Appendix B: Autocad Booklet
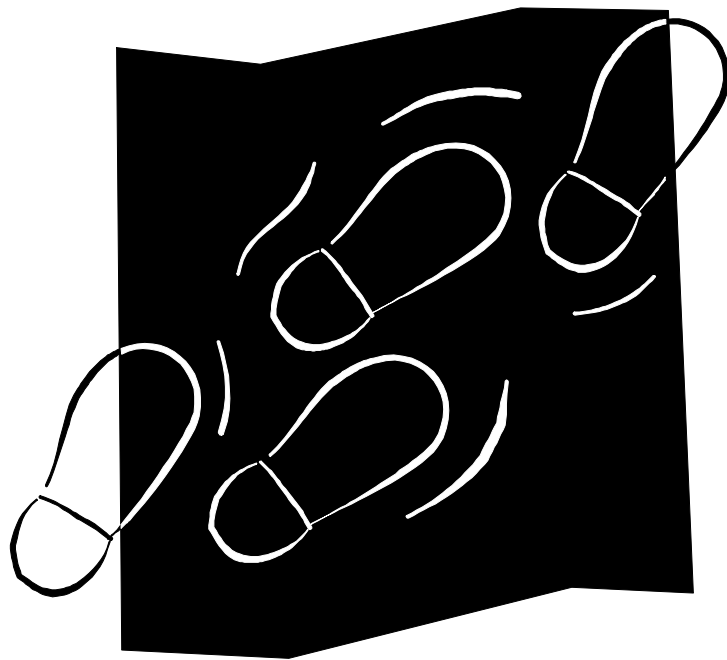
YR 9 REFERENCE BOOKLET

ORTHOGRAPHIC PROJECTION

Autocad 2000

AUTOCAD 2000'S DRAWING SCREEN

To load Autocad:

> ➢ Click the start button
> ➢ Click on Programs
> ➢ Click on technology
> ➢ Click Autocad 2000
> ➢ Click **browse**
> ➢ Click on pull down arrow next to **Acad2000**, near top left of menu
> ➢ Click on **Student Resource Area**
> ➢ Open **Technology** Folder
> ➢ Double click on **TemplateA3**
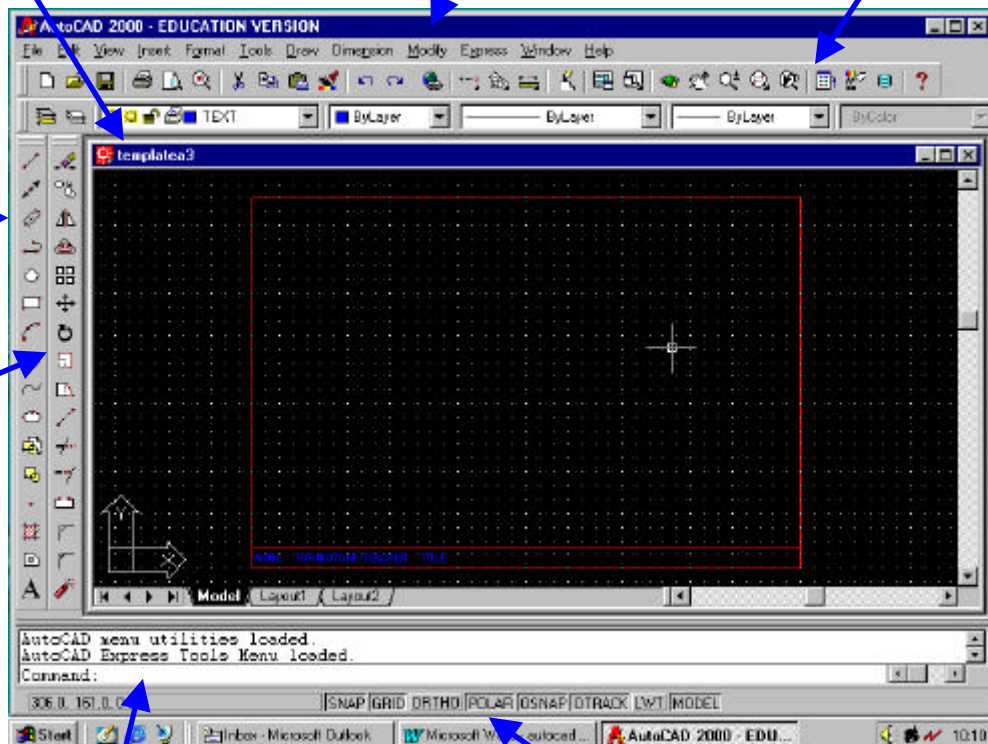> ➢ Select **Yes** to open 'read only' file

The current drawing name. If this is 'Drawing.dwg' then it has not been saved.

The pull-down menus. These contain the drawing and editing commands.

The Standard toolbar with frequently used commands.

The 'Draw' toolbar

The 'Modify' Toolbar

The 'Command line'. You can type commands here and watch for AutoCAD 2000's response.

Status bar: shows the available drawing aids and co-ordinates.

TEXT COMMAND

TemplateA3 is a border page that is opened as a read only file, you need to save it in your area.

> ➢ Click on **File**
> ➢ Select **Save as**
> ➢ Find your user area, click on pull down arrow next to **Save in**
> ➢ Click on **00user name$on'Srv_data' (U:)**
> ➢ Type new file name **boxes**

The bordered sheet has text written on it, but it needs to be edited to your name, group and title. Using the following commands edit the text.

