



# Design out the box

# Computer Aided Design: Aircraft Lamp

## Lesson Objectives...

Computer Aided Engineering: Step by Step Guide to Lamp Construction

- To understand the basic tools used in SketchUp.
- To understand the advantages of using CAD
- To be able to successfully use CAD independently to complete a range of tutorials in 2D and 3D
- To develop advanced skills and problem solving skills when using Sketch Up
- To use correct dimensions when using sketch up to draw models that can be 3D printed or manufactured using CAM machines in school (i.e. Laser Cutter, 3D Router).

# Skills to be used in this project...

Basic Skills	New and Higher Skills
Zoom tool	Rotate tool
Orbit tool	Move tool
Pan tool	Offset tool
Line tool	Arc tool
Rectangle tool	Follow Me tool
Circle tool	Paint Bucket tool
Eraser tool	Dimensions tool
Push/Pull tool	Making Components

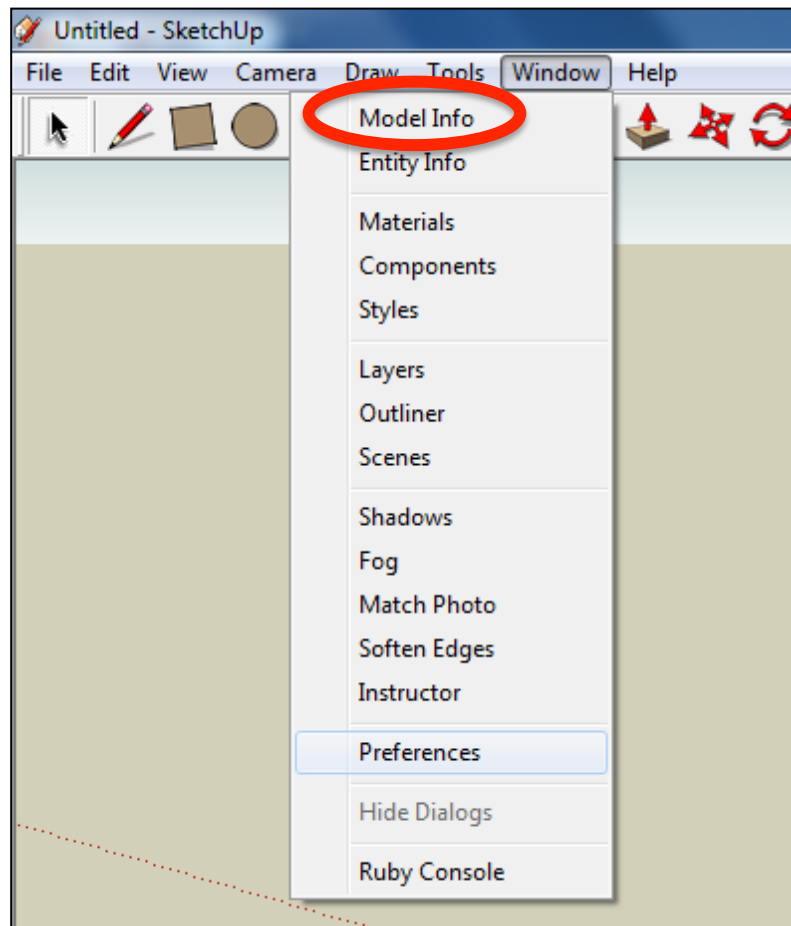
**Basic skills** are those required to do very basic drawings and are detailed as part of this presentation.

**New and higher skills** may be new to the novice and are the focus for learning in this presentation.

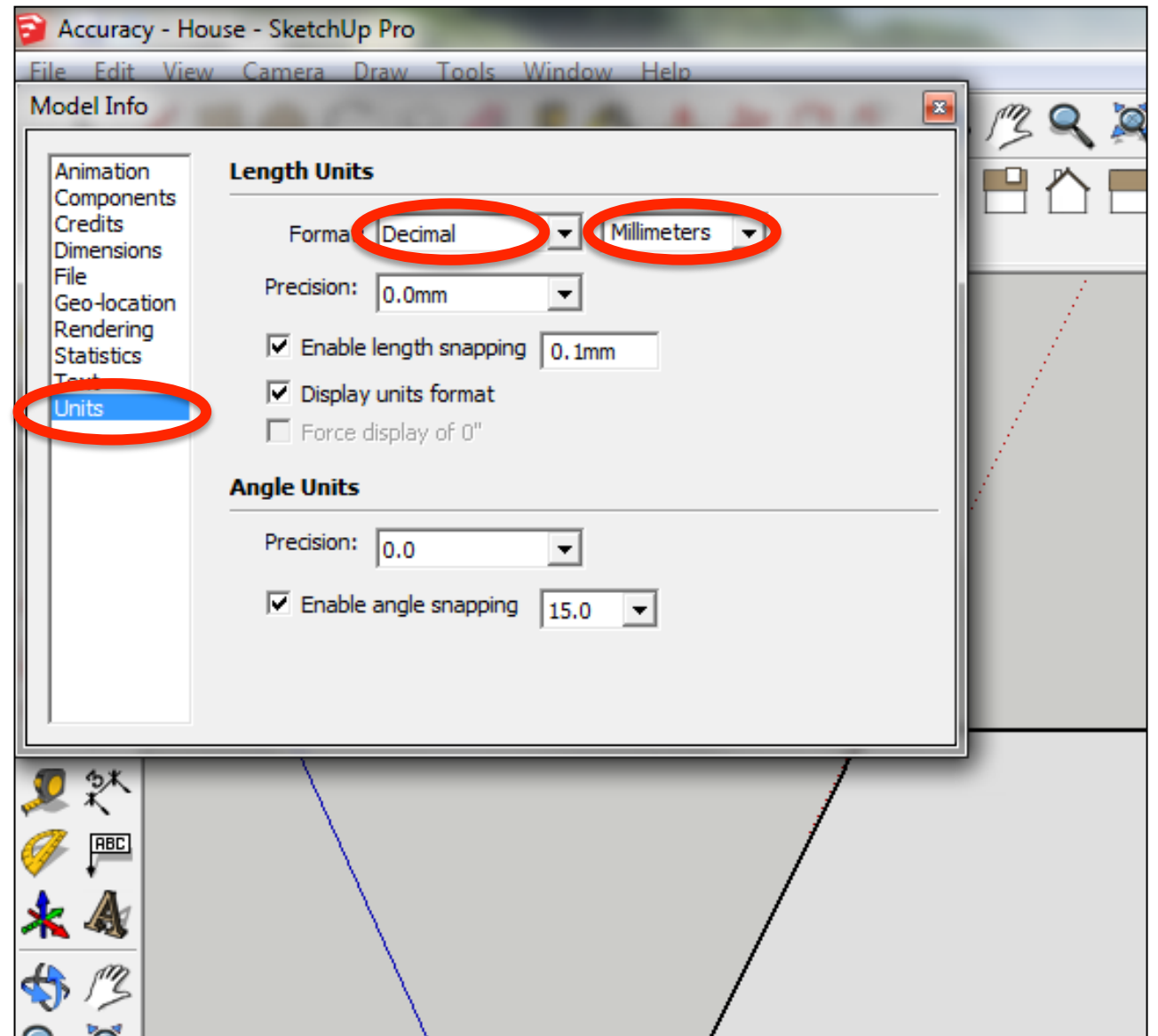
# Lesson Outcomes...

By the end of this tutorial you will be able to...

- Use the push pull and move tool
- Learn about centre lines
- Create, Move and Rotate components
- Use the offset tool to make objects and add detail
- Shape and form your design
- Draw your design to the correct size to enable it to be manufactured.



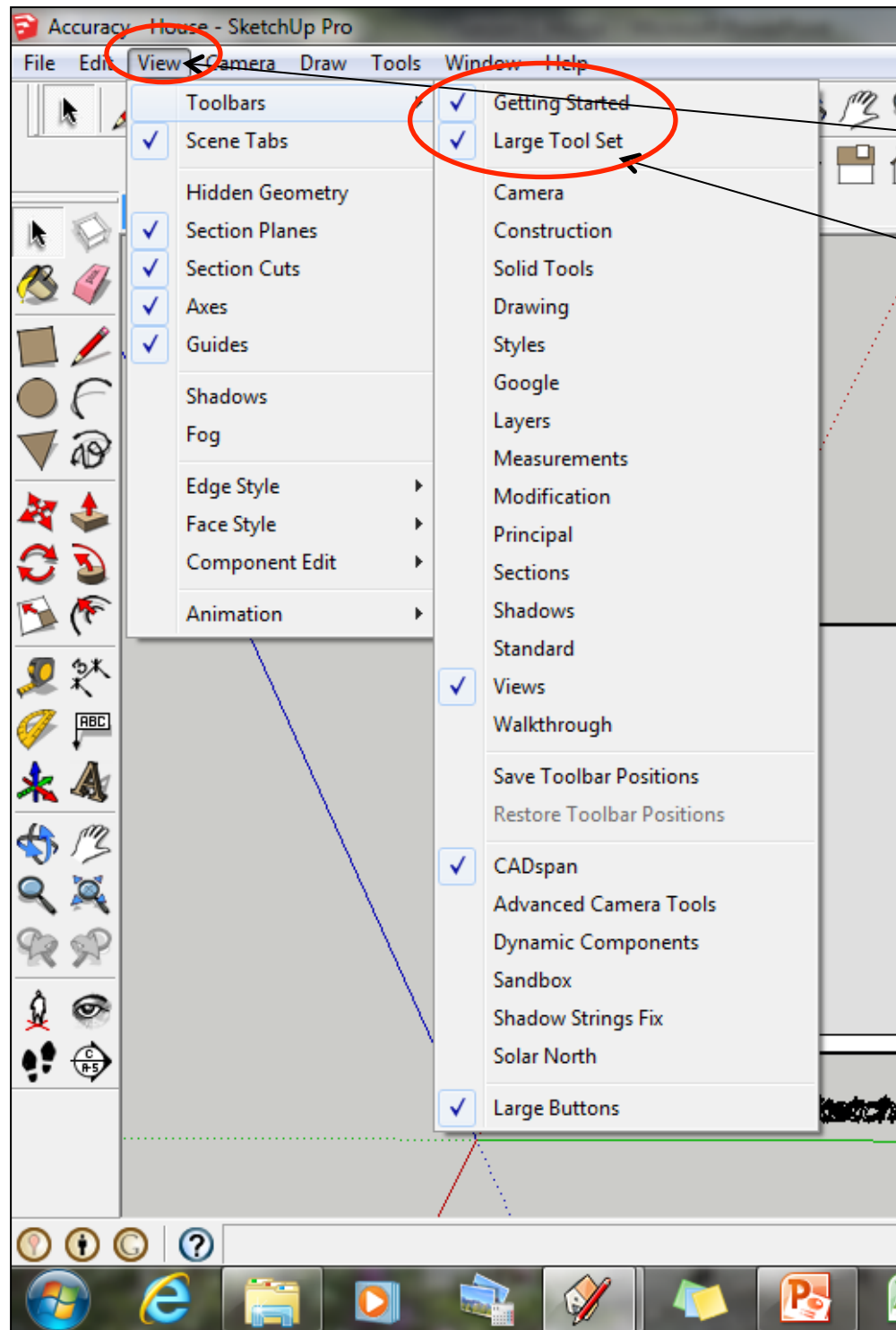
1. Open the sketch up drawing. Once you have opened SketchUp, go to **Window** and select **Model Info**



2. Select **Units** and choose **Decimal Millimetres**. We are using this template because we are doing a product design.

**Note:** It is often necessary to start a new file to use the new template. Go to **File** then **New**.

3. Now select the **View** then **toolbars** and ensure **Getting Started** and **Large Tool Set** are ticked



3a Select **View**

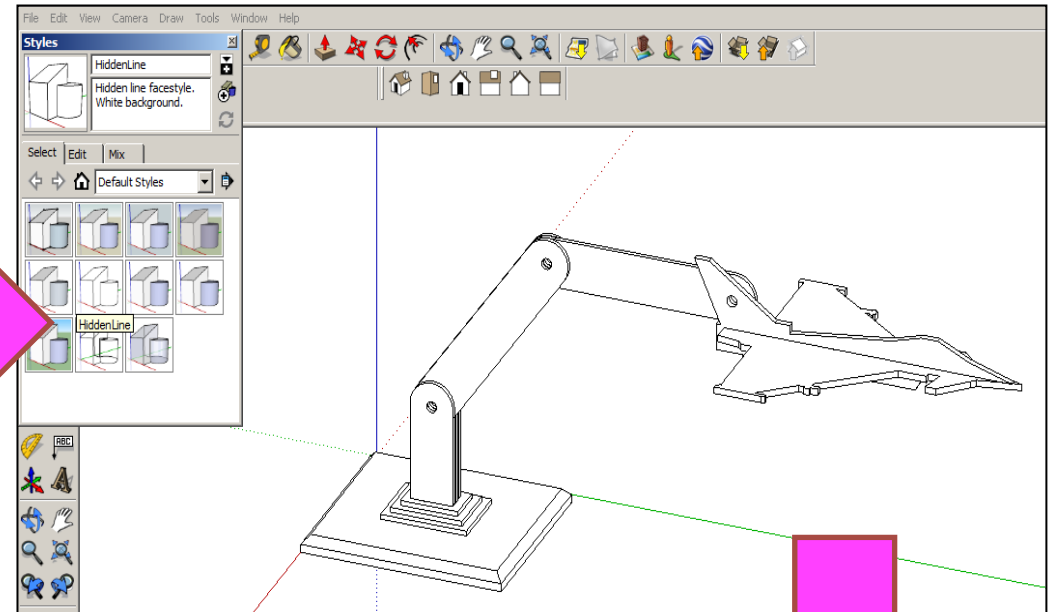
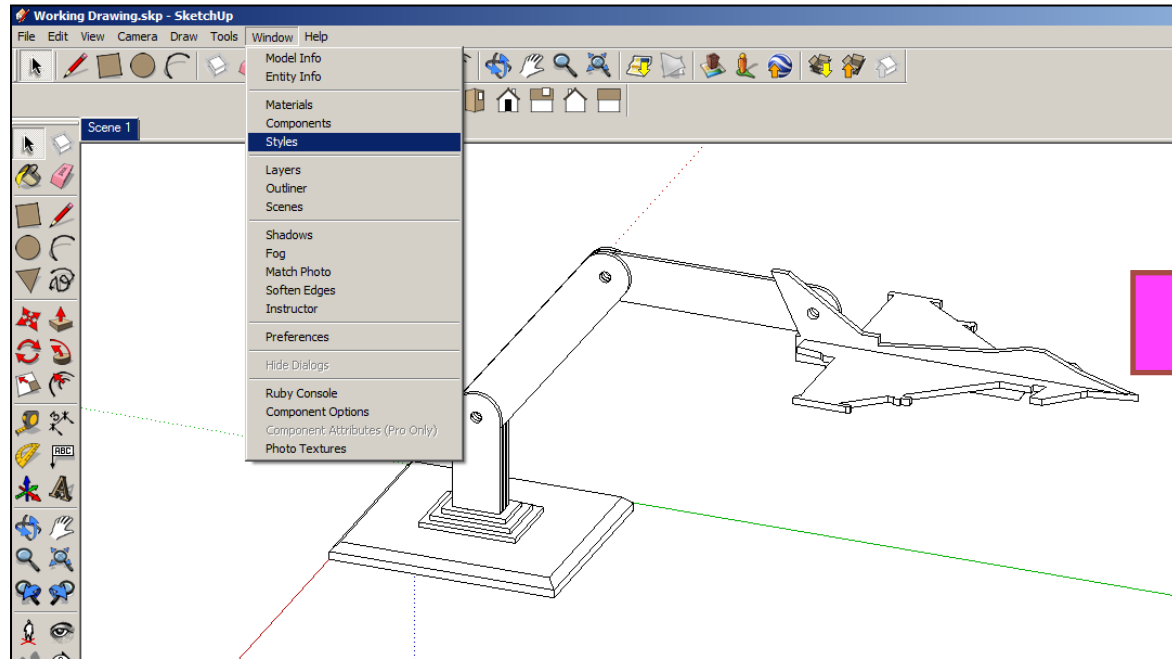
3b Tick Getting Started

3c Tick Large Tool Set

**Note:** this will place a tool bar across the top (**getting started**) and the side (**Large Tool Set**)

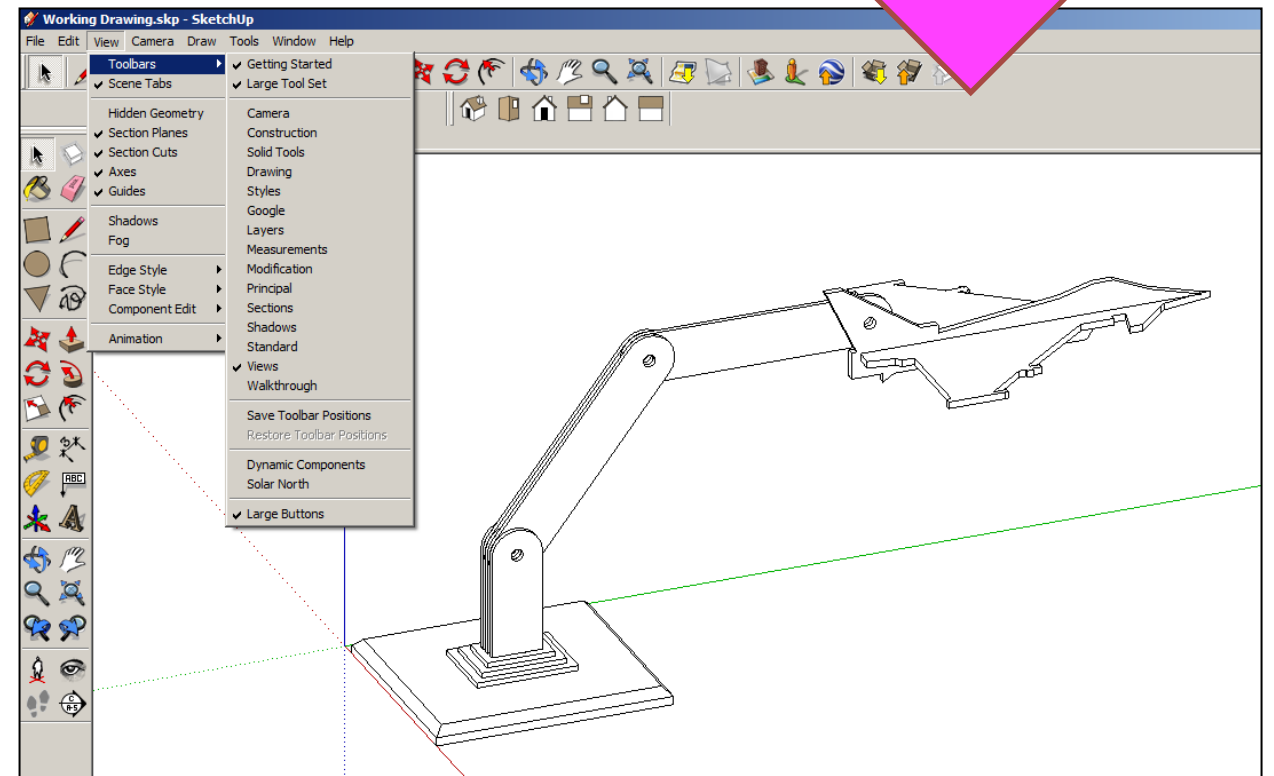
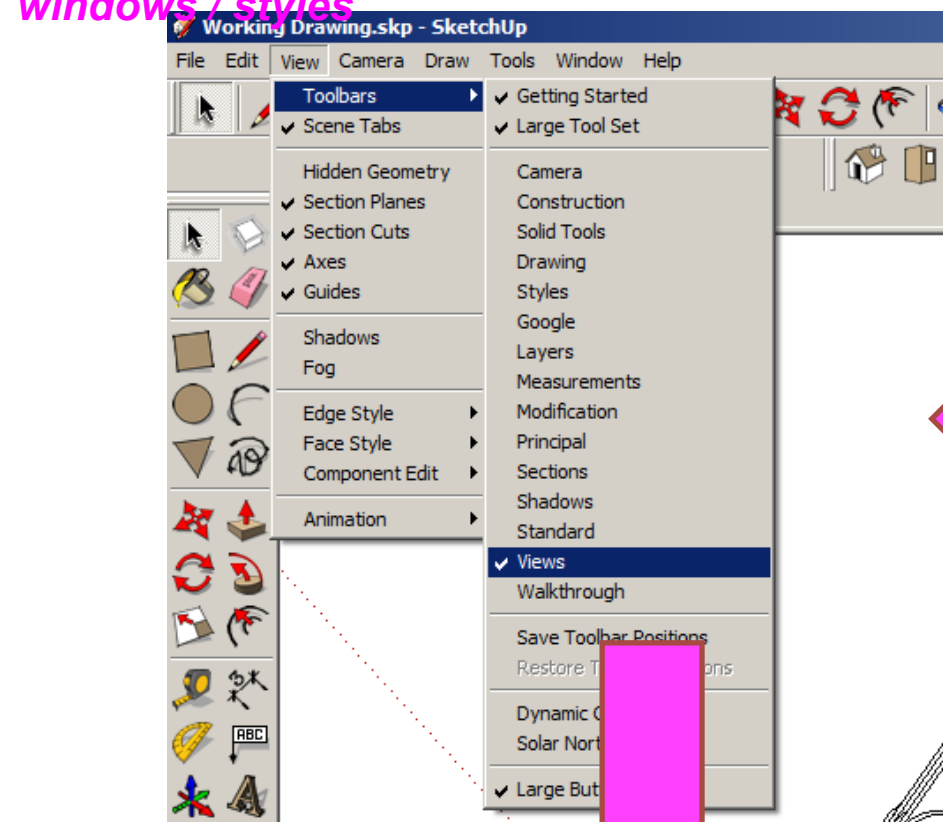
# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 1. Working Drawing Instructions (Setting up Correct Format)



Click on **Windows / Default / hidden line**

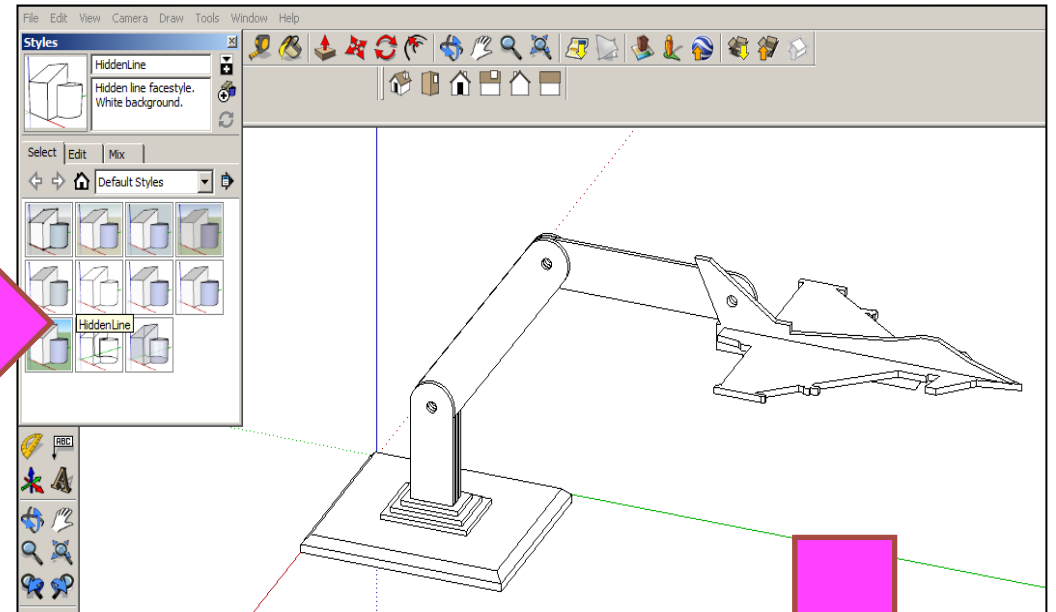
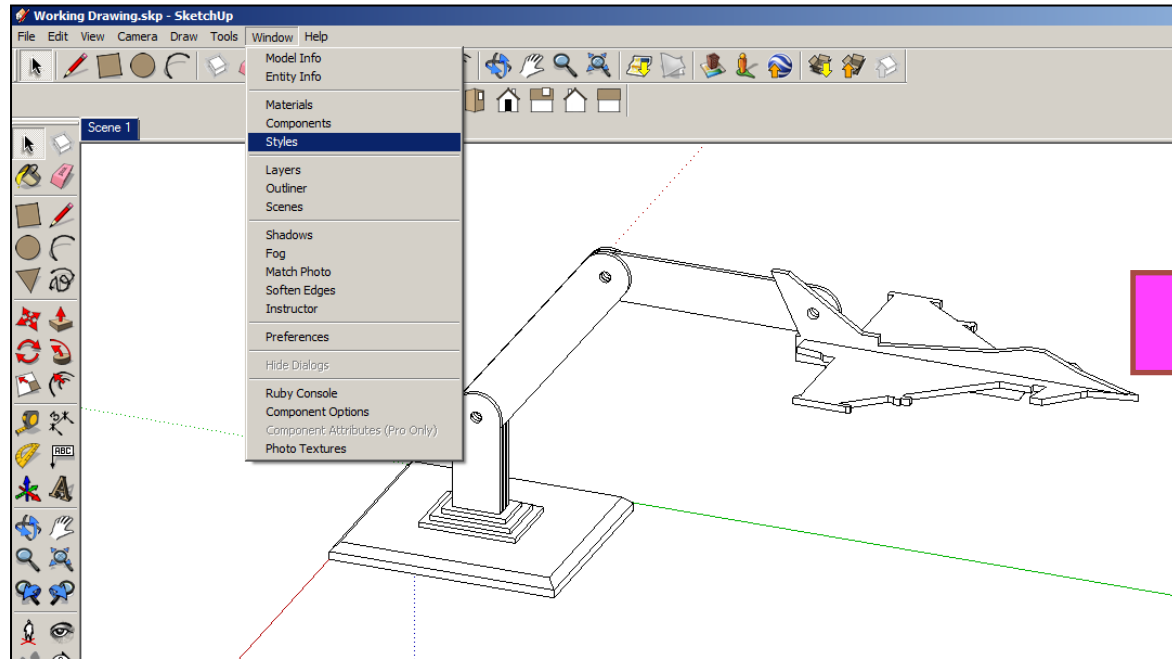
Now its time to convert your drawing into a working drawing (NB this **must be exact** to achieve a level 2. **Click windows / styles**



