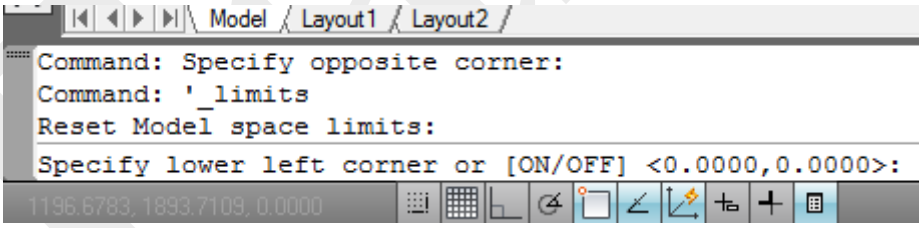
3. On your own, examine the other settings that are available.
4. In the Drawing Units dialog box, set the Length Type to Decimal.
This will set the measurement to the default S.I units, millimeter.
5. Set the Precision to two digits after the decimal point as shown in the above figure.
6. Pick OK to exit the Drawing Units dialog box.



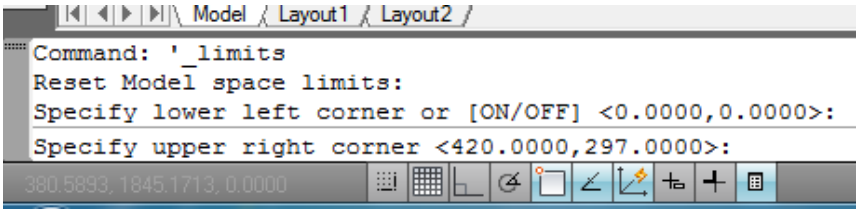
Drawing Area Setup

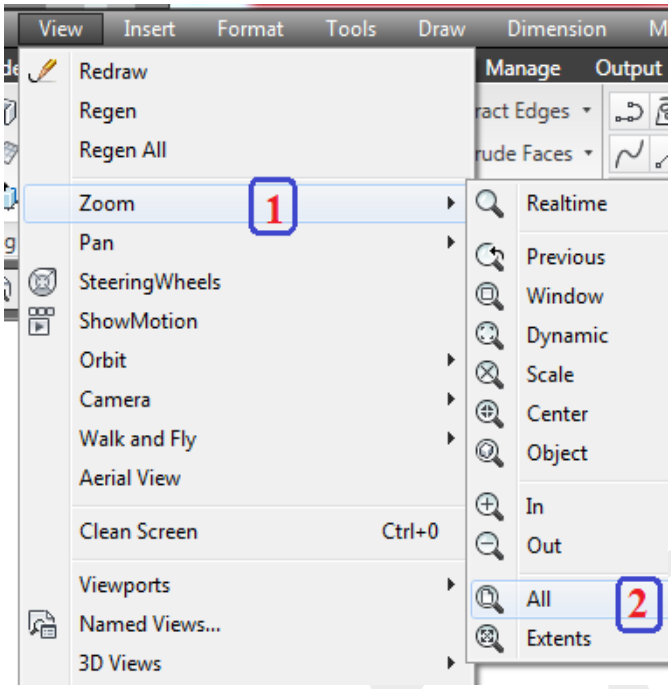
Next, we will set up the Drawing Limits by entering a command in the command prompt area. Setting the Drawing Limits controls the extents of the display of the grid. It also serves as a visual reference that marks the working area. It can also be used to prevent construction outside the grid limits and as a plot option that defines an area to be plotted/printed. Note that this setting does not limit the region for geometry construction.

1. In the Menu Bar select:
Format ➪ Drawing Limits
2. in the command prompt area, the message "Reset Model Space Limits: Specify lower left corner or [On/Off] <0.00, 0.00>:" is displayed. Press the ENTER key once to accept the default coordinates <0.00, 0.00>.



3. In command area, the message "Specify upper right corner <420,297>:" is displayed. Press the ENTER key again to accept the default coordinates <420,297>.





4. On your own, move the graphic cursor[15] near the upper-right comer inside the drawing area and note that the drawing area is unchanged. (The Drawing Limits command is used to set the drawing area, but the display will not be adjusted until a display command is used.)
5. Inside the Menu Bar area select:

View ➪ Zoom ➪ All

The Zoom All command will adjust the display so that all objects in the drawing are displayed to be as large as possible. If no objects are constructed, the Drawing Limits are used to adjust the current viewport.

6. Move the graphic cursor near the upper-right corner inside the drawing area and note that the display area is updated.

Second method to set the drawing area (Short Method)

1. Choose File ➪ New.

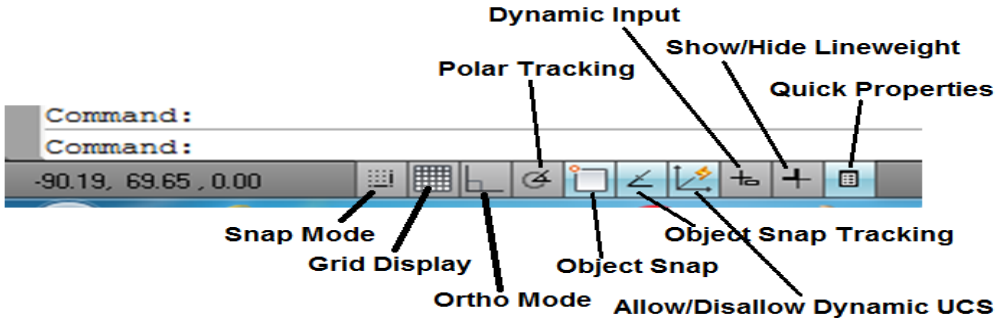
Then, Template dialog box appears.

2. Choose **acadiso.dwt** if you're working in metric, or acad.dwt, if you're working in imperial units. Then click OK.

3. Write in the command lines: Z (This is the abbreviation of zoom).

4. Respond to choices and write: A (the abbreviation of All).

Buttons on Status Bar



To make your own template

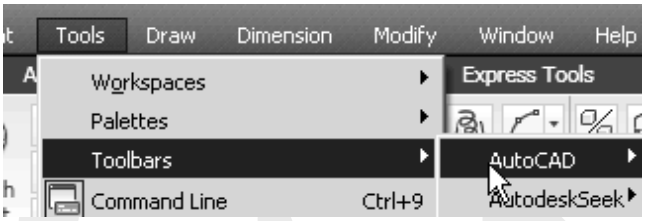
After you set all the requirements (unit, paper size. Etc.) .You can make your own template by

File ➪ save as and open the template (you will find no file there)

In the file of type get the AutoCAD Drawing Template (*.dwt)

Write a name to your file then O.K.

AutoCAD Tool bars



In order to get any tool bar

1-Tools ➪ Toolbars ➪ AutoCAD

2- At any toolbar > right-click on it and select the required toolbar

To show the toolbars in AutoCAD 2010 if there is no any toolbar existed and your AutoCAD version doesn't show the toolbars command within the tools tab in the ribbon.

Solution:

At command lines, Write: -toolbar then: draw (or any tool bar you want)

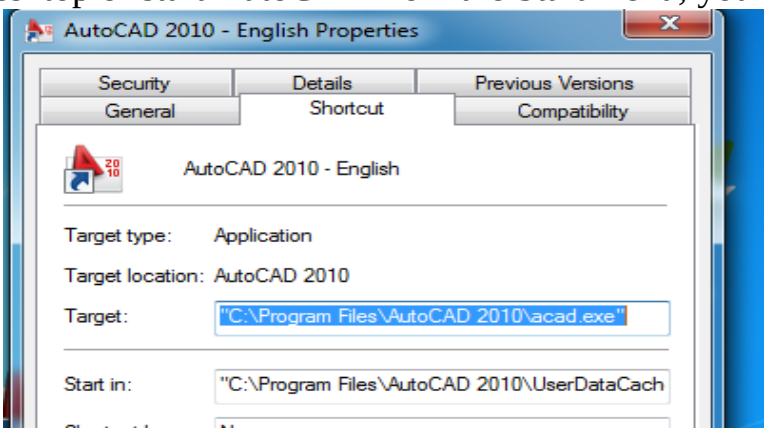
Then: Show or s

The draw toolbar will be displayed. Then you can get any other toolbar by right click the existing tool bar and get the desired toolbar

How to open AutoCAD with a specific template

You can launch AutoCAD with a specific template of your choice. You do this with a *command line switch*.

When you double-click the icon on your desktop or start AutoCAD from the Start menu, you are executing a statement. You can customize this statement by adding parameters, also called switches.



To learn the statement of your desktop icon, **right-click the AutoCAD icon** and choose **Properties.** On the Shortcut tab, look in the **Target** text box. This is also where you **add a switch**. For example, the statement might look like this:

"C:\Program Files\Autodesk\AutoCAD 2010\acad.exe"

To add a switch: insert a space after the end of the statement and add a forward slash (/), then the switch you want. (AutoCAD has a number of switches, not just for templates.) In most cases you also add a descriptor.

For a template named tariq1, you would add /t tariq. The statement for template would then look like this:

"C:\Program Files\Autodesk\AutoCAD 2010\acad.exe" /t tariq1

Add: space+ /t+space+ tariq1

Note: You need to add quotation[15] marks around any path or name (such as the template name) that contains spaces.

It is recommended to duplicate the existing shortcut. When you use this method, you can create different shortcuts for different templates. To change the command line switch, follow these steps:

1. Right-click the shortcut and choose Copy.
2. Right-click the desktop and choose Paste. You'll either get a new shortcut with "Copy" appended to the name or a dialog box that gives you the option to keep both the original and the copy with a number appended to the name. You can change the name of the shortcut to reflect the name of the template it will open.
3. Right-click the shortcut copy and choose Properties.
4. On the Shortcut tab, in the Target text box (not the Start In box), move the cursor to the end of the existing statement.
5. Press the spacebar to add a space, then type /t and another space. Finally add the name of the template. Be sure to add quotation marks around the template name if it contains spaces.
6. Click OK.

Defining Positions

In AutoCAD, there are five methods for specifying the locations of points when we create planar geometric entities.*

1- **Interactive method**: Use the cursor to select on the screen.

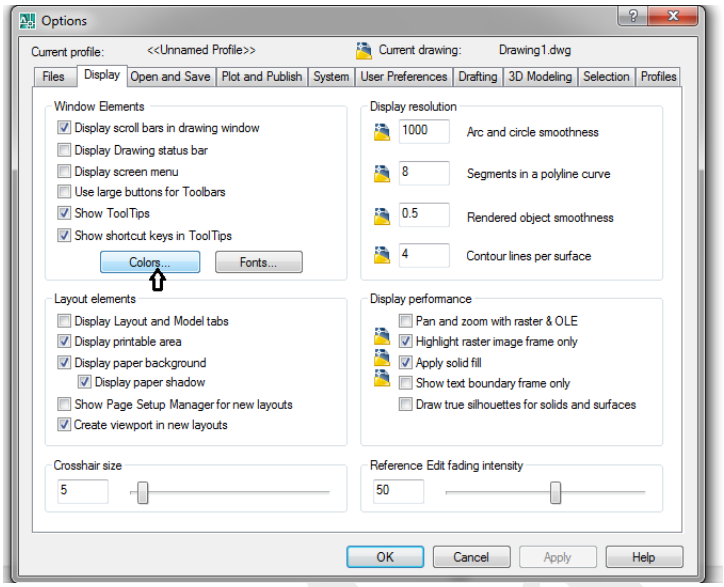
2- **Absolute coordinates** (Format: X,Y): Type the X and Y coordinates to locate the point on the current coordinate system relative to the origin. (for example, 7,4).

3- **Relative rectangular coordinates** (Format: @X,Y): Type the X and Y coordinates relative to the last point. (For example, @3,2)

4- **Relative polar coordinates** (Format: @Distance<angle): Type a distance and angle relative to the last point. (For example, @6<45)

5- **Direct Distance entry technique**: Specify a second point by first moving the cursor to indicate direction and then entering a distance.

To show command lines [Tools ⇨ command lines, or Ctrl+9]

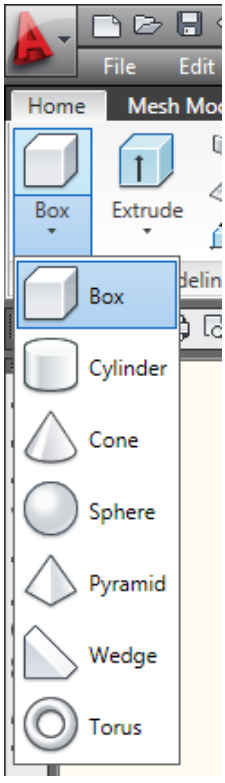


To change the color of the drawing area

1- Menu bar: Tools ➪ option, the Options dialogue box will appear as in Fig.
2- Click Display then the color button and choose the color.

To Display the scroll bar in the drawing window

1- Menu: Tools ➪ option, the Options dialogue box will appear as in Fig. above and click Display then Display scroll bars in drawing window.



Visual Styles

Five default Visual Styles are available.

1• **2D Wireframe**: Displays the objects using lines and curves to represent the boundaries of objects created. Line types and line weights are visible with this option.
Note that this is the default AutoCAD display mode.

2• **3D Hidden**: Displays the objects using the 3D wireframe representation with lines that are located behind surfaces and solids removed.

3• **3D Wireframe**: Displays the objects using lines and curves to represent the boundaries of objects created. Displays a shaded 3D user coordinate system (UCS) icon. Note that linotypes and line weights are not visible with this option.

4• **Conceptual** Visual Style: Creates a shaded image of polygon faces and solids that uses the Gooch face style, a transition between cool and warm colors rather than dark to light. The effect is less realistic, but it can make the details of the model easier to see.

5• **Realistic** Visual Style: Creates a shaded image of polygon faces and solids that gives the objects a smooth and realistic appearance.

To add or remove tabs or panels from ribbon

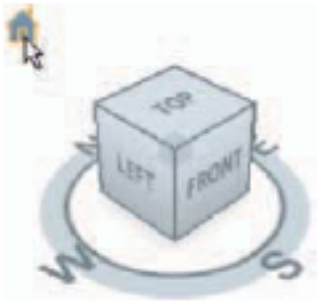
Right-click on a clear space on the ribbon.

Tick any square in front of that tab to add or remove the tick to remove the tab

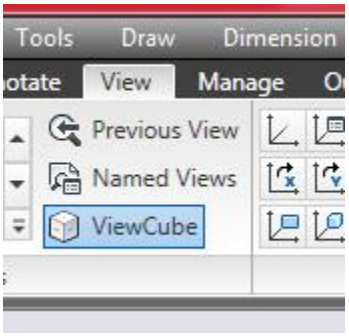
Differences between Isometric and 3D solid drawings

3D solid is a 3D drawing (i.e. x, y, and z coordinates). While Isometric is 2D drawing (i.e. x and y coordinates only).

View Cube: ViewCube is a 3D navigation tool that is displayed when you are working in a 3D visual style. With ViewCube, you can switch between standard and isometric views.



Click on the left to show the left side of your object. Click on the home icon to show isometric view.



To call the View Cube

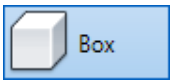
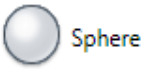
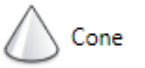
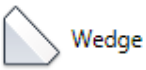
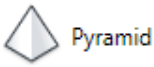
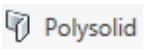
Ribbon: View tab ➪ Views panel ➪View Cube

Menu: View ➪ Display ➪ ViewCube : On

Command entry: *navvcube*

3D Primitives

A primitive solid is a ‘building block' that you can use to work with in 3D. Rather than extruding or revolving an object, AutoCAD has some basic 3D shape commands at your disposal. From these basic primitives, you can start building your 3D models. In many cases, you get the same result from drawing circles and rectangles and then extruding them, but doing it one command is generally faster. Using these with Boolean operations can be a very effective way of drawing in 3D. There are eight different primitives that you can choose from and are on the Home > Modeling Tool Panel (when in the 3D workspace).

SHAPE	COMMAND	ICON	DESCRIPTION
BOX	BOX		Creates a solid box after you provide 2 opposite corners and a height.
SPHERE	SPHERE		Creates a solid sphere from a center point and radius.
CYLINDER	CYLINDER		Creates a straight cylinder from a center point, radius and height.
CONE	CONE		Creates a tapered cone from a center point, radius and height.
WEDGE	WEDGE		Creates a triangular wedge from 2 opposite points.
TORUS	TORUS		Creates a torus (donut shape) based on center point, radius and tube radius.
PYRAMID	PYRAMID / PYR		Draws a solid object with a polygon (3-32 sides) base that rises to a central point.
POLYSOLID	PSOLID		Draws a solid object with width and height as you would draw a polyline.

You can use primitives to either begin building a model, or it can even be a finished object on its own. Many of these commands are similar to 2D commands, except with an extra coordinate in the Z axis. Here is a summary of working with these commands.