> ➢ Click on **Modify** on the top menu bar
> ➢ Select **text**
> ➢ Left click the text on the page
> ➢ A hidden menu comes up with the following written text showing;
> **NAME   FORM/DTGROUP/TEACHER   TITLE**
> ➢ Delete these and add your information in the shown order
> ➢ Click **ok**
> ➢ **Save work**

MAIN DRAWING COMMANDS

Autocad has several ways in which to draw a line, below are the various ways explained.

If at any time you are confused about something in a command press **ESC,** this will cancel the command you are in.

Autocad usually has several methods available to create the same end products. It is up to the user to decide which method they prefer.
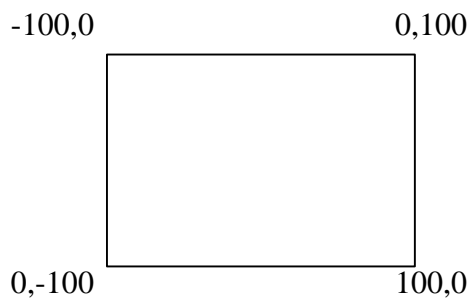
Method 1:
This method you will use most frequently to start with. This method helps you to draw a line or series of lines easily using co-ordinates.

Relative co-ordinate line command
This command relies on the previous point entered. The @ symbol is entered before the co-ordinates (@ means 'from the last point'). A co-ordinate @45,30 specifies a location of 45 units along X and 30 units along Y relative to last point.

For example, to draw a box on the screen: (↵ means return/enter)

> Click on **Line Icon** top left of drawing toolbar
> Left click on lower left of the screen away from previous box
> Type **@100,0** ↵
> Type **@0,100** ↵
> Type **@-100,0** ↵
> Type **@ 0,-100** ↵
> Press ↵
> **Save work**

-100,0   0,100

0,-100   100,0
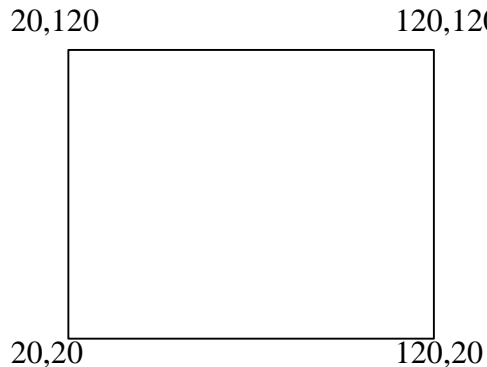
Method 2:   **Line Icon**

Absolute co-ordinate line command
This relies on the origin of the sheet 0,0. This is located at the bottom left corner of the sheet. The sheet works on a graph method of X and Y. The absolute co-ordinate is input as two numbers separated by a comma. The first is the X and the second number is the Y co-ordinate. For example, to draw a box that is 20 units up and 20 units in from the bottom left corner of your paper.

> Type **L** ↵ or click icon
> Type **20,20** ↵
> Type **20,120** ↵
> Type **120,120** ↵
> Type **120,20** ↵
> Type **20,20** ↵
> Press ↵

20,120   120,120

20,20   120,20

Method 3:

Line command
A simple line drawing can be done by free hand.

> Type **line** ↵ or click on line icon
> Left click on screen
> Move mouse to next point, left click
> Continue this until object is complete and ↵
> This ends the command

Polar co-ordinate line command
This line command allows you to specify a distance and an angle from the last point. It takes the format, **@300<90**, meaning 300 units long and at a 90° angle.

Erase command

The erase command can erase any line or multiples of lines at one time. There are various ways this can be performed. The simplest is explained below:

- ➢ Click on the erase icon next to the line icon
- ➢ Click on the required line or lines and then press ↵
- ➢ Erase all lines on your screen except for the border
- ➢ And press ↵

Erase Icon ●

Circle command

A circle can be easily drawn in Autocad by clicking on the icon and specifying the radius or diameter. To draw a circle:

- ➢ Type **circle** ↵ or click on the circle icon
- ➢ Left click on the screen to specify the centre
- ➢ Type **r** ↵ to specify radius
- ➢ Type **25** ↵, the circle is drawn

Or the circle can be drawn using the diameter instead of the radius

Circle Icon ●

- ➢ Click on the circle icon
- ➢ Left click on the screen to specify centre
- ➢ Type **d** ↵ to specify the diameter
- ➢ Type **25** ↵, the circle is drawn, note it should be half the size of the first one
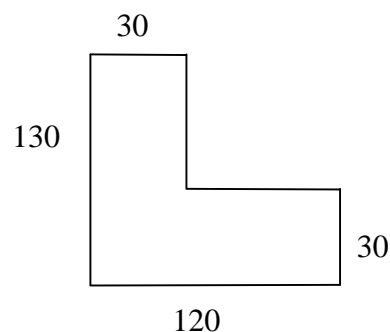- ➢ **Save work**

TASKS

- ➢ Erase all previous lines and save the file now as **Letters.**

Task 1

Draw the shape shown;
Clue use the relative co-ordinate line
Command

Save work

30

130

30

120

The next command shown is very useful for cutting down lengths of lines that join to others. Work through the following steps to understand how you use this command.