Click on **Toolbars / Views**

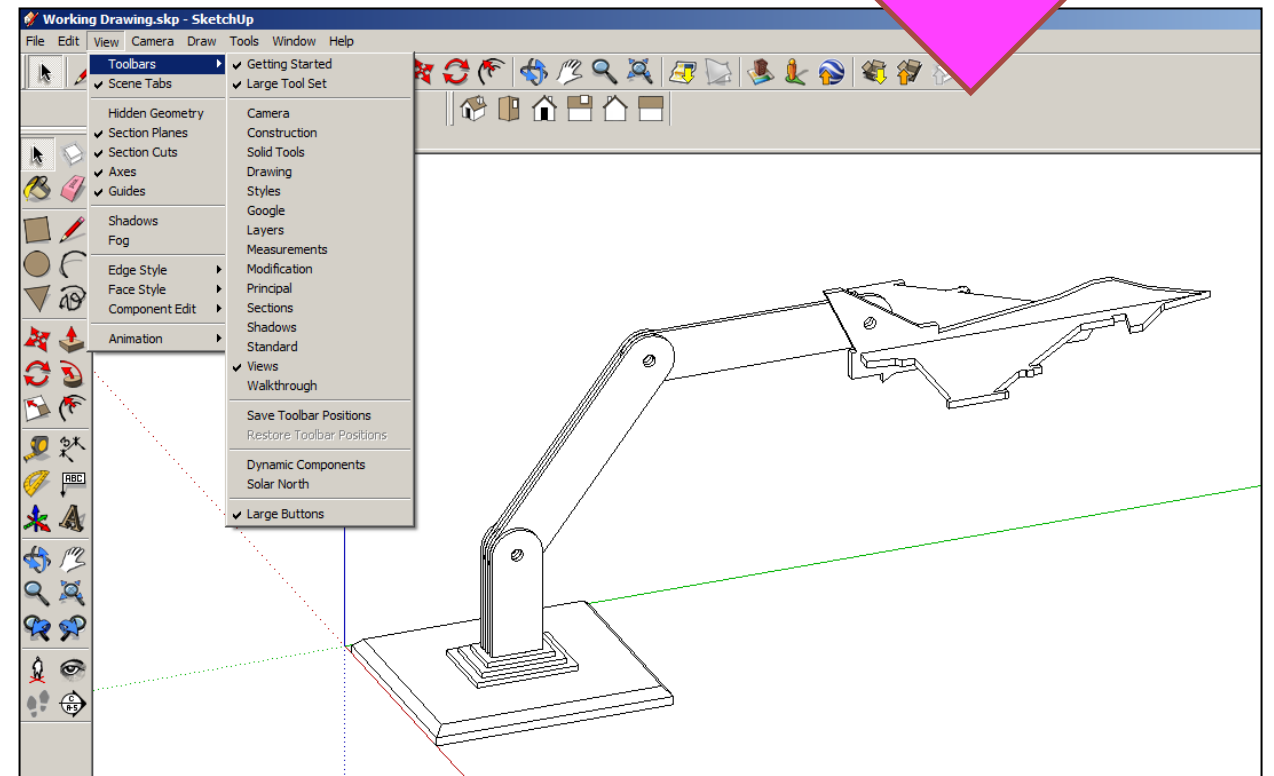
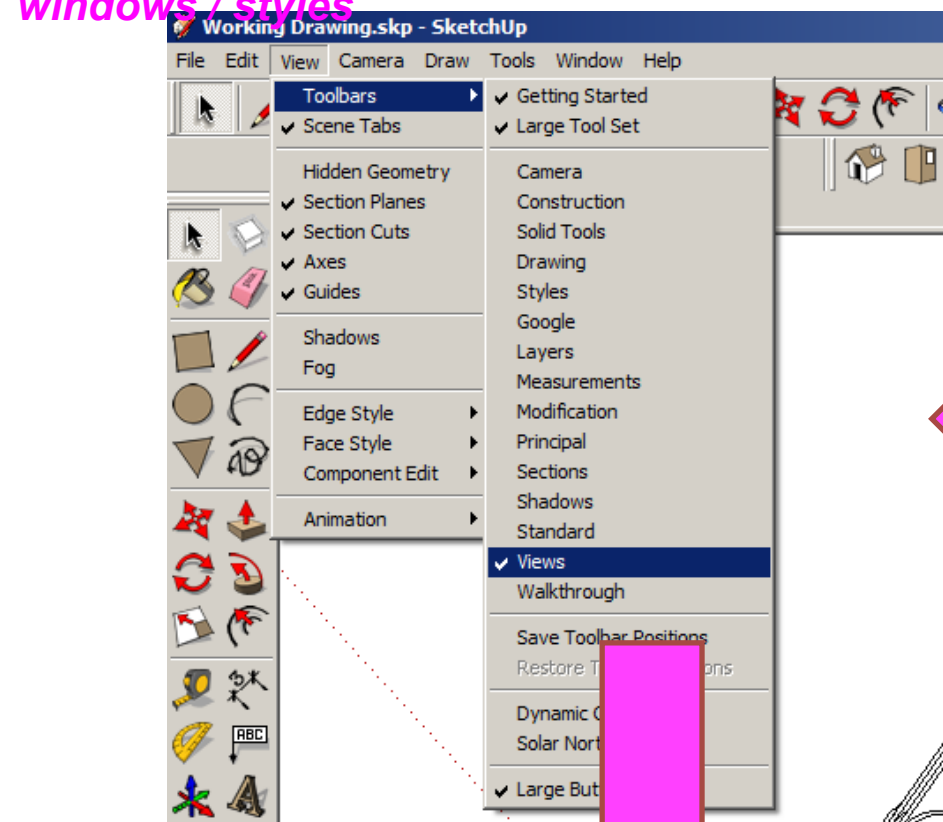
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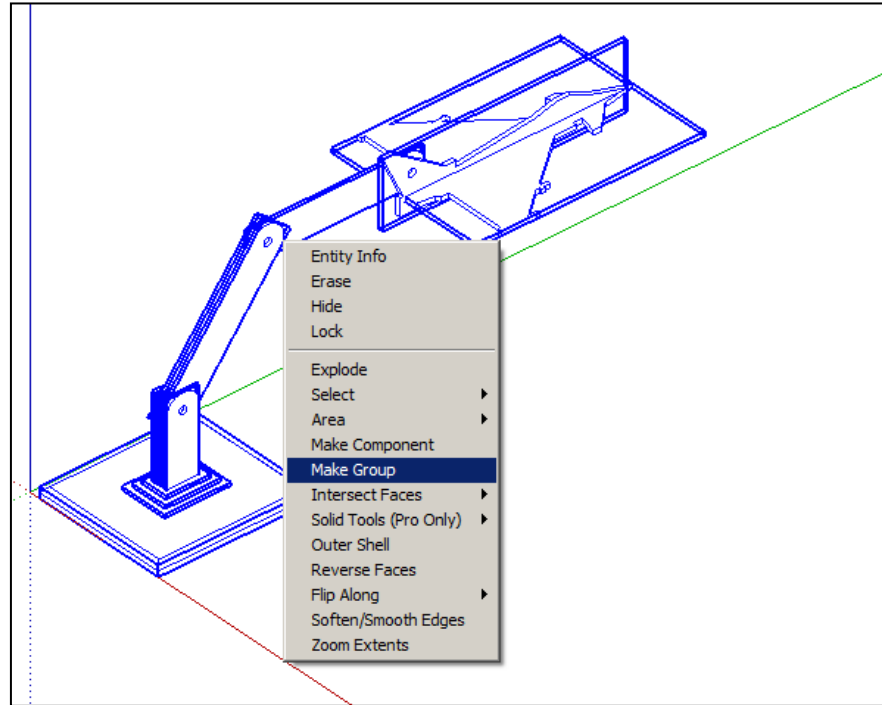


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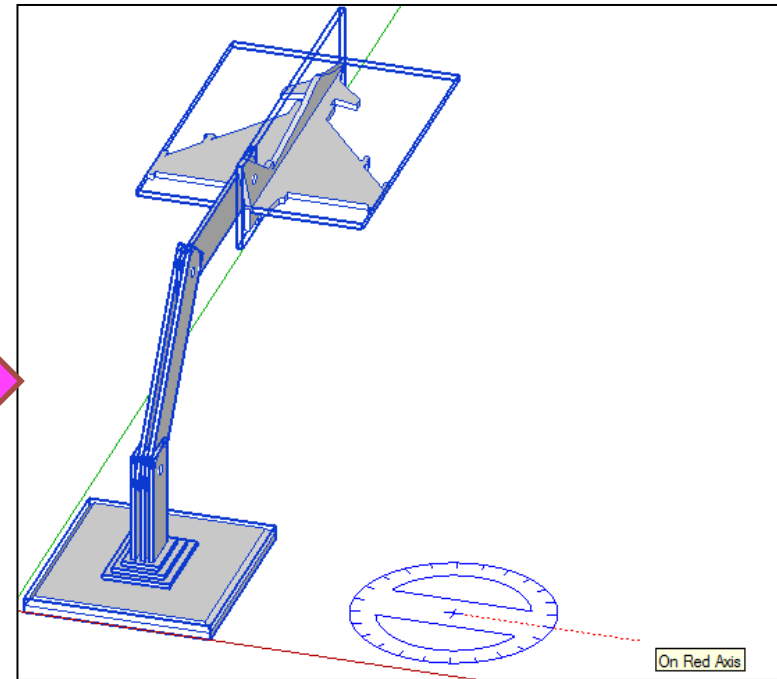
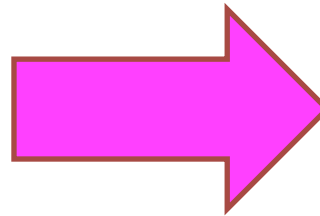


# Computer Aided Design: Aircraft Lamp Working Drawing

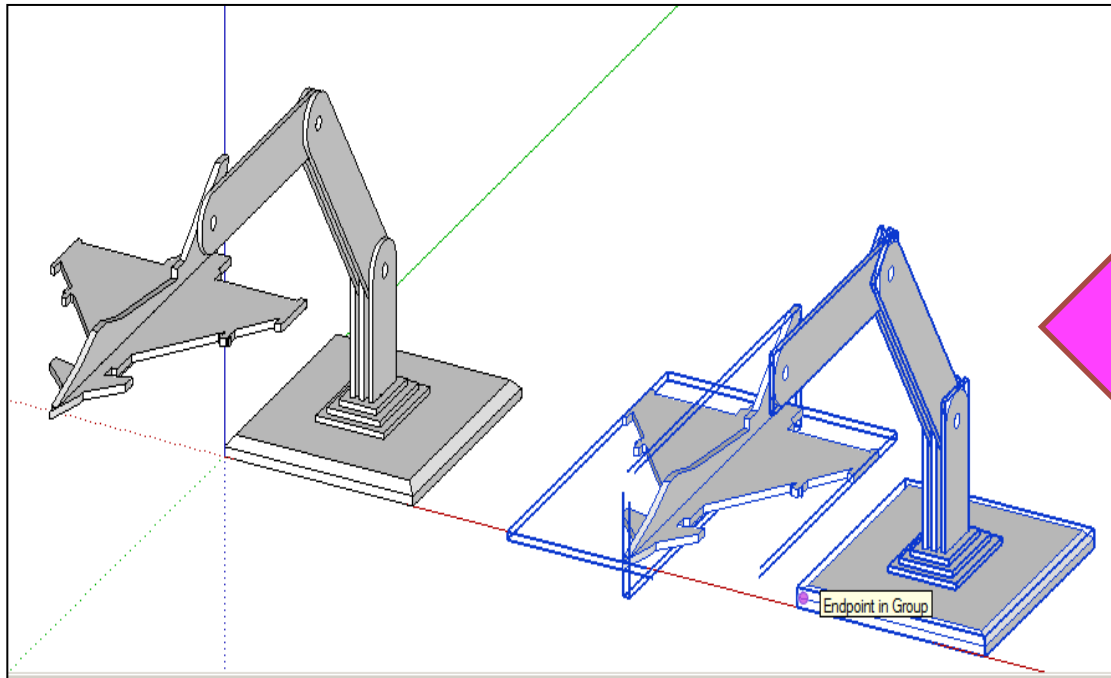
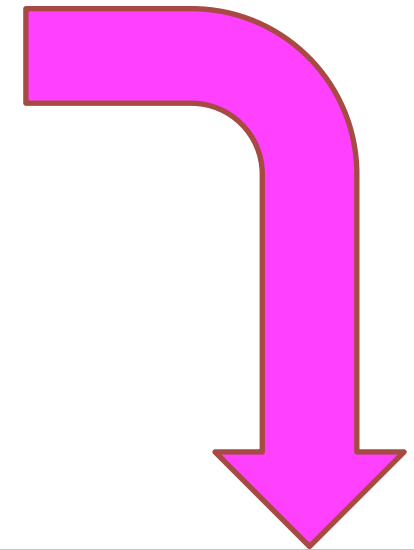
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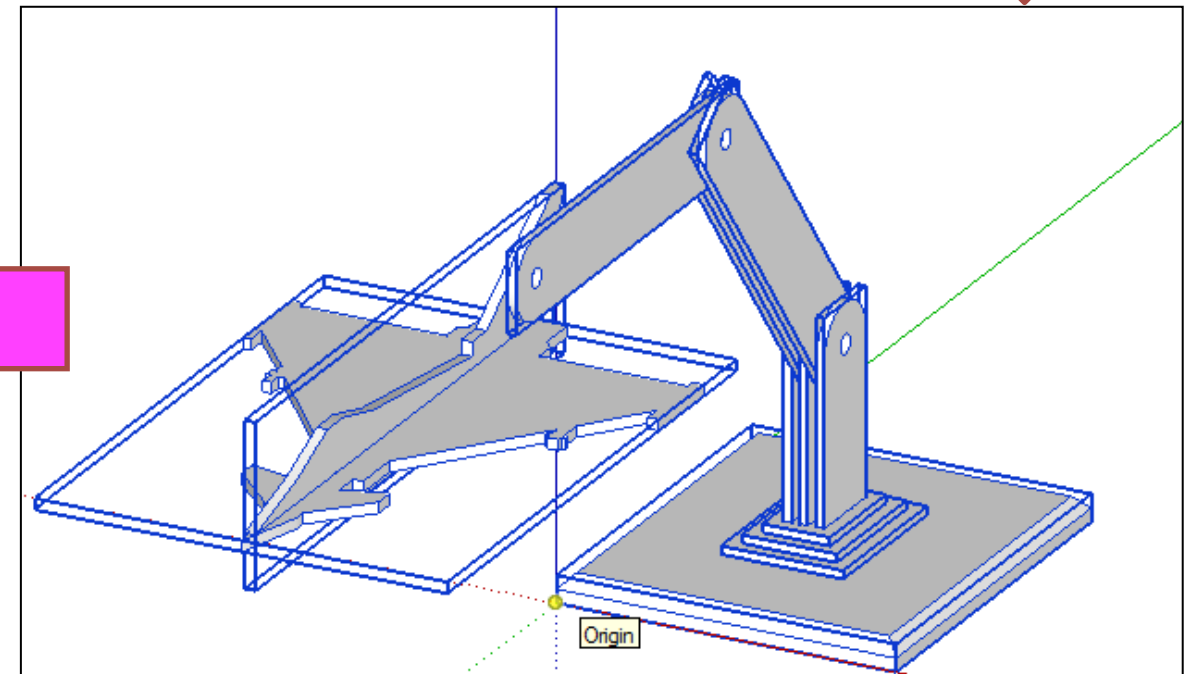
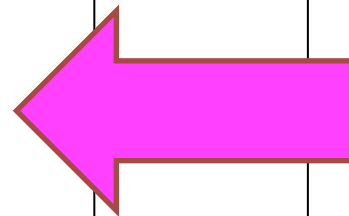
Highlight the entire lamp and right click  
**make group**



Click on the rotate tool and turn the  
lamp **around as shown below**



Copy and move a second lamp along the **red axis**

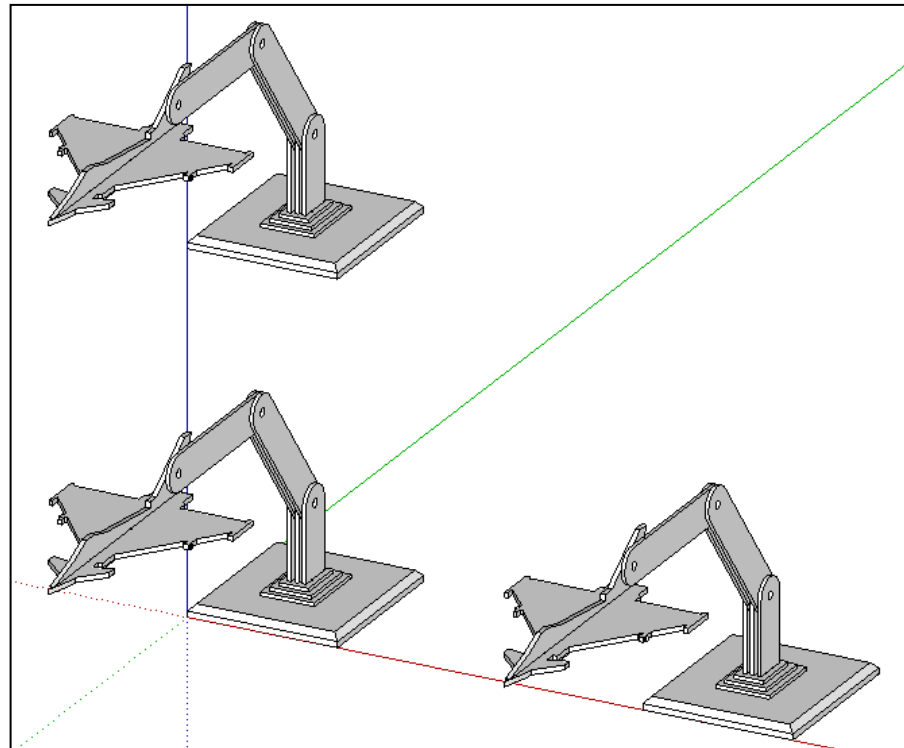


Click on the **move tool** and move the  
lamp so the corner is on the origin

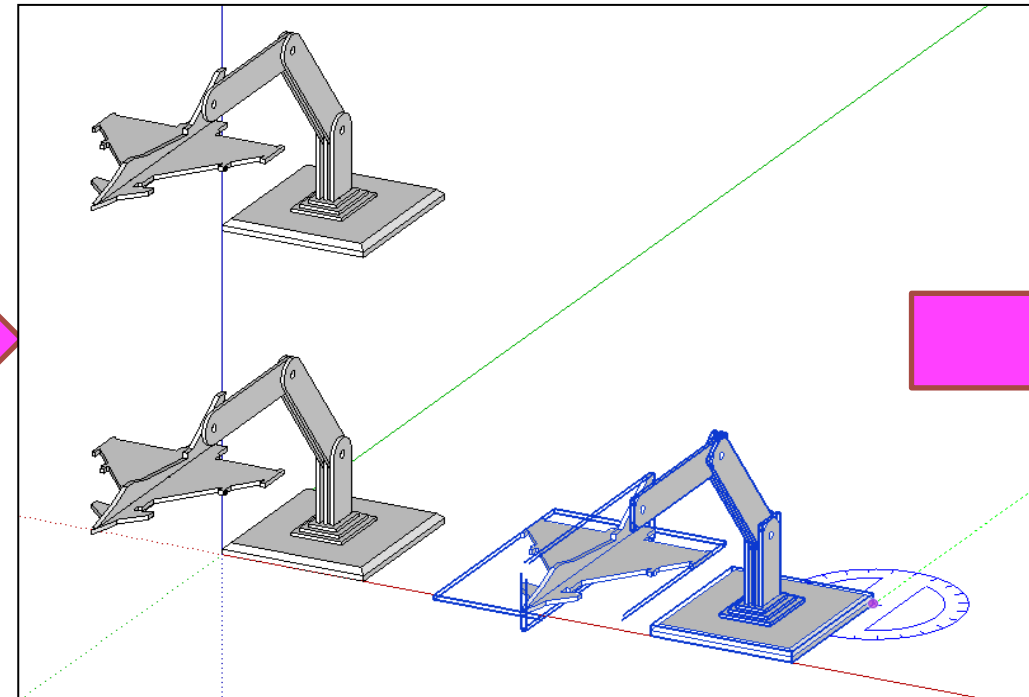
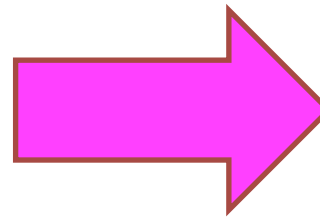


# Computer Aided Design: Aircraft Lamp Working Drawing

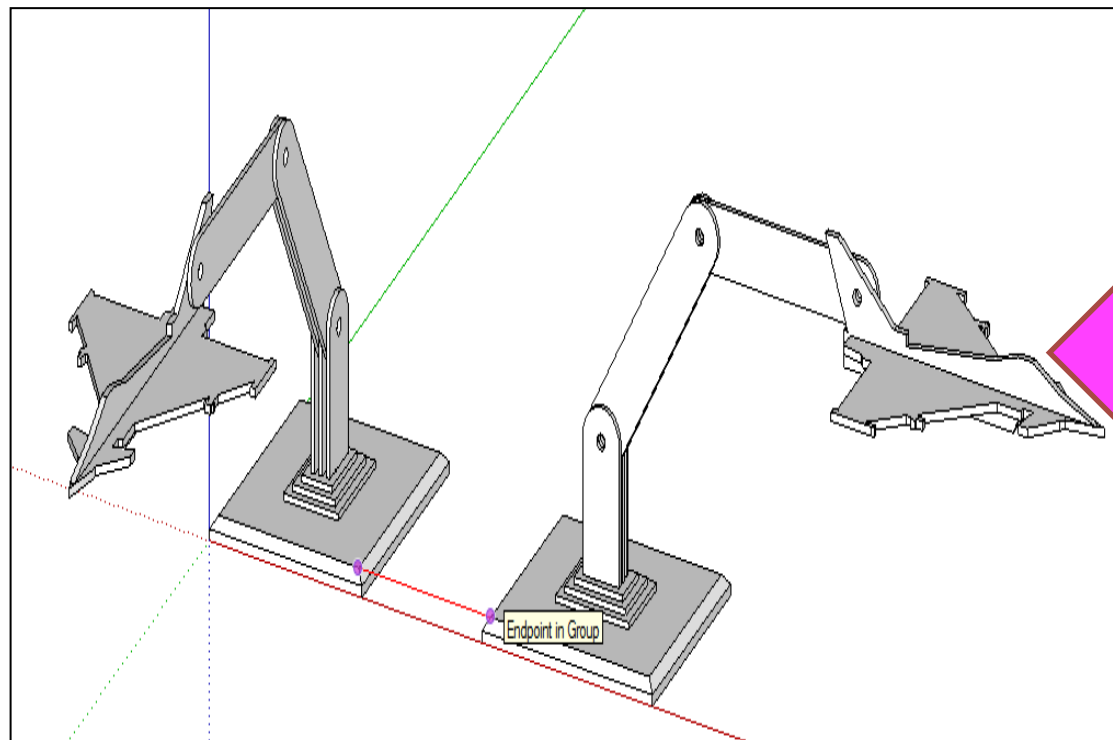
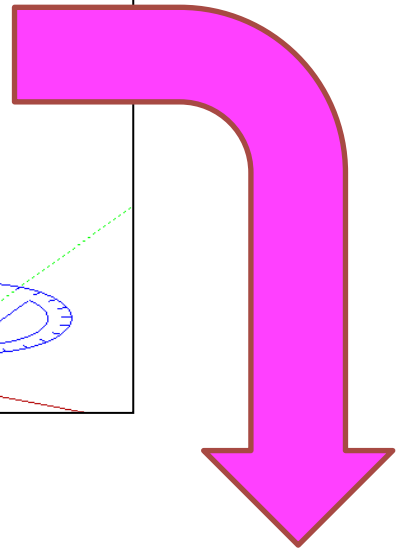
## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



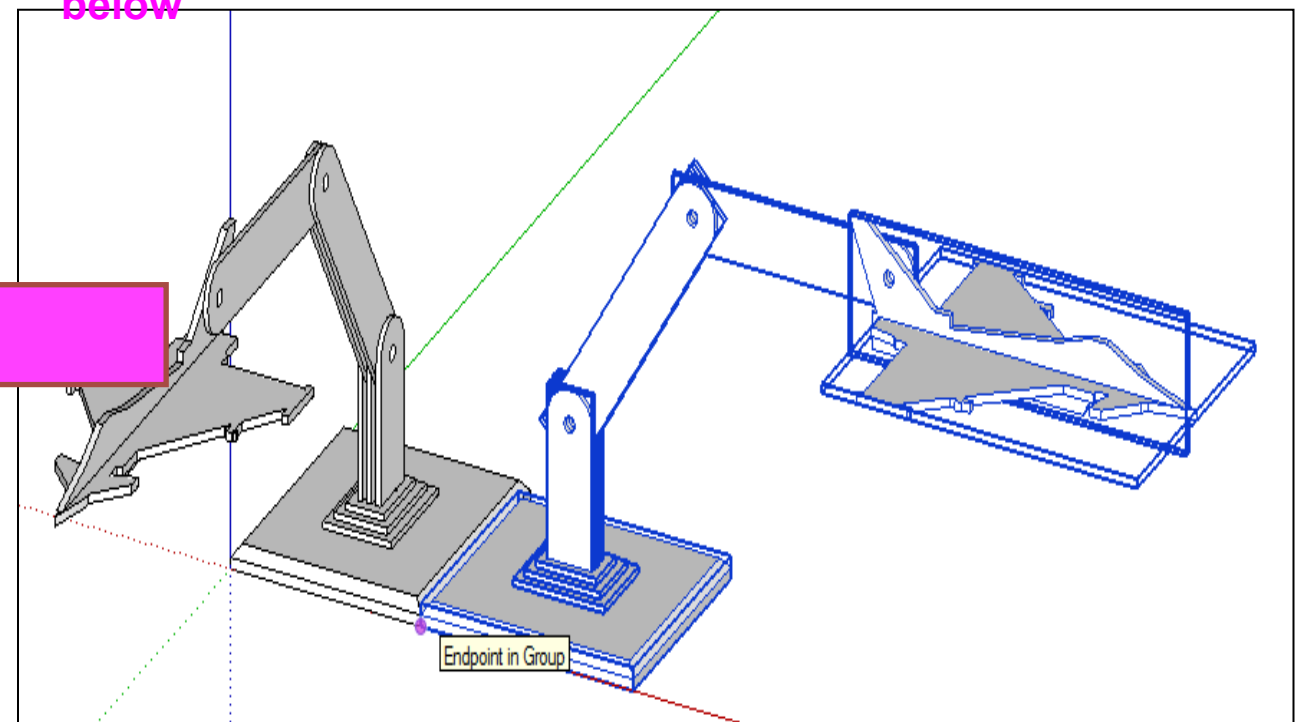
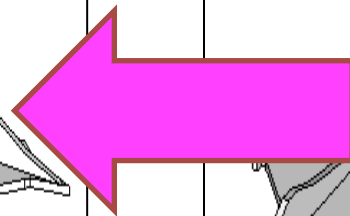
Copy and move a second lamp along the **blue axis**