There are four Access Methods for any 3D primitive, taking Box  as an example

1- Ribbon: Home tab ➤ modeling panel ➤ Box
2- Menu: Draw ➤ Modeling ➤ Box
3-Toolbar: Modeling
4- Command entry: box

Region

Converts an object that encloses an area into a region area

The methods to call region:

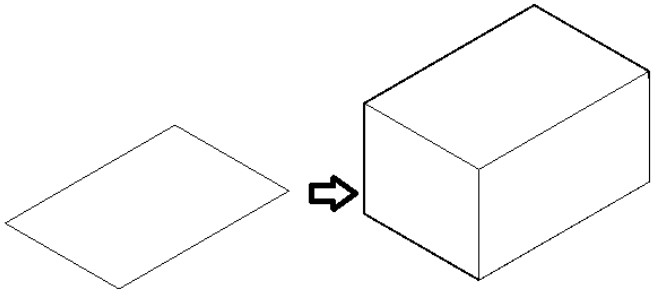
1- Toolbar: Draw ➪region
2- Command entry: region
3- Menu: Draw ➪region
4- Ribbon ➪ Home ➪ Draw

If you draw a 2d enclosed lines using the command line, when these lines extruded, it will be converted to surfaces, while using region (or **boundary**) for these lines, then the extrude, will turn them to a 3d object.

Region is a command that applied at any closed 2d object to convert it to a region which can be extruded after that to make a 3d object. Extruding 2d without region will result a surface.

Extrude

Extrude: To transform 2D objects to 3D objects



Can be called by:

1- Toolbar: Modeling

2- Ribbon➪ Home➪ Extrude

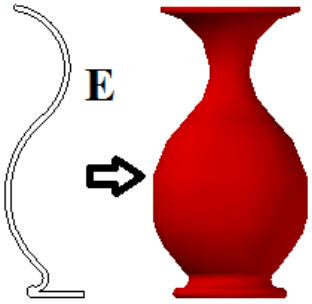
3- Menu: Draw➪ Modeling

4- Command entry: Extrude

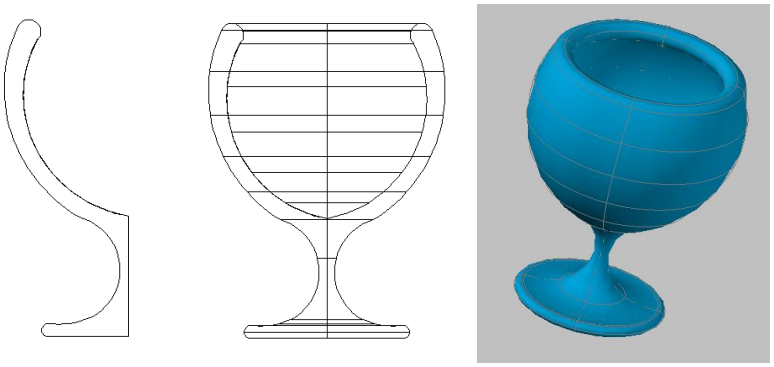
Revolve

To revolve a 2d object around an axis

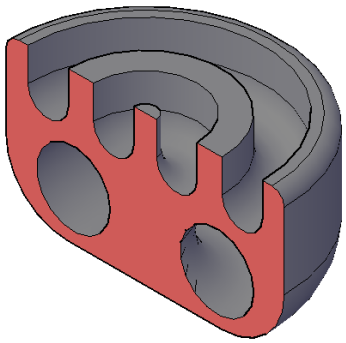
Example 1:



Example2: How to make a glass

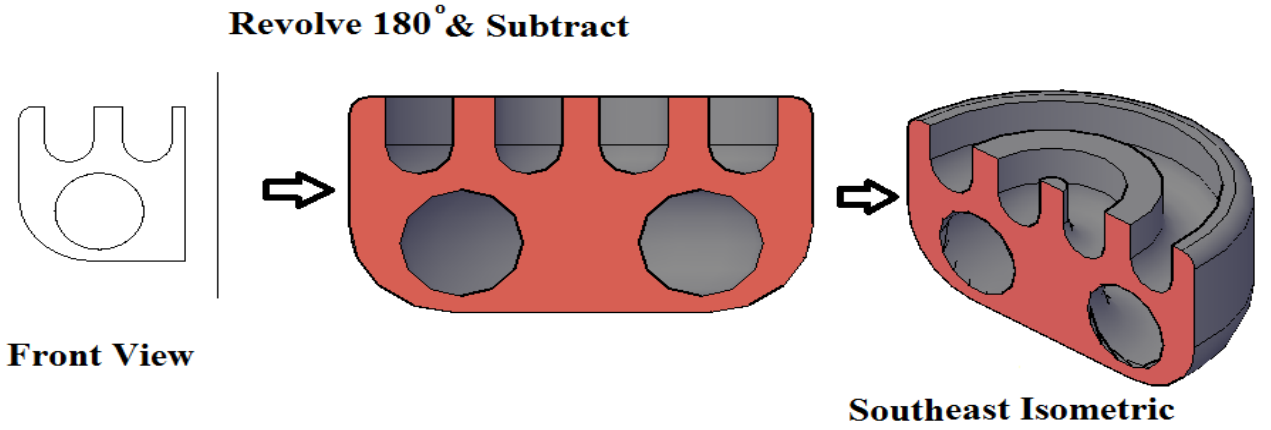


Example3: List the **shortest steps** (commands and their details) to draw the fluid coupling end cap shown in figure below in AutoCAD 2010.



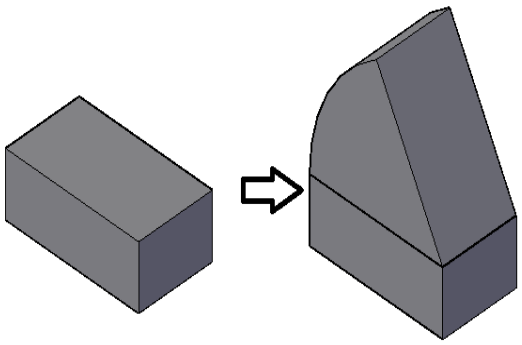
Solution:

1- File➪ New➪ acadiso➪ Z ➪ A
2- Front view
3- Draw Fig. A
4- Boundary
5- Revolve the two polylines, the angle 180
6- Subtract
7- Southeast Isometric view



Revolve can be used with 3d by holding Ctrl button and select a face

Revolve , then press and hold CTRL , then select the top face , axis of rotation , and angle



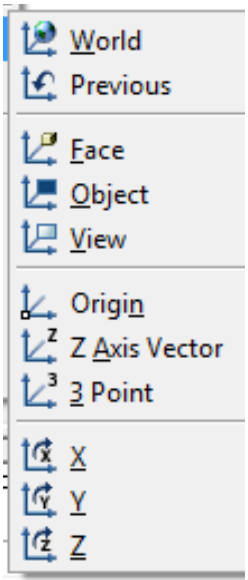
UCS

UCS stands for user coordinates system, While

WCS stands for World coordinates system.

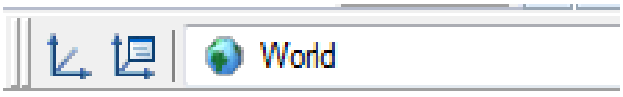
How to call UCS

1- Ribbon: View tab ➤ Coordinates panel ➤ UCS
2- Menu: Tools ➤ New UCS ➤ UCS



3- Toolbar: UCS
4- Command entry: UCS

There are two toolbars of UCS UCS and UCSII



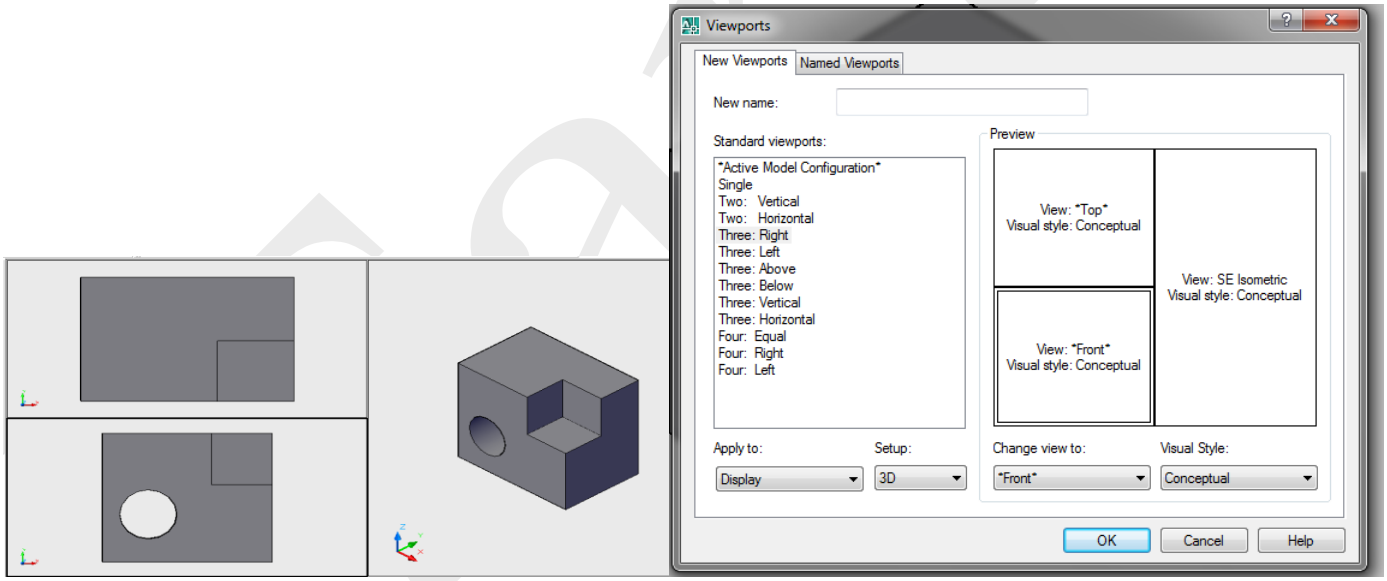
UCS II

Viewports

How to call Viewports Dialog Box

Ribbon: View tab ➤ Viewports panel ➤ Named Viewports
Menu: View ➤ Viewports
Toolbar: Layouts
Command entry: vports

How to set the viewports

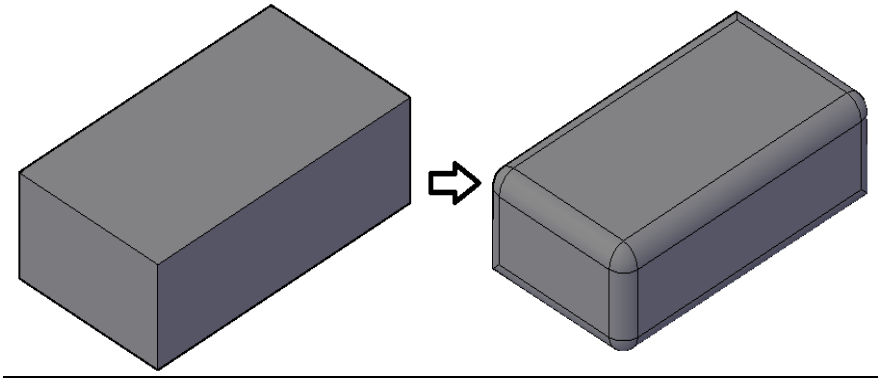


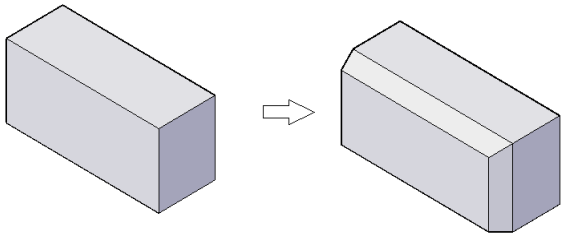
To make three view on the screen:

View ➪Viewports ➪New viewports (or 3 viewports). A dialogue box appears .choose Three: Left or any type of view.

Fillet

To round the edge of any two connected surfaces of the 3d object





Chamfer 

SWEEP 

Creates a 3D solid or surface by sweeping a 2D object along a path.

Access Methods

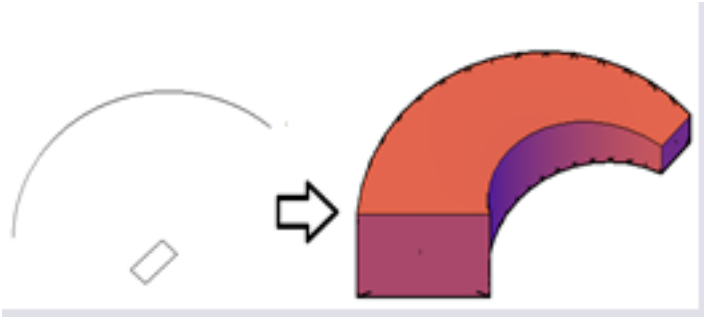
1-Ribbon: Home tab ➤ Modeling panel ➤ Sweep
2-Toolbar: Modeling
3-Menu: Draw ➤ Modeling ➤ Sweep
4-Command entry: sweep

Summary

With the SWEEP command, you can create a new solid or surface by sweeping an open or closed planar curve (profile) along an open or closed 2D or 3D path. SWEEP draws a solid or surface in the shape of the specified profile along the specified path. You can sweep more than one object, but they all must lie on the same plane.

When you select an object to sweep, it is automatically aligned to the object that is used as the path.

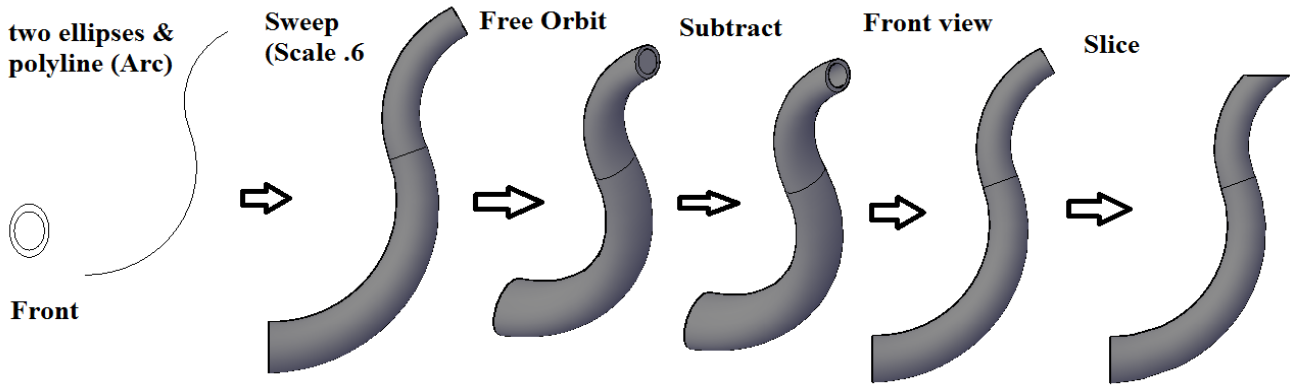
Example1: Sweep➤ (scale)



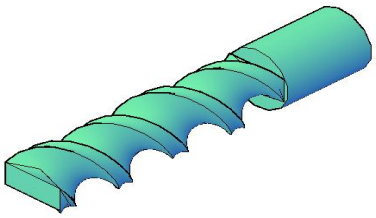
List the **shortest steps** (commands and their details) to draw the tea pot tube shown in figure below in AutoCAD 2008.

Solution:

1- File- New- acadiso- Z – A
2- Front view
3- Draw two ellipses and pick the polyline (choose Arc) and start from lower point to draw first figure
4- Sweep and choose the two ellipses and the path is the arc
5- Subtract the inner swept ellipse from the outer one
6- Slice the lip



List the shortest steps to draw the object in Fig. 1



1- Draw a rectangle according to the cross-section of the object
2- Draw a line represents the path or the length of the twisted part
3- From dashboard choose Sweep and pick the rectangle then enter
4- Write t (twist), then enter the value of the twisted angle
5- Pick the left side then draw a circle and make presspull
6- Union

Helix

The methods to call Helix

1- Menu: Draw ➪Helix

2- Ribbon ➪Draw ➪ Hilux

3- Command line: helix

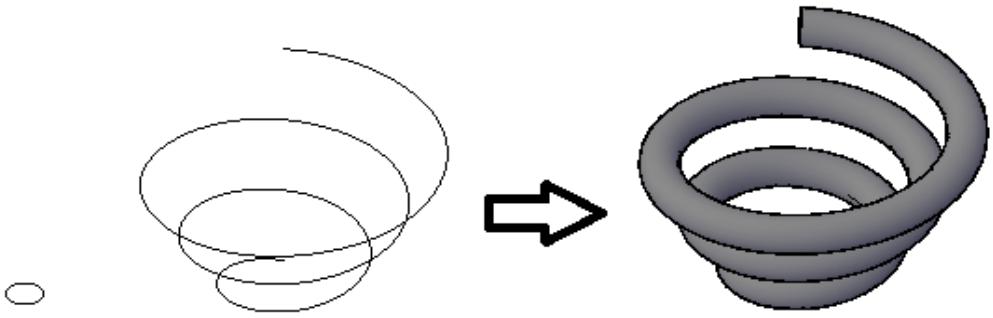
4- Tool bar: modeling

Example: The shortest steps to make a **spring** from a 8mm dimeter wire in AutoCad 2008

1- Draw a 8mm dia. circle using the command circle

2- Draw a helical using the command helix

3- Sweep the circle on the helix



LOFT

Creates a 3D solid or surface in the space between several cross sections.

