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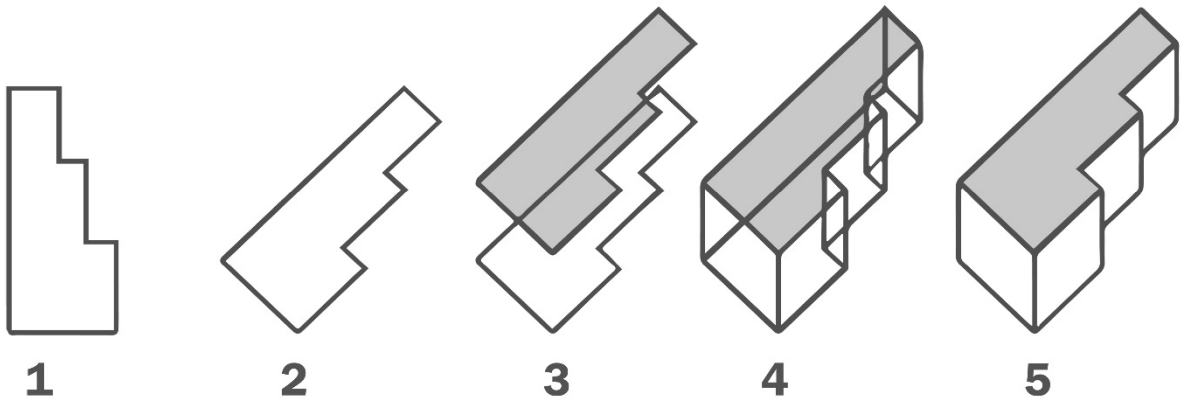

MANCHESTER | URBAN DESIGN | LAB

MUD-Lab Toolkit
Axonometric Perspectives

In this handout you will be introduced to axonometric perspectives. The handout aims to teach you how to draw them, using both hand drawing techniques and software, how to use them as a design tool and when to use them.

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1-INTRODUCTION

Axonometric perspectives are useful urban designs tools that can be used in both the analysis and the design stages, in addition to using them in the final presentation. An axonometric perspective is distinguished from the two point perspective by its parallel lines in which its lines do not head toward the vanishing points. They are useful because:

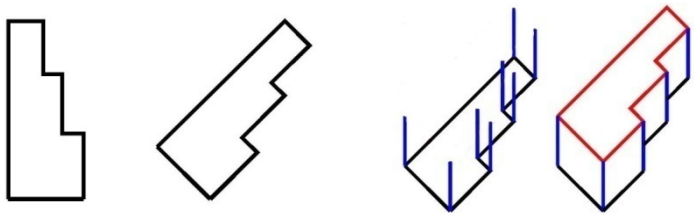
1- Unlike other types of perspectives, the axonometric perspective is drawn to scale. So we can measure the actual heights and dimensions in them and;

2-They are easy to draw and do not require artistic skills.

So axonometric perspectives are used to present a measurable 3D view of space. In the analysis stage they are helpful to show the existing building heights, shapes and ratios of different elements. On the other hand, in the design stage they can be used to give different alternatives and to express different ideas that are difficult to show in the 2D layout. Axonometric perspectives can be presented as sketches, rather than detailed and completely accurate presentations in the design stage. However, they should present approximate measurements in this case in order to be fully functional.

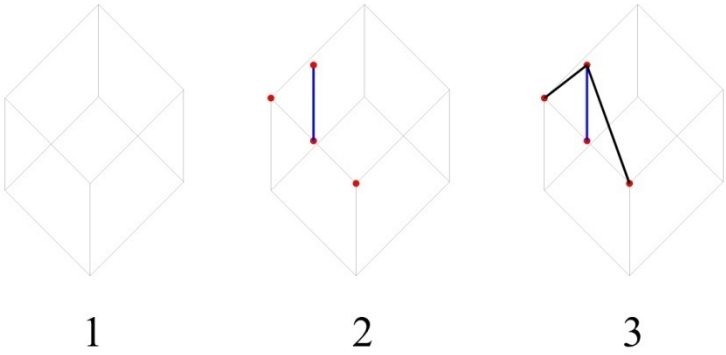
2-THE BASICS

The concept is simple. You need to rotate the 2D layout to an angle, preferably 45 degrees. Then you have to draw vertical lines from each corner (remember to draw them to the same scale of the layout). Next you need to connect between the end points of the lines to create a closed box as shown below.