If you are going to use circles for letters that are curved, such as P, G, C etc. Then you need to learn the following command.
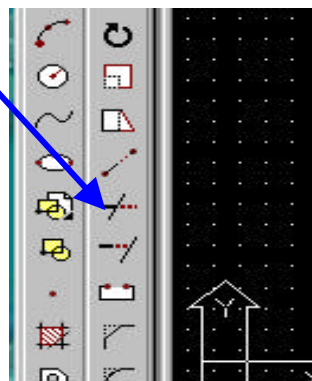
Trim Command

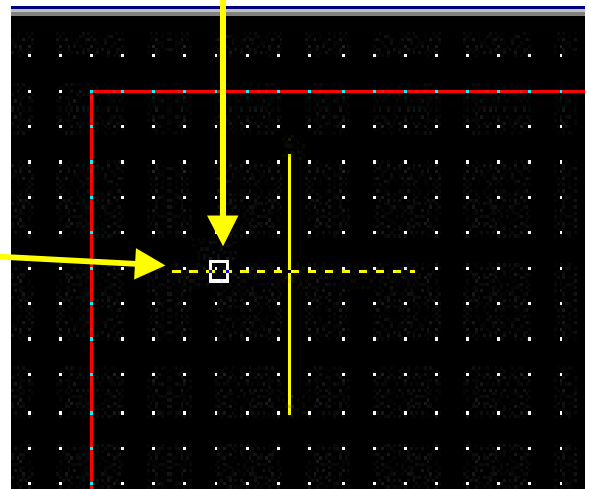This command allows the user to trim a line to a set size after it has been drawn.

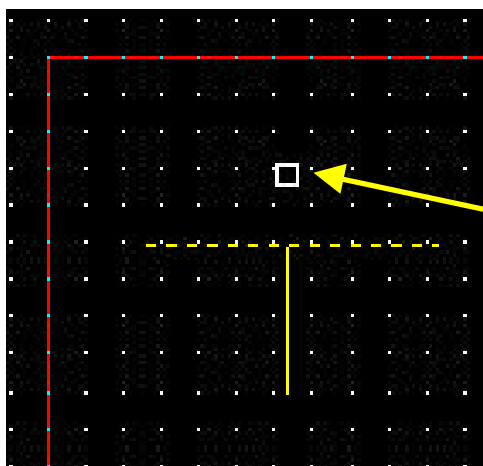➢ **Step 1,** Draw two lines any where on the page that cross one another, as shown**.**
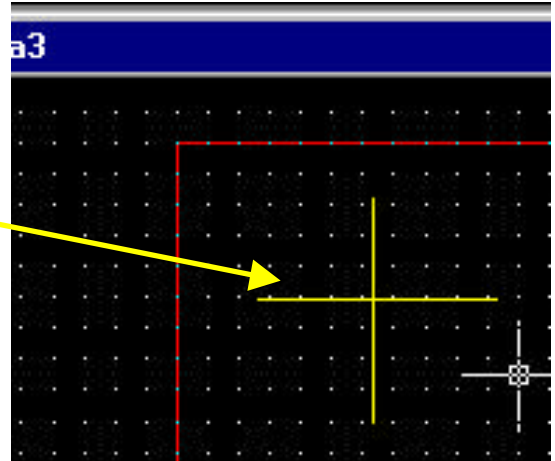
➢ **Step 2,** Click on the **Trim Icon**, at the bottom of the 'Modify Toolbar'.

➢ **Step 3,** Click on the line to trim to, i.e. the line that acts as a cutting line. Click the horizontal line. Then press ↵.

(Notice that the selected line changes to a dotted line.**)**

➢ **Step 4,** Next you need to click the line you wish to trim down, i.e. the side of the vertical line you wish to shorten. Click the top part of the vertical line. Then press ↵**.**

Task 2

On the same sheet, draw your initials using straight lines and if you are feeling up to it try circles. Use some rough paper to calculate sizes of the lines required.

> ➢ **Save work** when finished still under **Letters**

Once you have finished the two tasks, have a look at the reference sheets at the back of this booklet (pages 14 and 15). It refers to the grid (the dots on the screen) that you can see and how to zoom in on you drawings.

Try out the Grid set up and the Main zoom commands, these will help you in your next task.