Access Methods

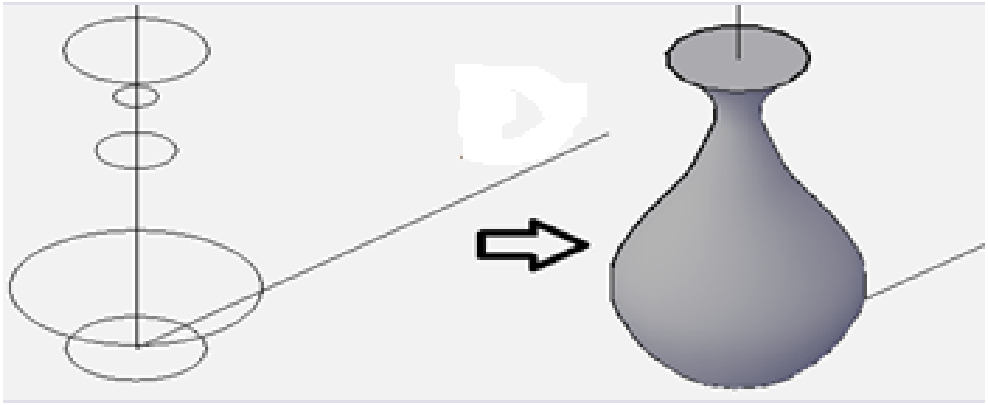
Ribbon: Home tab ➤ Modeling panel ➤ Loft

Menu: Draw ➤ Modeling ➤ Loft

Toolbar: Modeling

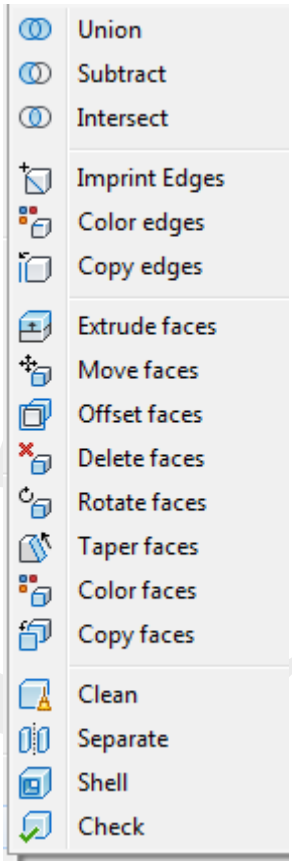
Command entry: loft

The cross sections can be either open or closed 2D objects such as circles, arcs, or splines.



SOLIDEDITING

Edits faces and edges of 3D solid objects.

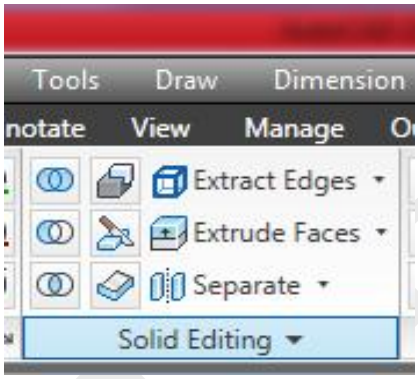


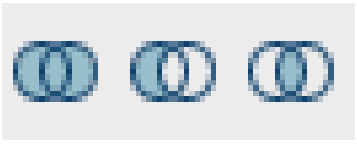
Access Methods

Ribbon: Home tab ➤ Solid Editing panel
Menu: Modify ➤ Solid Editing
Menu: Tools ➤Toolbars ➤Solid Editing Toolbar
Command entry: solidedit

Summary

The SOLIDEDIT command provides many ways to modify the edge and face sub objects of 3D solid objects. You can extrude, move, rotate, offset, taper, copy, delete, and assign colors and materials to faces. You can also copy and assign colors to edges. You can imprint, separate, shell, and clean.
You cannot use SOLIDEDIT with mesh objects. However, if you select a closed mesh object, you will be prompted to convert it to a 3D solid.





Union, Subtract, Intersect

Union: to join **At least 2 solids or coplanar regions**

The methods to call the following tools in AutoCAD 2010

1- Toolbar: Modeling

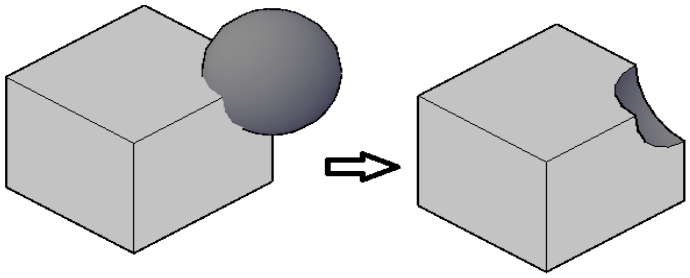
2-Toolbar: Solid Editing

3- Menu: Modify ⇨ Solid Editing

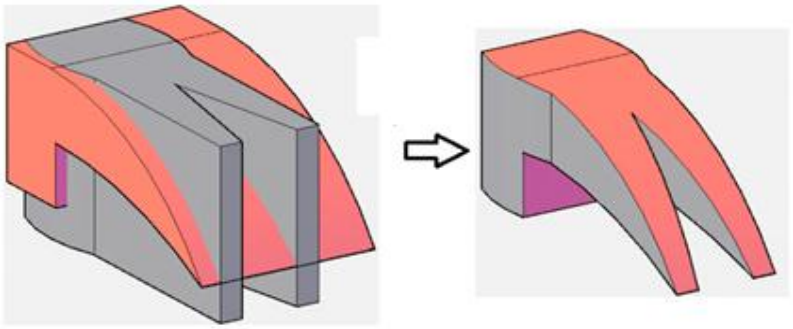
4- Command entry: Union, Subtract, Intersect

5- Ribbon: Solid Editing

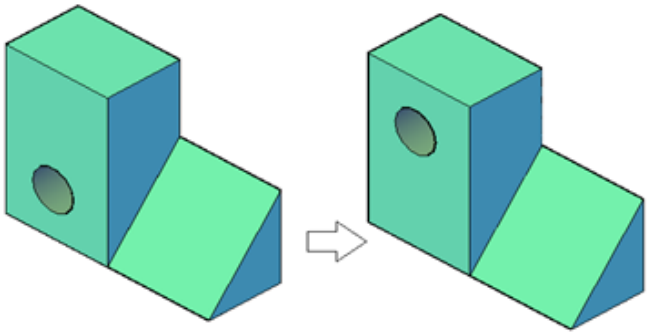
Subtract: to subtract an object from other



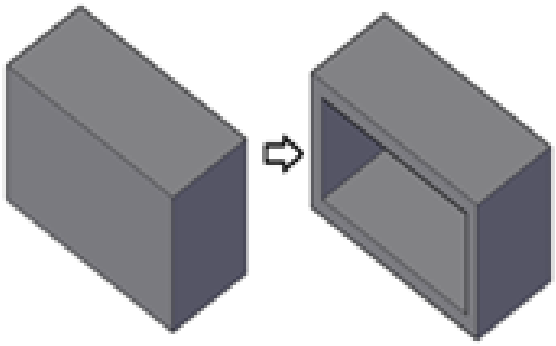
Intersect to make an object from the interference of two objects



Move faces



Shell



State the differences between Offset Faces and Extrude Faces.

Ans. There is no taper for Offset faces

How to change the color of **one face** for an object.

Ans. Menu: Modify: Solid editing –Color faces

What are the differences between the following commands?

1- Extrude faces and Offset faces.

Ans.
Extrude faces has taper while Offset faces doesn't have

2- Extrude and Extrude faces.

Ans.
Extrude is used for 2D drawing while Extrude faces is used for faces in 3D solids.

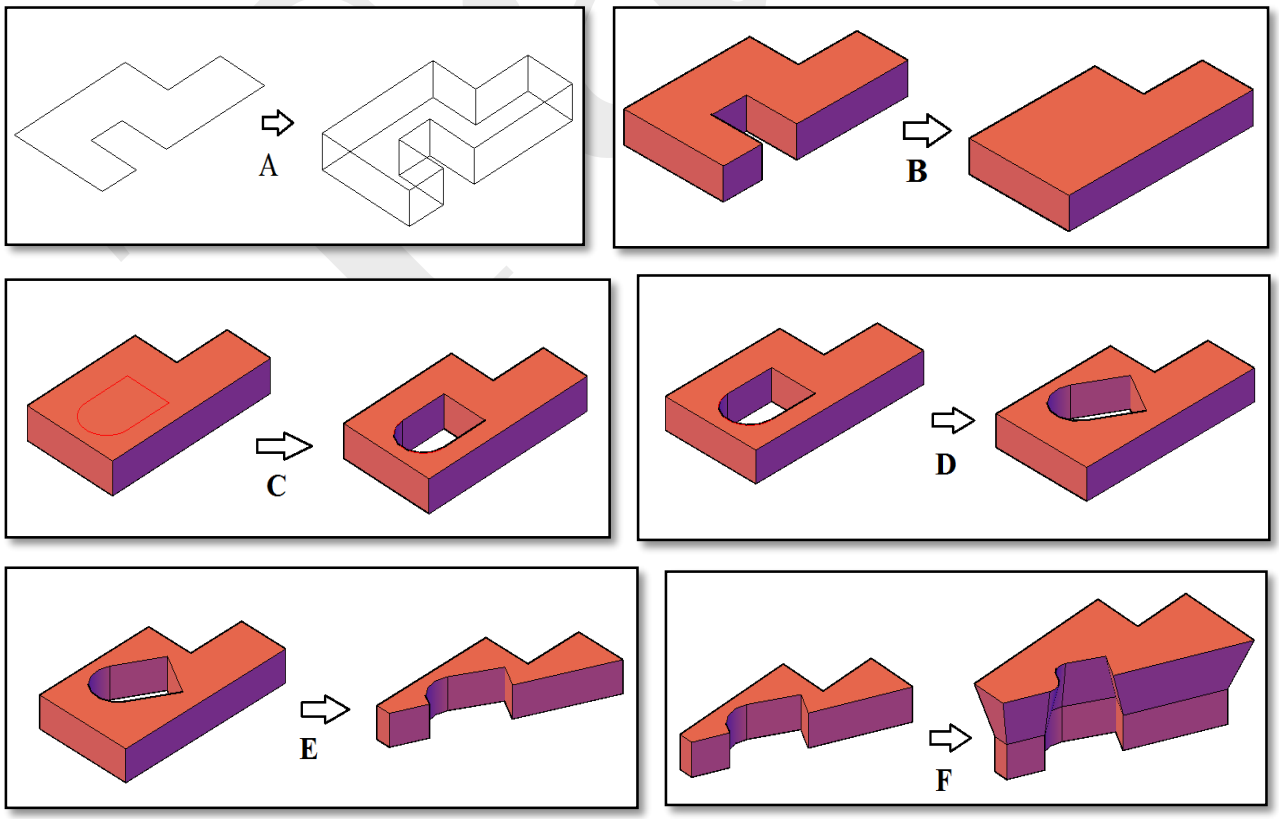
3- Extrude and sweep.

Ans.

Extrude can be used without path

Extrude cannot be done when the 2D drawing and the path are at the same plane

State the tool and its details- if needed- for the following changes:



Answer:

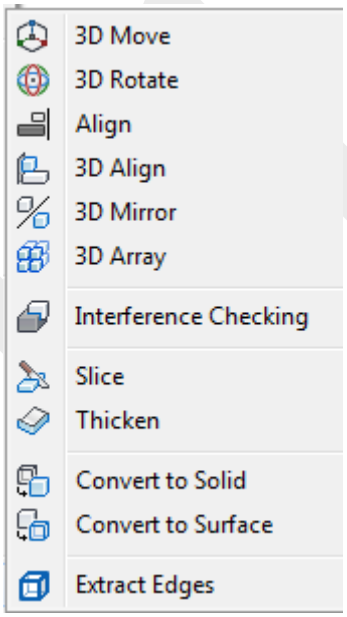
A- Extrude, or presspull . B- Move faces, C- presspull, D- Rotate faces, E- Slice,

F- Extrude faces- taper negative angle

State the tool and its details- if needed- for the following changes:

A) 1- Slice (by choosing an axis that slices the body to two objects 70*50*60 and keep both objects).

2- Slice (by choosing 3 points then press enter and choose the three points that give the inclined plane , then keep one object of the slice).



3D Operations

Menu: Modify ➤ 3D Operations

SLICE 

Creates new 3D solids and surfaces by slicing, or dividing, existing objects.

Access Methods

Ribbon: Home tab ➤ Solid Editing panel ➤ Slice
Menu: Modify ➤ 3D Operations ➤ Slice
Command entry: slice

Summary

The cutting plane is defined with 2 or 3 points, by specifying a major plane of the UCS, or by selecting a surface object (but not a mesh). Either one or both sides of the sliced 3D solids can be retained.

Objects that Can Be Used in a Slice Operation

Objects that can be sliced	Objects that can be used as cutting planes
3D solids	Surfaces
Surfaces	Circles
	Ellipses
	Circular or elliptical arcs
	2D splines
	3D polyline segments

Convert to solid

1-Draw a circle or rectangle.
2- Open properties.
3- Select the circle (or rectangle), so you can see it properties.
4- Change the thickness from 0 to any number like 20.
5- The circle will get a thickness.
6- Pick Convert to solid, so the circle becomes a solid.

Convert to Surface

The same steps from Convert to solid, so the circle becomes a surface.

Surfaces

There are at least five methods to make surfaces

1- Write in the command line 3d then choose any primitive surface you want.

2- Write in the command ai_dish or any shape (dome pyramid torus….)

3- Draw a line then from 3d make in the dashboard pick extrude and pick the line (any object made by line without region or boundary, when extruded, It will turn to a surface).

4- Draw any 2D object using line command then pick properties pick the drawing. The properties window defines the object as line. In front of thickness, change the number 0 to any other number like 4. The object will be extruded. But still a line.

From 3d make choose ➪ convert to surface and pick the object. It will turn to surface.

5- Draw ➪ Modeling➪ Meshes

How to do the following activities

Change the color of an object.

Ans.
Properties➪ in front of color pick the desired color

Enforce lines to be drawn just horizontally and vertically.

Ans. Activate the ORTHO button on the Status bar

Make three view on the screen

View ➪ Viewports ➪ New viewports (or 3 viewports). A dialogue box appears. Choose 3 viewports.

Measure the Area and Perimeter of an irregular 2D enclosed shape in AutoCAD2010.

Ans. Tools➪ Inquiry ➪Area then pick the ends of the shape lines

---

Display the scroll bar in the drawing window.

Ans. Menu: Tools ➪ option, , the Options dialogue box will appear as in Fig. above and click Display then Display scroll bars in drawing window

---

Change the color of **one face** for an object.

Ans. Menu: Modify: Solid editing ➪Color faces

Moving a hole in an object to a new place.

Ans.

Menu: Modify: Solid editing ➪Move faces

---

1. Enables you to draw at any face of an object directly.
   Ans. Activate the ORTHO button on the Status bar

How to draw in Word Microsoft program using AutoCAD program

While you are in word program pick

Insert ➪Object…

Then choose AutoCAD program

A new page of AutoCAD program opens

Draw your drawing, then

File➪ update Microsoft Word

Now return to Word. Your drawing will be there.

Another method is to draw the required drawing in AutoCAD, then Edit➪ Copy (0r Copy with base point), then select the drawing, and open the Word Program and Paste

Explain the function of the following:

1- ORTHO 2- Union 3- delobj 4- Flatshot 5- DUCS 6- Intersect 7- pedit

8- Properties 9- Mocoro 10- Clean Screen 11- Area 12- oops

Ans.

1- **ORTHO**: To enforce lines to be drawn just horizontal and vertical

2- Union: To join two objects and make them one object

3- Delobj In order to maintain or erase the original object after some operations like Extrude, Revolve.

Set delobj to 0 will deactivate its function, hence the original object will remain.
Set delobj to 1 will activate its function, hence the original object will be erased.

4- **Flatshot**: create 2D geometries from a 3D model using its different views on XY plane in model space (to make projection view for a 3d object)

5- DUCS Enable you to draw at any face of an object directly.

6- Intersect: to form a shape by connecting to object. The connection zone is the result of the Intersect

7- Pedit: To convert any number of lines to one polylines orTo edit a polyline or to change a line or lines to a polyline.

8- Properties: To identify and change any object in the drawing area.

9- Mocoro: this command contains four operations:

Move
Copy
Rotate
Scale

10 - Clean Screen: To hide all tool bars in order to increase the space of drawing

11- Area: To measure the area and perimeter of any 2d object

12- Oops: To restore a deleted object without erasing the objects that done after the delete operation.

How to show the Ribbon on the drawing area of AutoCAD 2010 in case it is not existed.

Solution:

1- Menu ➪ Tools ➪ Pallete ➪ Ribbon
2- Write down at command lines : _ribbon

How to make a Template file.
File➪ save as: go to C: Program files➪ autocad2008 ➪ Template:
In the File of Type: choose AutoCAD Drawing Template (*.dwt)

List at least 8 button (Status toggles) in status bar
Answer:

How to show the Ortho button in Status bar if it is not existed in AutoCAD2010

Answer: click the black arrow head at the lower right corner of screen (called Application Status Bar Menu). Then click the Status Toggles to show the shortcut menu. Tick the square in front of Ortho

How to lock a docked toolbar

Ans. Open the lock in the lower right corner and then tick the square in front of Docked toolbars

Materials

Applying materials to objects

From Menu: Tools ➪ Palettes ➪ Tool palettes, then select the object and click the required material to attach the object.