1 2 3 4

The same concept applies to different shapes and roofs. However, you might need to project up the midpoint, or certain points, on certain lines other than the corners in order to extrude, for example, gable roofs as the examples show below:



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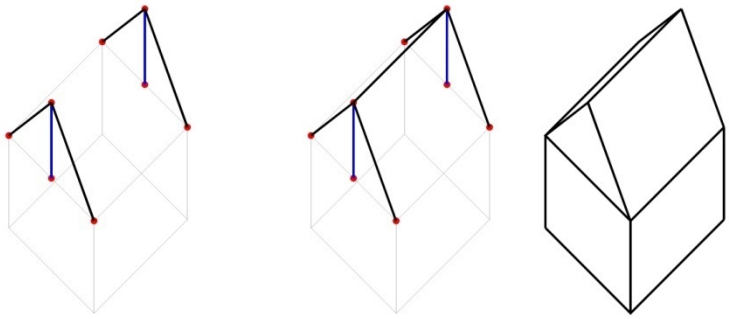

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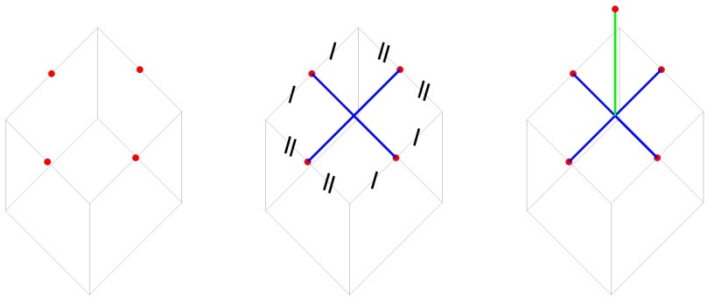

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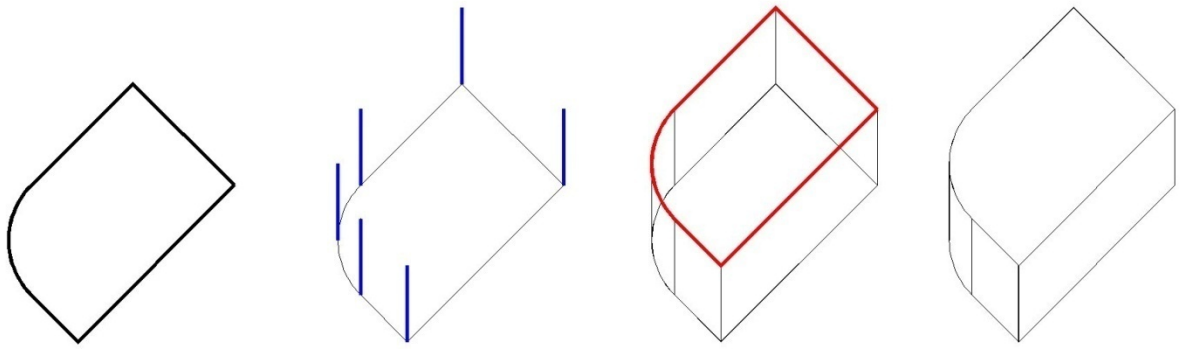