MAIN TASK 3

The next task is to produce an Orthographic projection of the wooden box. Use all the commands taught so far in this booklet and the guidance notes on the next pages to help you produce this drawing.
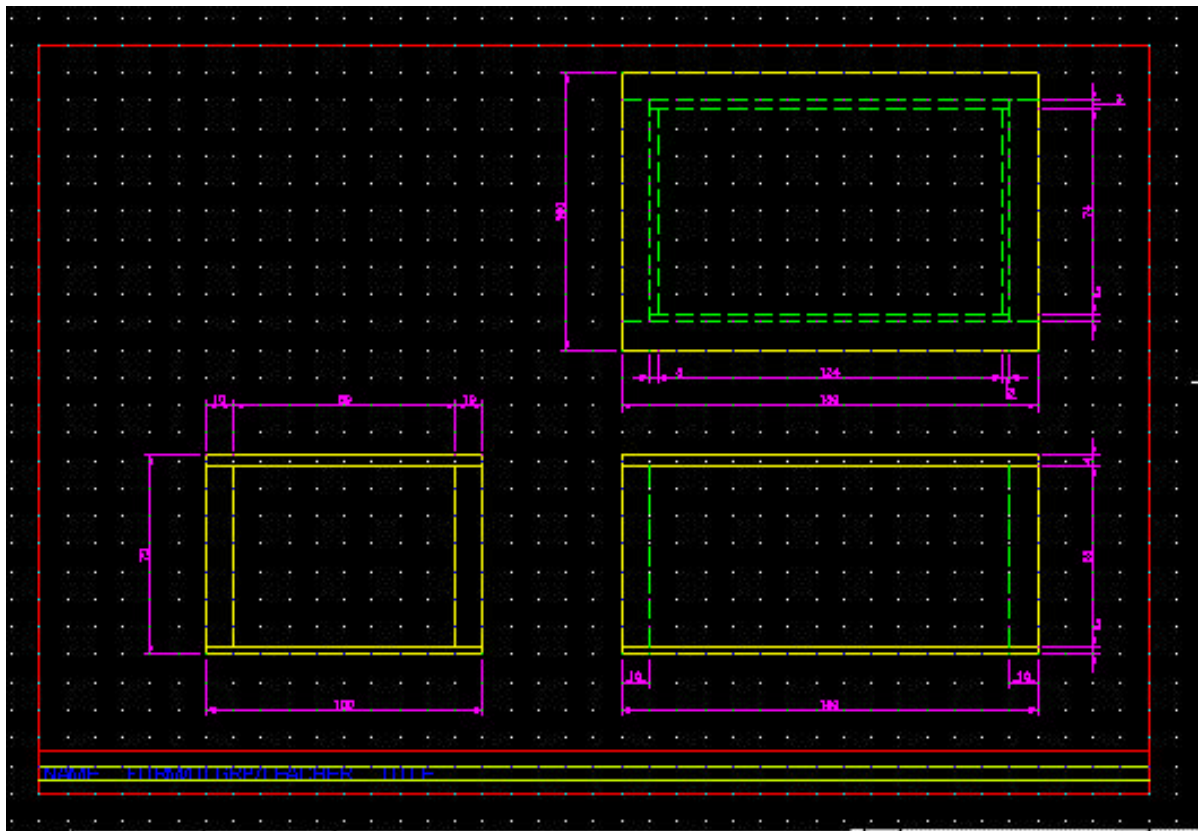
Accompanying this sheet is a A3 reference sheet showing the dimensions and drawing clearly.

STEPS TO PRODUCE THE ORTHOGRAPHIC OF THE BOX

STEP 1: CREATE A NEW FILE
> ➢ Open the file **templatea3** from the student resources area
> ➢ Save as **Ortho** in your area
> ➢ Change the details of the title box

The next step is to change the layer of the page to Outline. Autocad is made up of several layers. Each layer has a name and is linked to colours. Look at your page, you will see the border line is red and the text is blue. This means that the text is on a different layer. You can add and delete layers.

> ➢ Click on the pull down arrow next to the word TEXT, top left corner.
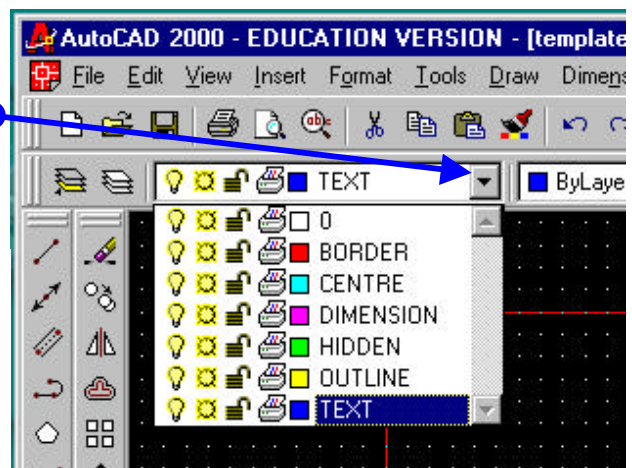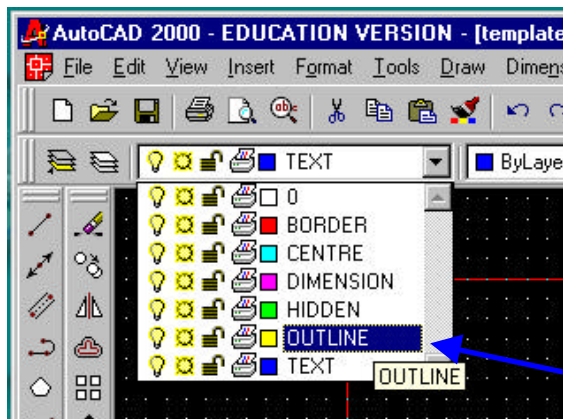
> ➢ Click on OUTLINE, this changes the layer from TEXT to OUTLINE. The lines drawn are now yellow.