Calculation methods in AutoCAD 2010

1- Write in the command line :

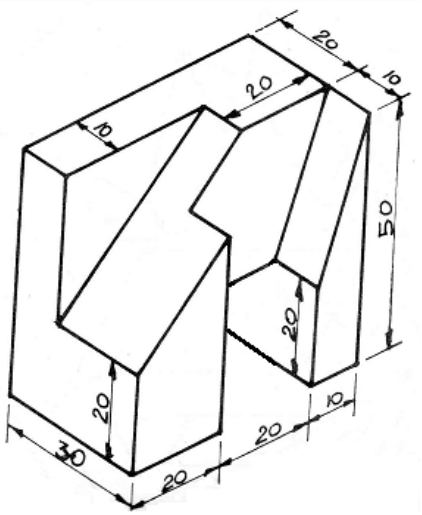
```
Command: cal
>> Expression: 5+2
7
Command:
```

2- Write in the command line

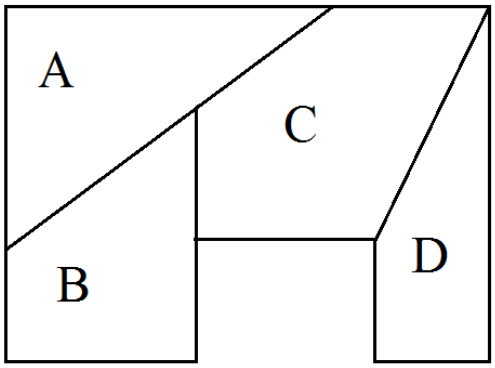
```
Command: (+ 3 6)
9
```

3- Write in the command line: quickcalc
A calculator is shown.
4-Press (ctrl+8) to show the calculator.
5- Standard toolbar ➪ quickcalc
6- Right-click and choose quickcalc.
7- Menu ➪Tools➪ palettes ➪ quickcalc.
8- Ribbon ➪ View tab ➪ Palettes ➪ quickcalc.

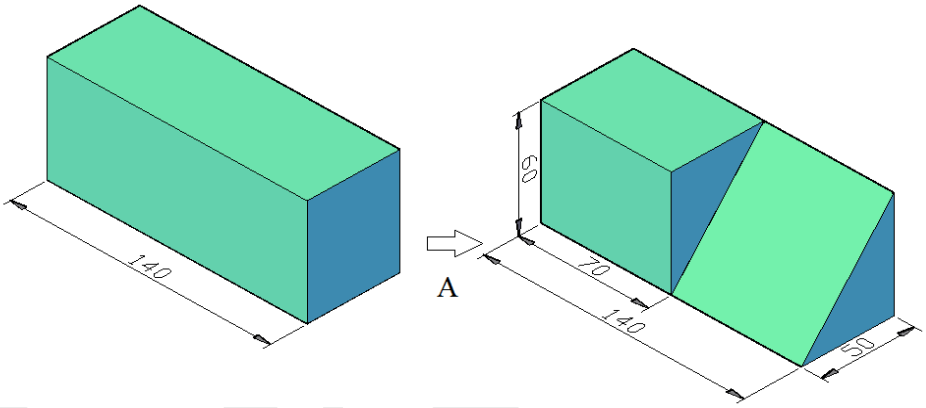
Write down (and draw for every changing state) the steps to draw the following 3D object in AutoCAD2010.



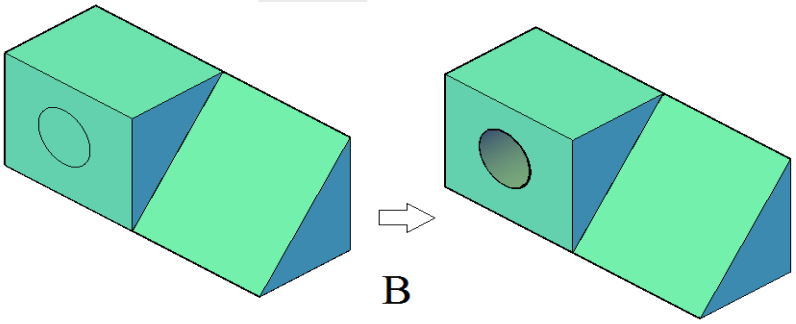
1- File—ACADISO
2- Z--- A
3- At Front view , Draw the following



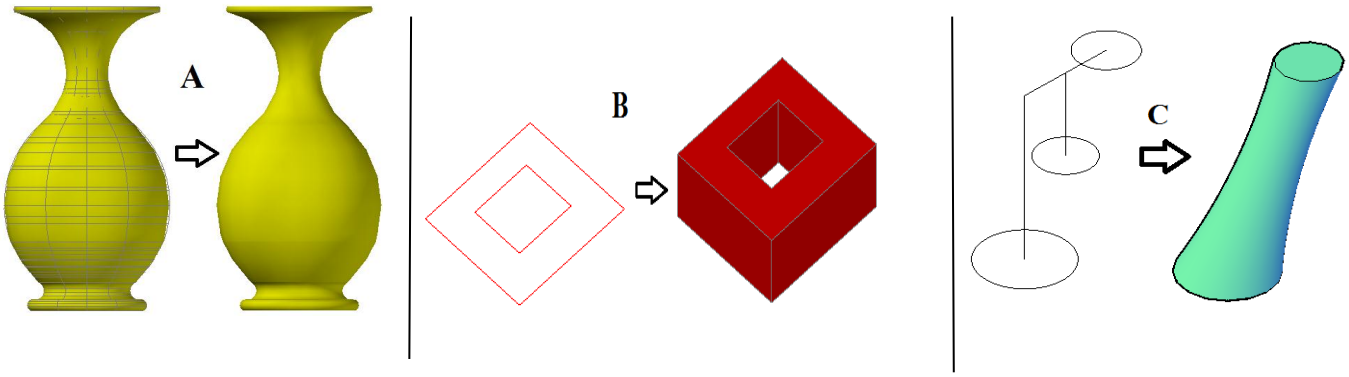
4- Isometric View
5- Presspull A by 20 (or region the whole object then Extrude)
6- Presspull B by 30 (or region the whole object then Extrude)
7- Presspull C by 20 (or region the whole object then Extrude)
8- Presspull D by 30 (or region the whole object then Extrude)

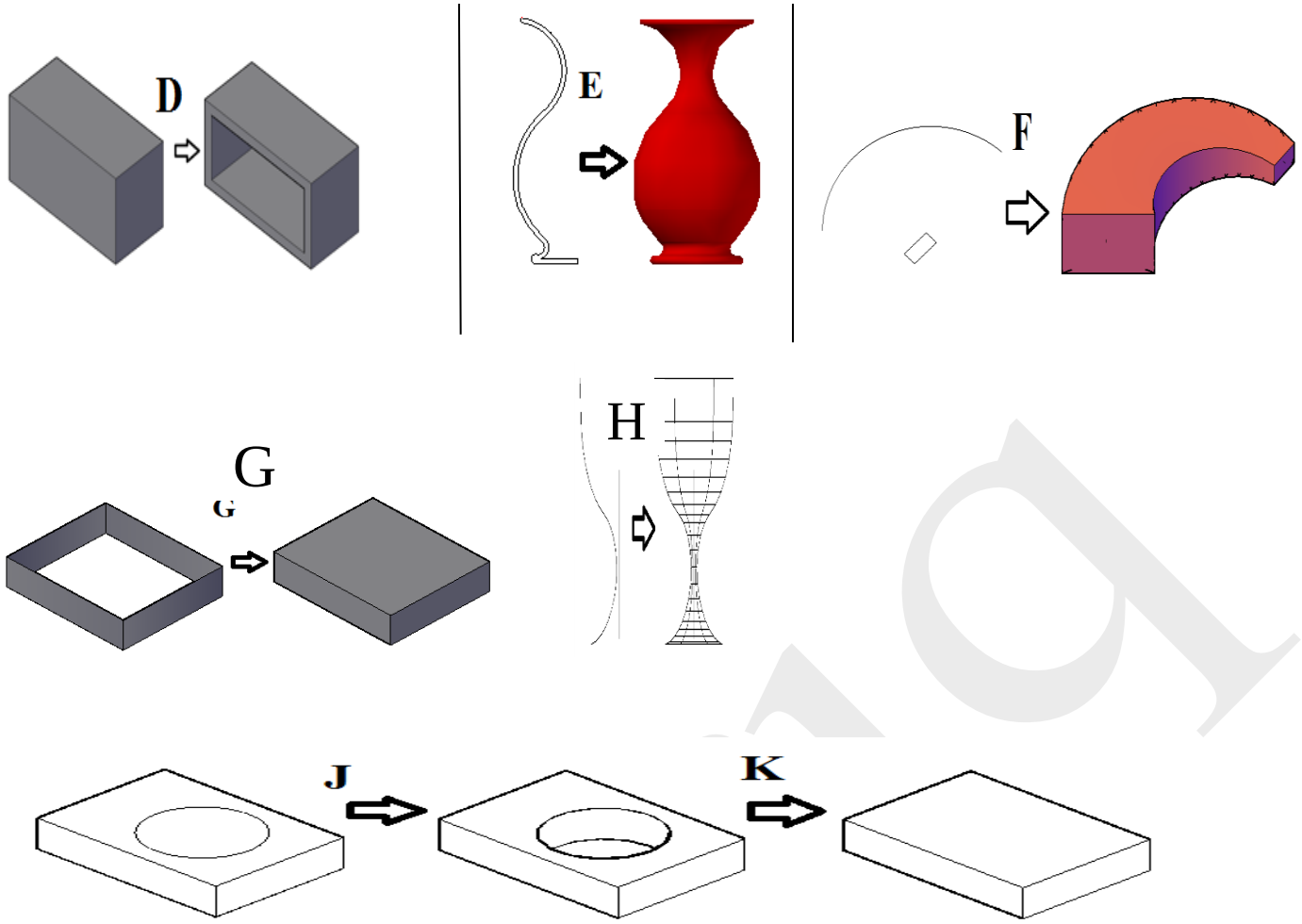


B) Presspull



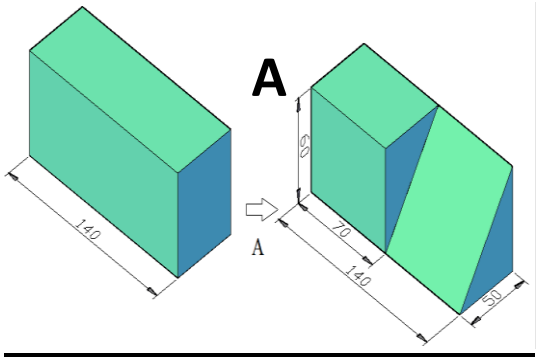
State the tool and its details- if needed- for the following changes:

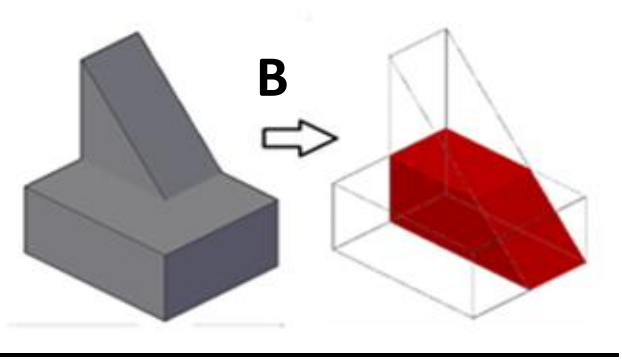


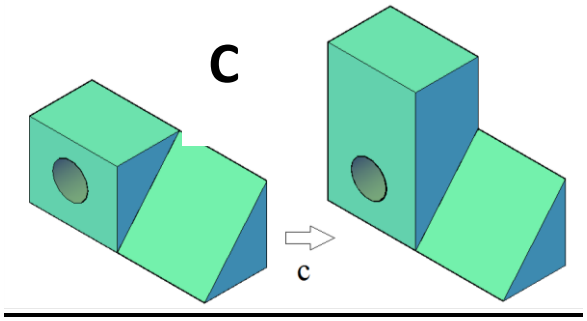


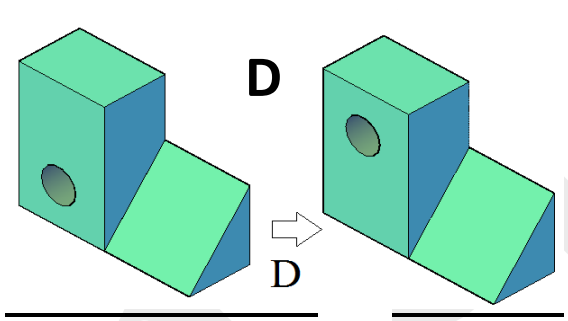
A- Visual styles-- Visual styles Manager—Edge Settings—Edge mode—change the edge mode from isolines to none
B- Presspull
C- Loft
D- Shell
E- Revolve
F- Sweep- (scale)
G- Convert to solid
H- Revsurf
J- Presspull
K- Delete faces

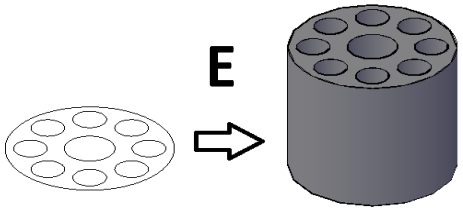
State the tool (or tools) and its details- if needed- for the following changes: (note: shortest methods are required)







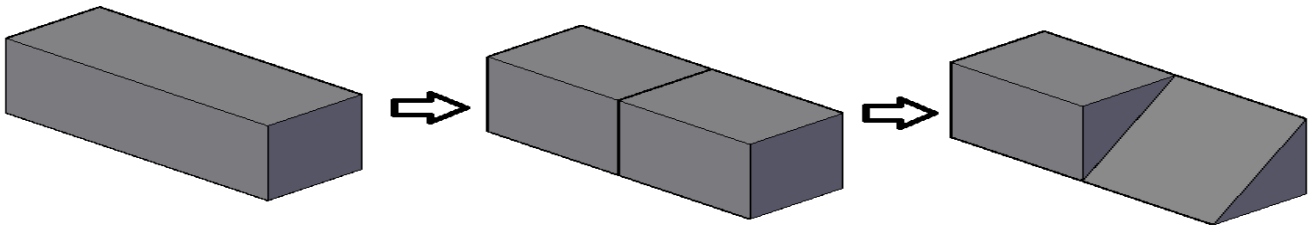




Answer:

A- 1- Slice the object from the middle to make two equal and similar objects.

2- Slice again one object as in fig below (or Taper faces)



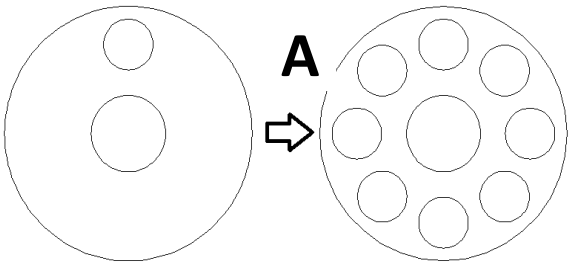
B- Interference checking

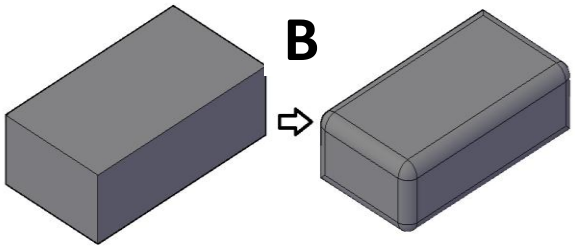
C- Move faces or Offset faces

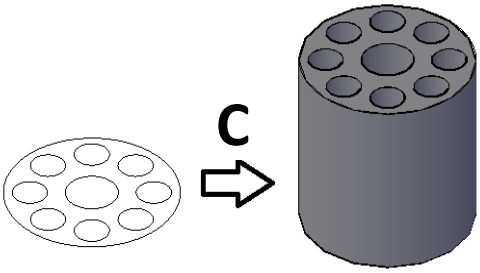
D- Move faces

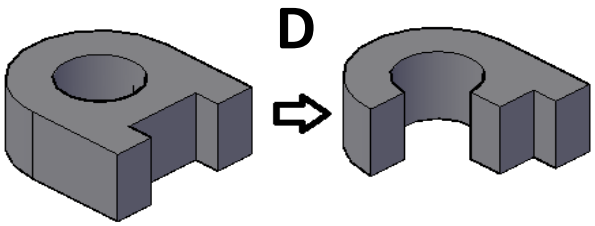
E- Presspull

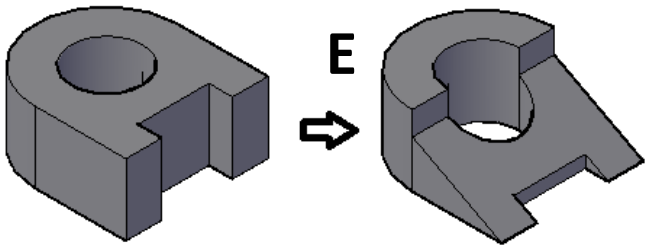
State the tool (or tools) and its details- if needed- for the following changes:











Answer:

A- Array- polar , B- Fillet , C- Presspull , D-1- Slice 2-Slice 3- Union

E- 1-Slice 2- Slice the front part 3- Union

Example:

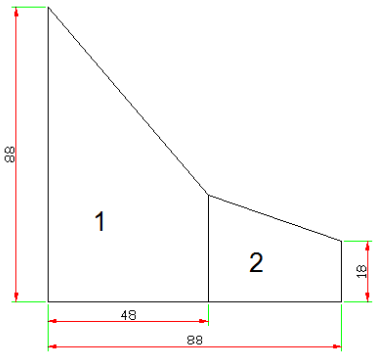


Fig. 1

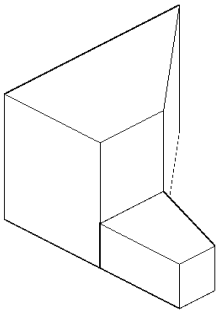


Fig. 2

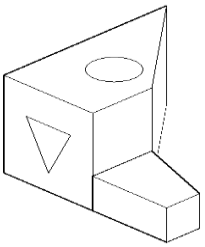


Fig. 3

STARTING FROM TOP VIEW,
1- LINE , DRAW FIG. 1
2- FROM DRAW MENU,
CHOOSE BOUNDARY AND
CHOOSE THE INTERNAL
POINTS 1 & 2
TO CREATE TWO POLYLINES
3- FROM 3D MAKE PANEL IN THE
DASHBOARD PICK EXTRUDE AND
APPLY IT AT THE TWO ENCLOSED
POLYLINES WITH HEIGHT 62 & 22
RESPECTIVELY.