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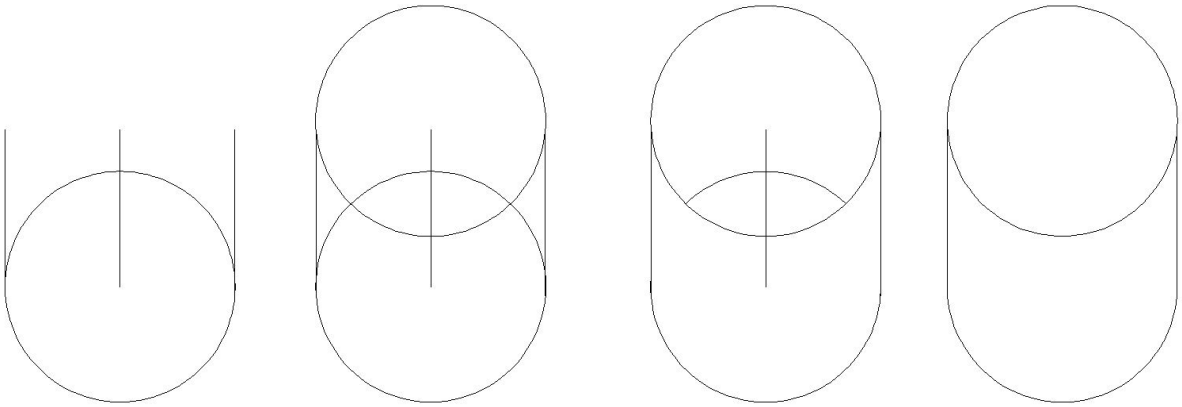

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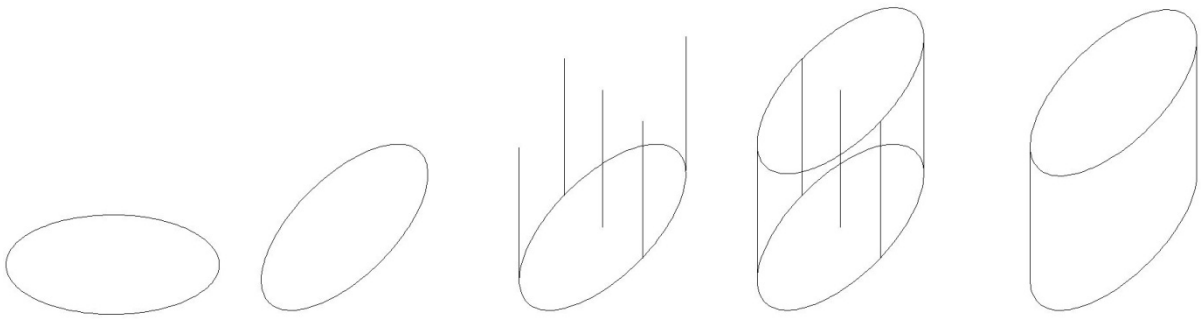
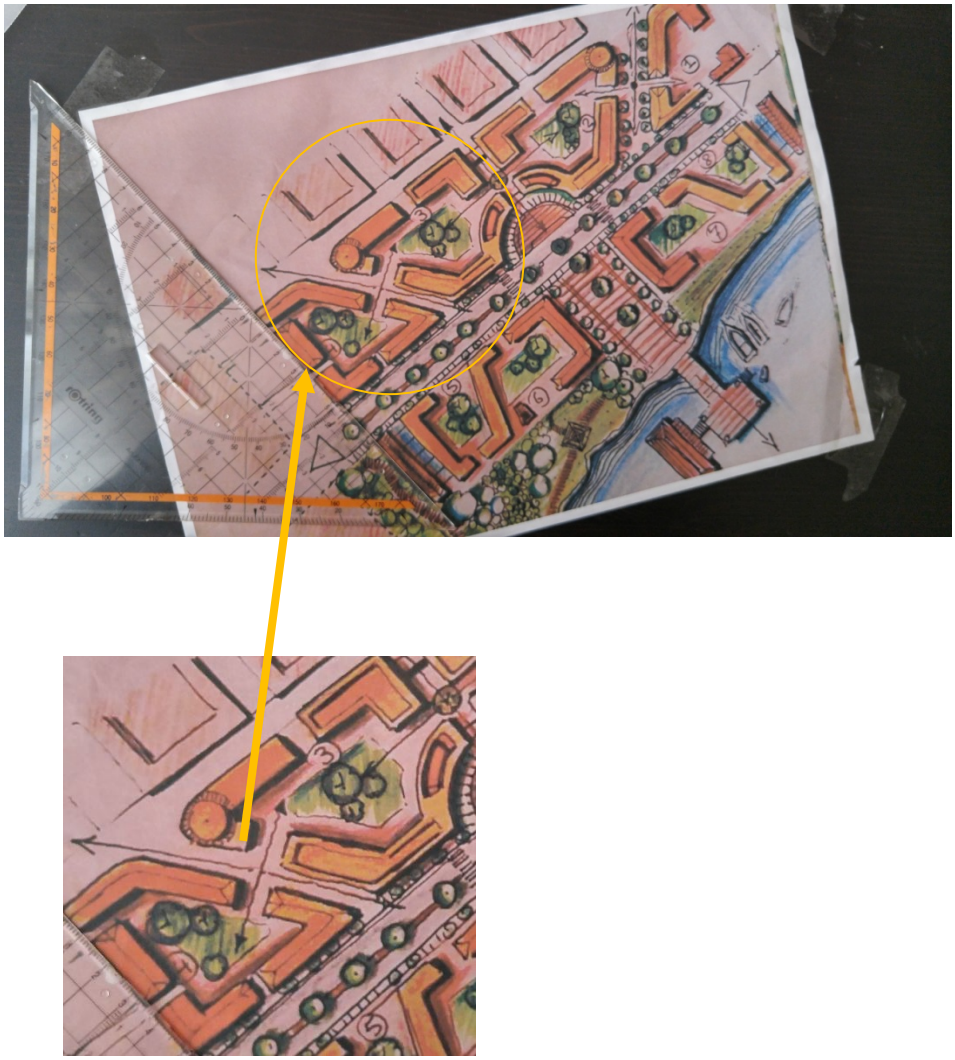