Step 2: To draw the Front View
> ➢ Select the **Line** command
> ➢ Left click the mouse in the bottom right hand corner, within the red border lines
> ➢ Type **@-150,0**↵
> ➢ Type **@0,72**↵
> ➢ Type **@150,0**↵
> ➢ Type **@0,-72**↵
> ➢ Press ↵

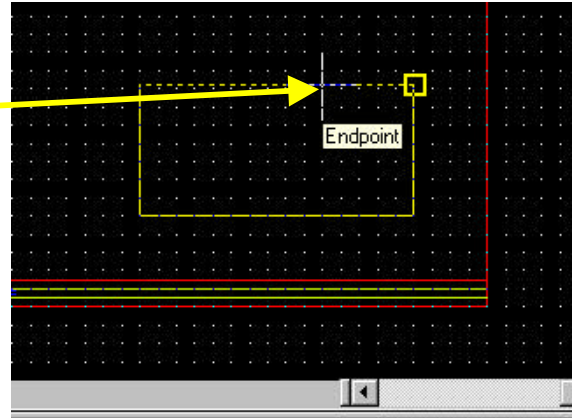
SAVE YOUR WORK REGULARLY!!

Offset Command
This command draws a line the same as another, at a set distance apart i.e. parallel to it. This command can be used to draw the thickness line of the lid and the base.
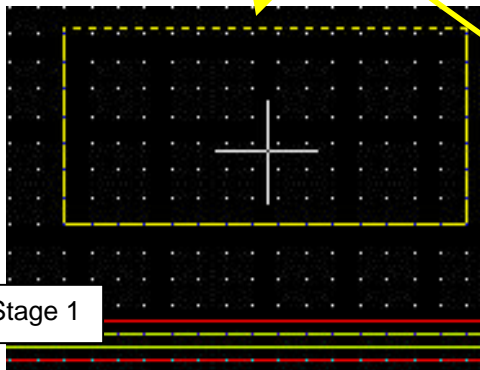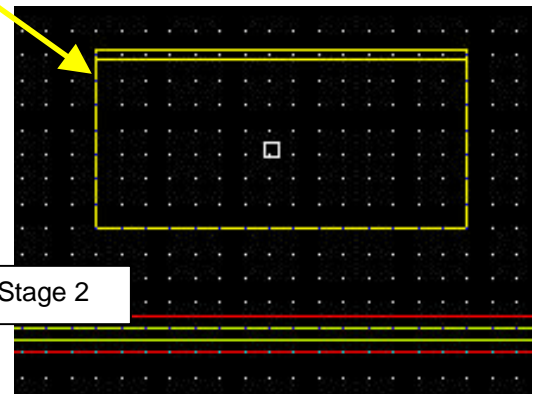> ➢ Click the **Offset Icon**
> ➢ Type **4**↵
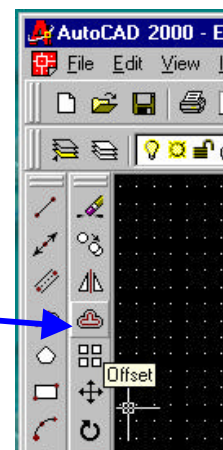
➤ Click the top line of the view ↵

➤ Click below the line, the side you wish the new line to be created
➤ Press ↵

Stage 1 and 2 show these steps.

Stage 1

Stage 2

Now you need to repeat these steps but create a new line **above** the bottom line.

➤ Click **Offset**
➤ Type **3**↵
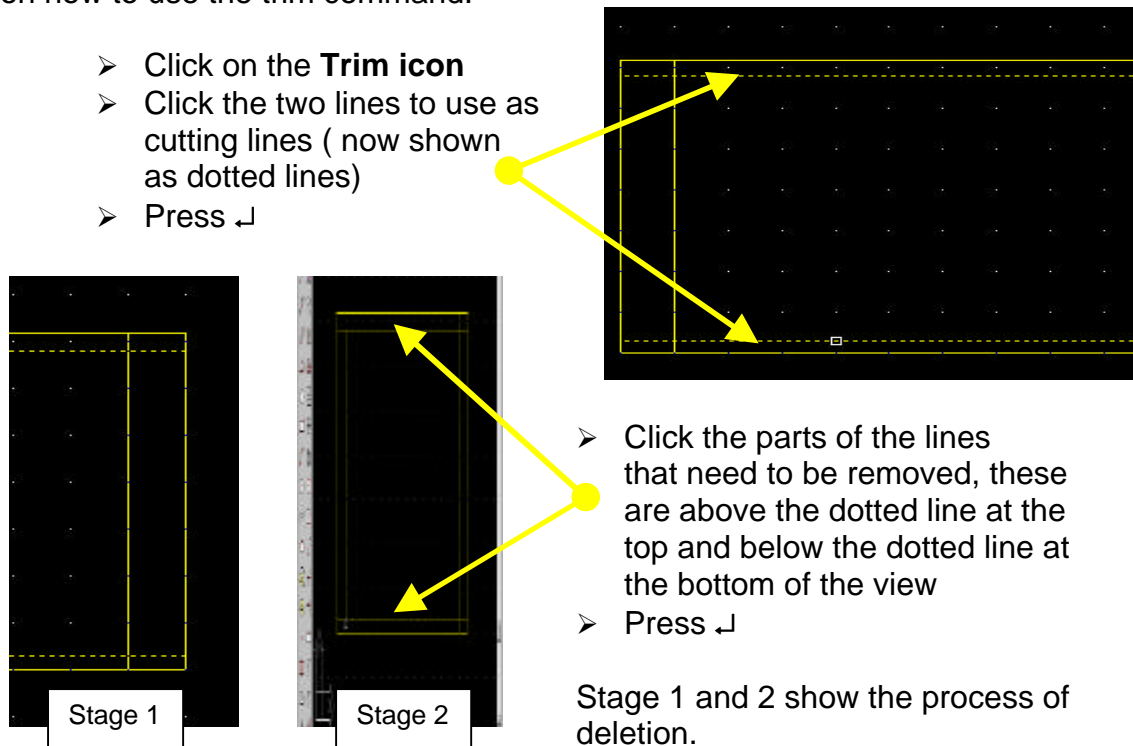➤ Click the bottom line↵
➤ Click above this line
➤ Press ↵

Using the reference sheets at the back, if you cannot remember how to use the **Zoom** command.