4- In the 3D Navigate panel pick the southeast isometric view,

5- Visual Styles pick 3D Hidden Fig. 2.

6- Activate the Dynamic UCS (DUCS), Draw the circle and the triangle Fig. 3.

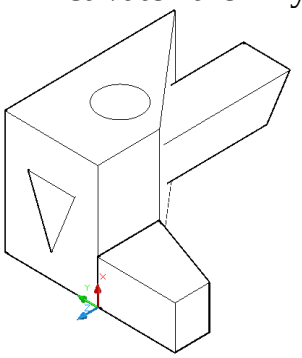


Fig. 4

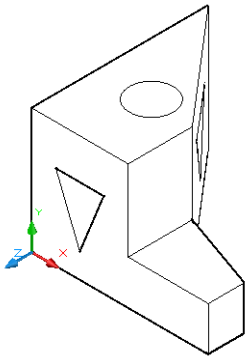


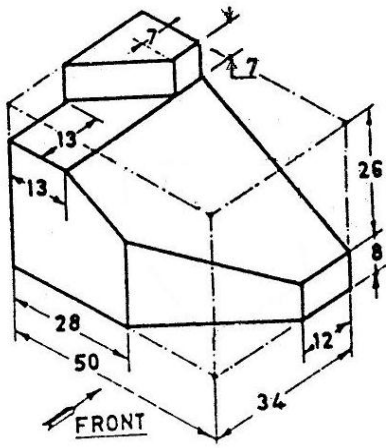
Fig. 5

7- Boundary for the triangle

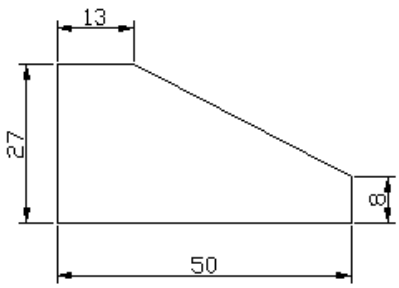
8- presspull the circle and the triangle. Fig. 4.

9- Union the two solids to get the solid Fig. 5

Write all the commands that you need with details, to draw the figure shown below (Confirm your answer with necessary sketches for each step).



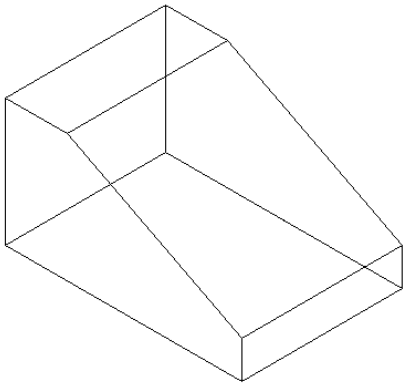
1- Choose left side view and select line or polyline to draw the following Fig.



2- Boundary and pick the inside point

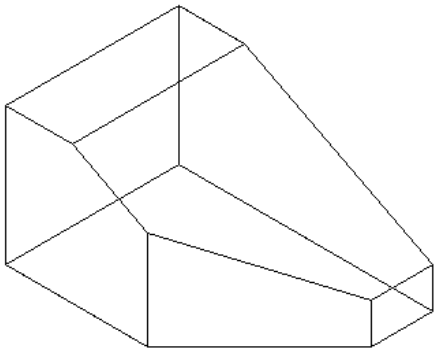
3- Extrude With height 34 to get Fig. below

3- Locate 3 points by using line or point tools



4- Slice and choose 3points (in default) and press enter then pick the three points in order to get the following Fig.

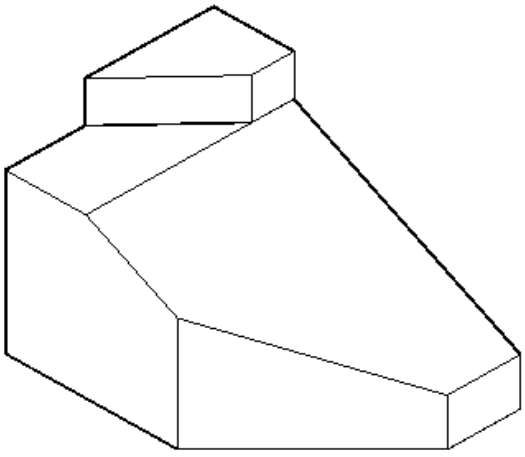
5- Activate the DUCS Button & go to the horizontal upper face and draw the base of the second object then use the Region tool and pick the lines to create a region (the polyline can be used).



6- Extrude the region to height 7

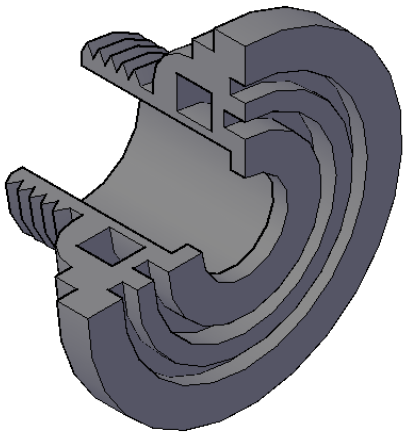
7 – In Visual Styles pick 3D Hidden.

8- In 3D Navigate Pick Southeast Isometric. The object will be as in Fig. below:

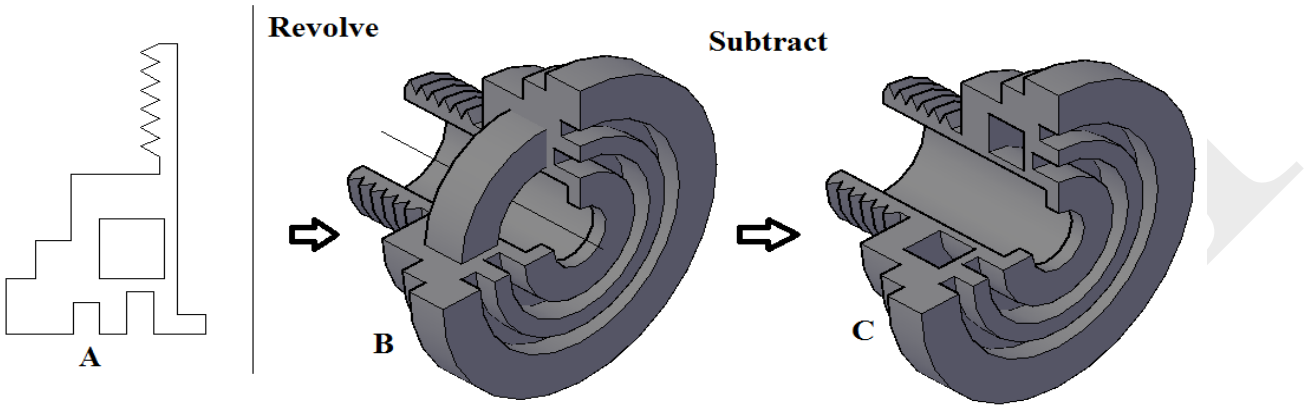


B- List all the shortest steps to draw- with sketches - the object in Figure below. (Note: Approximate any dimension)

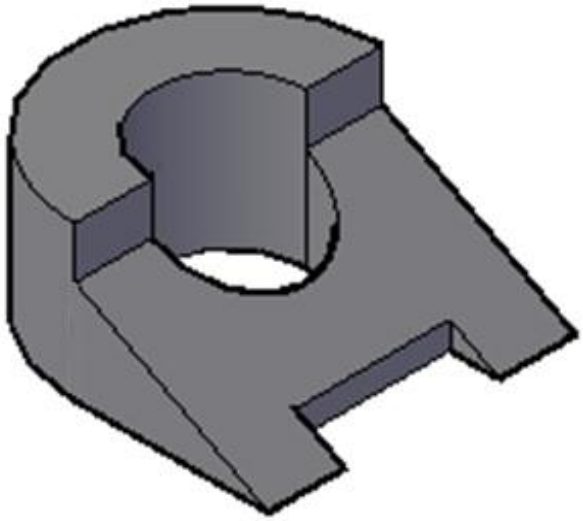
Solution:

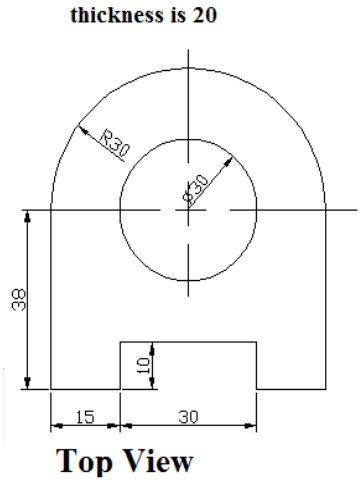


1-File- New- acadiso- Z – A
2- Choose Top view
3- Draw the 2D as in fig. A
4-Menu: draw- boundary
4- Revolve the rectangle 360 degree, and the object 270 degree
5-from the 3D Navigate in the Dashboard, pick Southeast Isometric fig. B
6- Subtract, Fig. C



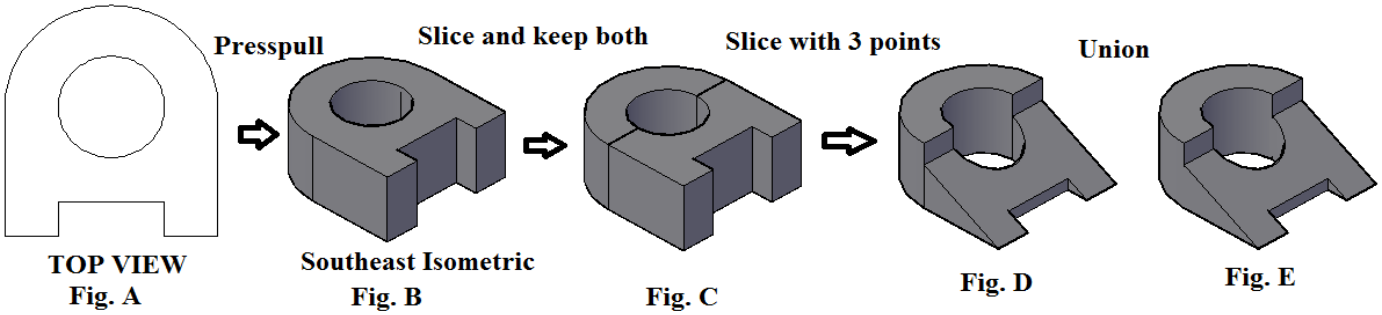
Write down the steps (with sketches for each step) to draw the following 3D solid shown in figure below (note: the 3D solid is one part).



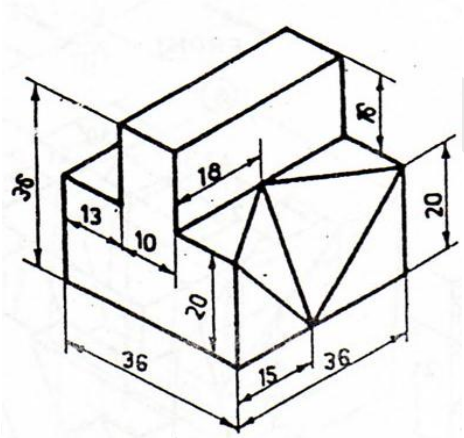


Solution:
1-File- New- acadiso- Z – A
2- Choose Top view
3- Draw the 2D as in fig. A
4-from the 3D Navigate in the Dashboard, pick Southeast Isometric

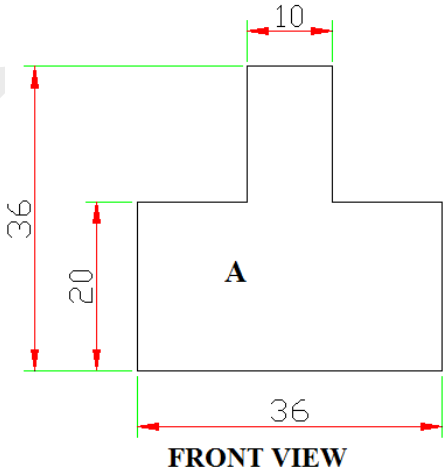
5- Presspull as in fig. B
6-Slice from the center of the hole and keep both sides
7- Slice the front part and choose 3 points as in Fig. D
8- Union as in Fig. E



Write down the steps (with sketches for each step) to draw the following 3D solid shown in figure below

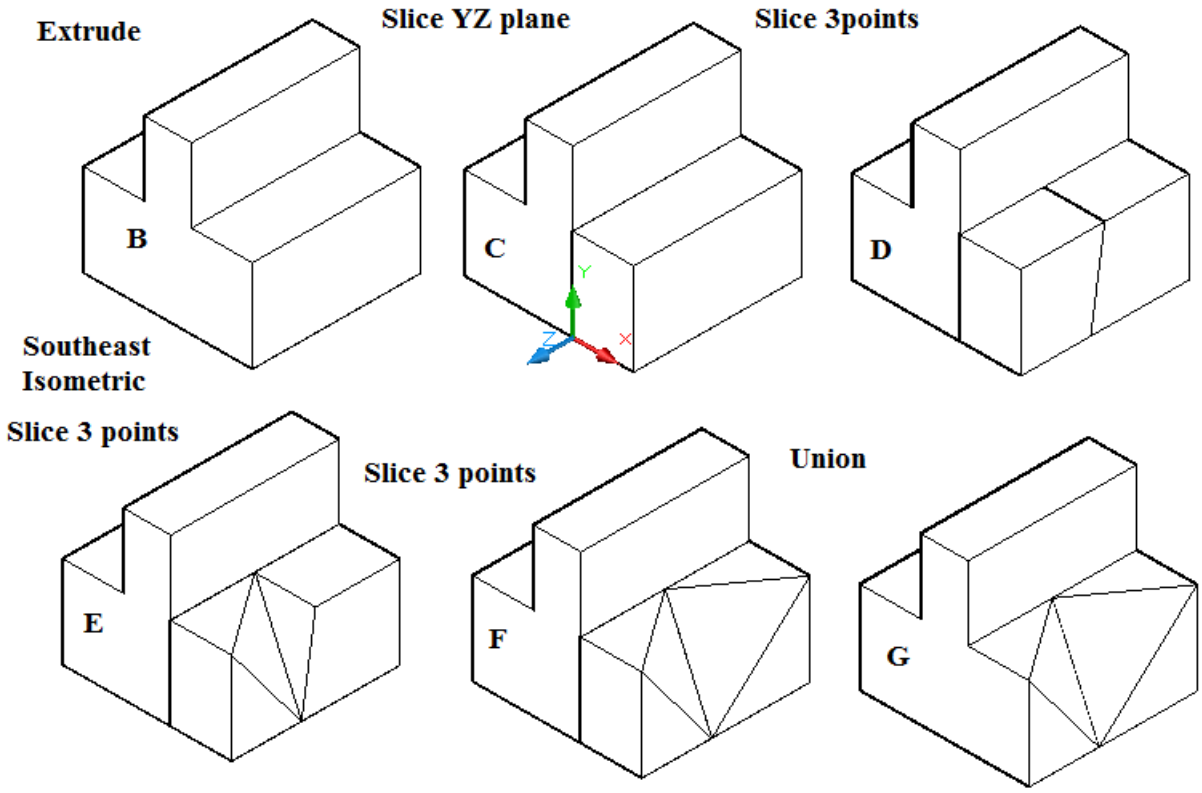


Solution:
1-File- New- acadiso- Z – A
2- Choose Front view
3- Pick from draw toolbar the polyline and circle then trim tool and draw the figure A