1 2 3 4

3- HOW TO DRAW AN AXONOMETRIC PERSPECTIVE

In this section we will draw an axonometric perspective based on a sketch 2D layout done by hand which represents a design proposal. While measurements are not 100% accurate in this example (i.e. they are not drawn by a scale ruler as it is a sketch), they are approximate and very close to the actual measurements. The aim of this exercise is to illustrate the 3D view of this layout and explore alternatives.

The first thing to do is taping the whole layout down on your drawing table. Make sure that it is rotated to an angle of 45 degree (you can do this using a protractor or a 45 degree triangle).

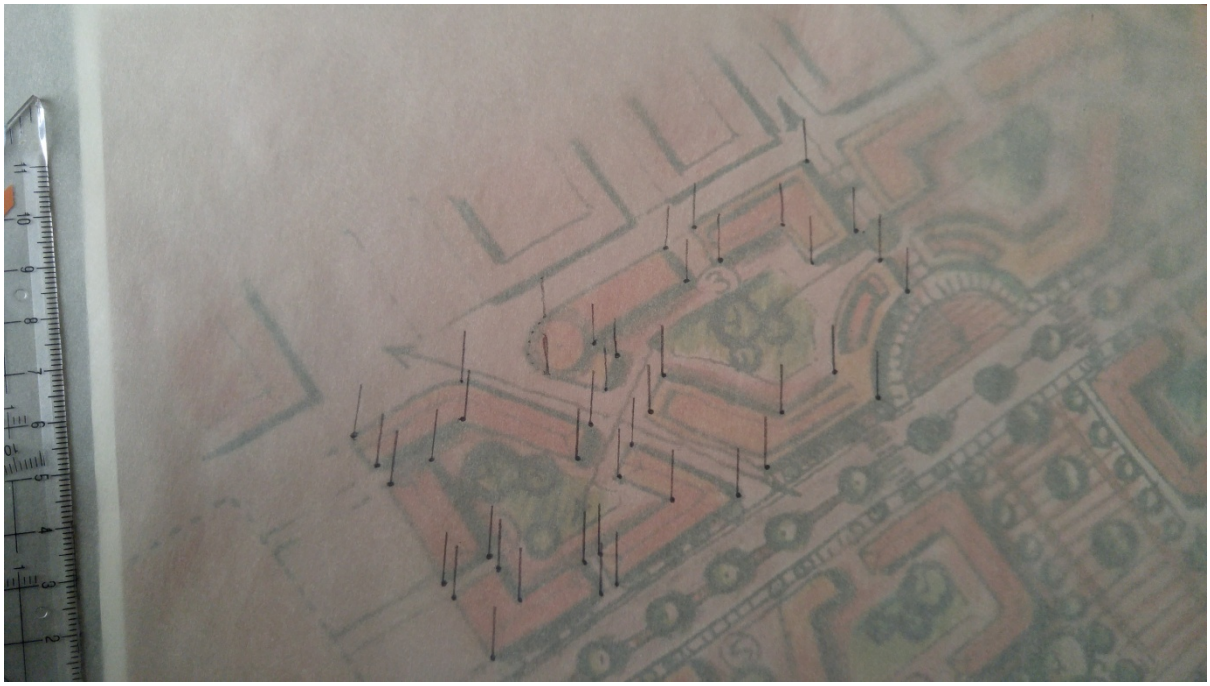