➤ Type **Z** ↵ and then **W**↵
➤ Then create a drawn window around the view of the front of the box i.e. click above the left top corner of the view and drag to the bottom right corner of the view.
➤ Click the **Offset Icon**
➤ Type **10**↵

| **TIME TO SAVE!!** |

➤ Click the left side line↵
➤ Click to the right of this line inside the box
➤ Press ↵
➤ Redo these steps to produce a new line on the right side of the box

This view now needs to be cleaned up, so that it looks like the reference sheet. Using the trim command the two new lines at the sides of the box need to be **trimmed**. Using the trim command cut these lines. See **Page 6** for recap on how to use the trim command.

- ➢ Click on the **Trim icon**
- ➢ Click the two lines to use as cutting lines (now shown as dotted lines)
- ➢ Press ↵

- ➢ Click the parts of the lines that need to be removed, these are above the dotted line at the top and below the dotted line at the bottom of the view
- ➢ Press ↵

| Stage 1 | Stage 2 |

Stage 1 and 2 show the process of deletion.

If you have referred to the reference sheet you should have noticed that these inner lines should be dotted. The next step to finish off this view is to change the layer properties of these two lines. Refer to **Page 8** to recap this process.

- ➢ Click the two inner side lines
- ➢ Click on the pull down arrow next to OUTLINE
- ➢ Click on HIDDEN
- ➢ Press **ESC ESC**

TIME TO SAVE!!

Note you should see the lines change colour and become dotted.

- ➢ Use the **Zoom** to see all the sheet again

STEP 3: TO DRAW THE END VIEW
- ➢ Select layer back to OUTLINE
- ➢ Click **Line Icon**
- ➢ Left click the mouse in the bottom Left hand corner, within the red border lines
- ➢ Draw a box measuring **72mm up and 100mm across**
- ➢ **Remember to zoom in afterwards**
- ➢ Click **Offset command** to draw the lid and base inner lines, refer to **Page 8 and 9,** use these previous measurements

- ➢ Click **Offset command** to draw the thickness of the walls (10mm)
- ➢ Click the **Trim command** to fit the lines within the inner lid and base lines. (Like the Front view).
- ➢ **Remember to Zoom all the sheet at the end**

STEP 4**: TO DRAW THE PLAN (TOP) VIEW**
- ➢ Click **Line Icon**
- ➢ Left click the mouse in the top right hand corner, within the red border lines
- ➢ Draw the plan of the box, use the reference sheet for measurements
- ➢ **Remember the Zoom command**
- ➢ Click **Offset command** to draw the thickness of the walls (10mm) on the 4 sides

The 4 new lines created.
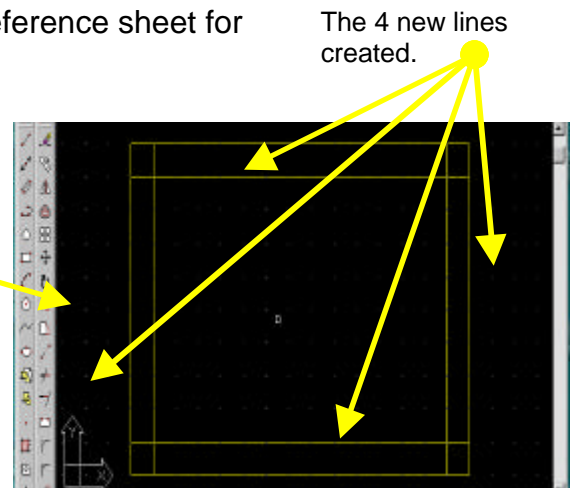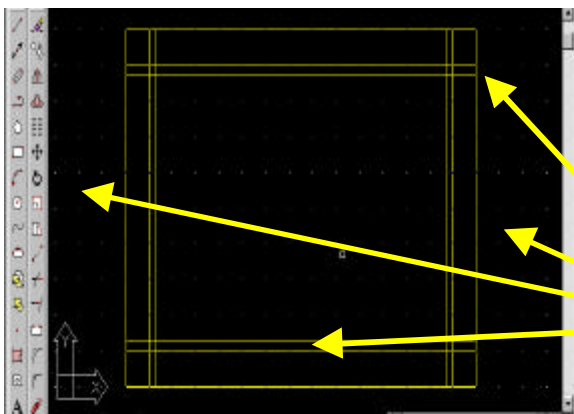
➢ Click **Offset command** to draw the thickness of the inserts (3mm) on the 4 new lines.

- ➢ Use the **Trim command** to trim these lines down to match the reference sheet

This view is different to the reference sheet as the new lines are dotted. They need to be changed by using the HIDDEN layer.