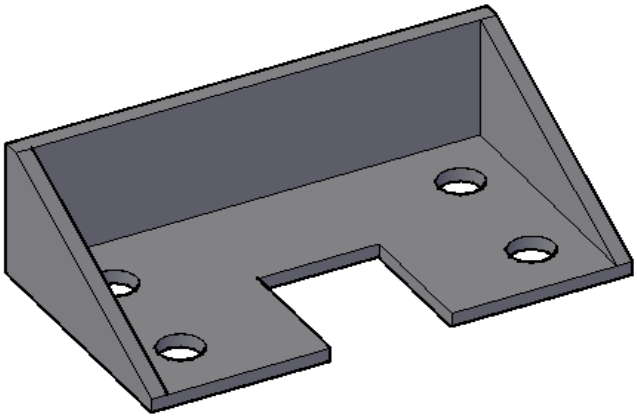


4- The 3D Navigate in the Dashboard, pick Southeast Isometric
5-Extrude depth 36, Fig. B
6-Slice and choose yz plane, Fig. C

7-choose the front object and activate DUCS and ORTHO buttons, draw lines 18, 13, and line 15
8- Slice this object by choosing 3points, Fig. D
9- Slice by 3 points the first part, Fig. E
10- Slice by 3 points the second part, Fig. F
11- Union Fig. G



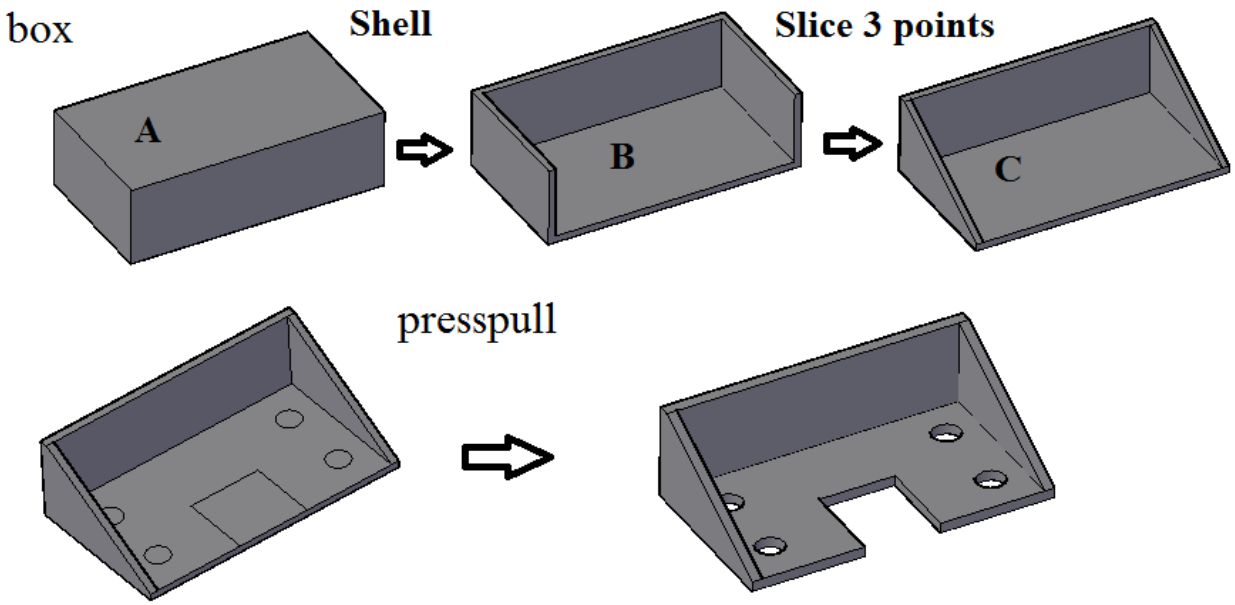
List the steps (with sketches) to draw the following figure in AutoCAD 2008:
(Note: approximate any dimension).



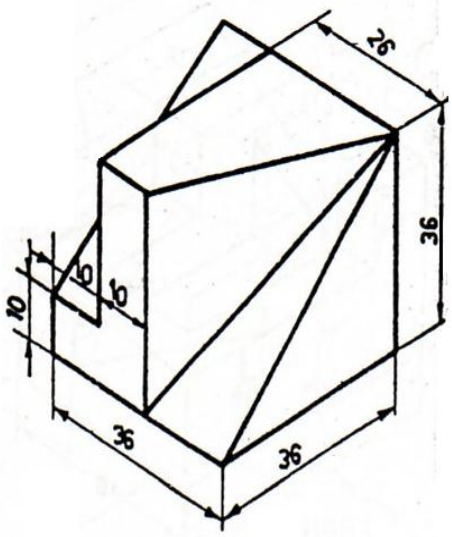
Solution:

1-File- New- acadiso- Z – A
2- Choose Southeast Isometric View
3- From 3D Make in Dashboard pick Box as in Fig. A

4- Menu: Modify- Solid Editing- Shell
And choose the top and front surface to be removed Fig. B
5-Slice-3points as in Fig. C
6-draw on the lower surface the rectangle and the four circles as in Fig. D
7- Presspull the rectangle and the four circles.



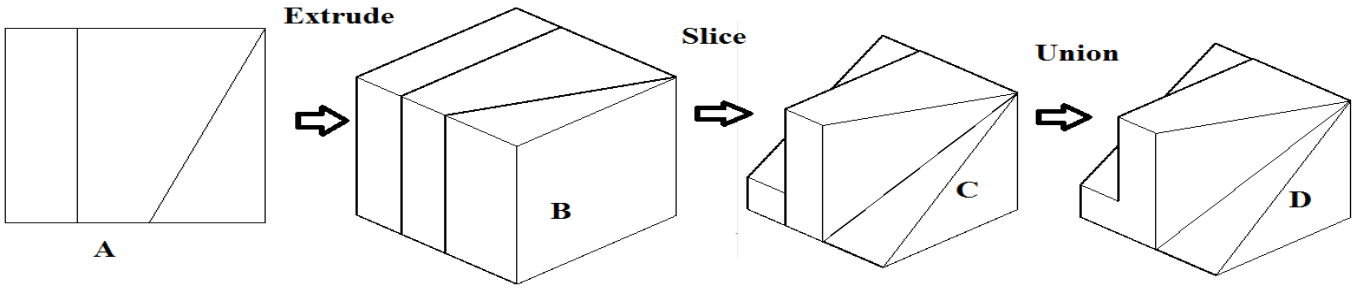
List the steps (**with <u>sketches</u> for each step**) to draw the following figure in AutoCAD 2010:



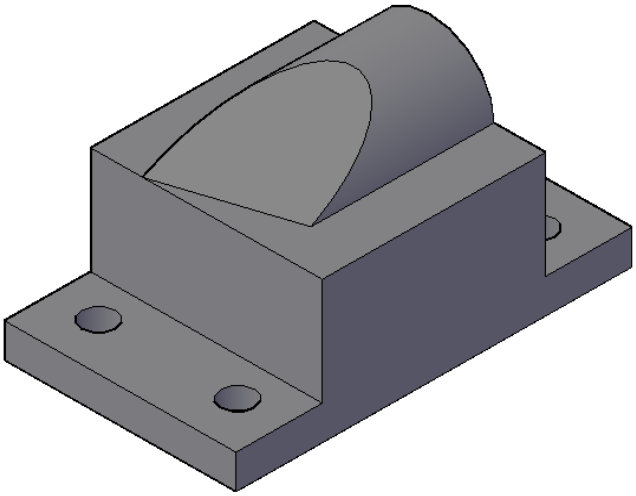
Solution:

1-File- New- acadiso- Z – A
2- draw Fig. A

3- Boundary and pick points in the three objects
4- Extrude the three objects to 36 depth
5- Slice after defining the 3 points
6- Union

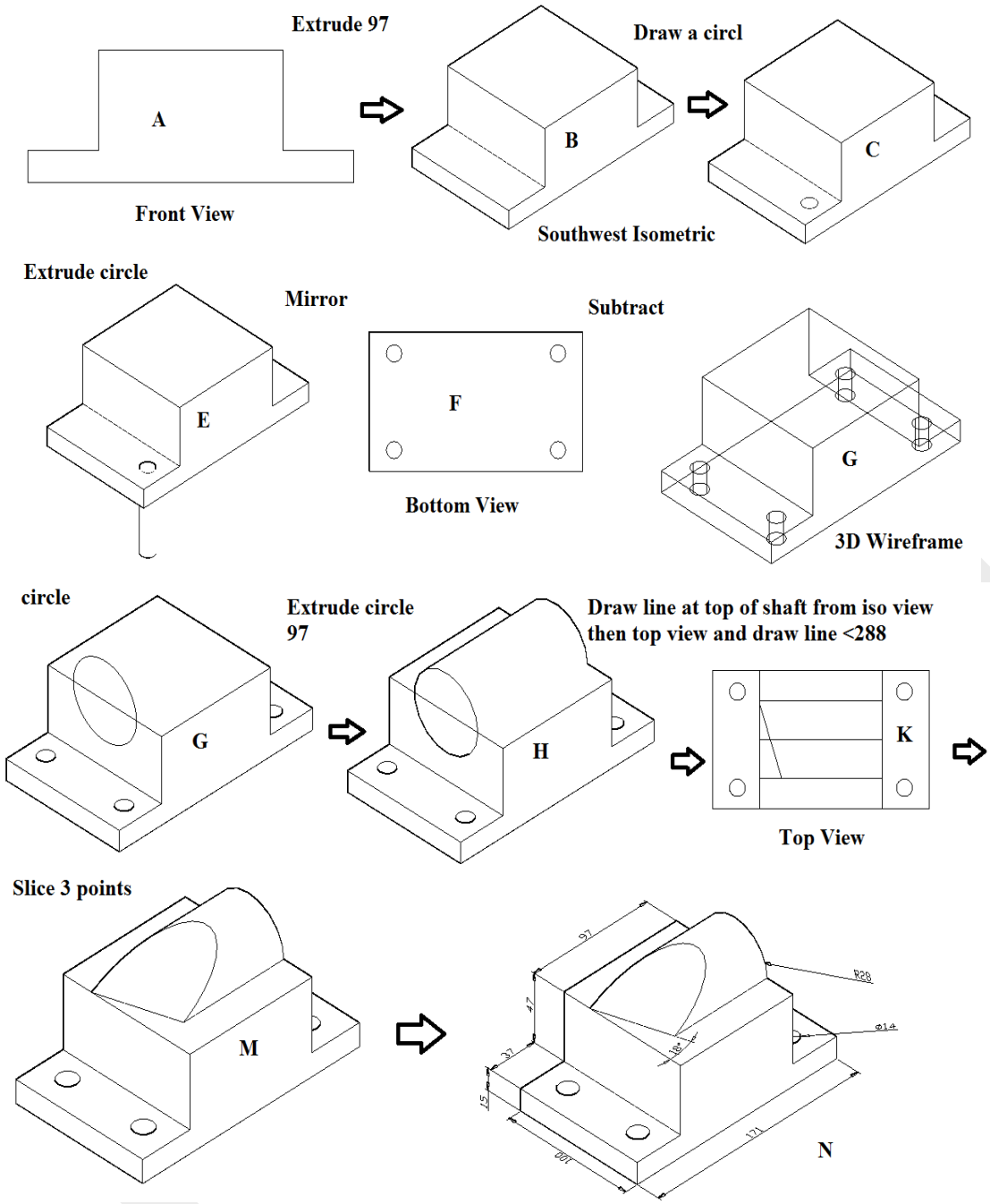


Write down the steps with sketches to draw the following figure (approximate any dimension).

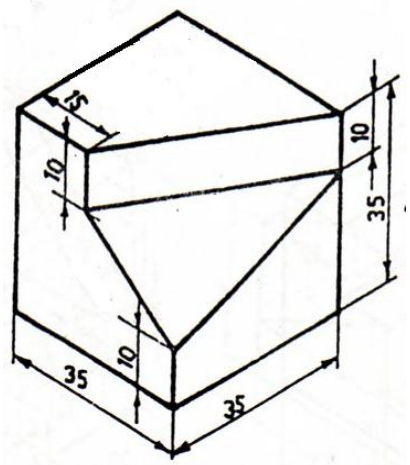


Solution:

1- File- New- acadiso- Z – A
2- Front view
3- Polyline: draw fig. A
4- Extrude: Depth 97, and change to Southeast Isometric Fig. B
5- Circle Fig. C
6- Extrude circle
7- Change to Bottom View and Mirror the Shaft two times. Fig. F
9- Change to 3D Wireframe to see the covered shaft and subtract the four shafts from the object. Fig. G
10- Circle R=28. Fig. G
11- Extrude the circle 97. Fig. H
12- Draw a line connecting



List the shortest steps (with sketches) to draw the following figure
]



Solution:

1- File- New- acadiso- Z – A

2- Southeast Isometric View

3- From 3D Make in Dashboard pick Box and choose cube with length 35, Fig. A

4-two lines 10. And one line 15, to specify point for slice

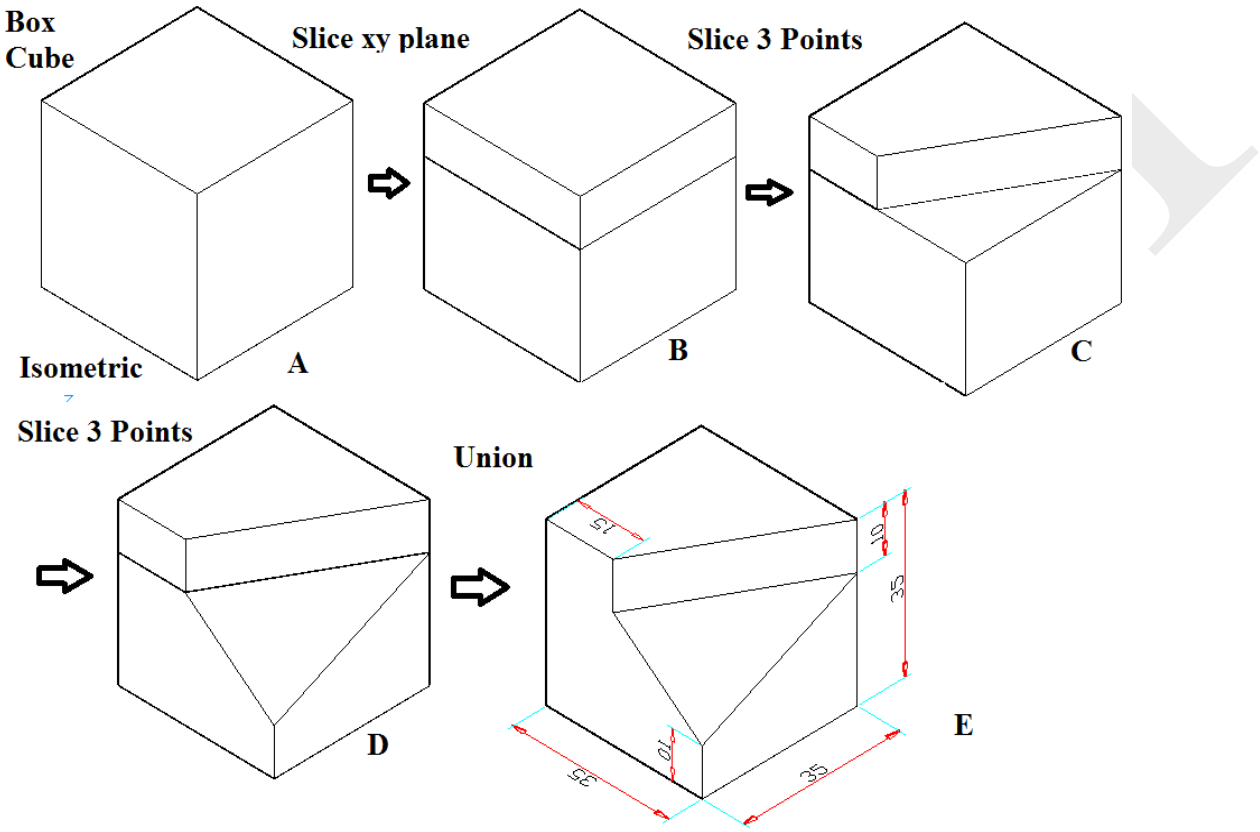
5- Slice and choose XY plane and pick the end of line 10. Fig. B

6- Slice and choose 3Points. Pick the end of line 15 with the corner. Fig. C

7- Slice and choose 3Points. Pick the end of line 10. Fig. D

8- Union

To apply dimensions transfer the UCS to the plane that is measured



How to draw freehand

1. At the Command prompt, enter **sketch**.
2. Press Enter again to accept the last saved type, increment, and tolerance values.
3. Move cursor in the drawing area to begin sketching.

As you move the pointing device, freehand line segments of the specified length are drawn. During the command, freehand lines are displayed in a different color.

4. Click to suspend sketching.

You can click a new start point to resume drawing from the new cursor location.