As we are in the design stage, the aim is to *explore building heights* and other 3D options. The design is symmetrical, so it might be handier to select only a small part of this layout as shown above.

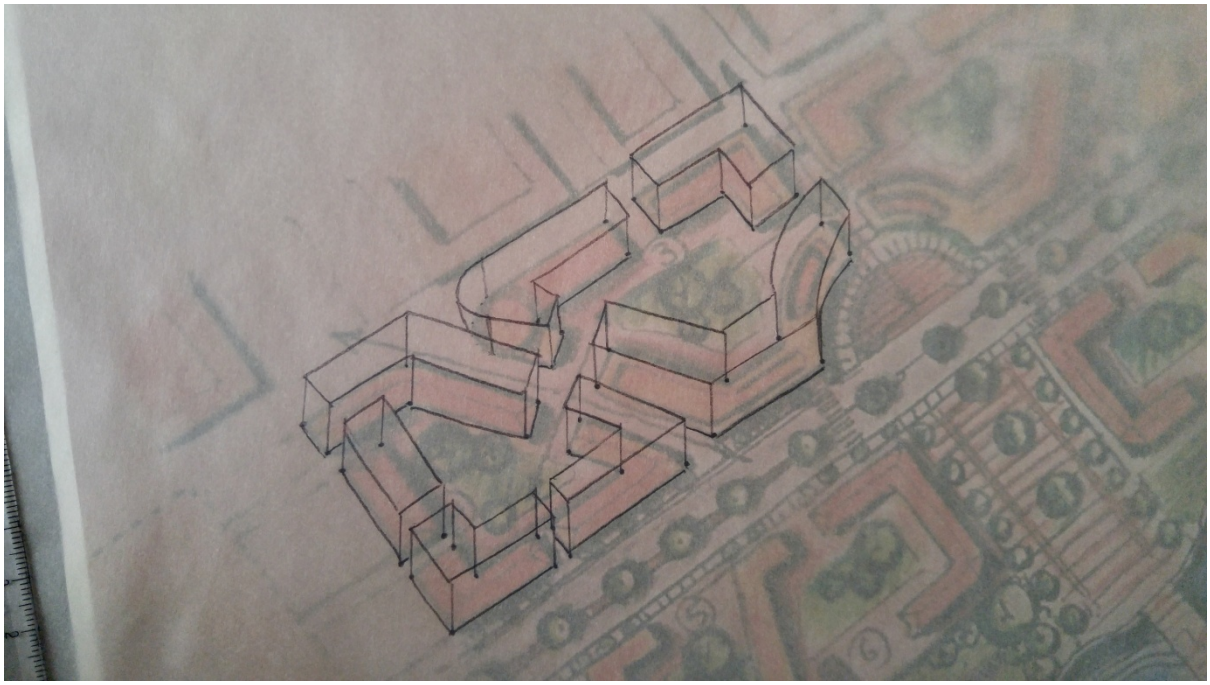
The next stage is taping down a tracing paper on the layout paper. Tracing papers are essential for exploring design alternatives and showing the different layers of your design scheme.

Next, highlight all the corners in the layout. These will be the bases of your vertical lines in the next step. In the case that you have a curve, you can select three or four points on the curve to help you in shaping the projected face.