- ➢ Click each new line in turn
- ➢ Click on the pull down arrow next to OUTLINE
- ➢ Click the HIDDEN layer
- ➢ Press **ESC ESC**
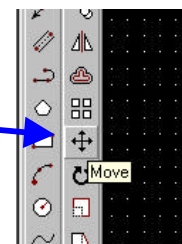- ➢ **Remember to Zoom out to see all your drawing**
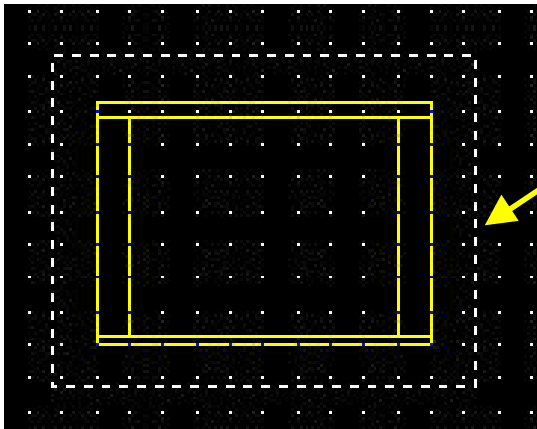
TIME TO SAVE!!

STEP 5: **ALIGNMENT OF VIEWS**
All three views need to be in alignment, just like the reference sheet showns. To do this easily one uses the command **MOVE**. This allows the user to move an object to another part of the screen after it has been drawn.
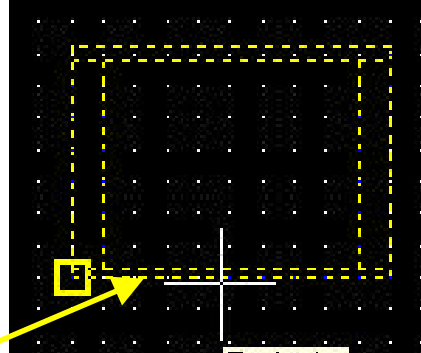- ➢ Click the **Move icon**

Move Icon

Move

➢ Select all the end view by clicking on the screen at the bottom right corner of the view and dragging up to the top left corner of the view.


➢ Left click again once you have dragged over the view, watch as the view changes to a dotted lines.
➢ Press ↵
➢ Left click on the **Base line** of the end view, release mouse button and move image to be inline with the **Front View**.
➢ Left click the mouse button when in position.
➢ Redo this command until all views are inline with one another
➢ **Save your work**

STEP 6: DIMENSIONING THE DRAWING

Now all the Views and Lines drawn need to be dimensioned, just like the reference sheet shows. To do this Autocad has a **Dimensioning command** that allows the user to dimension any type of line or arc. Using the below instructions dimension your Orthographic drawing of the box.
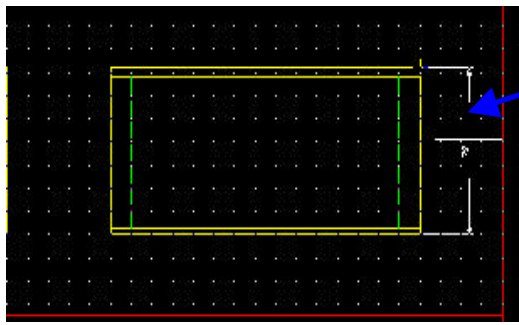
➢ Click on the pull down arrow next to HIDDEN
➢ Click the DIMENSION layer
➢ Click on **Dimension** on the top menu bar
➢ Click on **Linear**
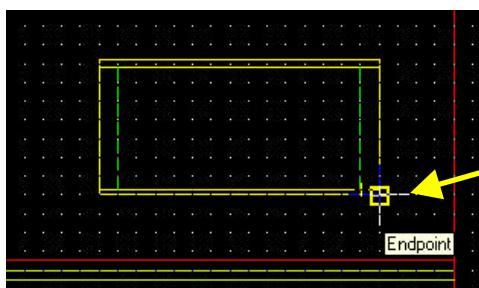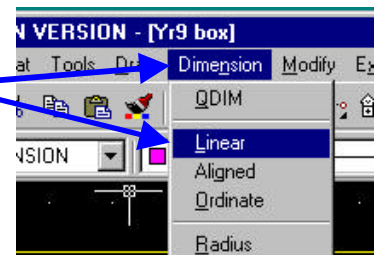
➢ Click the first line in which you wish to measure from

➢ Click the end of the line you wish to measure to
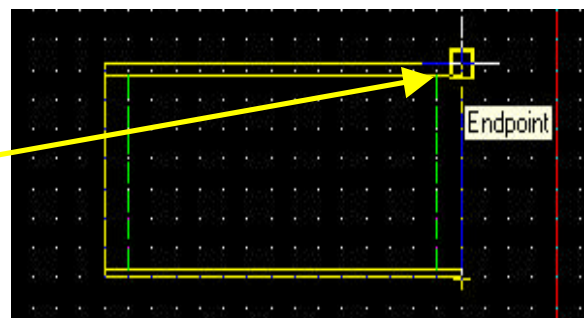
> Move the mouse to position the dimensioning line to where you want it placed, click the mouse once it is in place
> **Redo these steps for all Dimensions**

The dimension should read the exact length of the line to a whole number, refer to the reference sheet for confirmation.

As shown to the right, if the value is not a whole number then you have done one of two things.