5. Press Enter to complete the sketch.

An alternate method:

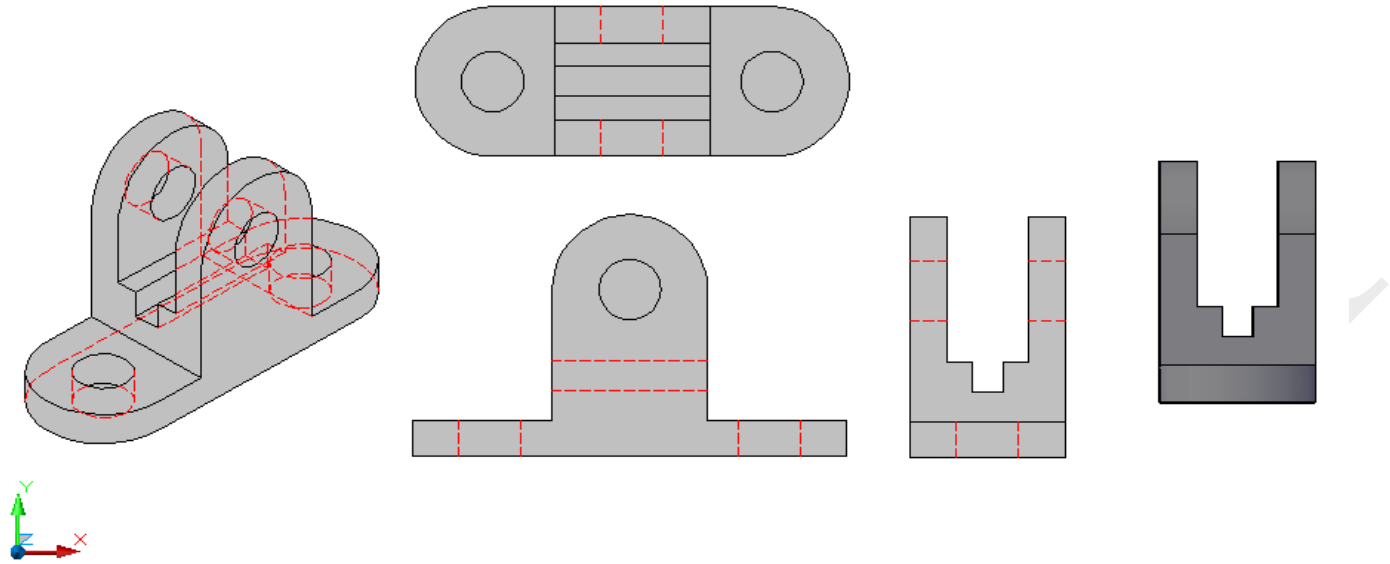
1. At the Command prompt, enter **sketch**.

2. Click and hold to begin sketching and move your cursor. Release to suspend sketching.
3. Repeat the previous step as needed.
4. Press Enter to complete the sketch.

Note: SKETCH does not accept coordinate input.

Flatshot:

This command can create 2D geometries from a 3D model using its different views on XY plane in model space



Export:

To transfer the object to photo with extension bmp

File- Export…

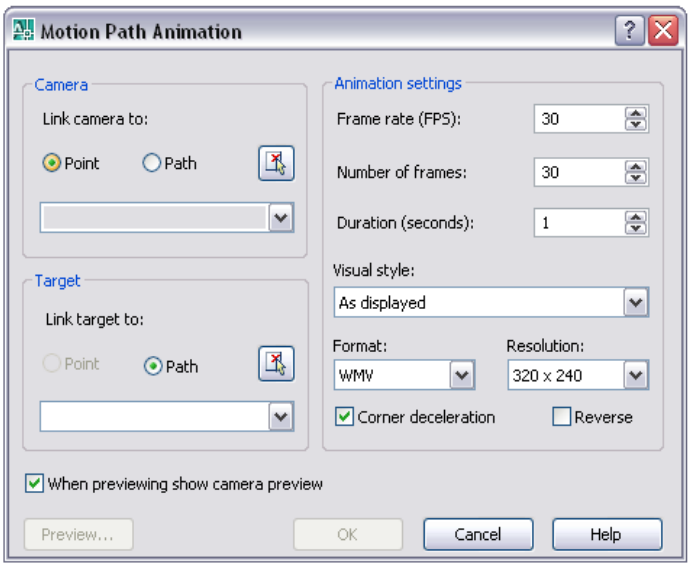
Then choose a name for the photo and from files of type pick bitmap(*.bmp)

Then pick the objects you want to be in the photo

Menu: View Motion Path Animations...At the Command prompt, enter anipath.

Command entry: anipath

Specifies settings for a motion path animation and creates an animation file.

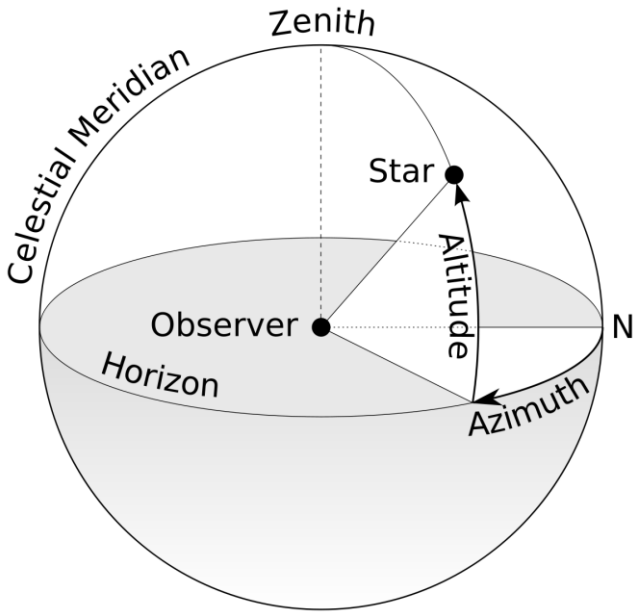


Camera
Link Camera To
Links a camera to a static point or a motion path in a drawing.
Point
Links a camera to a static point in a drawing.
Path
Links a camera to a motion path in the drawing.
Pick Point/Select Path
Selects either the point where a camera is located or the path along which a camera travels, depending on whether Point or Path was selected.
Point/Path List
Displays a list of named points or paths to which you can link a camera. To create a path, you can link a camera to a line, arc, elliptical arc, circle, polyline, 3D polyline, or spline.
Note When you create a motion path, a camera is automatically created. If you delete an object that you specified as a motion path, the named motion path is also deleted.
Target
Link Target To
Links a target to a point or a path.
If the camera is linked to a point, the target must be linked to a path. If the camera is linked to a path, you can link the target to either a point or a path.
Point
If the camera is linked to a path, links the target to a static point in the drawing.
Path
Links the target to a motion path in the drawing.
Pick Point/Select Path
Selects either the point or a path for the target, depending on whether Point or Path was selected.
Point/Path List
Displays a list of named points or paths to which you can link the target. To create a path, you can link a target to a line, arc, elliptical arc, circle, polyline, 3D polyline, or spline.
Animation Settings
Controls the output of the animation file.
Frame Rate (FPS)
The speed at which the animation will run, measured in frames per second. Specify a value from 1 to 60. The default value is 30.
Number of Frames
Specifies the total number of frames in the animation.
With the frame rate, this value determines the length of the animation. When you change this number, the Duration value is automatically recalculated.
Duration (seconds)
Specifies the duration (in sections) of the animation.
When you change this number, the Number of Frames value is automatically recalculated.
Visual Style
Displays a list of visual styles and render presets that you can apply to an animation file. See VISUALSTYLES and RENDERPRESETS for more information.

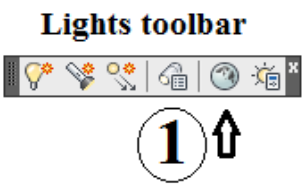
Format
Specifies the file format for the animation.
You can save an animation to an AVI, MOV, MPG, or WMV file format for future playback. The MOV format is available only if Apple QuickTime Player is installed. The WMV format is available and is the default selection only if Microsoft Windows Media Player 9 or later is installed. Otherwise, AVI is the default selection.
Resolution
Defines the width and height of the resulting animation in screen display units. The default value is 320 x 240.
Corner Deceleration
Moves a camera at a slower rate as it turns a corner.
Reverse
Reverses the direction of an animation.
When Previewing Show Camera Preview
Enables the display of the Animation Preview dialog box so you can preview the animation before you save it.

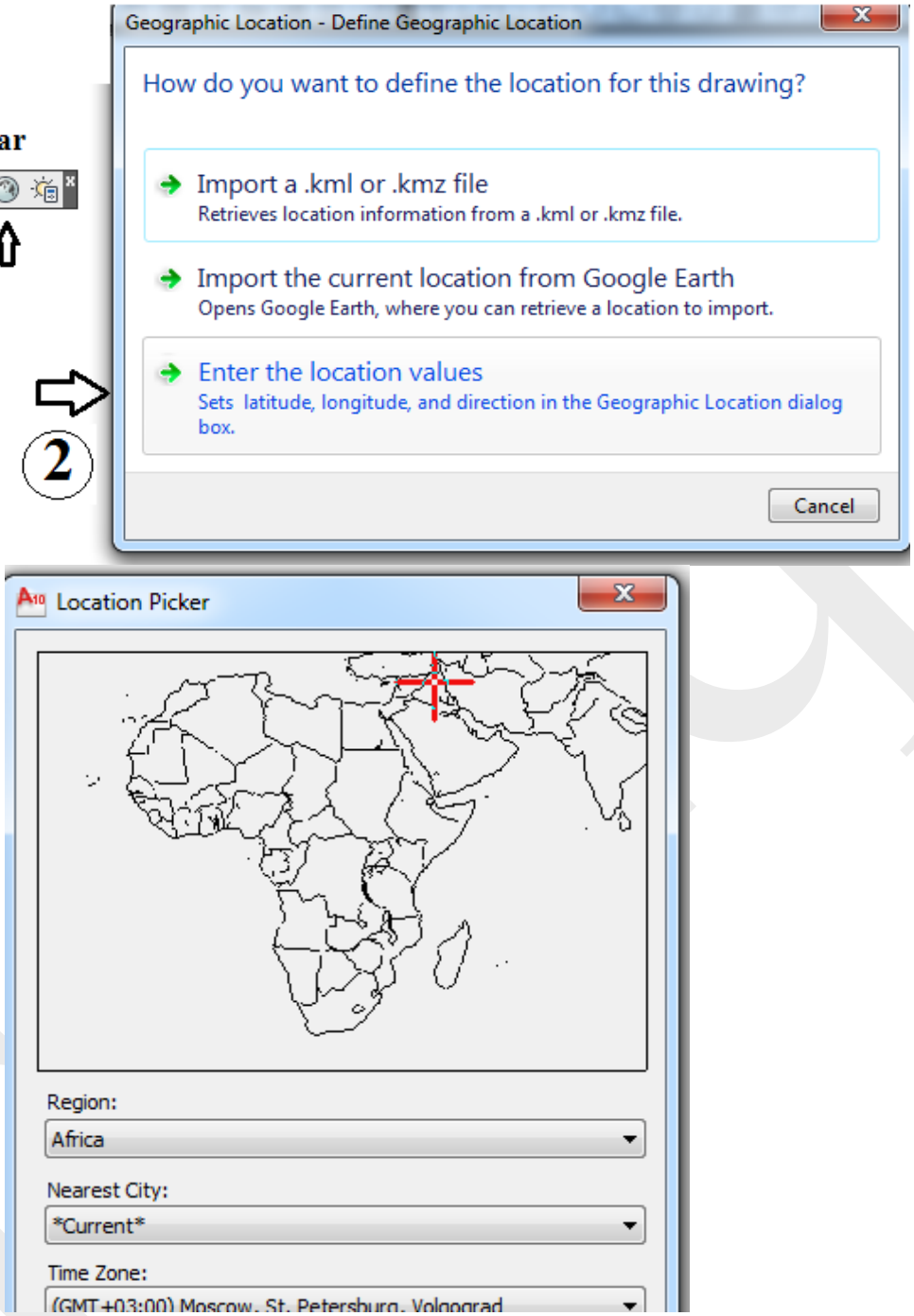
How to find the Azimuth and Altitude of Mosul

In order to calculate the sun angles (Azimuth and Altitude)
Right-click on any tool bar and get the Lights toolbar
Pick Geographic Location …
1- Enter the location Values
2- Use Map… (Or enter the location value)
3- Pick from region: Africa
4- Erase the tick in front Nearest Big City
5- By mouse choose Mosul region
6- Accept updated time zone
And close the window



Return to Lights toolbar and get Sun Properties
1- Pull down the scroll bar and choose Sun angle Calculator
2- Change the time and date to the required one, then the Azimuth and Altitude will be changed to the exact values.





Dimensioning

To change the color of Extension lines.

Ans.

From Dimensions tools bar pick Dimension Style. A dialogue box appears. Pick Modify ⇨Under the Lines gate ⇨ Extension lines. Then change the box in front the word color from by block to the desire color.

To change the color of Dimension lines.

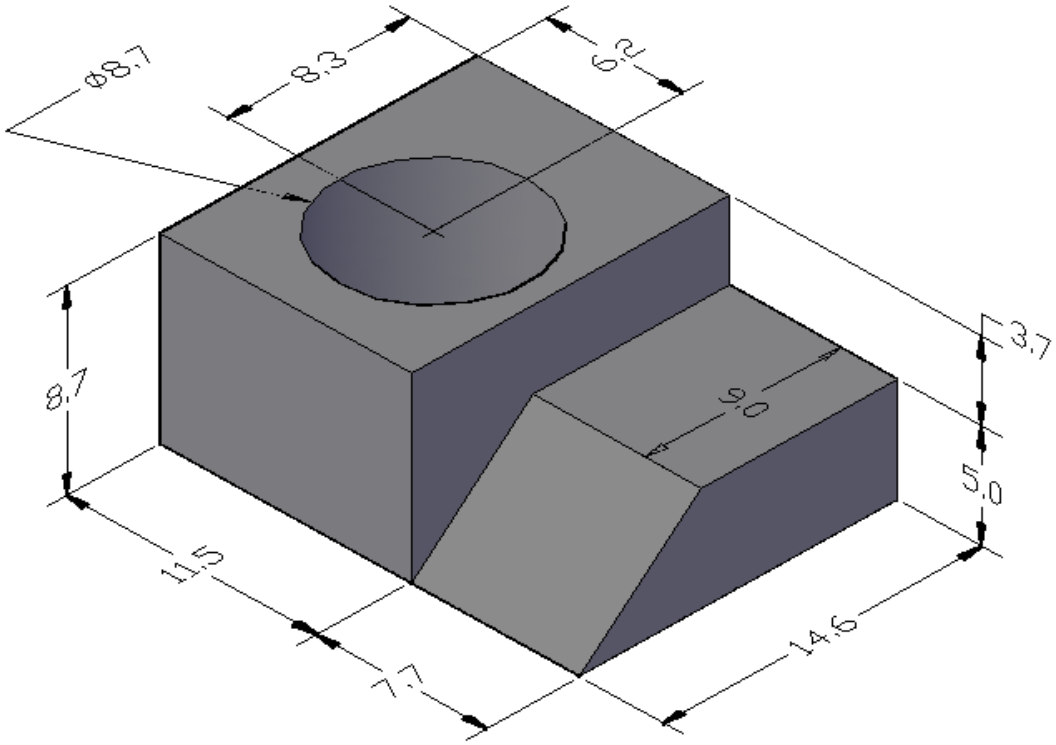
Ans.

From Dimensions tools bar pick Dimension Style. A dialogue box appears.

Pick Modify ➪Under the Lines gate ➪ Dimension lines. Then change the box in front the word color from by block to the desire color.