Click on the rotate tool and turn the lamp **around 90 degrees as shown below**



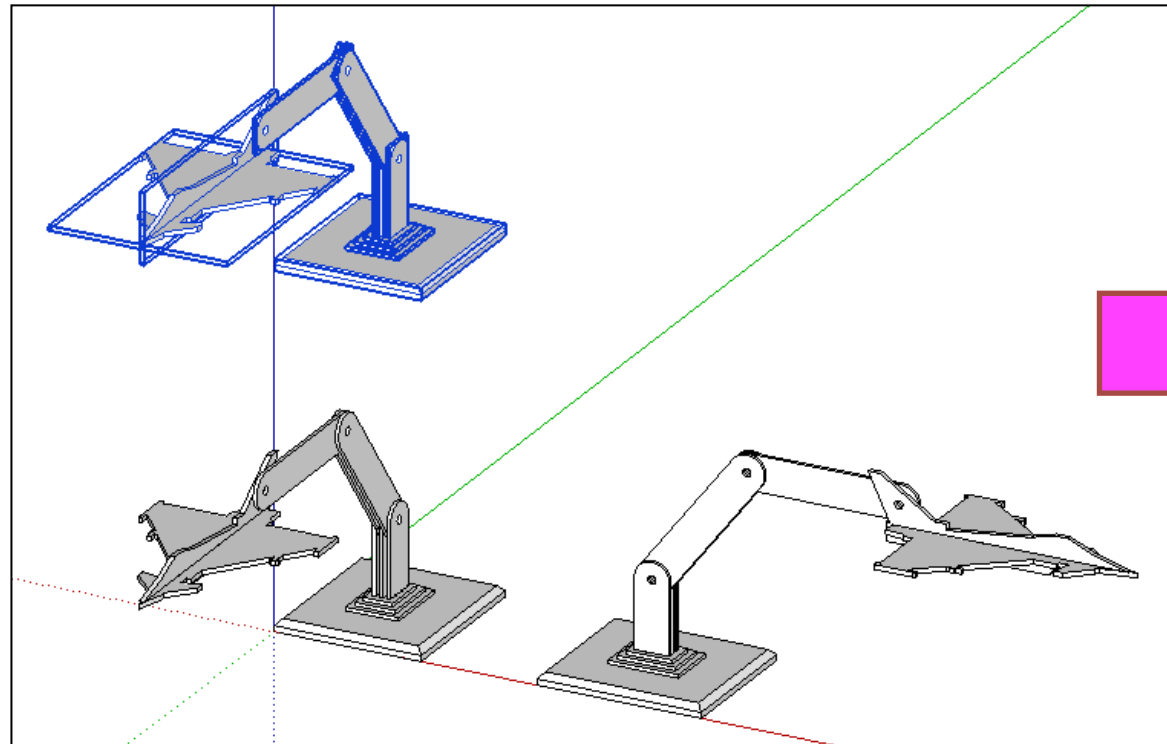
Click on the **move tool** along the red axis. You should be able to draw a line that turns red from corner to corner to indicate it lines up exactly



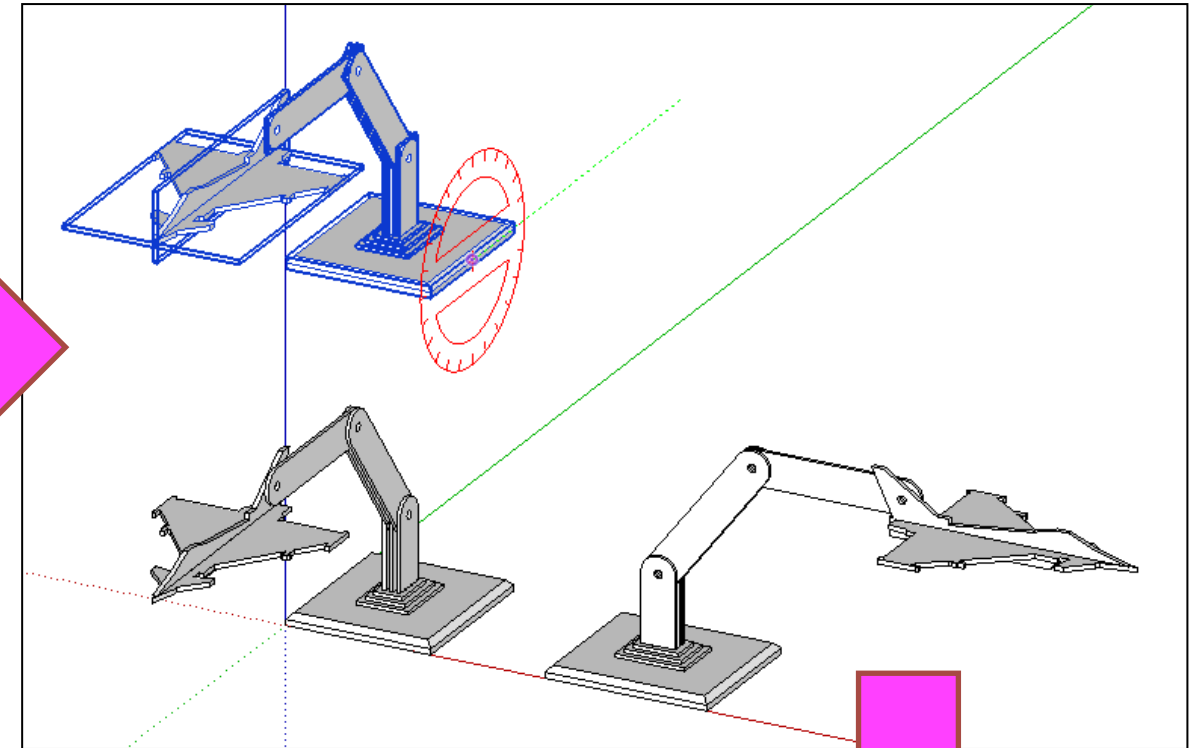
Click on the **move tool** and move the lamp so the corners of the base meet

# Computer Aided Design: Aircraft Lamp Working Drawing

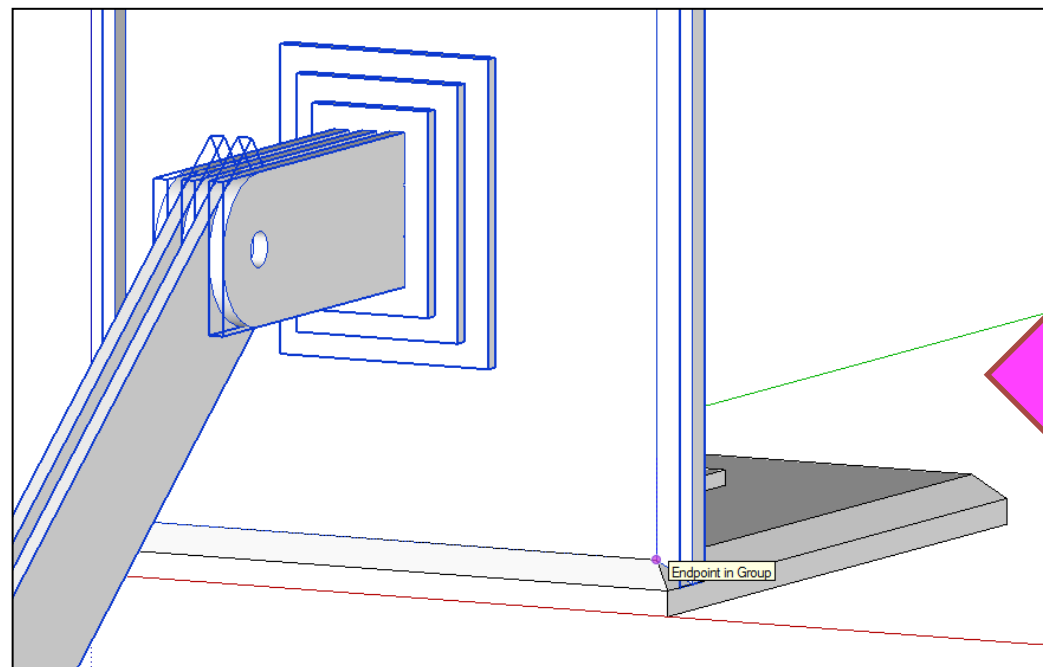
## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



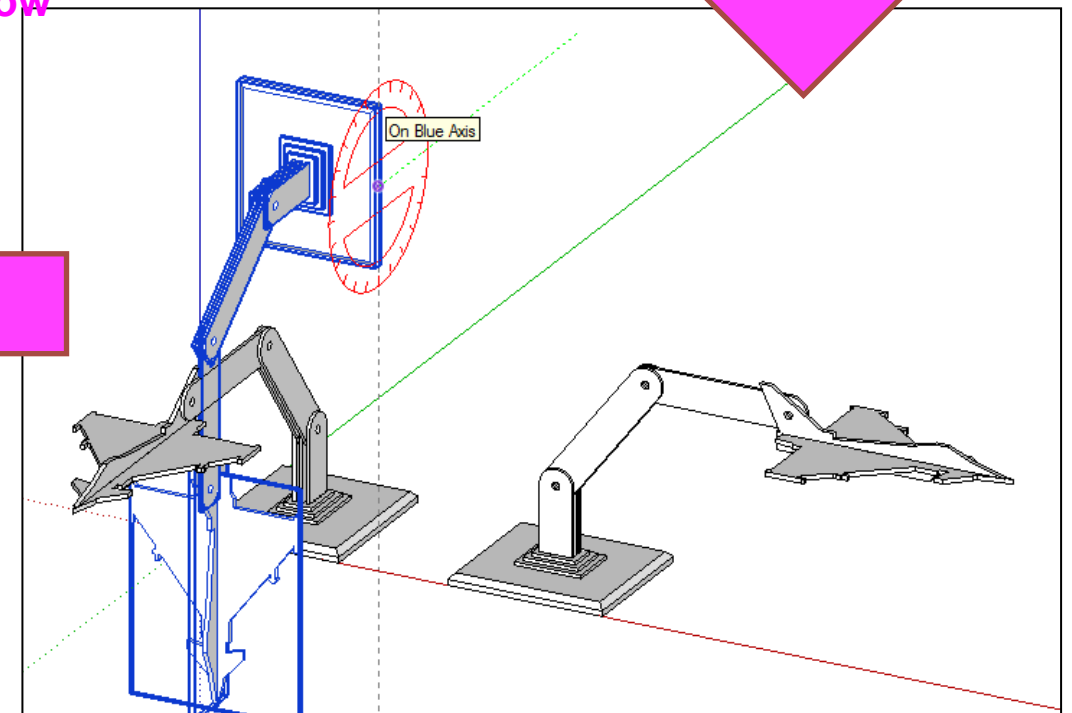
Click on the top lamp



Click on the rotate tool and turn the lamp **around 90 degrees as shown below**

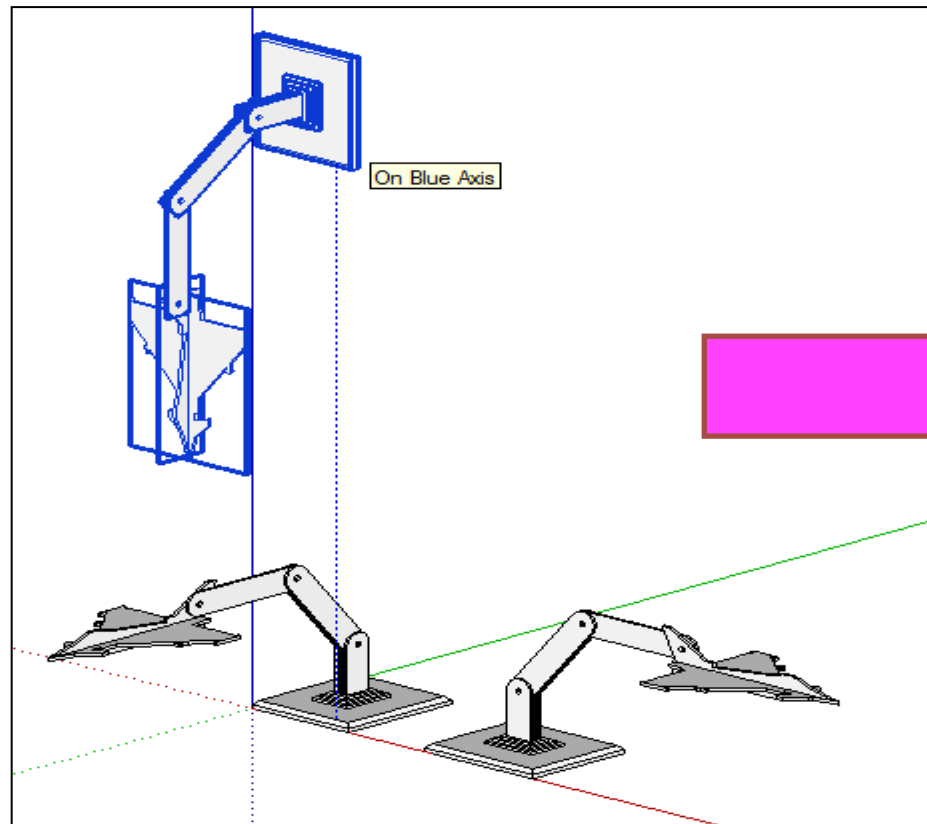


Click on the **move tool** and move the lamp so the corners of the base meet

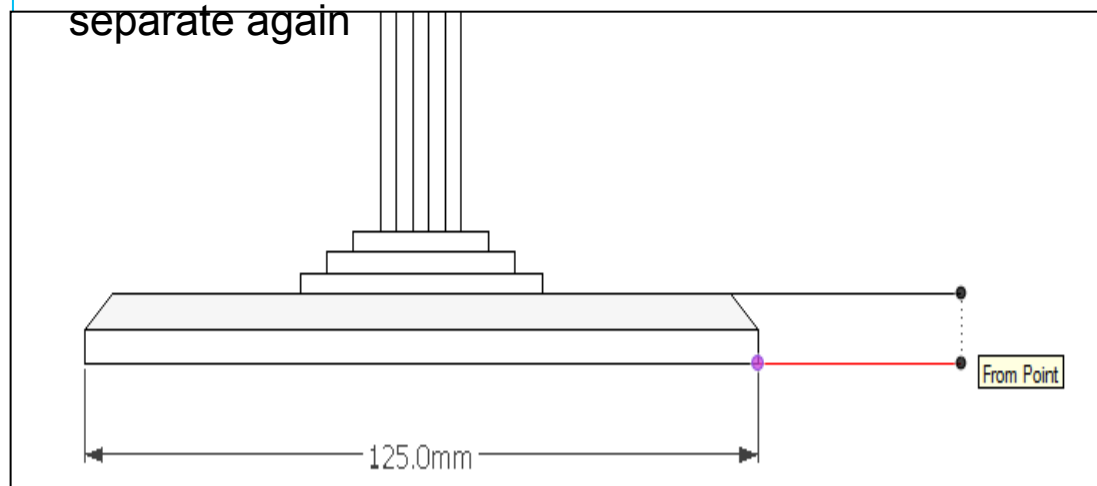


# Computer Aided Design: Aircraft Lamp Working Drawing

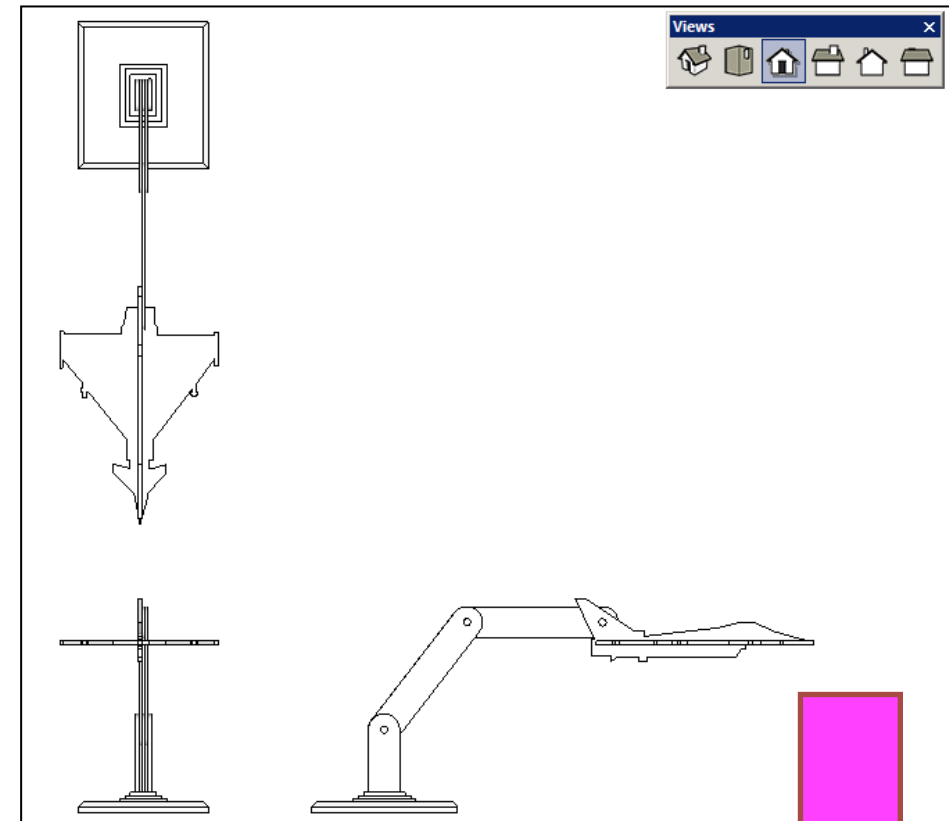
## Computer Aided Engineering: 2. Working Drawing (Adding Dimensions)



Click on the **move tool** and move the lamp so the corners of the base meet and then separate again



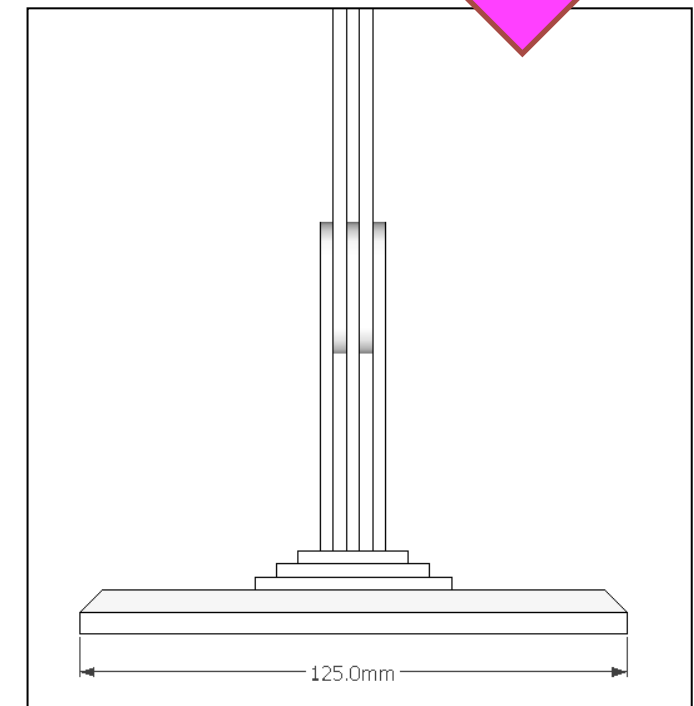
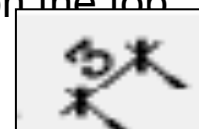
Certain points are difficult to add sizes using the pencil tool to line up edges as shown above.



Click on the **front view** using the **view toolbar**

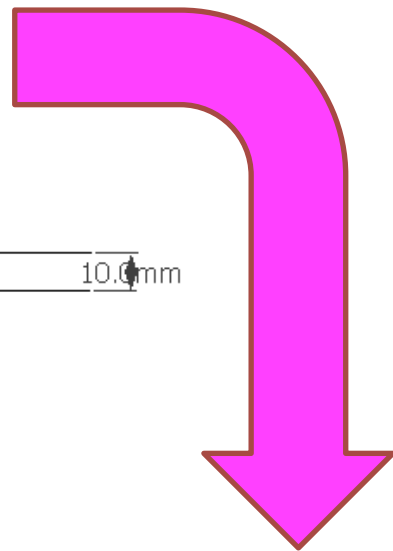
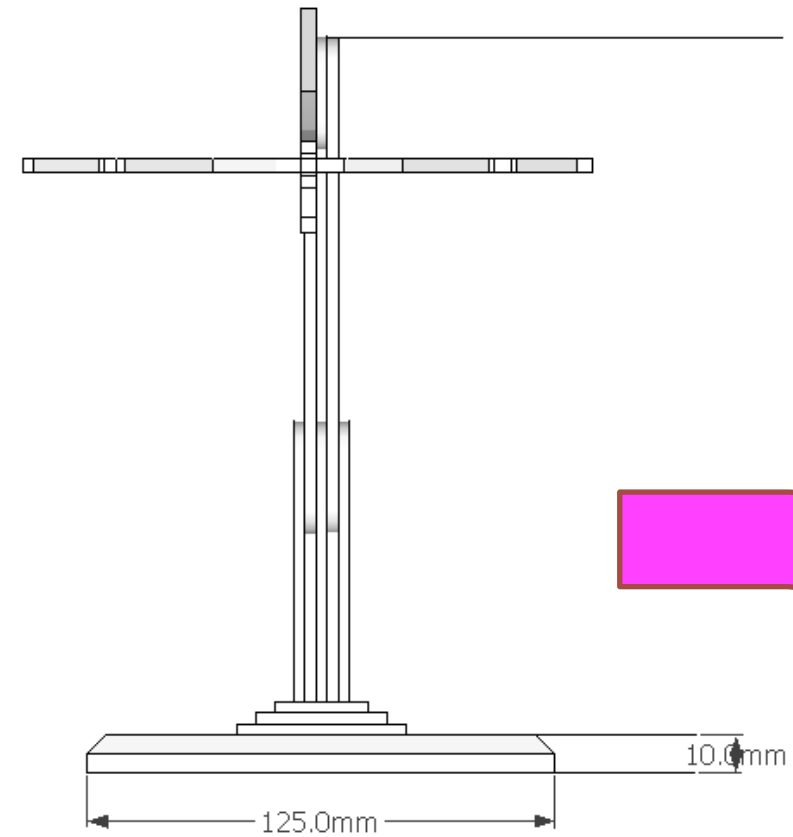
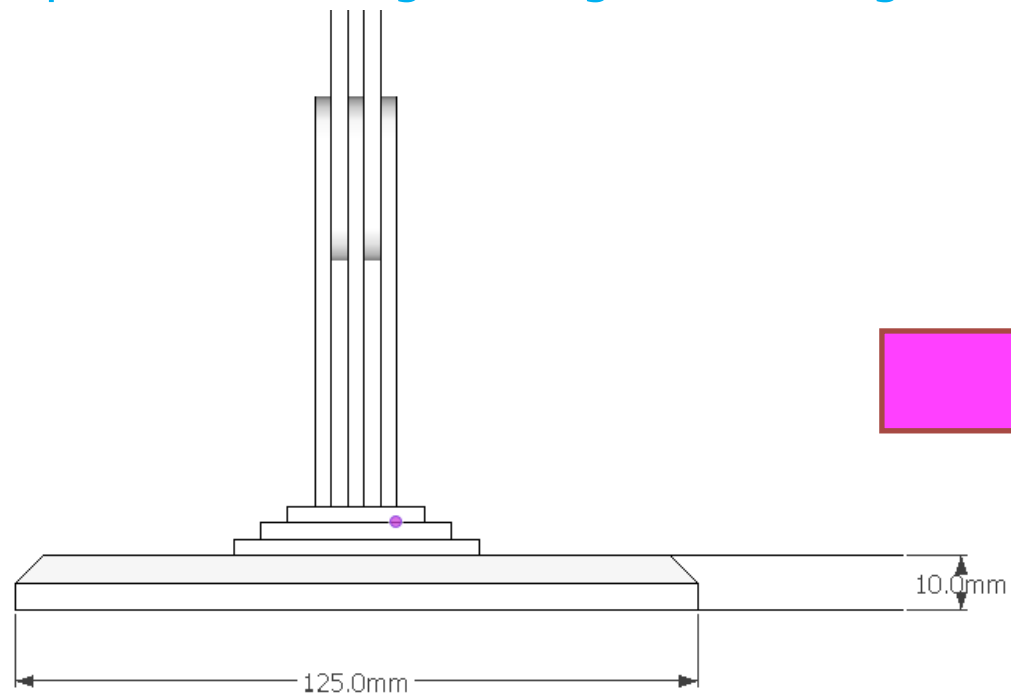


Click on the **dimensions tool bar** and add sizes. All sizes should be below and to the right. Never on the left hand side or on the top