1) The drawing is not to the correct dimensions
2) Or the dimension line was not started/ended in the correct places.
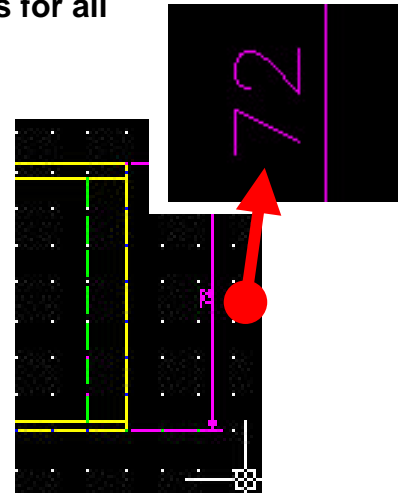
STEP 7: EXTENSION TASK, DRAW THE CUT LID OF THE BOX

If all the dimensions are finished, try to put in the cut line of the box. Using all the information that you have been taught and produce the lid of the box on the **Front and End View.** A few hints to help you get started.

> Use both OUTLINE and HIDDEN layers to produce the lines
> Use the **Offset and Trim commands** to help produce the lid lines
> You may need to use the circle and wave commands

REFERENCE PAGES

## USING THE GRID AND SNAP COMMANDS

The Ortho
Draws lines vertically and horizontally only.

The Grid
This is a collection of dots on the page placed over the drawing, it does not print. The grid shows you the size of the sheet set up, you can draw from dot to dot.

The Snap
This allows the cursor to move in set distances by you the user. When the Grid is visible, Snap is steps cursor makes between the grid dots. You only pick this movement up when you **zoom** in.
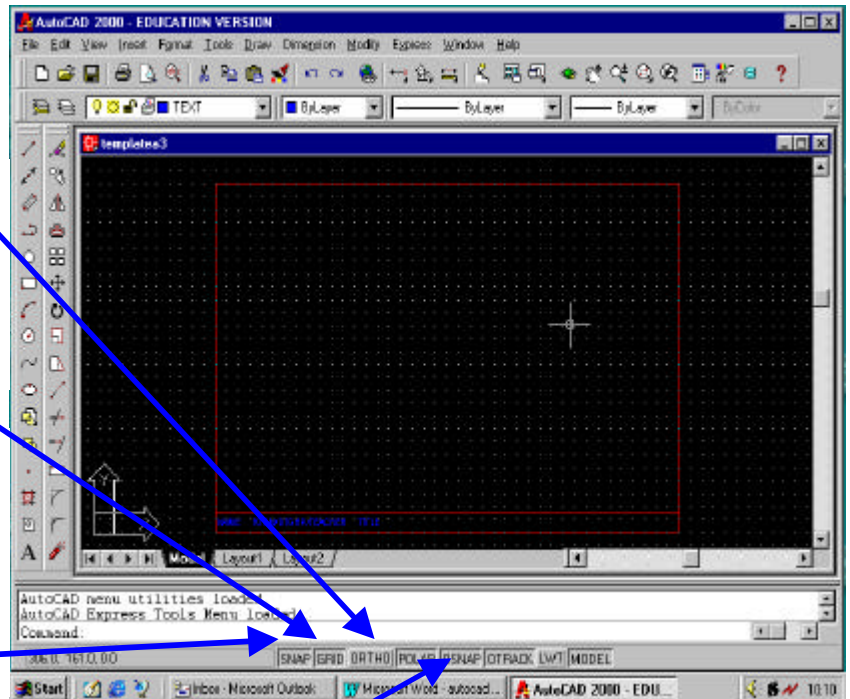
The Object Snap
If you find the cursor behaving in a way you do not understand, try switching off the object snap. To do this follow the steps below:
  ➢ Right click **OSNAP** at bottom of page
  ➢ Select **settings**
  ➢ Switch off object snap
  ➢ Click **ok**

To active any of these commands left click on the buttons at the bottom of the page.

To set up either the **Snap or Grid** do the following steps**.**

  ➢ Right click on **GRID** or **SNAP** at bottom of page
  ➢ Select **settings**
  ➢ Change X and Y of GRID to 10
  ➢ Change SNAP to 2
  ➢ Click **ok**

SETTING A PAGE UP

The first thing that must be set up is the size of the paper. The majority of drawings are on A3 paper which is 420 by 297mm. To check that this is the sheet size follow the commands below.

➢ Type **limits** ↵
➢ Check it reads 0.0,0.0, press↵
➢ Check it reads 420.0,297.0, if not type in and/or ↵

THE ZOOM COMMAND

This is a very useful command, it allows the user to move in and out of the drawing, like in Publisher. The zoom toolbar can be accessed by the zoom button up at the top right of the page. The diagram below shows the different actions that can be achieved.

Zoom Window Icon, this allows you to select a window or box around the area you want to magnify.
➢ Type **z** ↵
➢ Type **w** ↵
   ➢ Left click above the top left of the picture
   ➢ Release and drag to the bottom right
   ➢ Click button again and the picture zooms in

Zoom Centre Icon, allows you to pick a point which will be the centre of the zoom area.

Zoom In Icon, click on it to zoom in on the drawing.

Zoom Out Icon, click on it to zoom out from the drawing.

Zoom All Icon, this zooms to show the complete drawing you have done. It zooms out to the sheet limit.
➢ Type **z** ↵
➢ Type **a** ↵