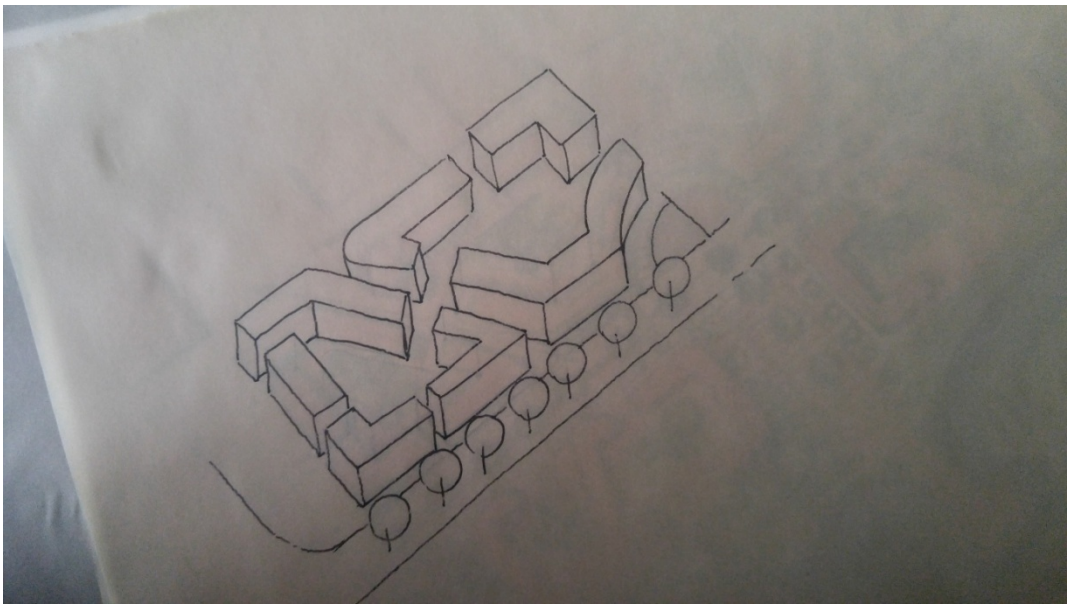
You can now project up lines from the points. The vertical lines represent the actual heights of the buildings. Remeber to draw them to scale (the same scale of the layout).



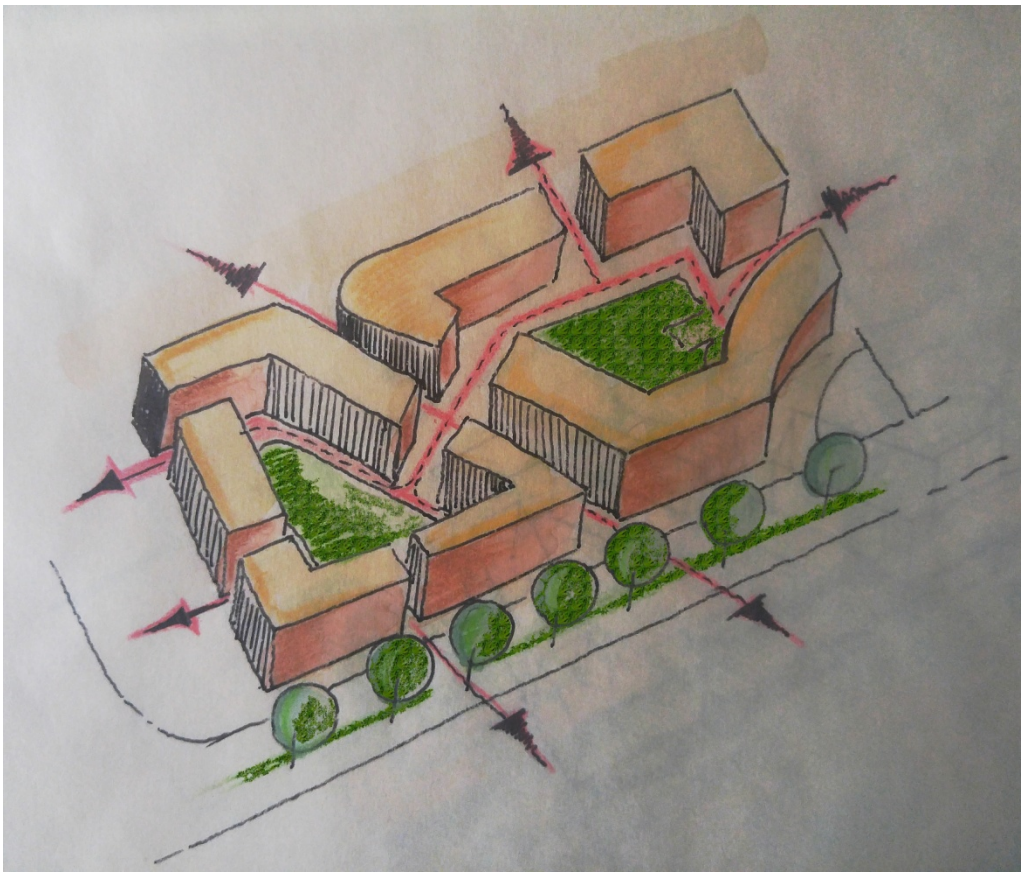
Next, simply connect between the end points of the projected lines to shape surfaces. The upper surfaces represent building roofs.