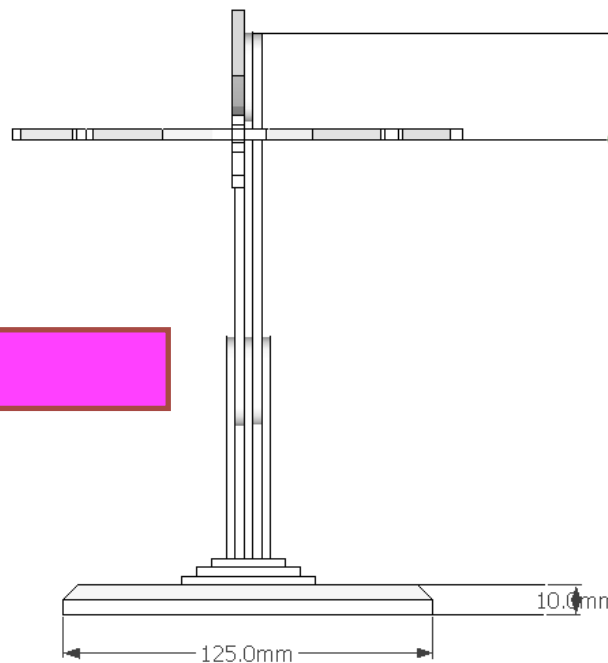
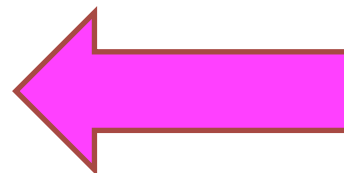
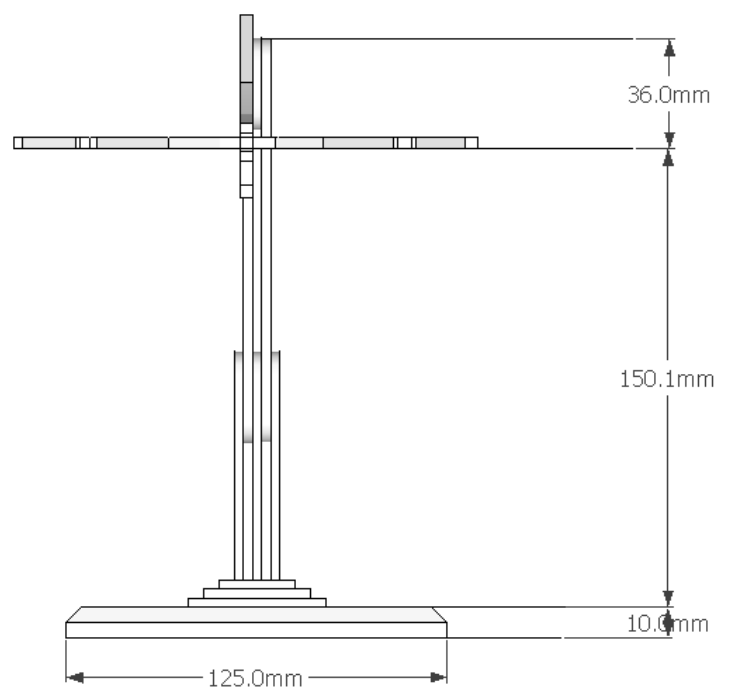


# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)

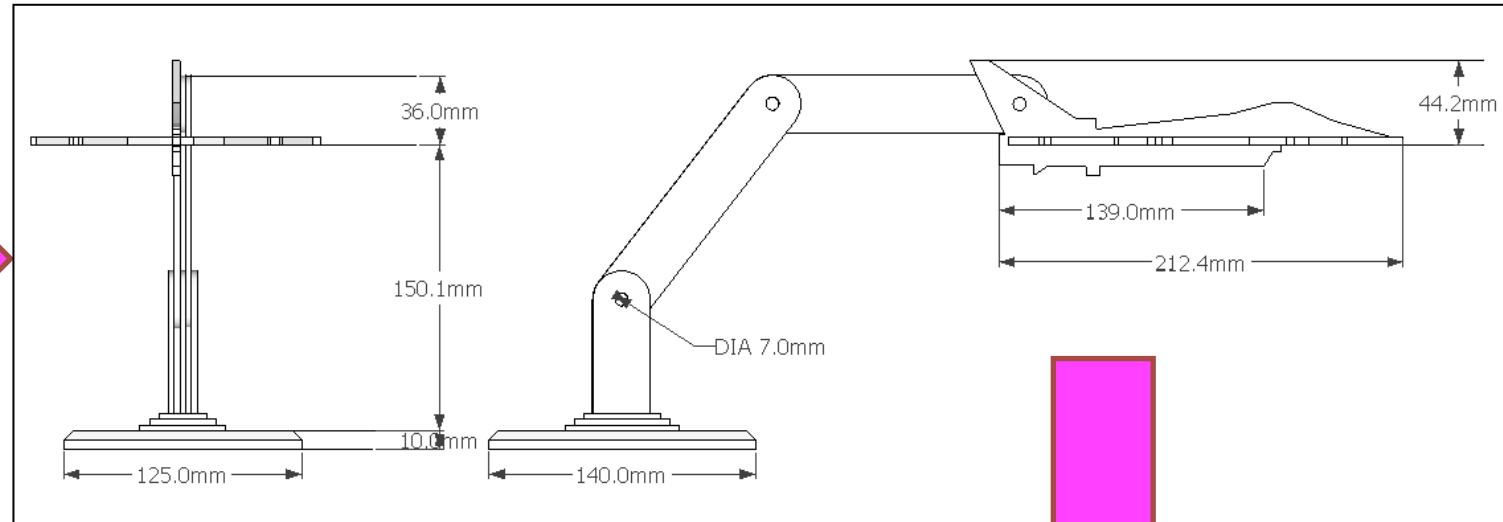
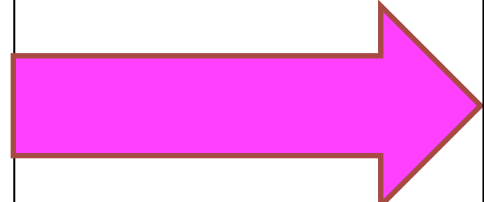
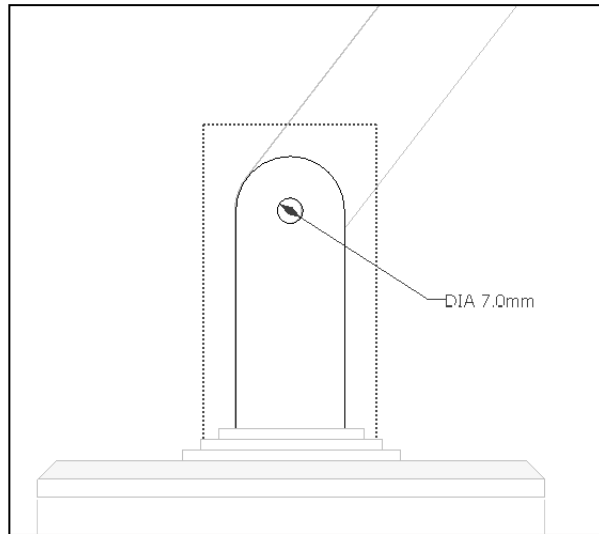


Add sizes to show height, width and any other important sizes. You will compare these to the lamp later on



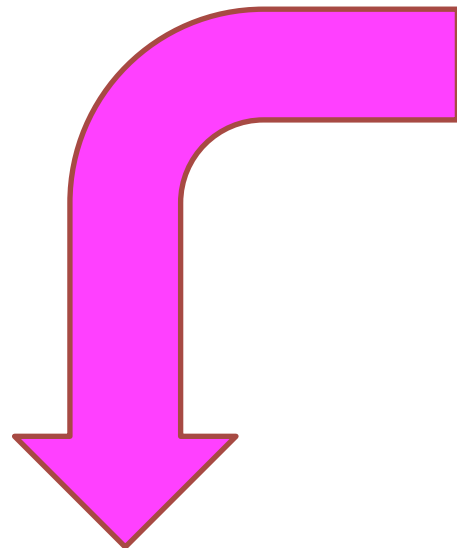
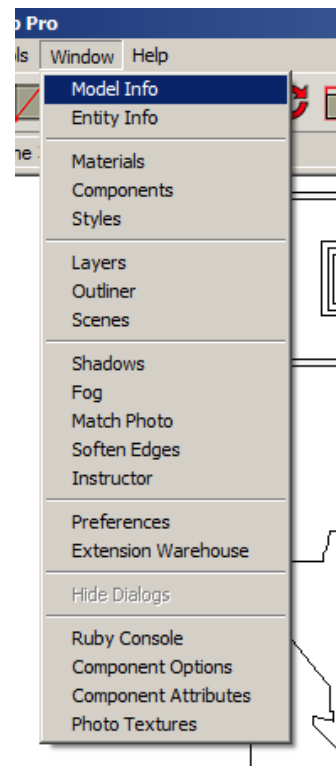
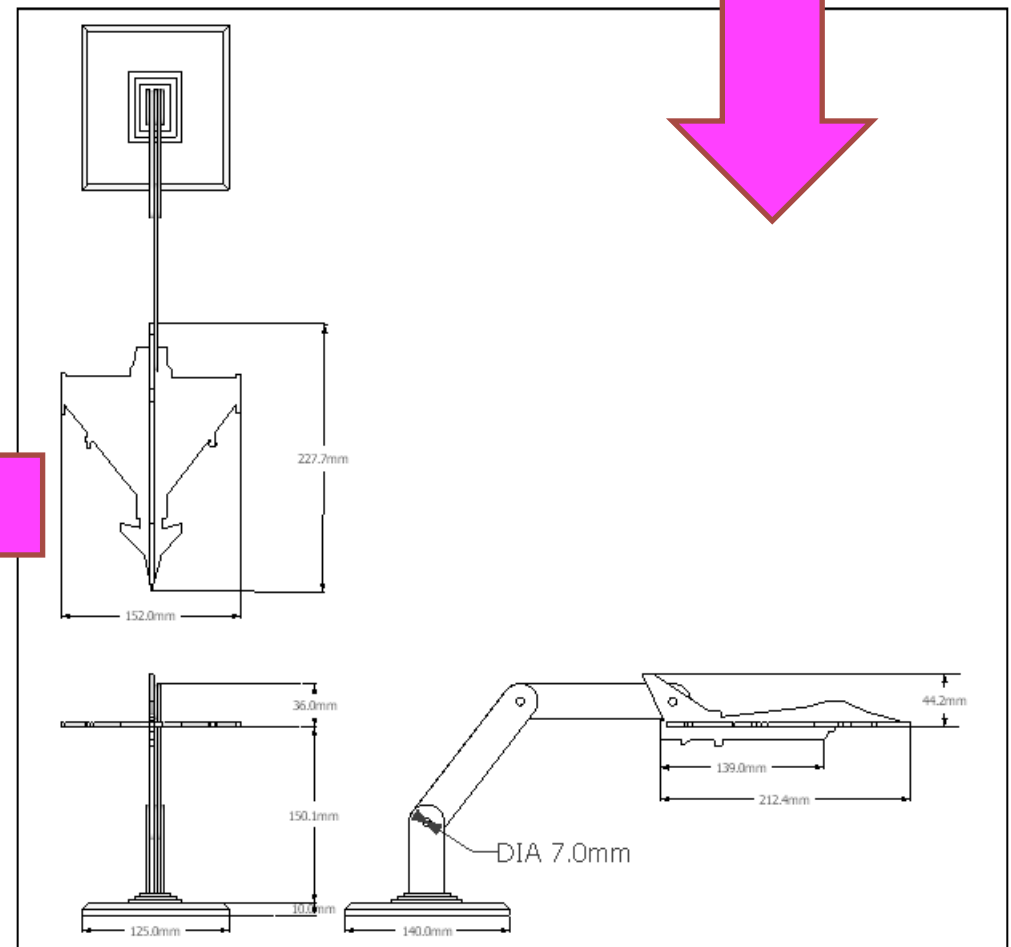
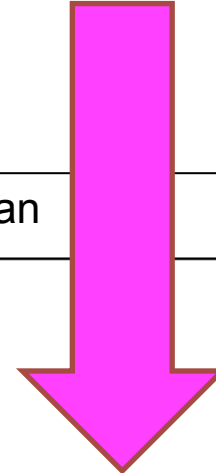
# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



If the object is grouped you may need to double click to add some sizes and radius

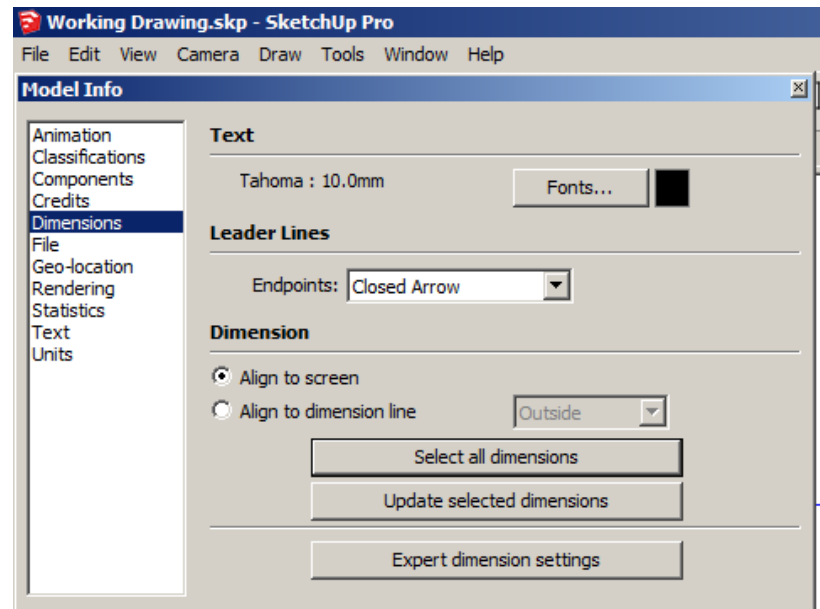
Add sizes to the three drawings Front, Side and Plan



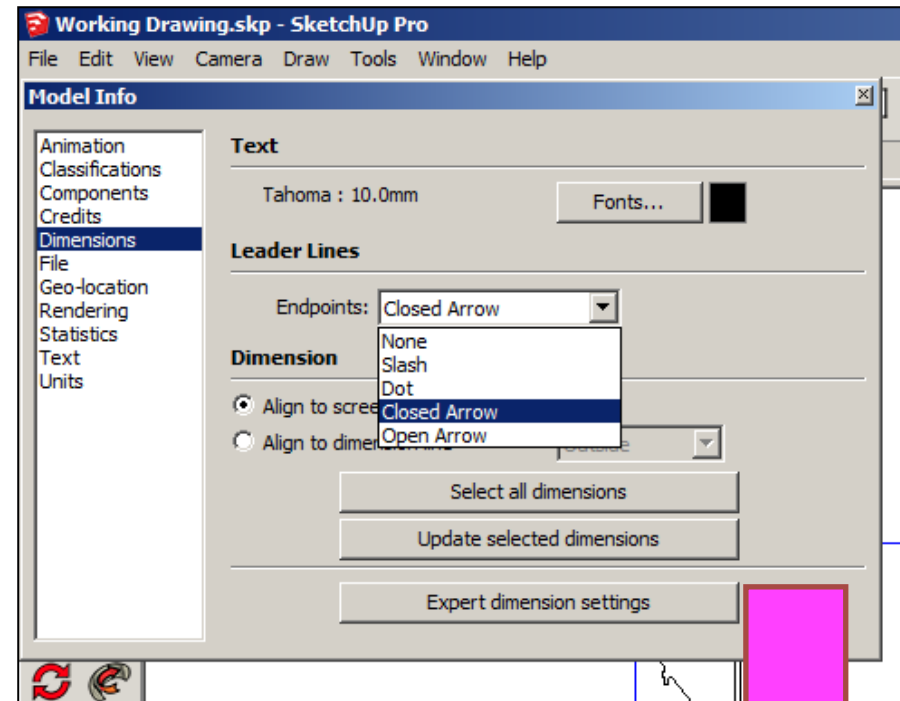
Click on *Window / Model Info*

# Computer Aided Design: Aircraft Lamp Working Drawing

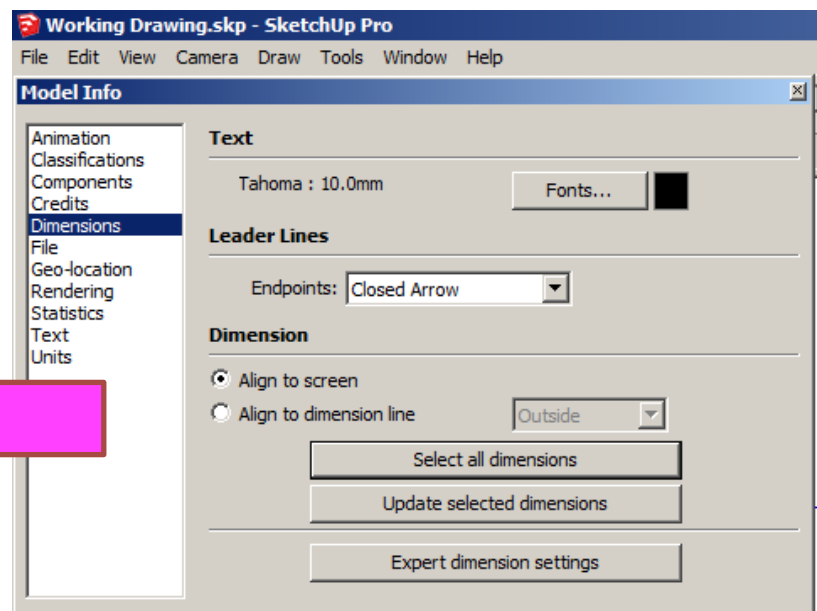
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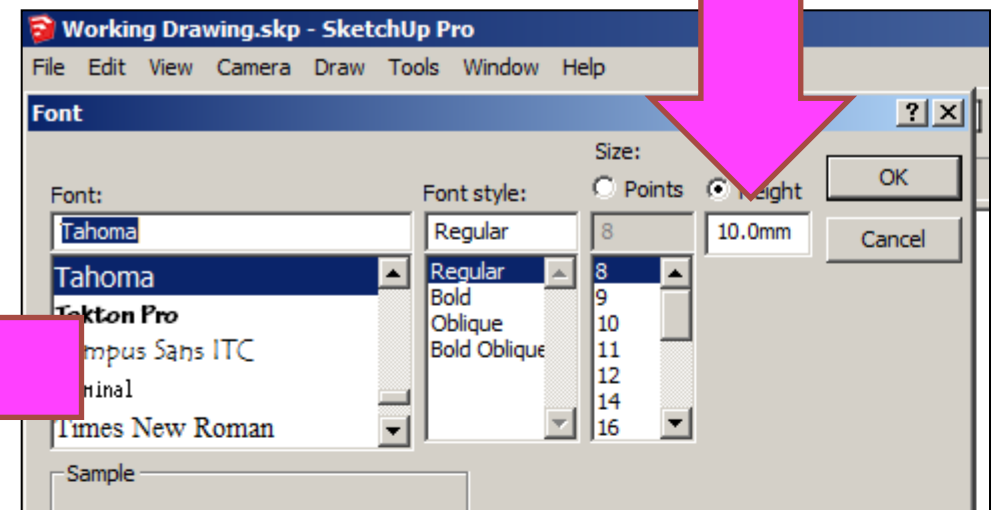
Click on **Dimension** and select all dimensions



Click on **Endpoints** and select closed arrow from the drop down menu



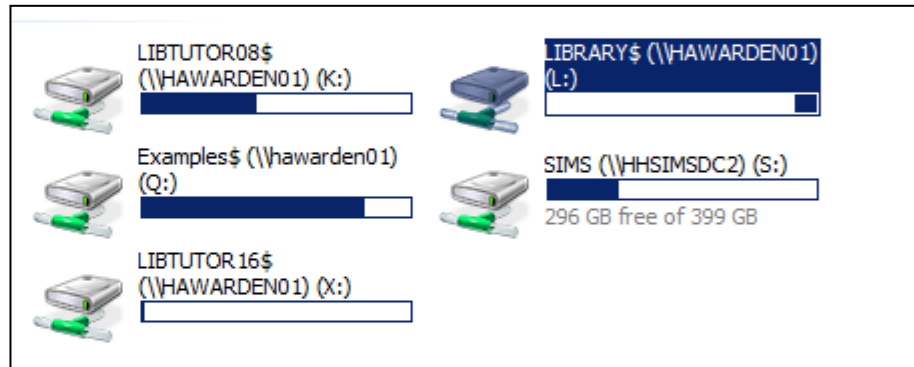
Click on **Update all dimensions**. The dimensions should change on the screen. When your happy close window down.



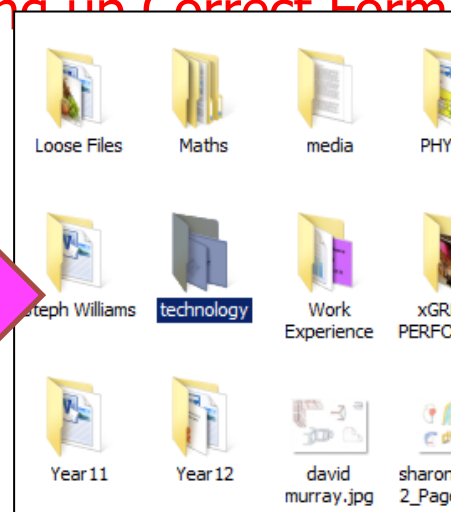
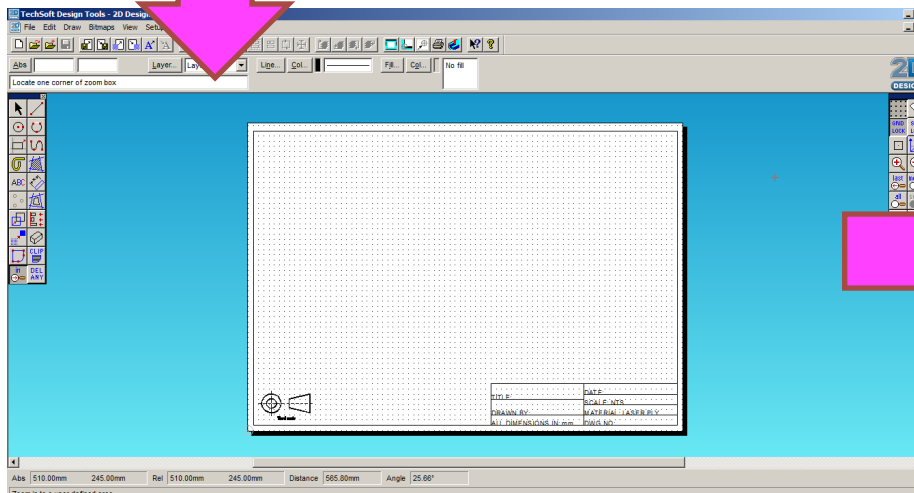
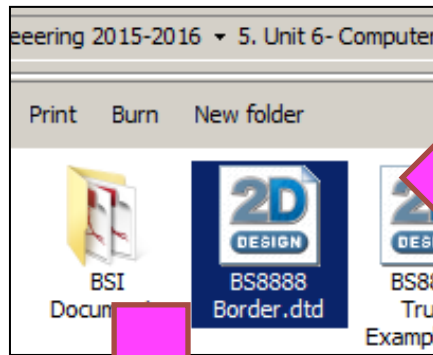
Click on **Fonts** and select a suitable size to be able to read the sizes on your drawing. You may have to repeat the above steps until your happy.

# Computer Aided Design: Aircraft Lamp Working Drawing

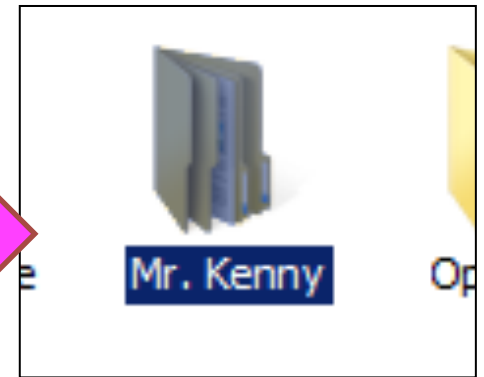
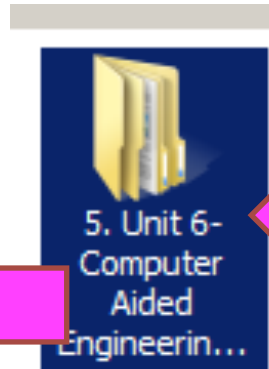
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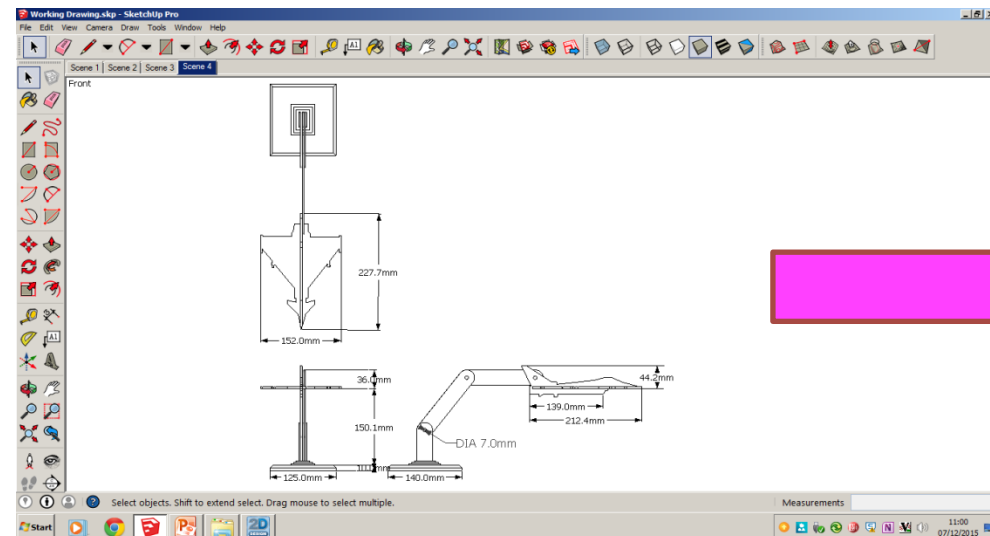
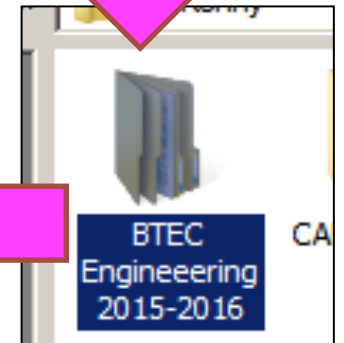
Click on *Library*.