Dimensioning For 3D solid

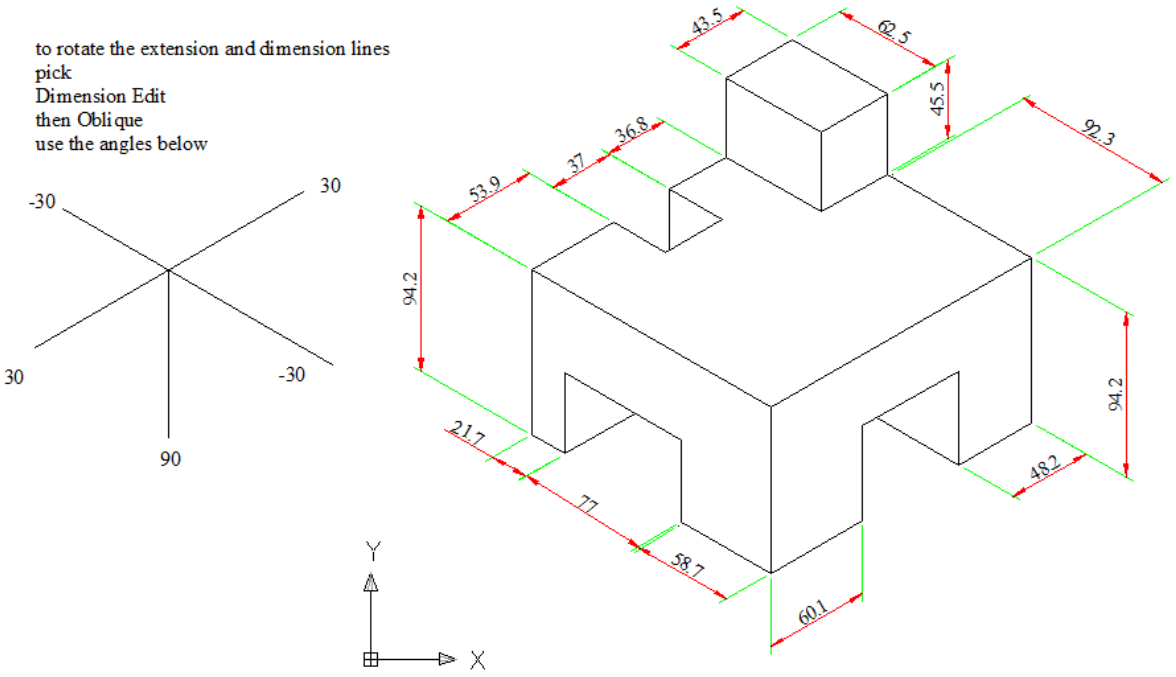
1- Use the UCS tool bar with each face you want to apply dimensions
2- Extension lines must be at xy-plane
3- Text direction is with the positive portion of y-axis



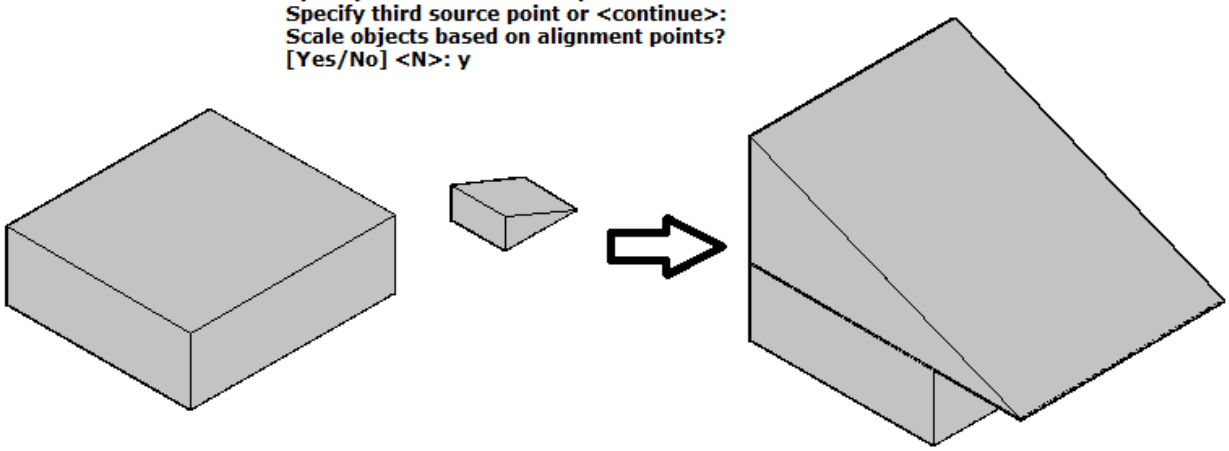
Dimensioning for Isometric

1- Make the cross-hairs suitable for each surface dimensioning (by Ctrl+E or F_5)
2- Apply the dimensions
3- To fix each dimension pick (Dimension Edit) from dimensions tool bar or write at the command lines (_dimedit) as below
Command: _dimedit
Enter type of dimension editing [Home/New/Rotate/Oblique] <Home>: o

Select objects: 1 found
Select objects:
Enter oblique angle (press ENTER for none): -30

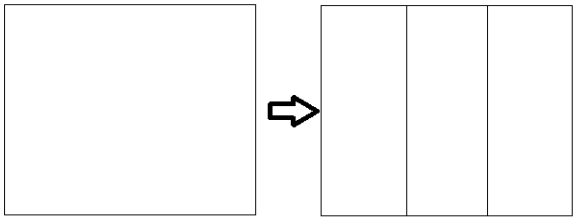


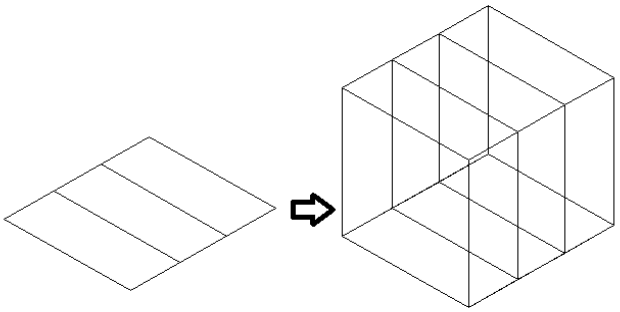
Command:
Command: _align
Select objects: 1 found
Select objects:
Specify first source point:
Specify first destination point:
Specify second source point:
Specify second destination point:
Specify third source point or <continue>:
Scale objects based on alignment points?
[Yes/No] <N>: y



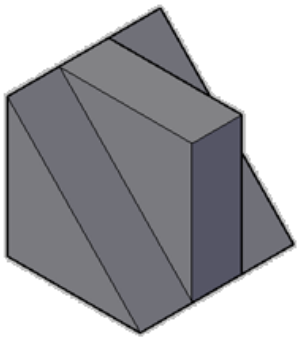
1- File- New- acadiso- Z – A

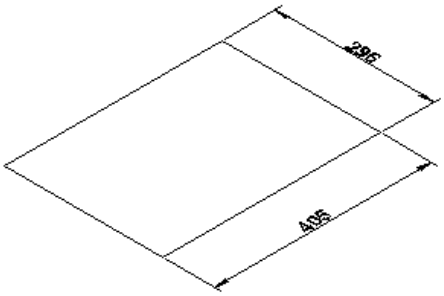
1- Rectangle
2- Lines to divide the rectangle to three portions
3- South- east isometric
4- Presspull
5- Slice- three points
6- conceptual

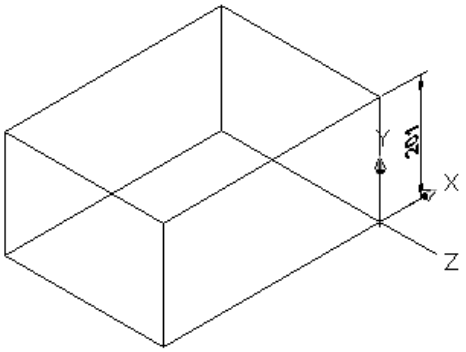


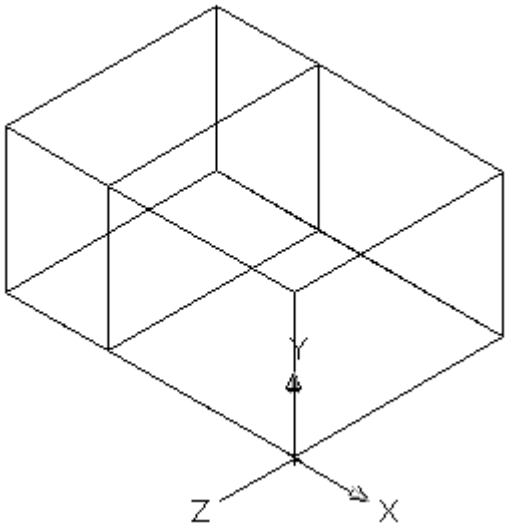


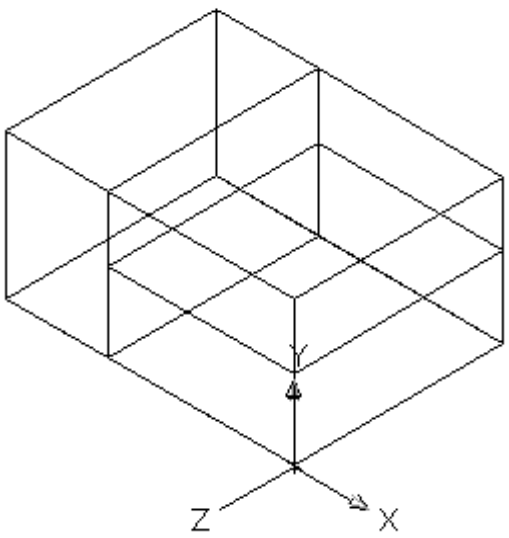
1- File- New- acadiso- Z – A
2- SE Isometric
3- Rectangle
4- Presspull
5- slice

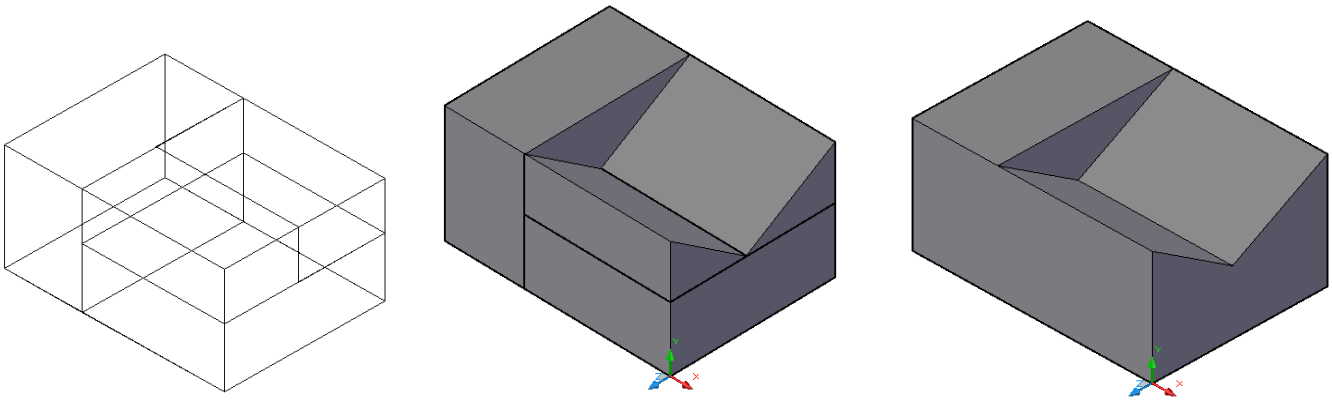




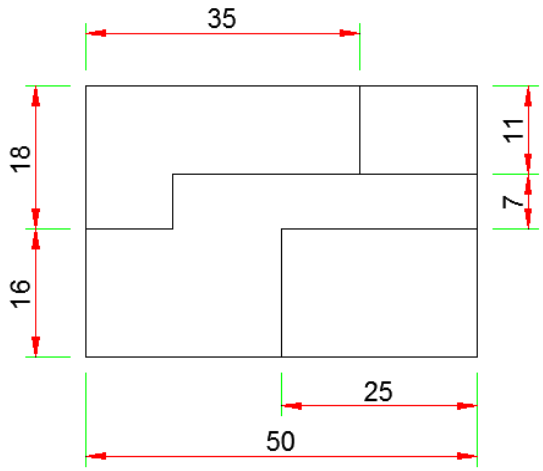


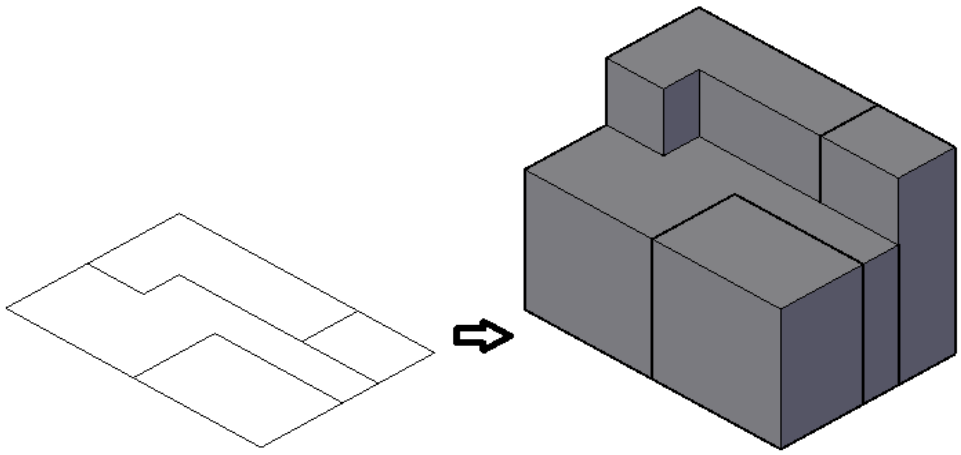


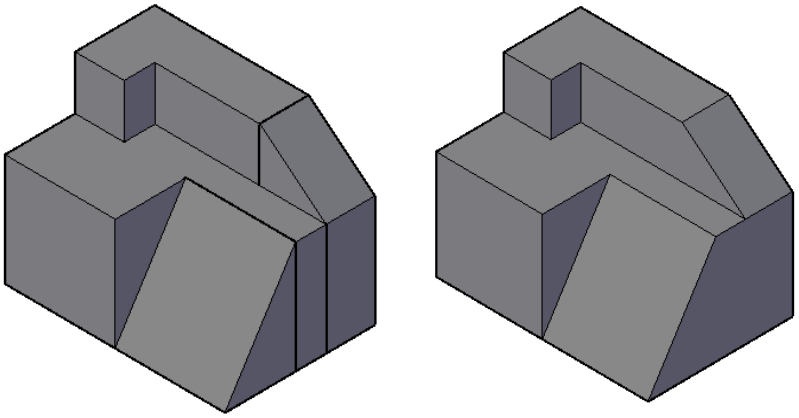


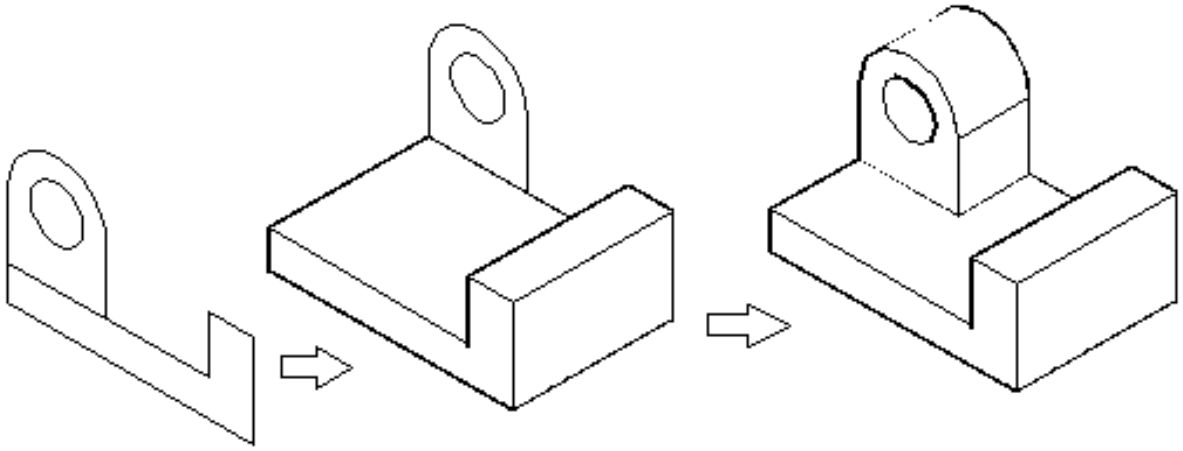


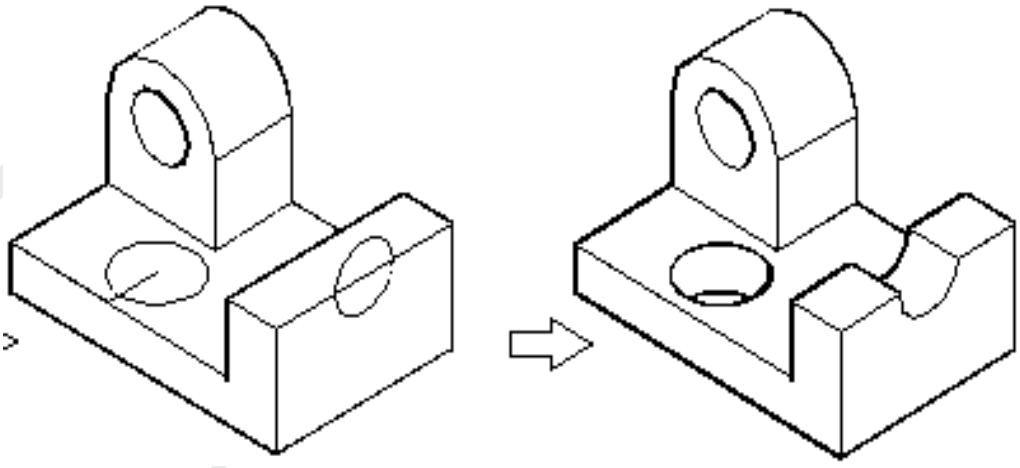
Ex:











Appendix A

1-الاختصار 2- يرمز ل او موقوف ل 3- واجهة المستخدم 4- يفصل 5- قالب 6- تفضيلات 7- وظيفة 8- شريط القوائم 9- يوفر الوصول 10- السهم النازل 11- شريط الوصول السريع 12- يمكن الوصول له او قابل الوصول له 13- مثبتة، راسية 14- منسدلة

15- مؤشر

فضاء العمل: هو مجموعة من القوائم، اللوحات، شرائط الادوات، شرائط، ولوحات المعلومات المفصلة من اجل مهمات معينة مثل النمذجة ثلاثية الابعاد او الرسم ببعدين.

List at least ten items at the Menu bar

List and Explain briefly the methods for specifying the locations of points in AutoCAD

Define the Following:

Worksapace

List the default workspaces in AutoCAD

List at least three methods to call workspaces

What does the acronym ISO stands for?. Classify its drawing sheets with their sizes

What is the relation between the length and width of the ISO drawing sheets

List the default Visual Styles in AutoCAD

Write down at least seven buttons on the status bar

List at least four methods for specifying the locations of points. And give an example for each one

State how to change the color of the drawing area

State How to Display the scroll bar in the drawing window

List the default Visual Styles in AutoCAD 2010

State how to show command lines

List at least two methods to show any toolbar

Explain the role of the command region in extrude