Click on *Technology*.



Click on *Mr Kenny*.

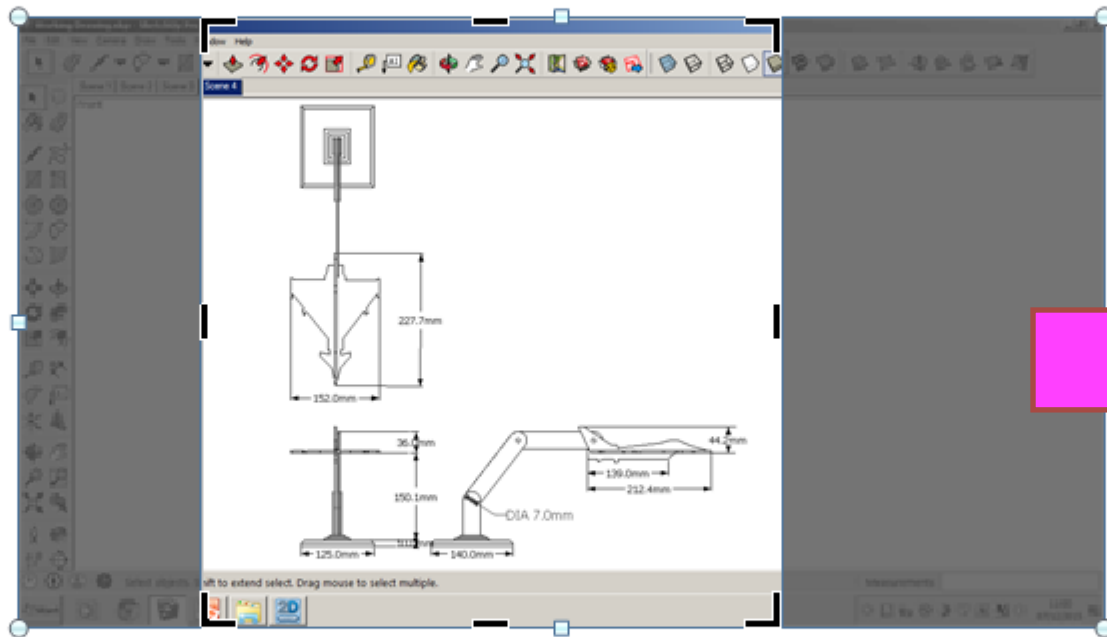


Go back to your working drawing. *Click on camera / Parallel projection and then press print screen*

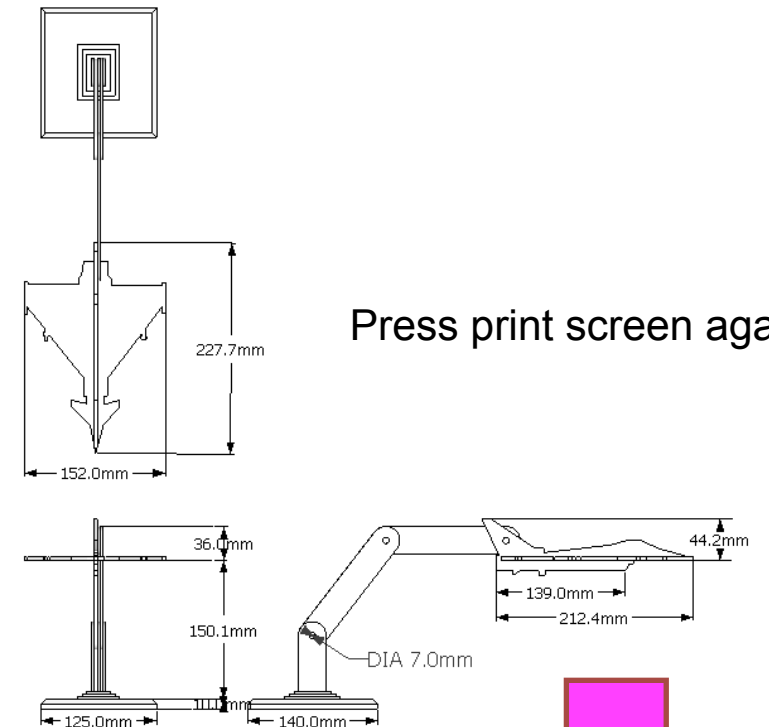


# Computer Aided Design: Aircraft Lamp Working Drawing

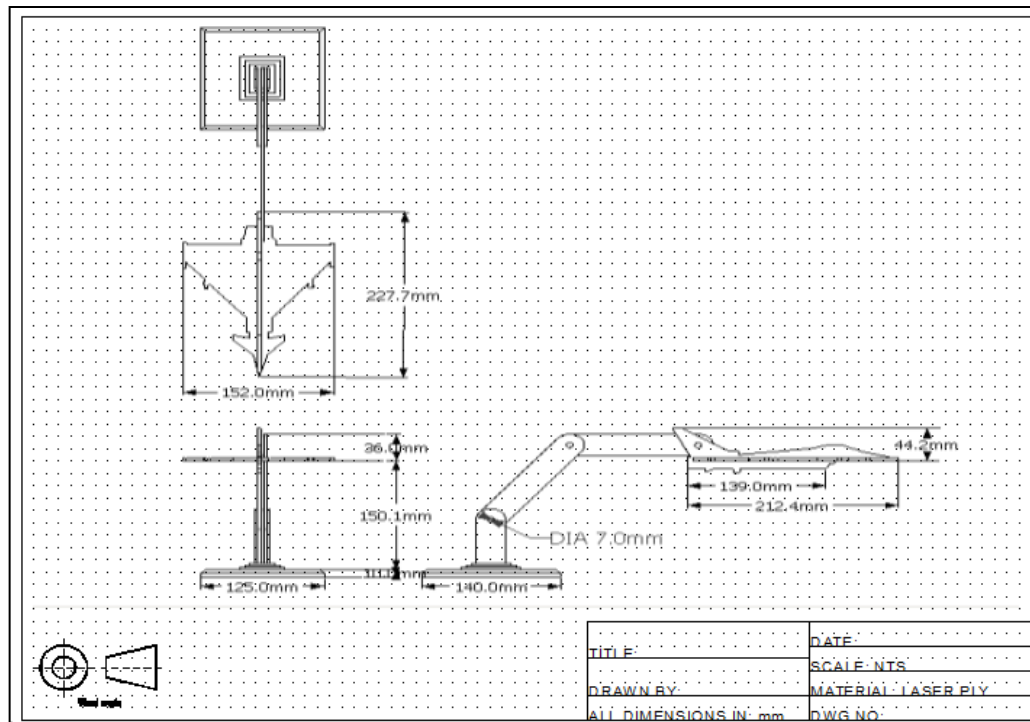
## Computer Aided Engineering: 2. Working Drawing (Importing DXF into 2D Design)



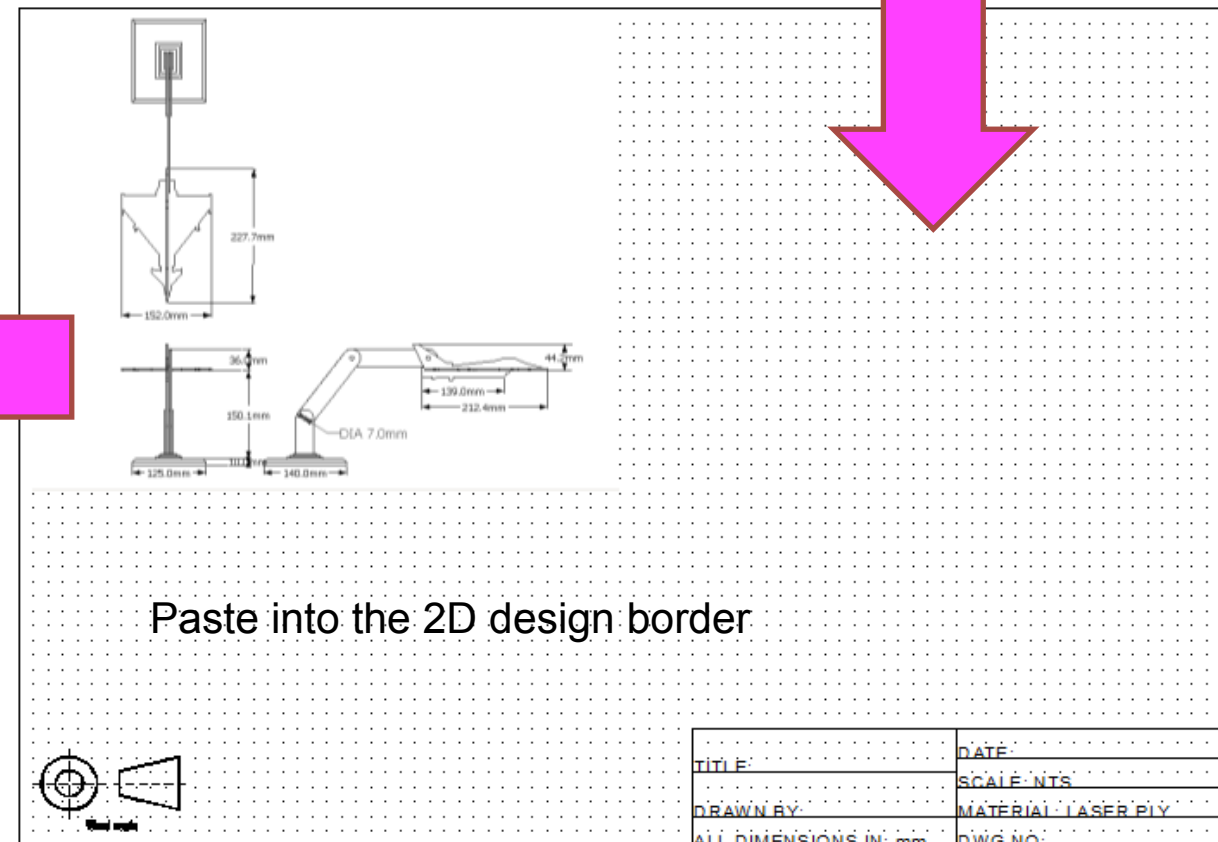
Paste into Power point first and then crop.



Press print screen again.



Resize appropriately



Paste into the 2D design border

# Computer Aided Design: Aircraft Lamp Working Drawing

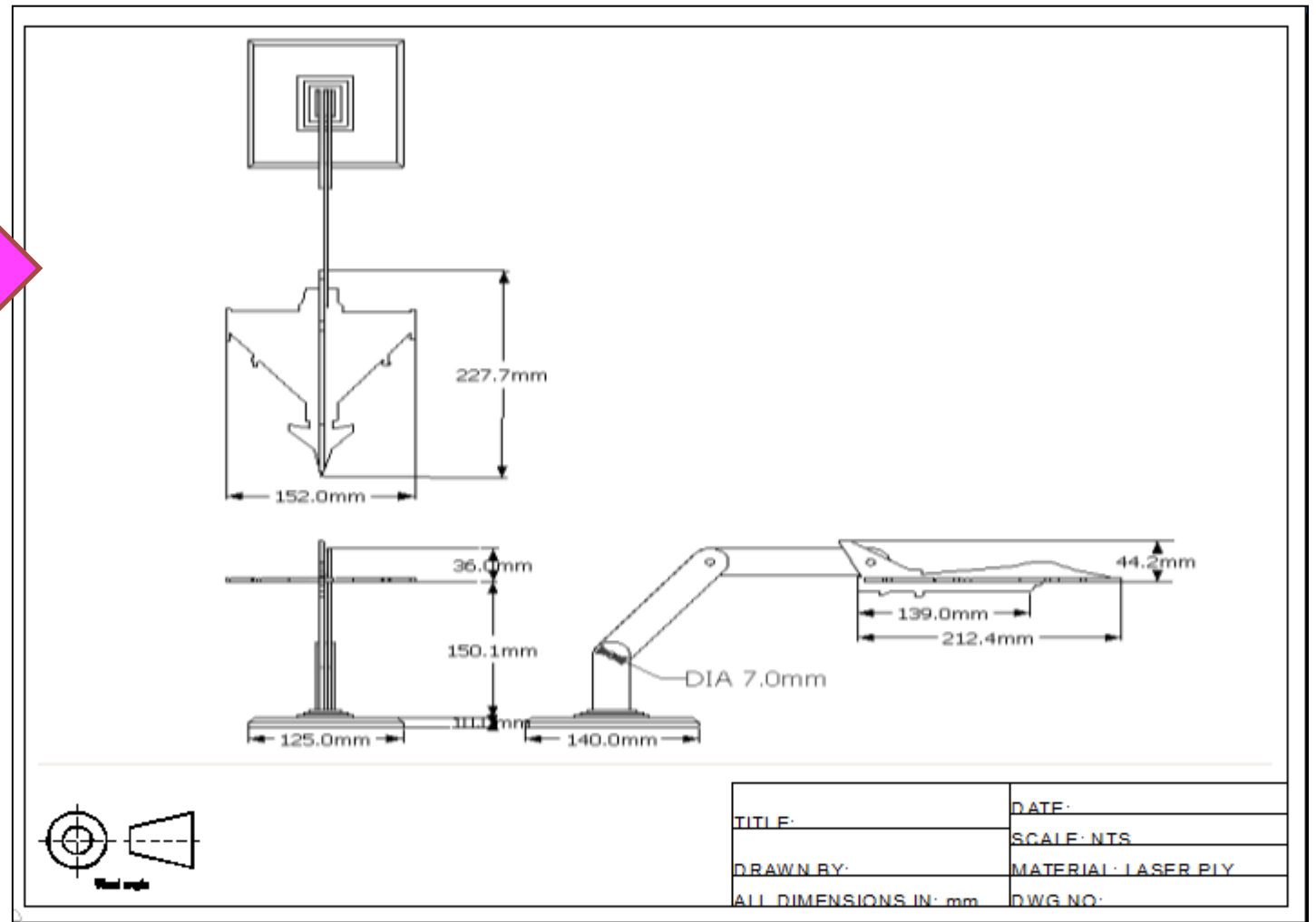
## Computer Aided Engineering: 2. Working Drawing (Importing DXF into 2D Design)



Click the dots **OFF**



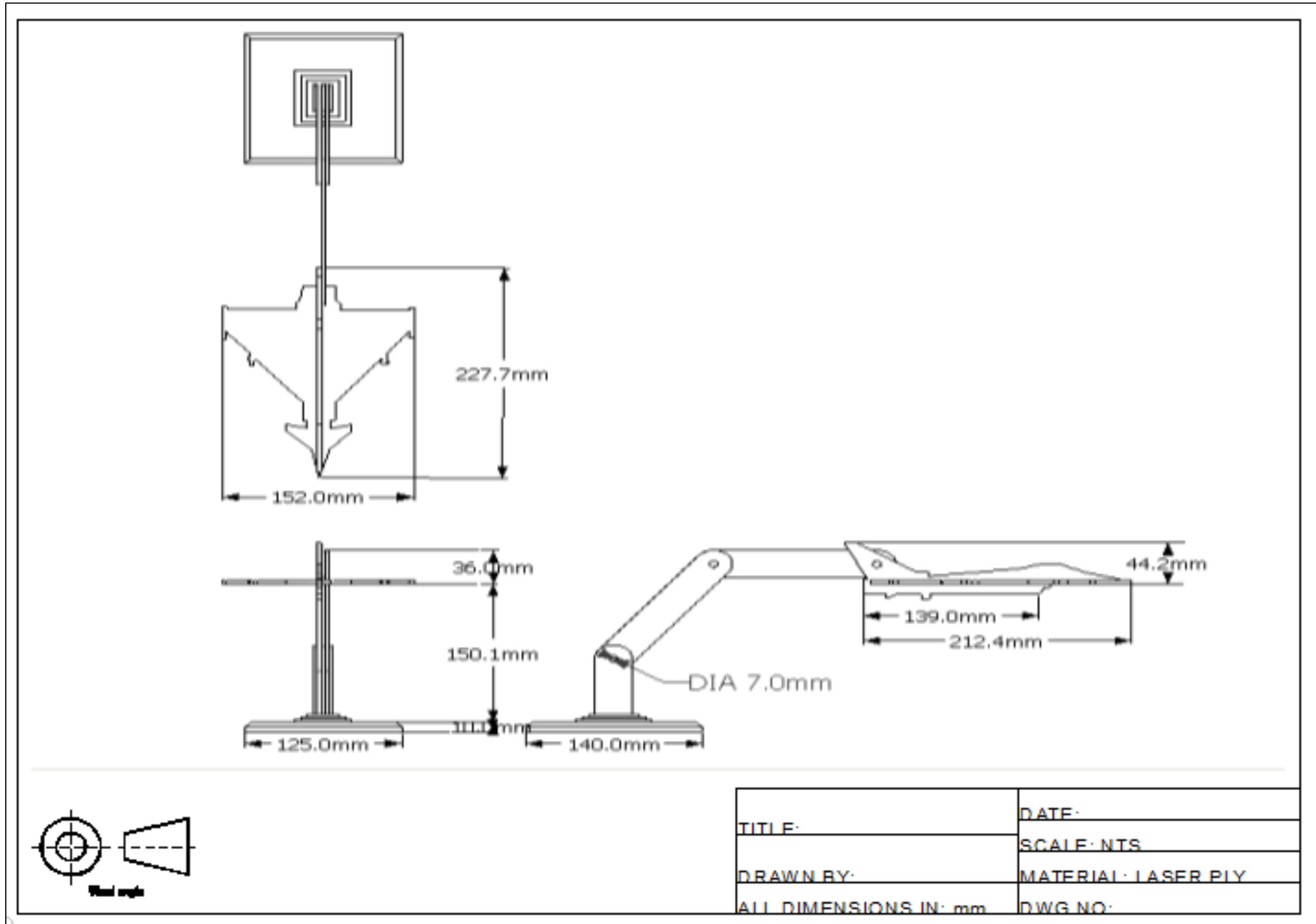
Complete the border at the bottom of the page  
**Title**  
**Drawn by**  
**Date**



Print screen and paste into your folder. Drawing on the next page represents a correct Engineered Lamp drawing. If yours **does not look like this you cannot achieve a level 2**

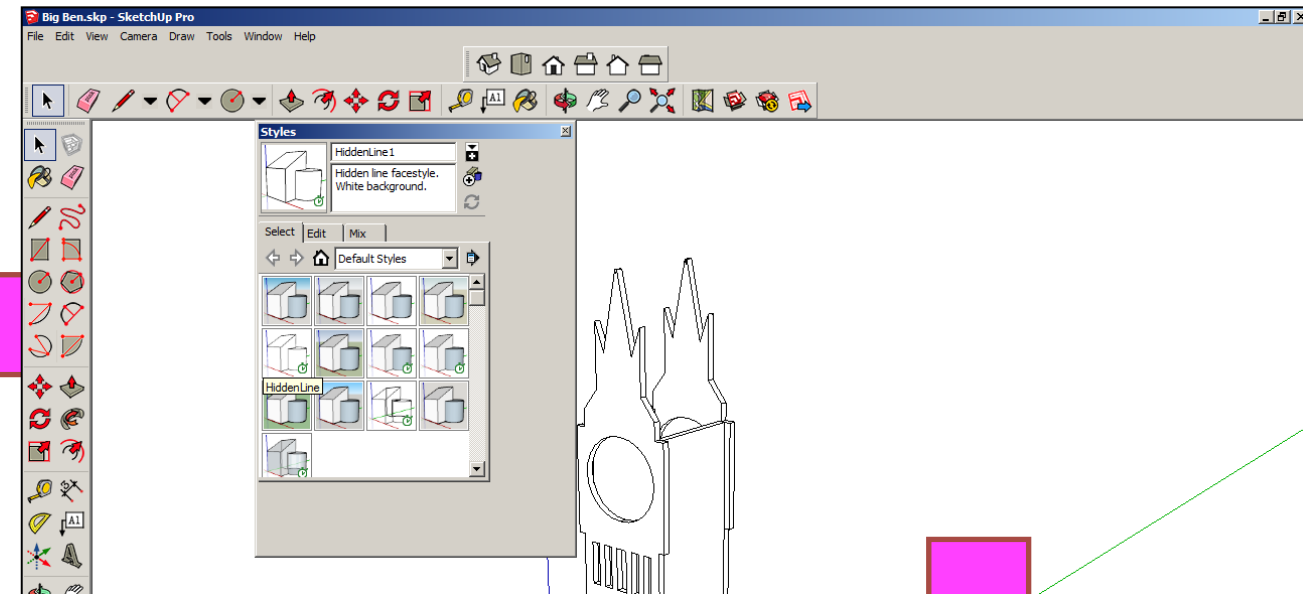
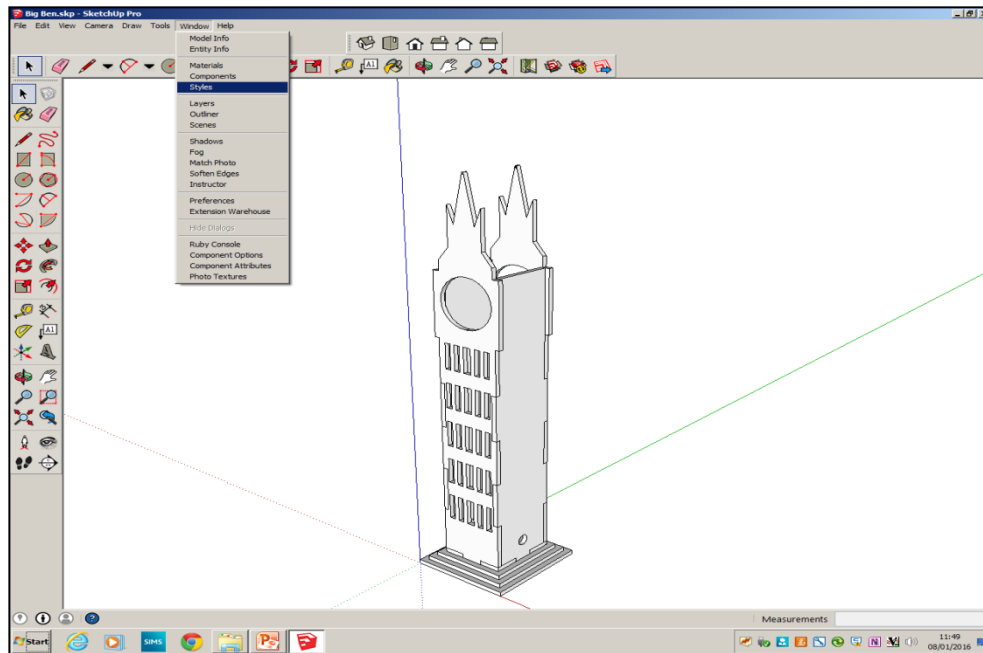
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Computer Aided Engineering: 2. Working Drawing (Importing DXF into 2D Design)



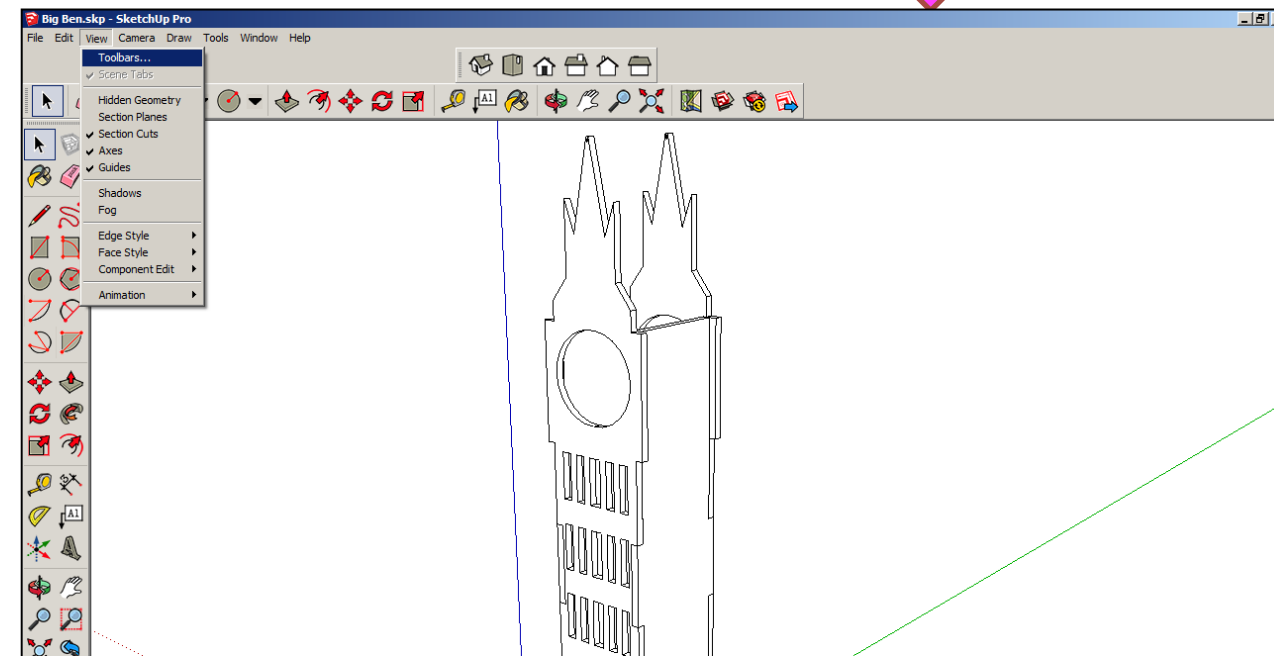
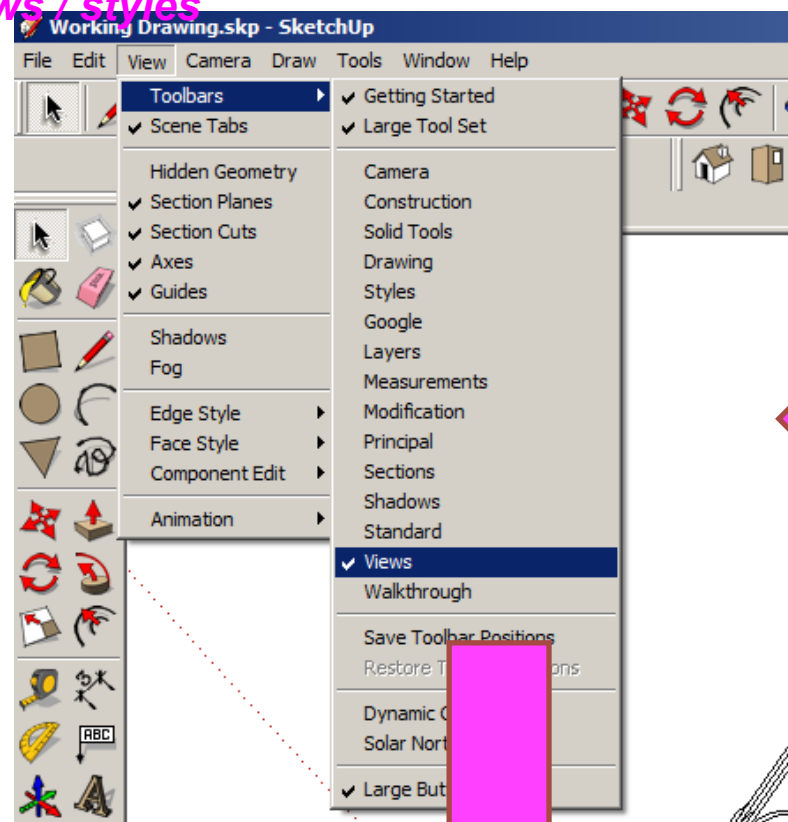
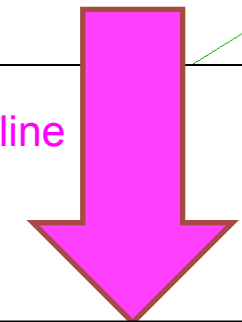
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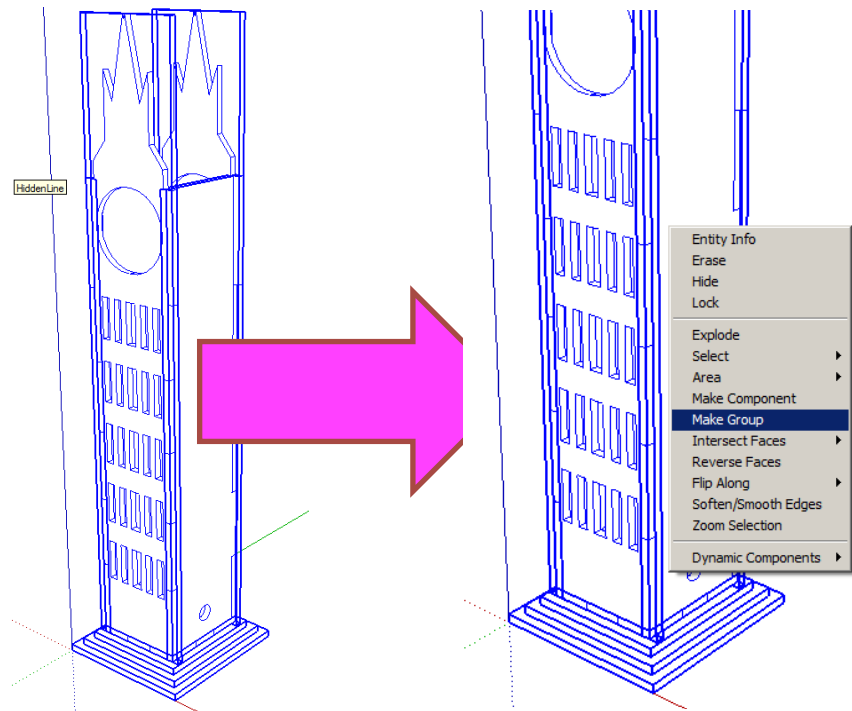


Click on **Toolbars / Views**

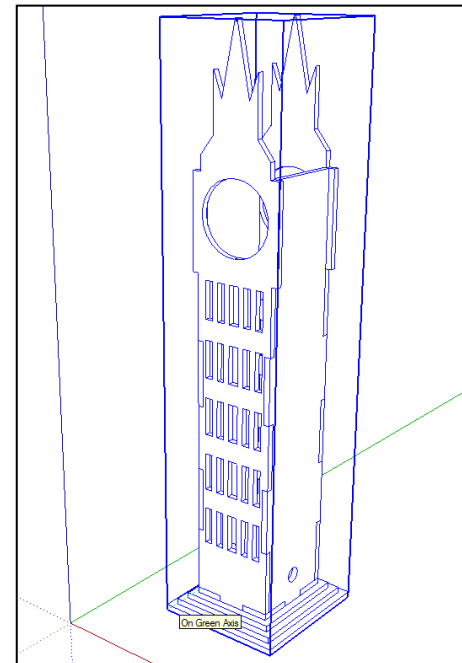


# Computer Aided Design: Aircraft Lamp Working Drawing

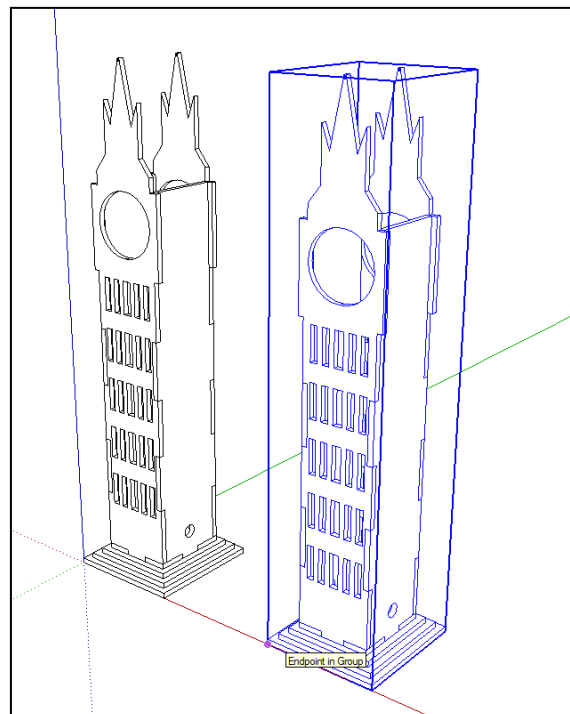
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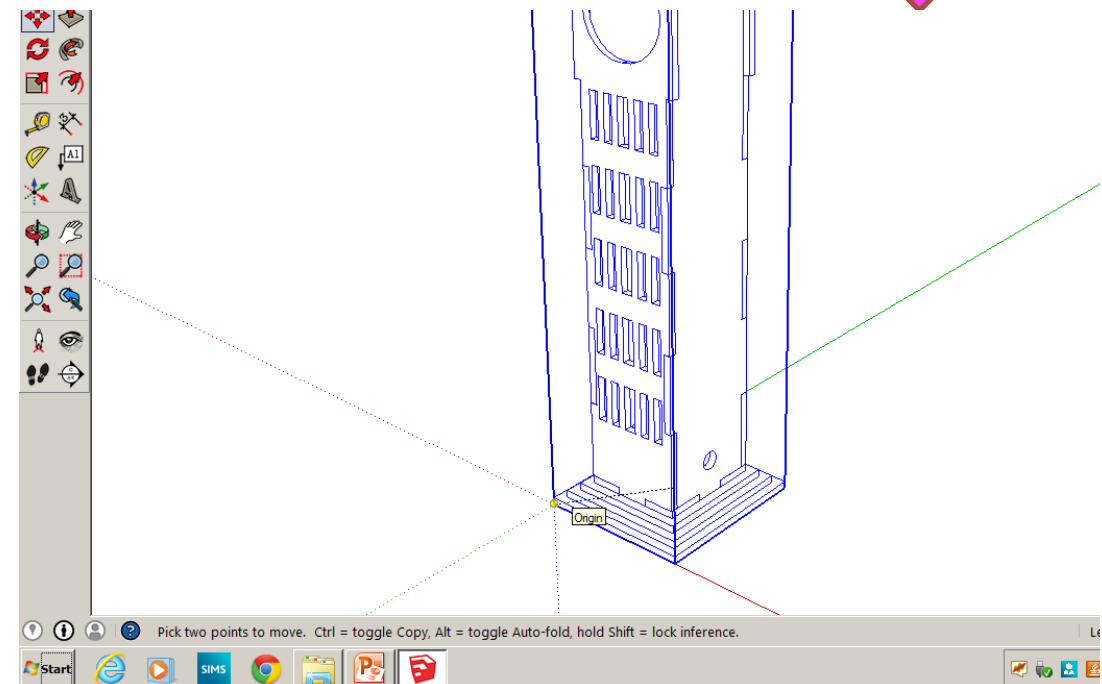
Highlight the entire lamp and right click **make group**



Click on bottom left **corner of lamp** using the **move tool**



Copy and move a second lamp along the **red axis**

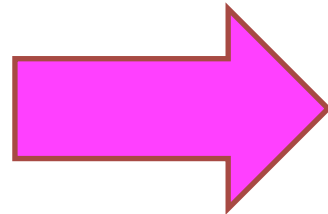
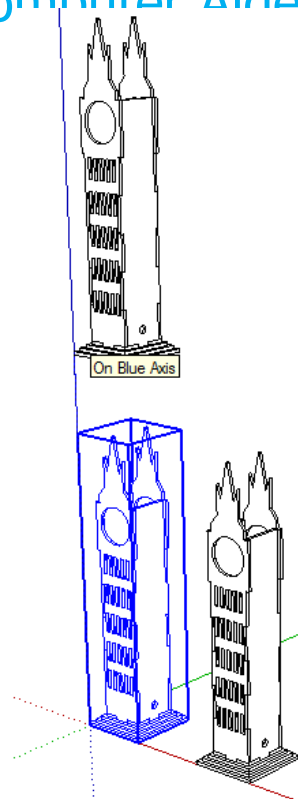


Click on the **move tool** and move the lamp so the corner is on the origin

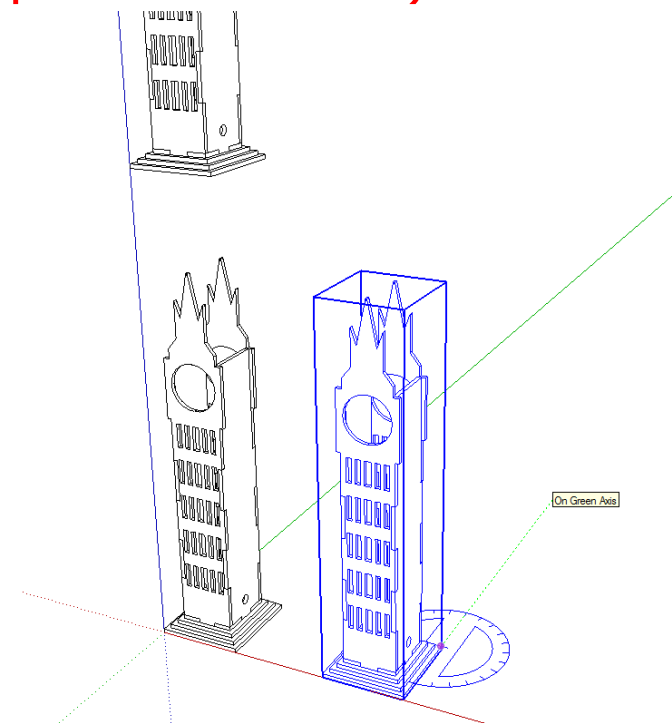


# Computer Aided Design: Aircraft Lamp Working Drawing

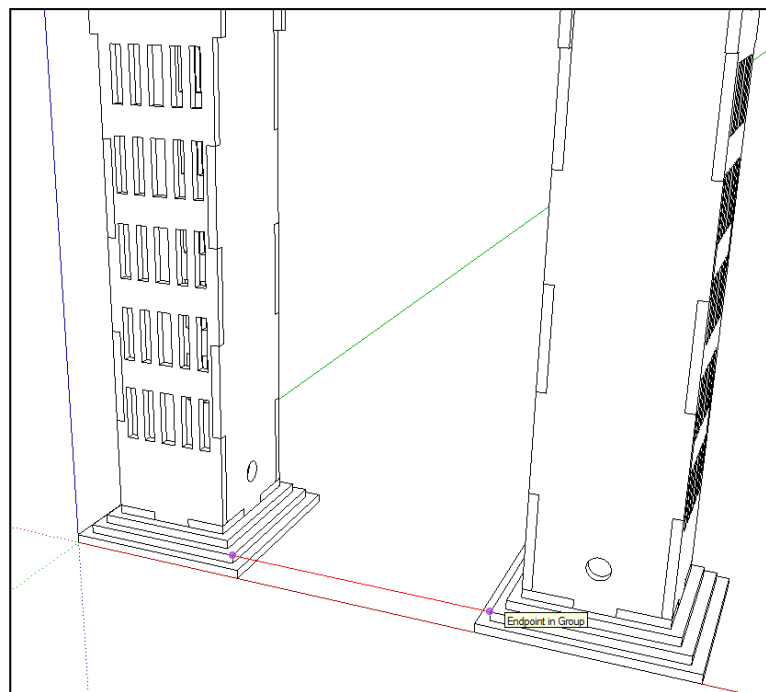
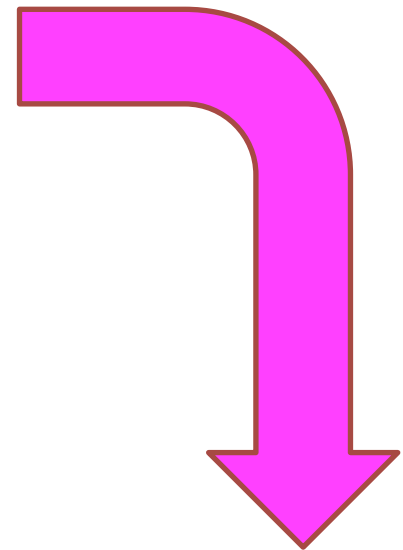
## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



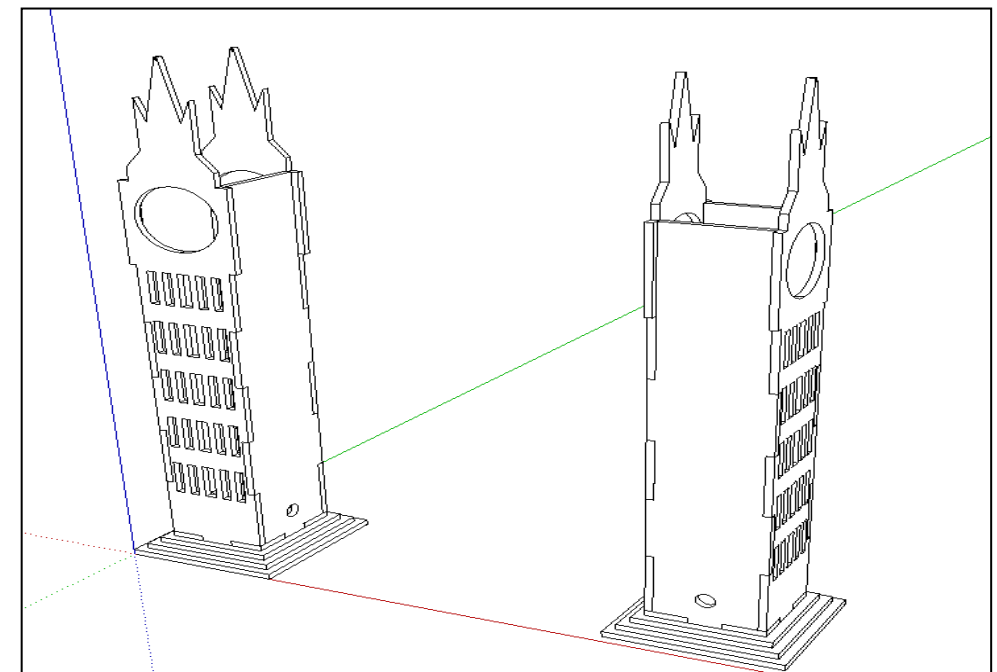
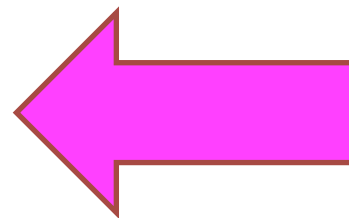
Copy and move a second lamp along the **blue axis**



Click on the rotate tool and turn the lamp **around 90 degrees as shown below**



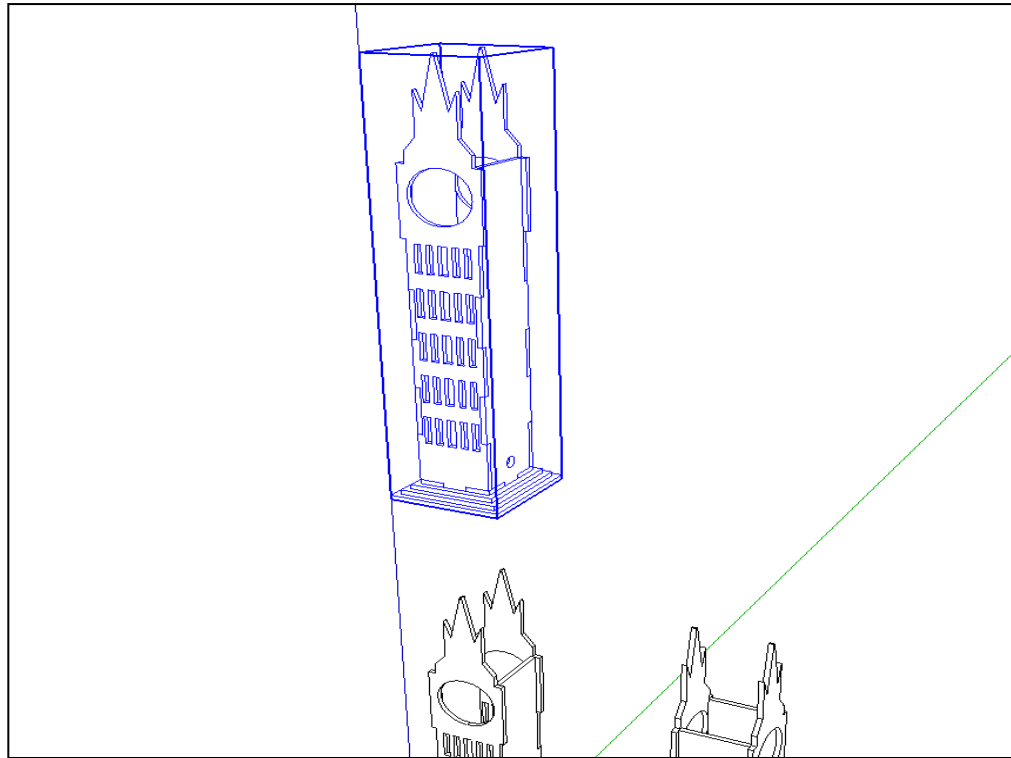
Click on the **move tool** along the red axis. You should be able to draw a line that turns red from corner to corner to indicate it lines up exactly



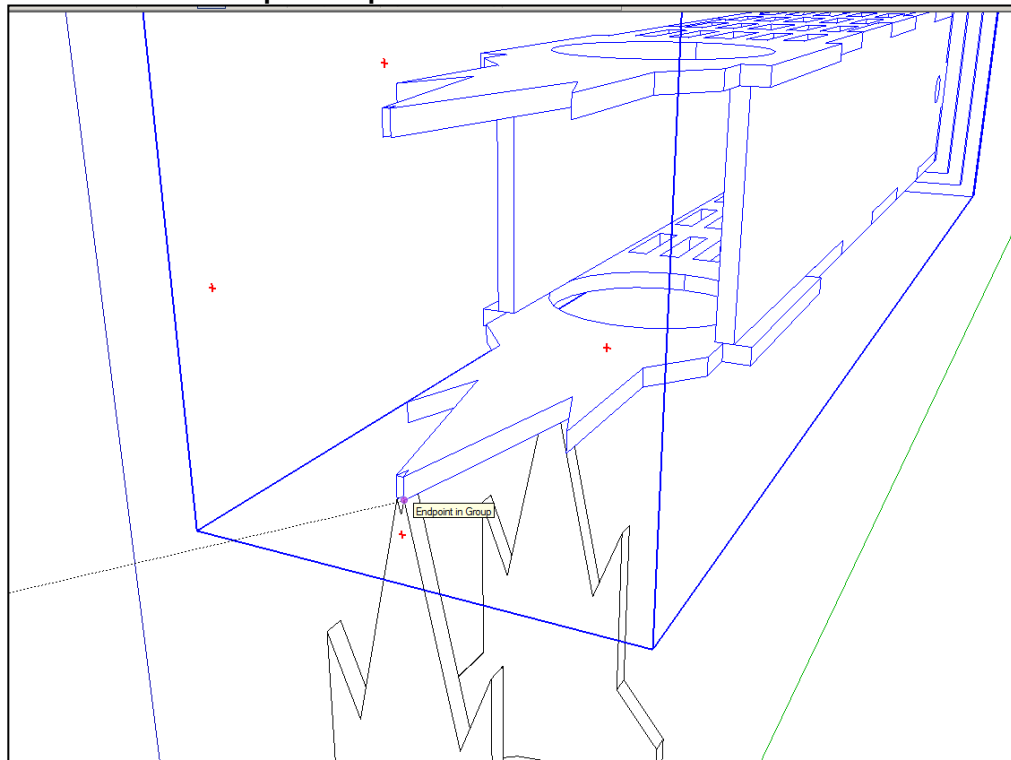
Click on the **move tool** and move the lamp so the corners of the base meet

# Computer Aided Design: Aircraft Lamp Working Drawing

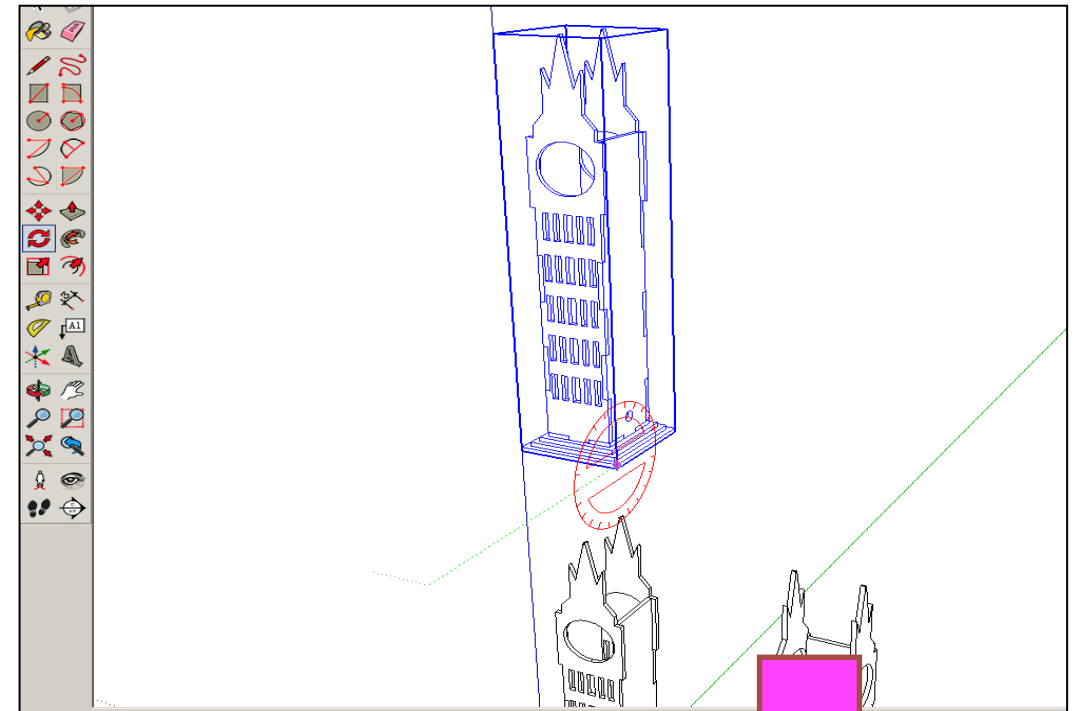
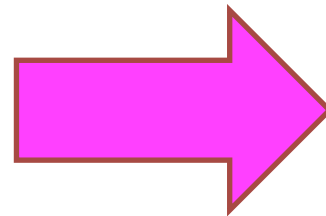
## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



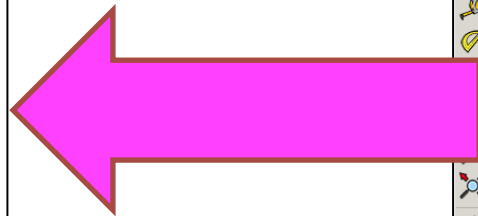
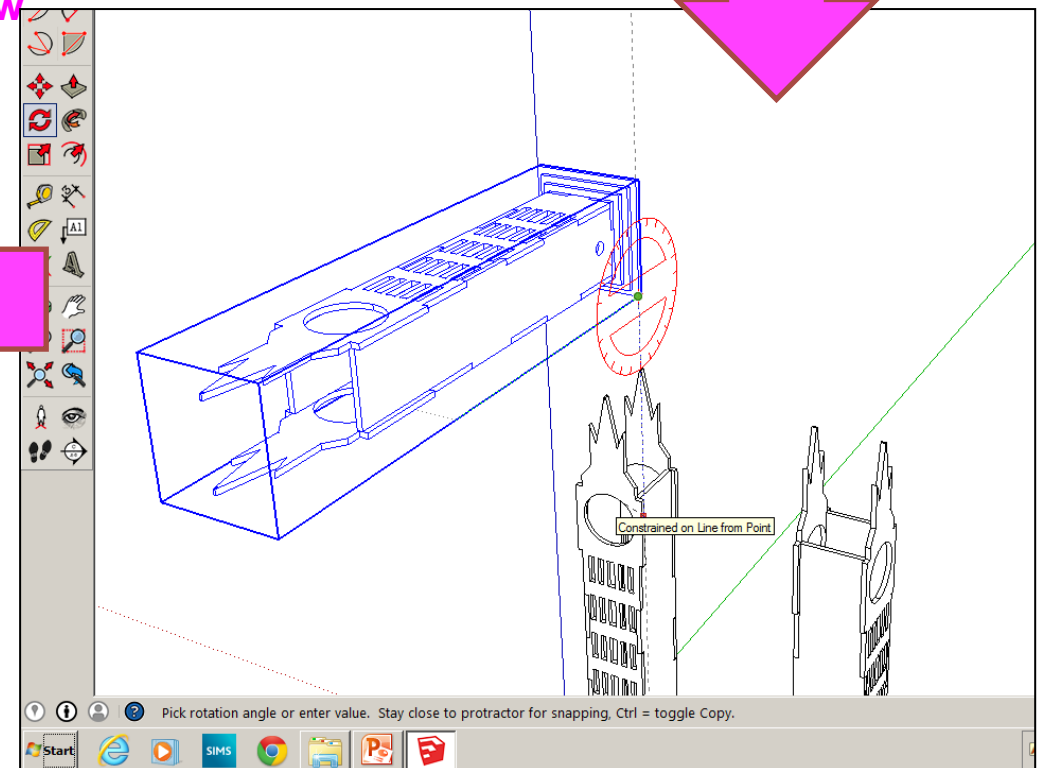
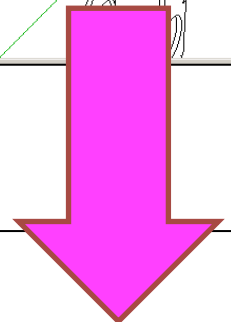
Click on the top lamp



Click on the **move tool** and move the lamp so the corners of the base meet

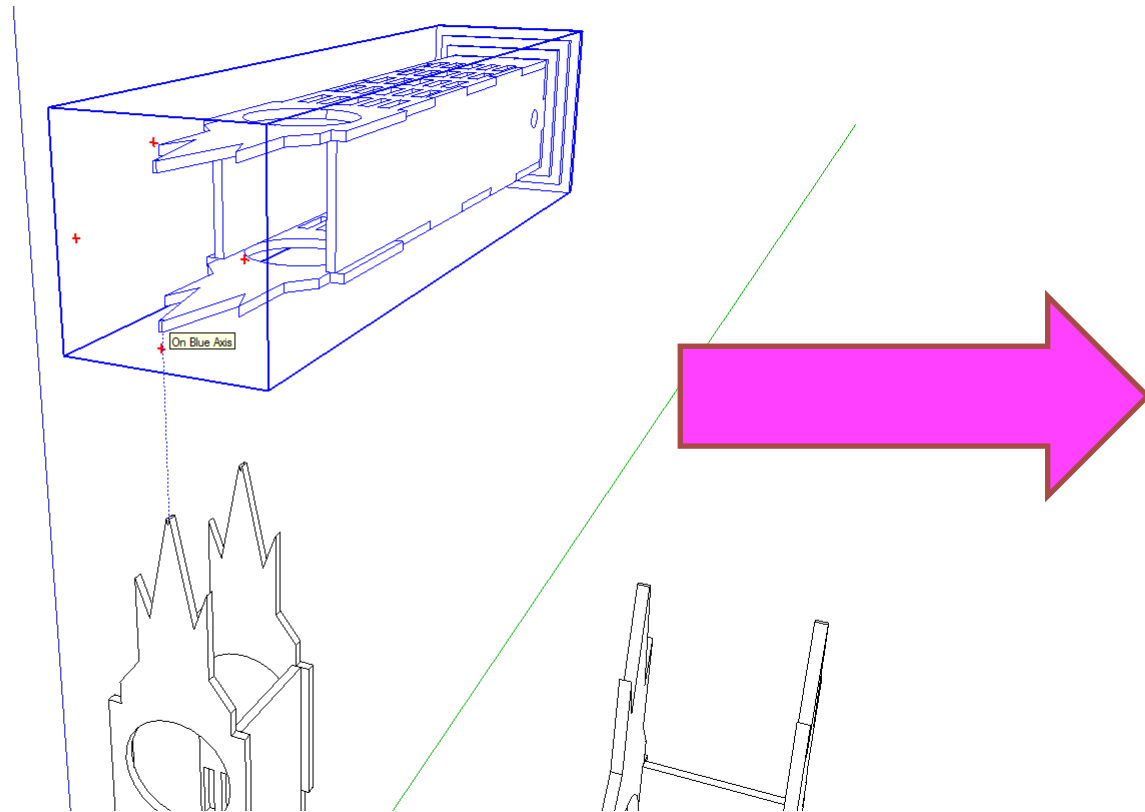


Click on the rotate tool and turn the lamp **around 90 degrees as shown below**

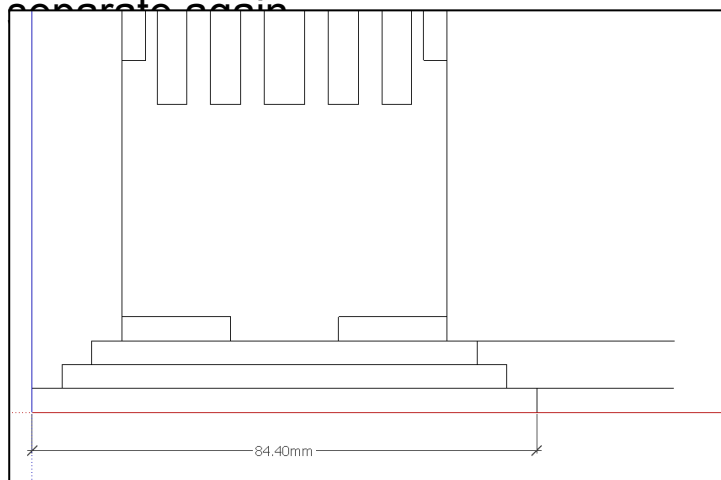


# Computer Aided Design: Aircraft Lamp Working Drawing

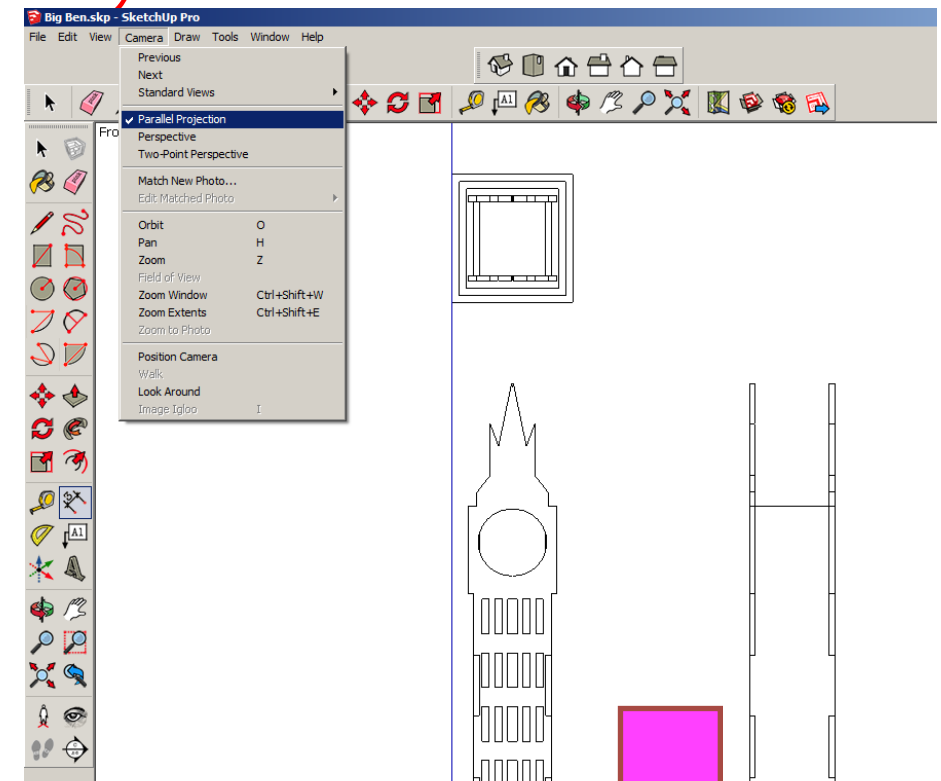
## Computer Aided Engineering: 2. Working Drawing (Adding Dimensions)



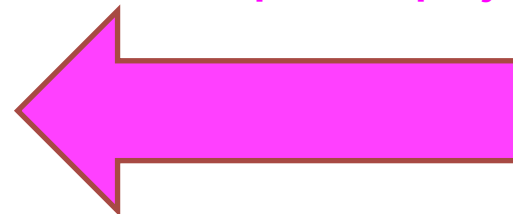
Click on the **move tool** and move the lamp so the corners of the base meet and then generate again.



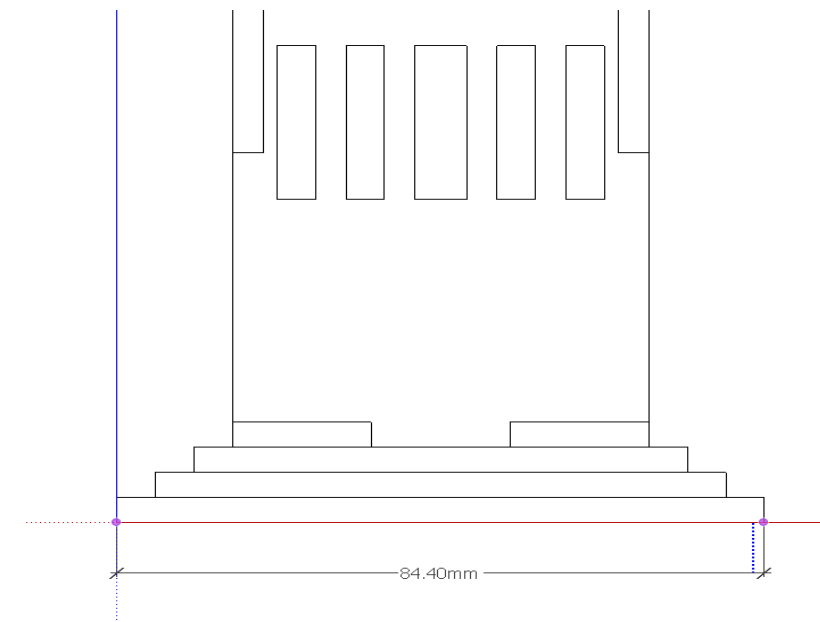
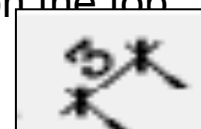
Certain points are difficult to add sizes using the pencil tool to line up edges as shown above.



Click on the **front view** using the **view toolbar** and the **camera parallel projection**



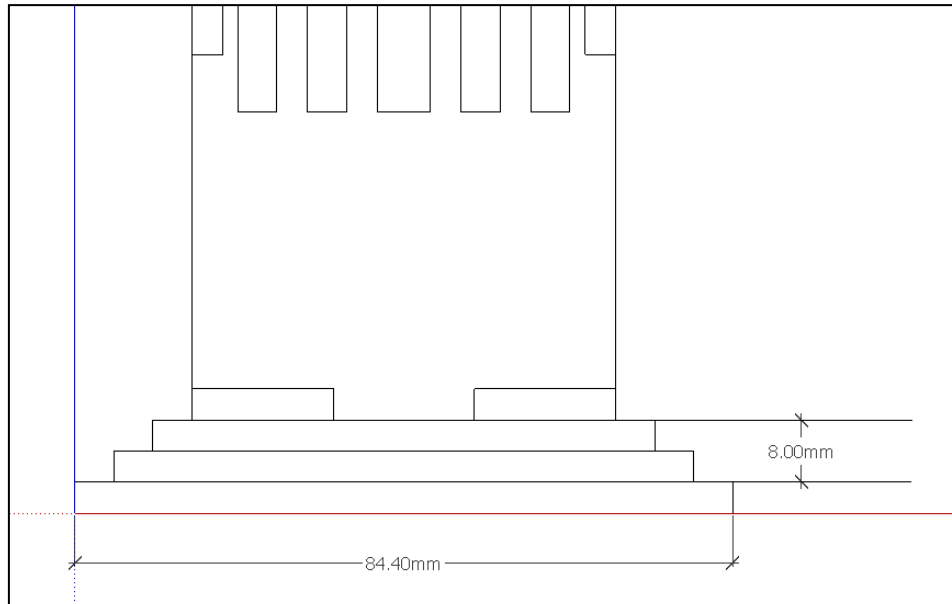
Click on the **dimensions tool bar** and add sizes. All sizes should be below and to the right. Never on the left hand side or on the top.



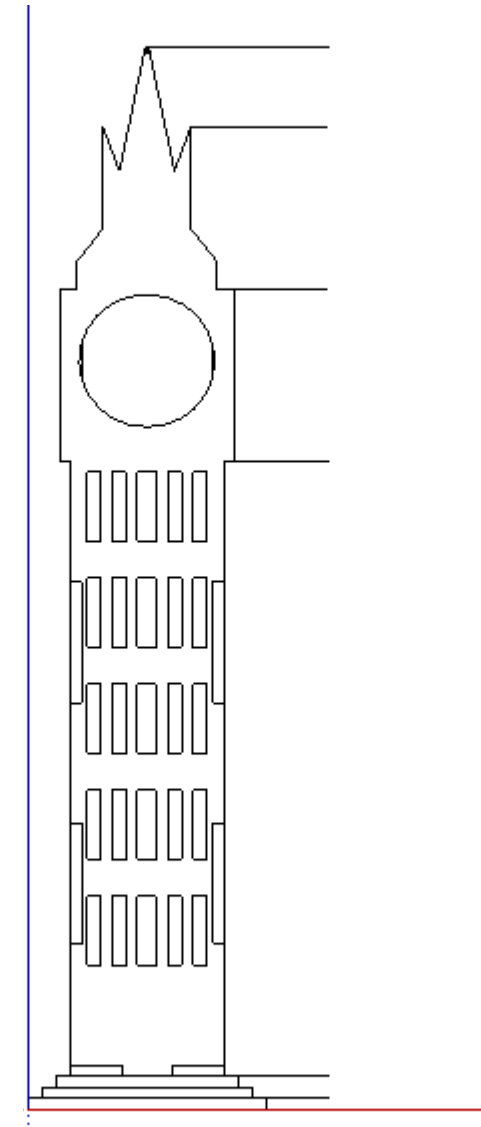
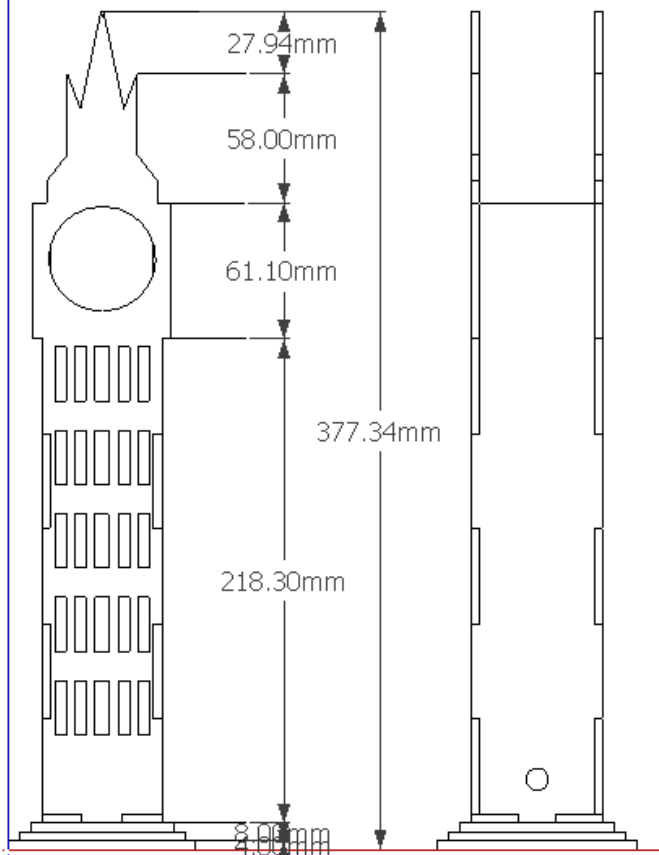
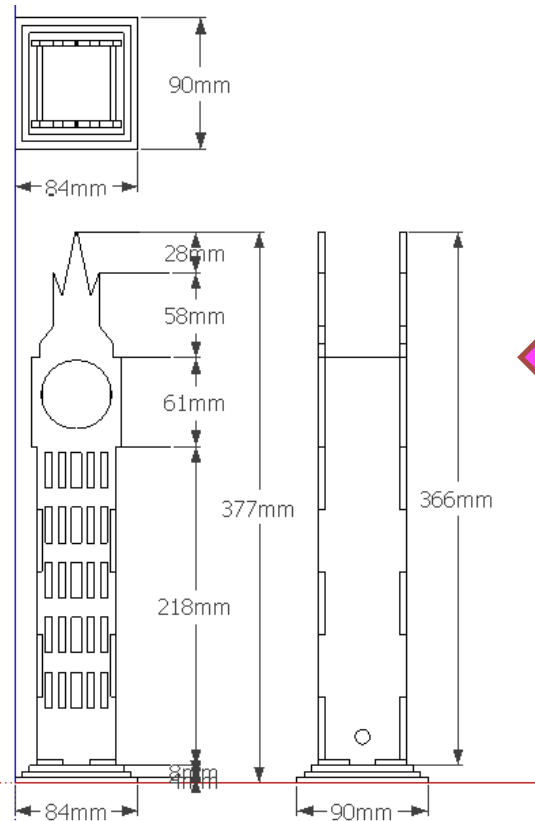


# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)

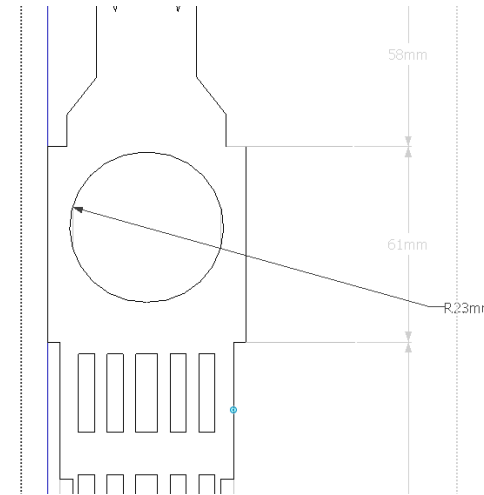
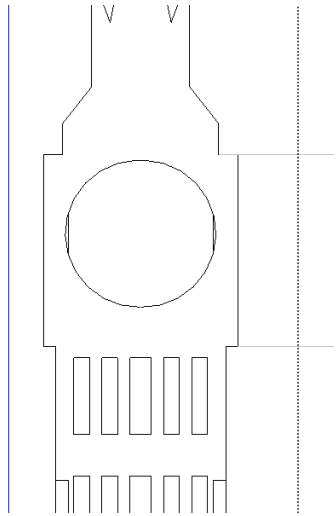


Add sizes to show height, width and any other important sizes. You will compare these to the lamp later on



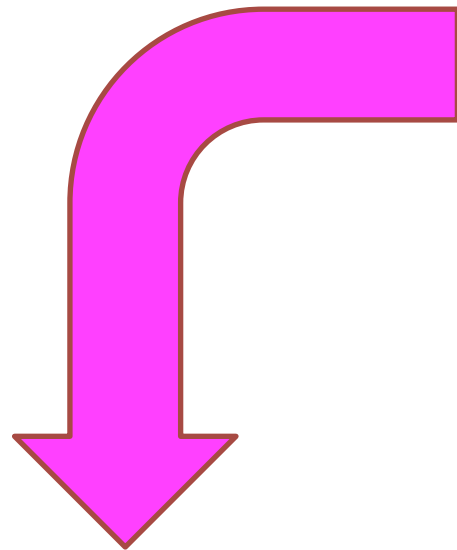
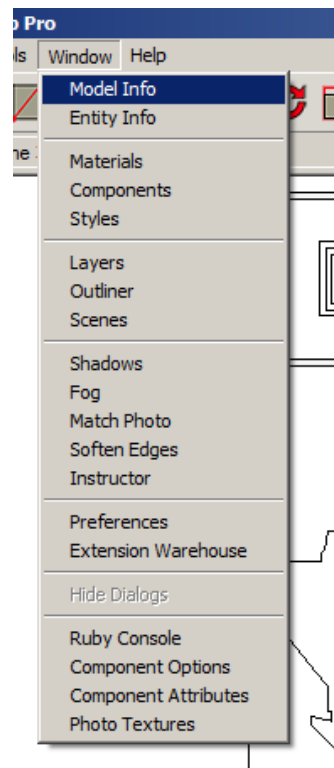
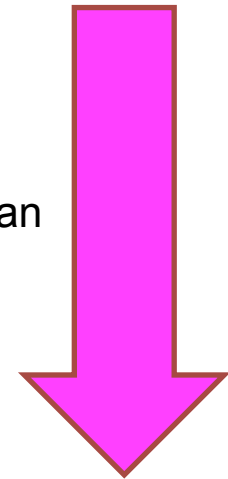
# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)

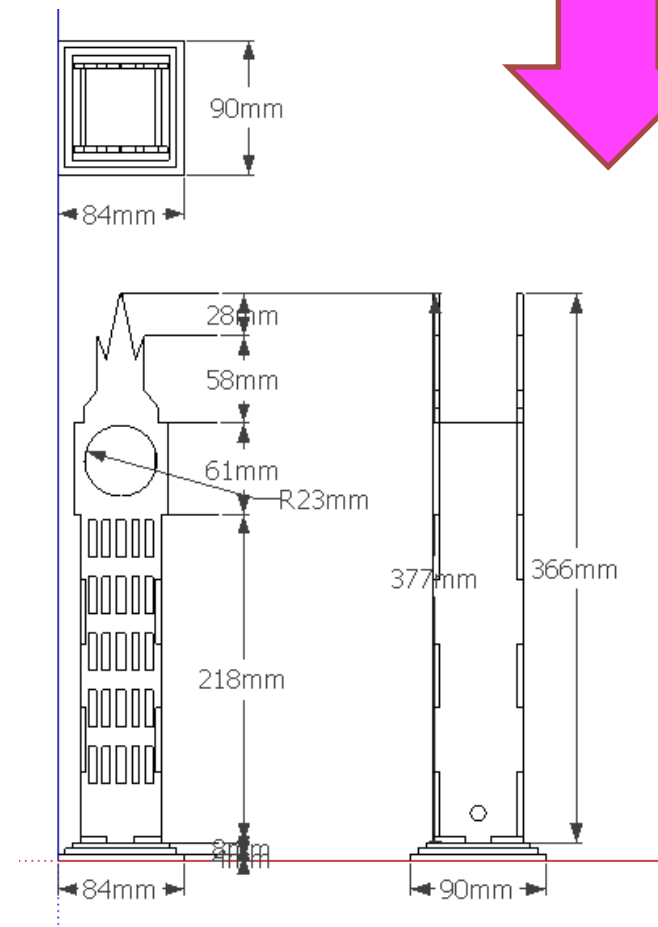
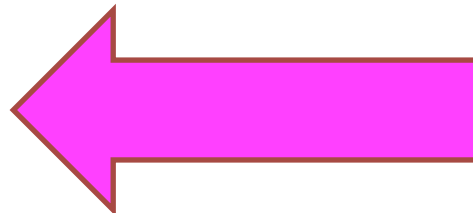


If the object is grouped you may need to double click to add some sizes and radius

Add sizes to the three drawings Front, Side and Plan

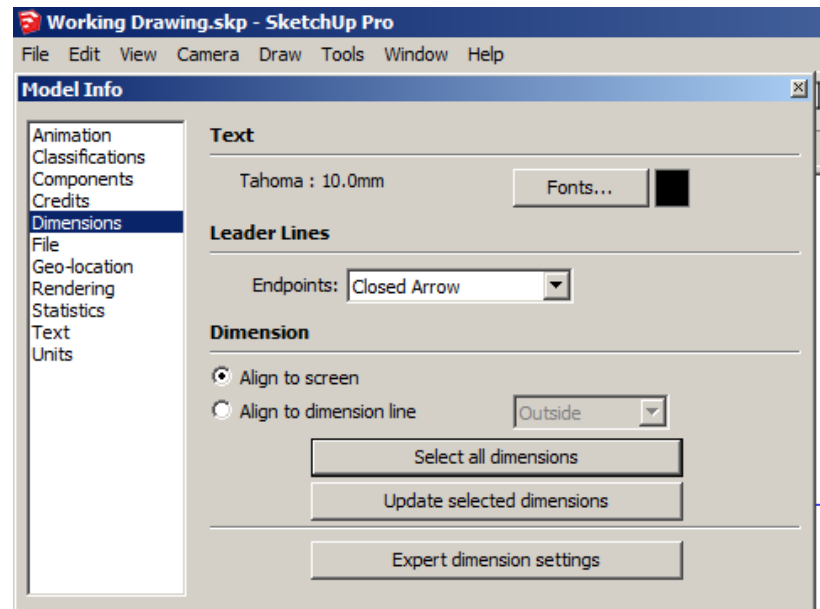


Click on *Window / Model Info*

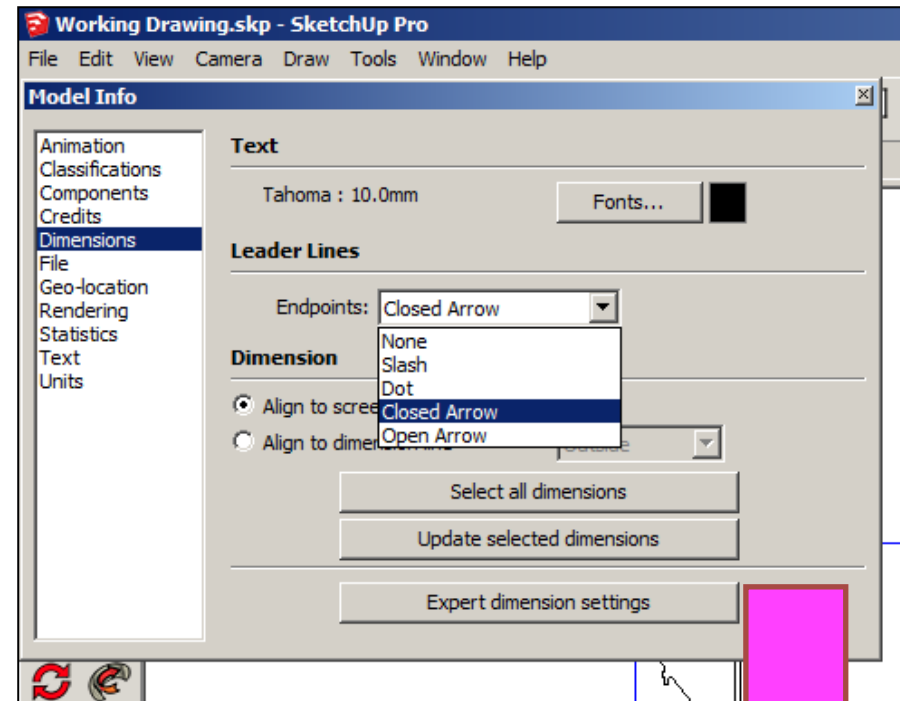


# Computer Aided Design: Aircraft Lamp Working Drawing

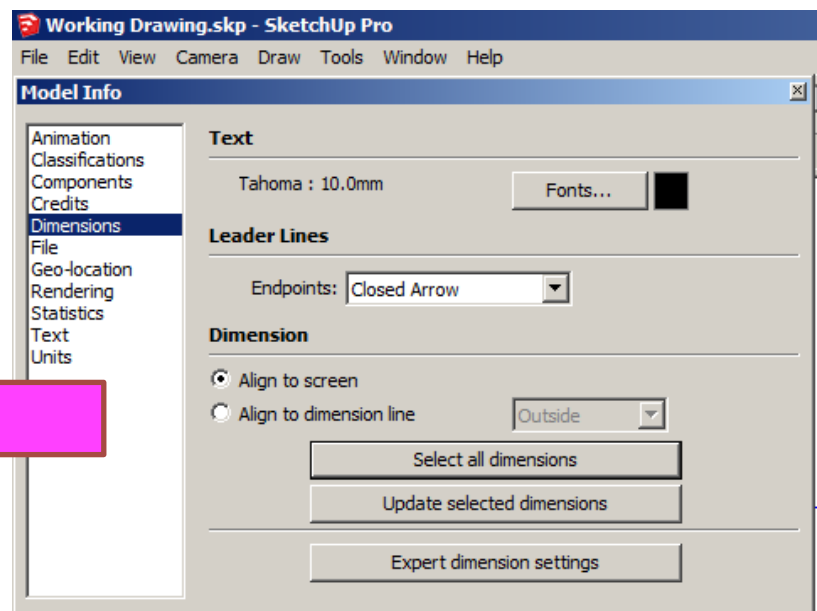
## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



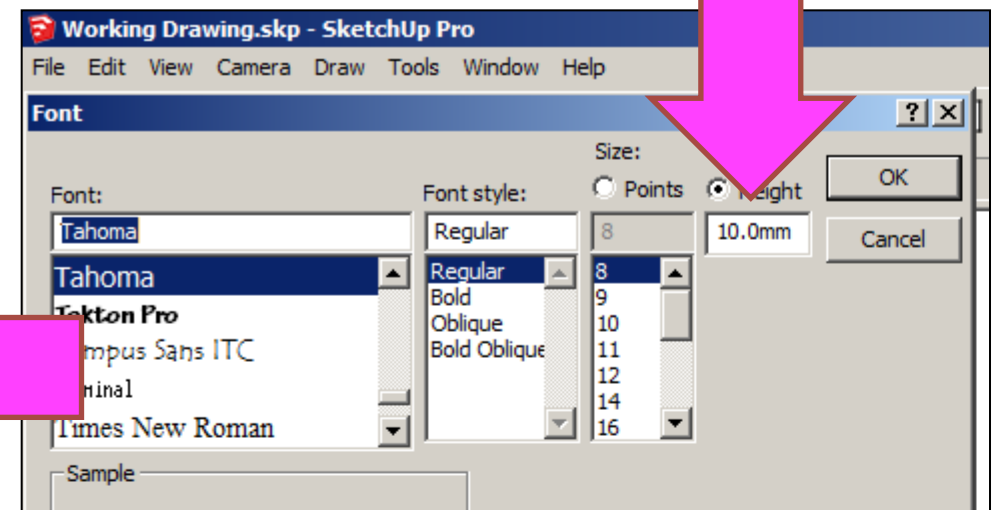
Click on **Dimension** and select all dimensions



Click on **Endpoints** and select closed arrow from the drop down menu



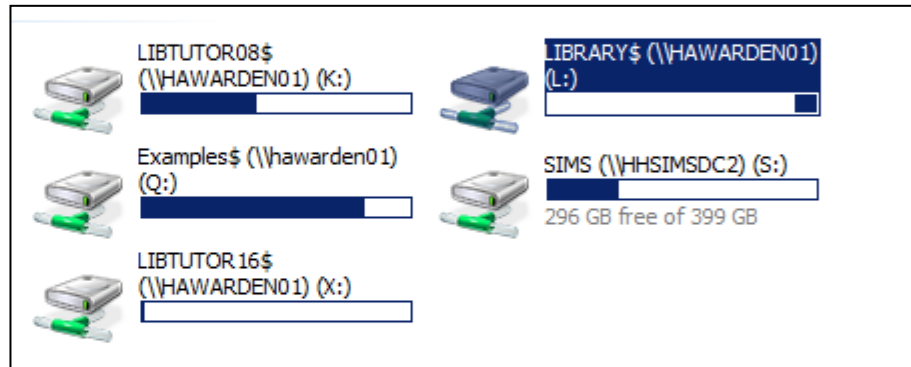
Click on **Update all dimensions**. The dimensions should change on the screen. When your happy close window down.



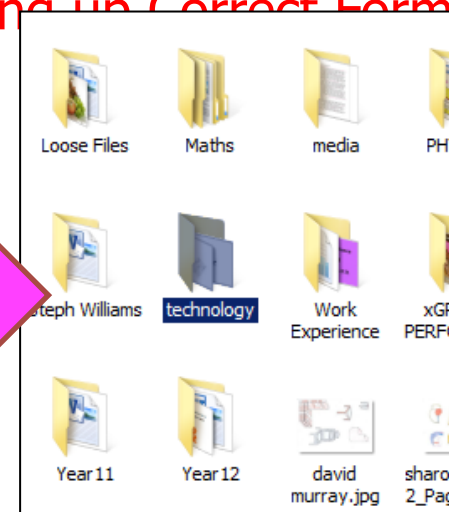
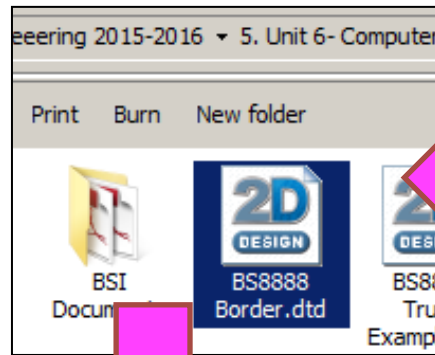
Click on **Fonts** and select a suitable size to be able to read the sizes on your drawing. You may have to repeat the above steps until your happy.

# Computer Aided Design: Aircraft Lamp Working Drawing

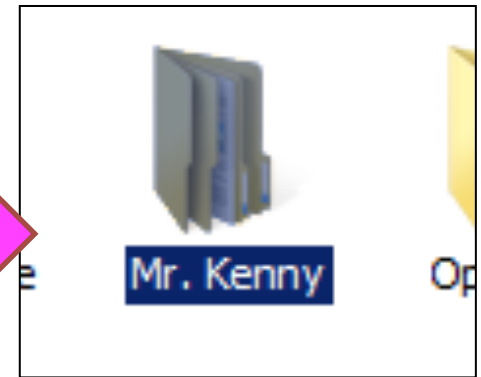
## Computer Aided Engineering: 2. Working Drawing (Setting up Correct Format)



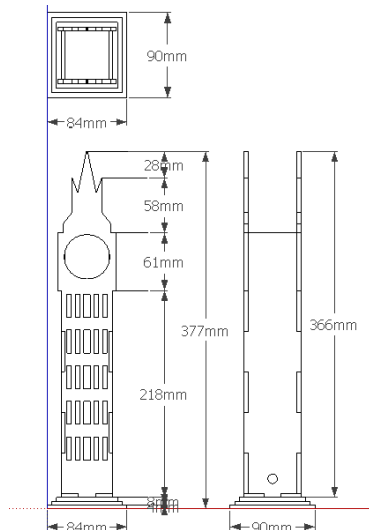
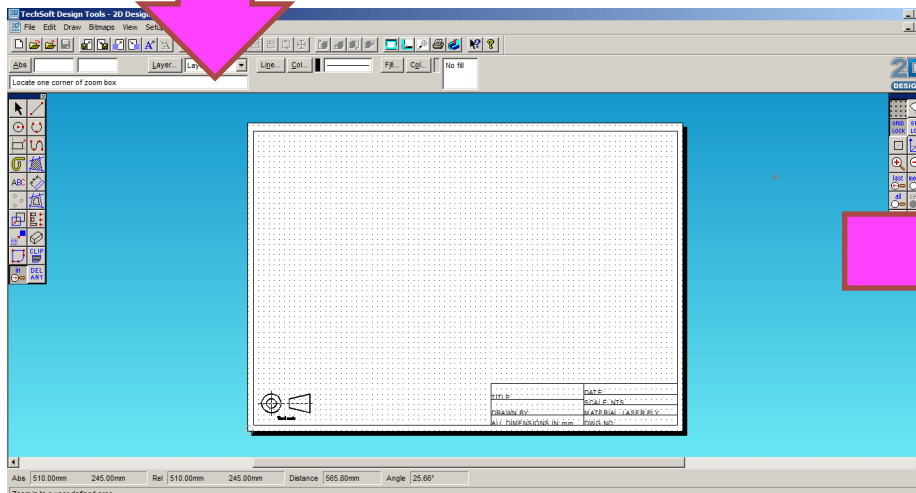
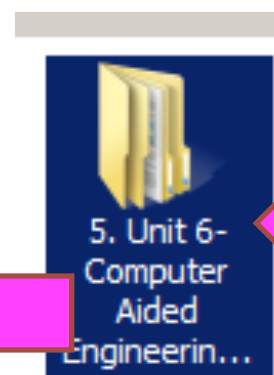
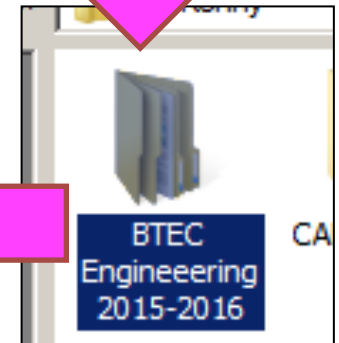
Click on *Library*.



Click on *Technology*.



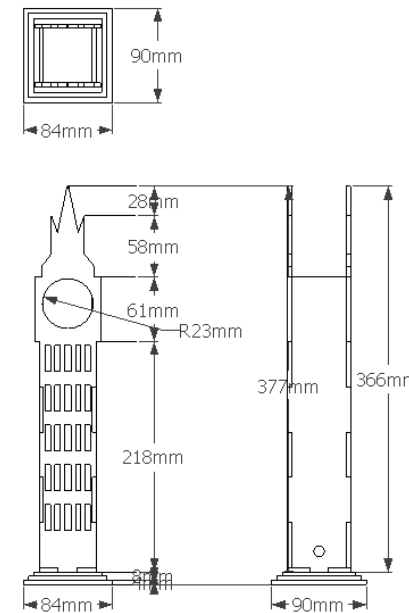
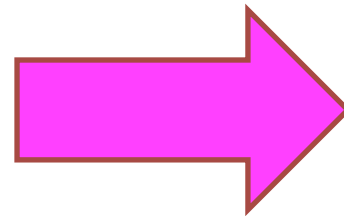
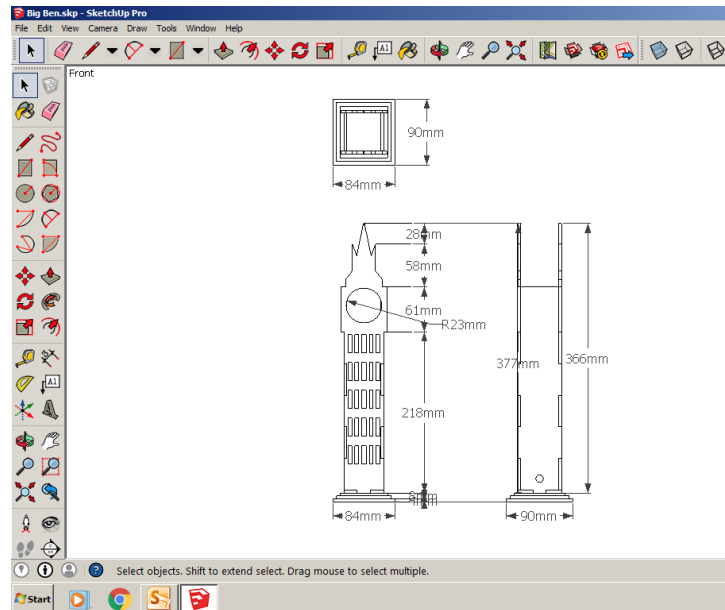
Click on *Mr Kenny*.



Go back to your working drawing. *Click on camera / Parallel projection, then view and click the axis off and then press print screen*

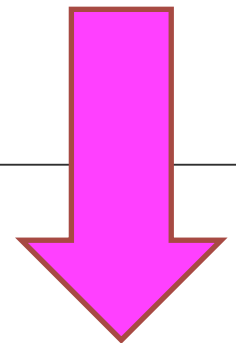
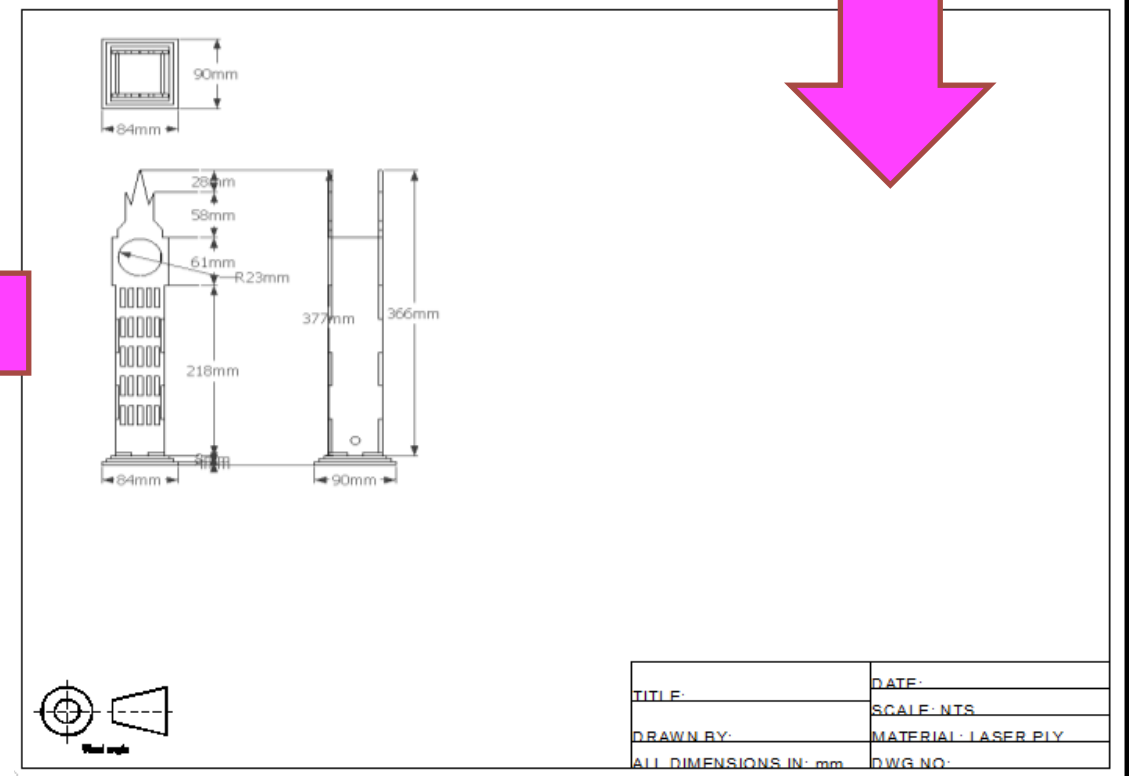
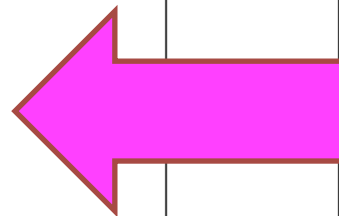
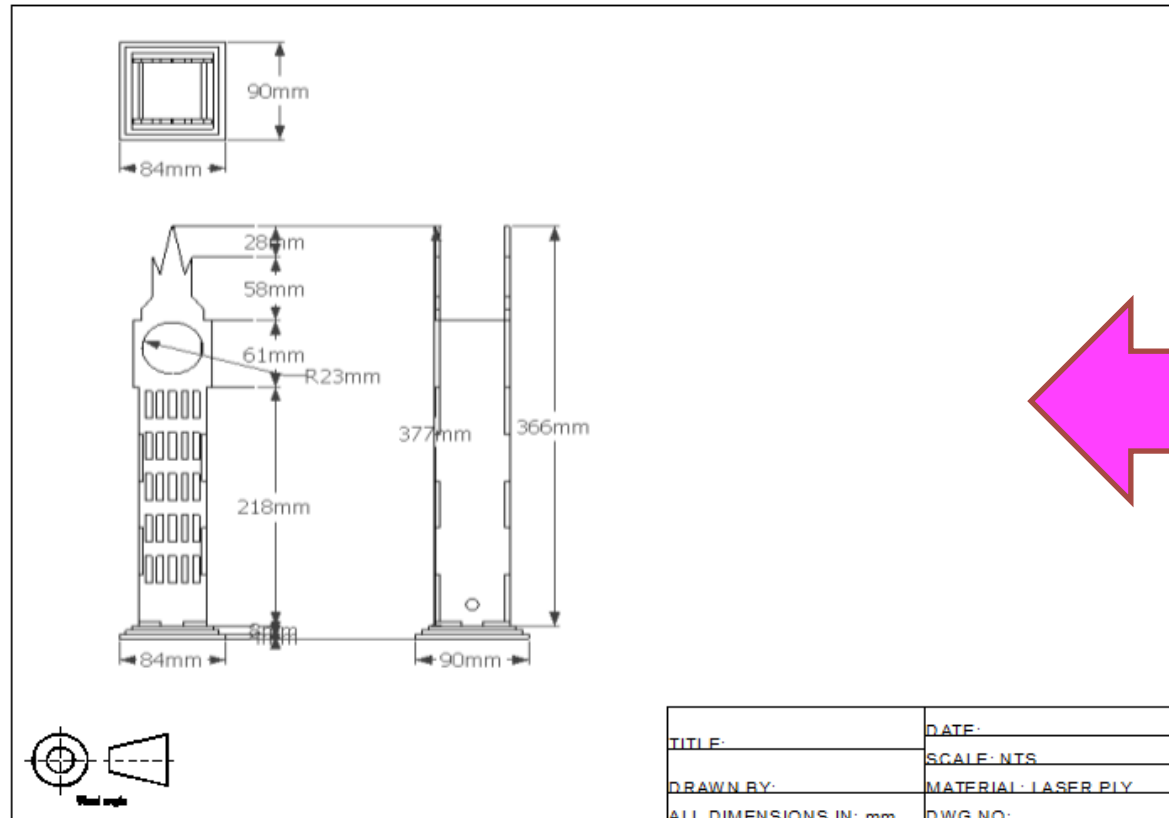
# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 2. Working Drawing (Importing DXF into 2D Design)



Press print screen again.

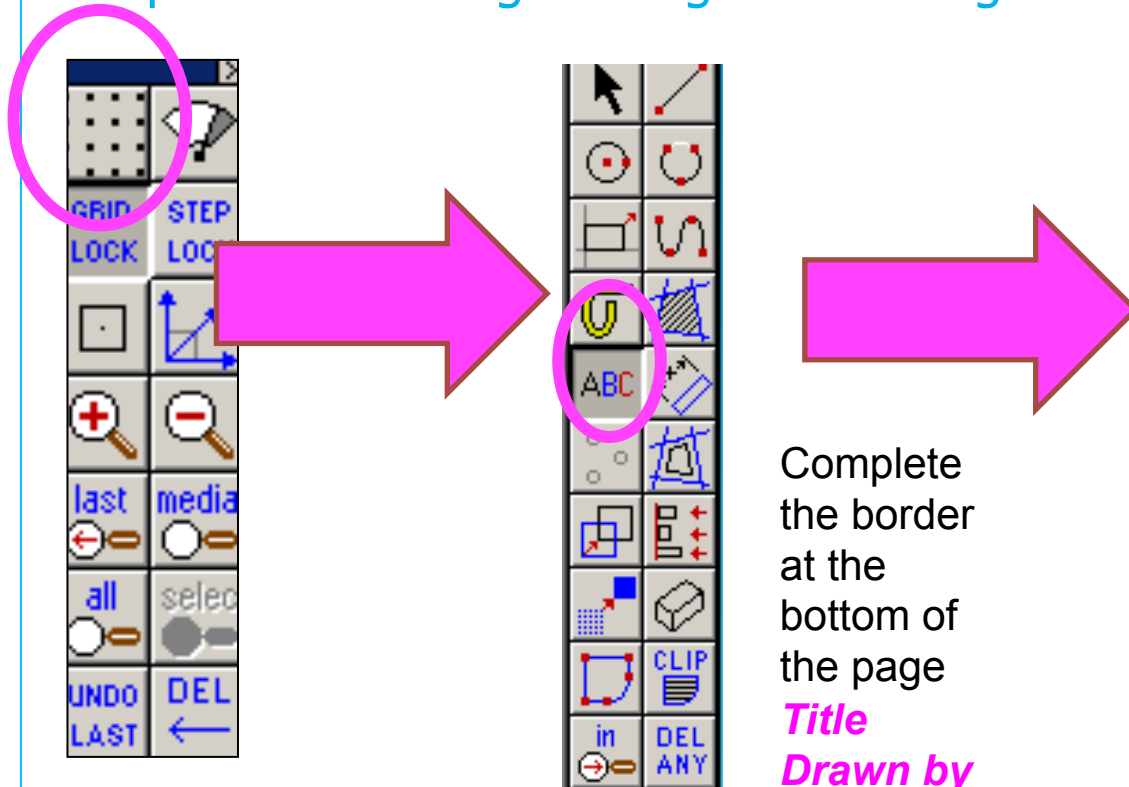
Paste into Power point first and then crop.



Resize appropriately

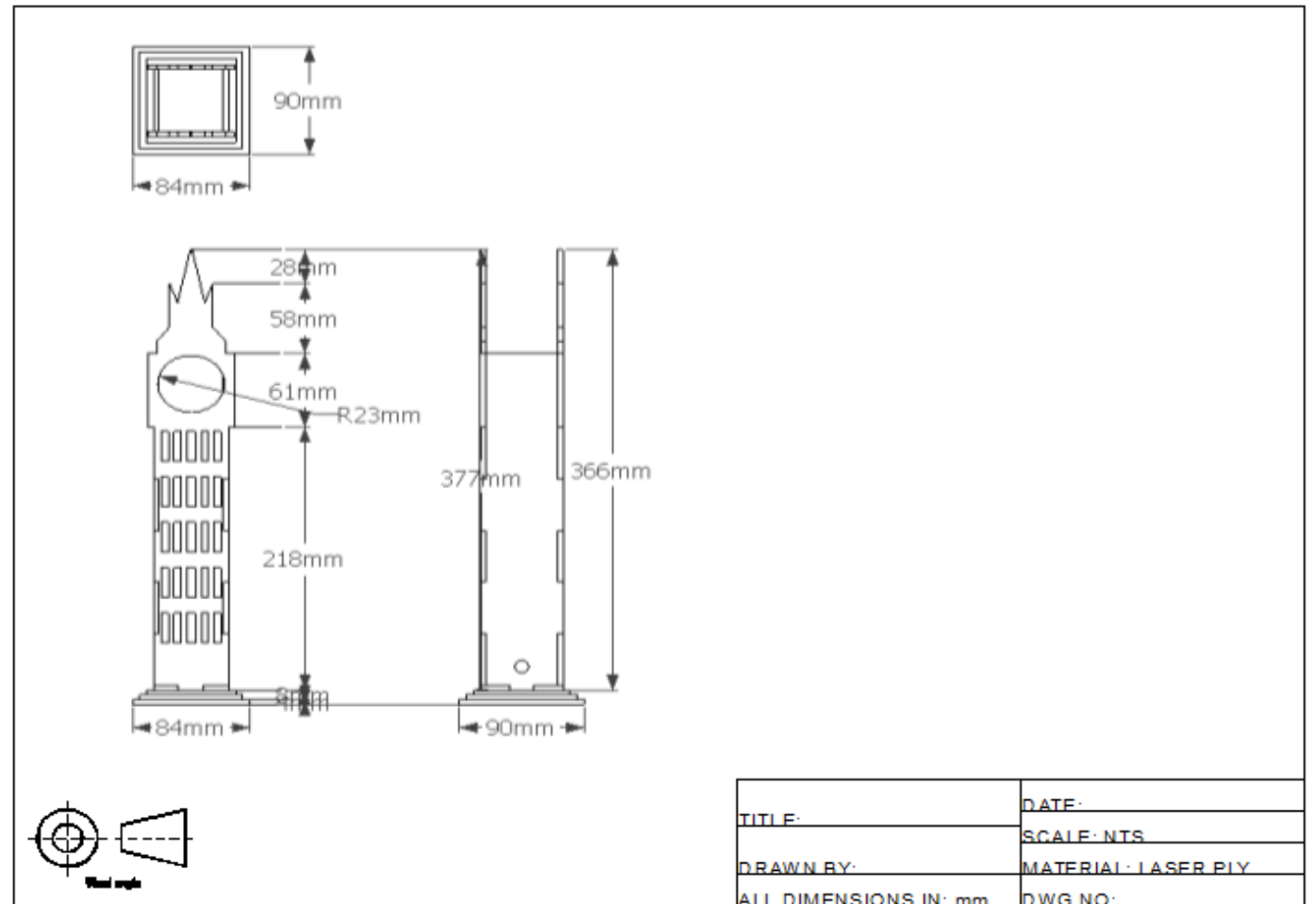
# Computer Aided Design: Aircraft Lamp Working Drawing

## Computer Aided Engineering: 2. Working Drawing (Importing DXF into 2D Design)



Click the dots **OFF**

Complete the border at the bottom of the page  
*Title*  
*Drawn by*  
*Date*



Print screen and paste into your folder. Drawing on the next page represents a correct Engineered Lamp drawing. If yours **does not look like this you cannot achieve a level 2**

# Computer Aided Design: Aircraft Lamp Working Drawing

Computer Aided Engineering: 2. Working Drawing (Importing DXF into 2D Design)