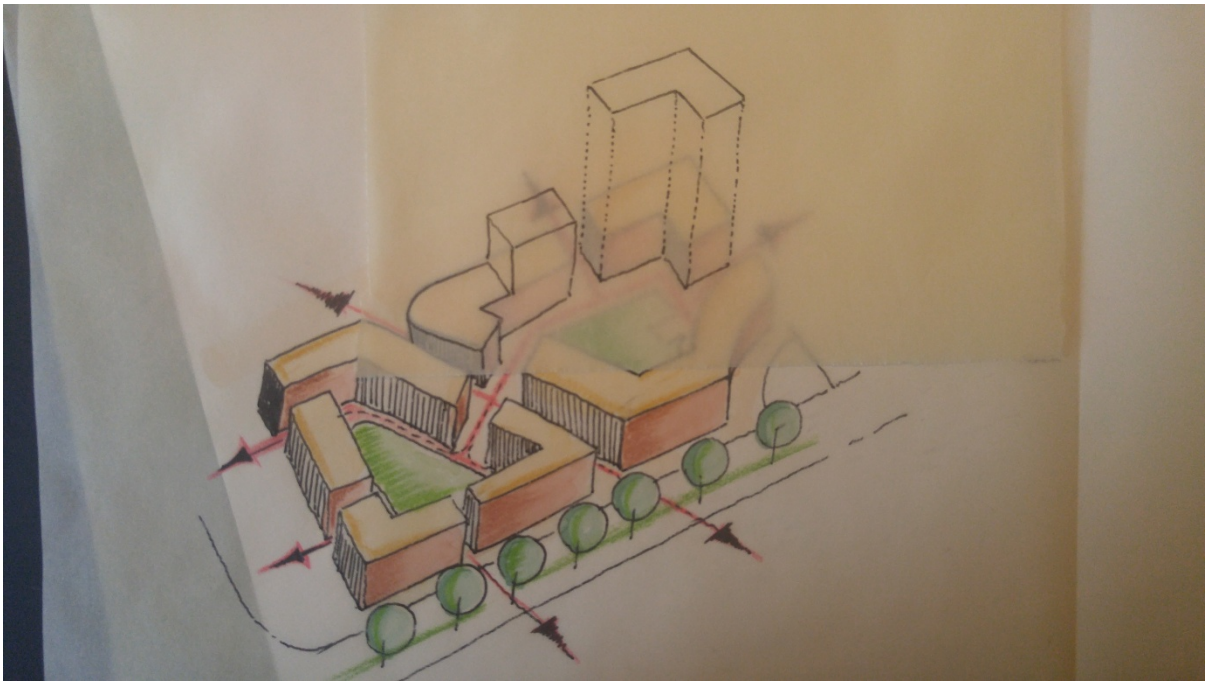
You should now erase the hidden lines. You can do this by an eraser or by using a new tracing paper and tracing the visible lines only. The latter method might offer a neater presentation.



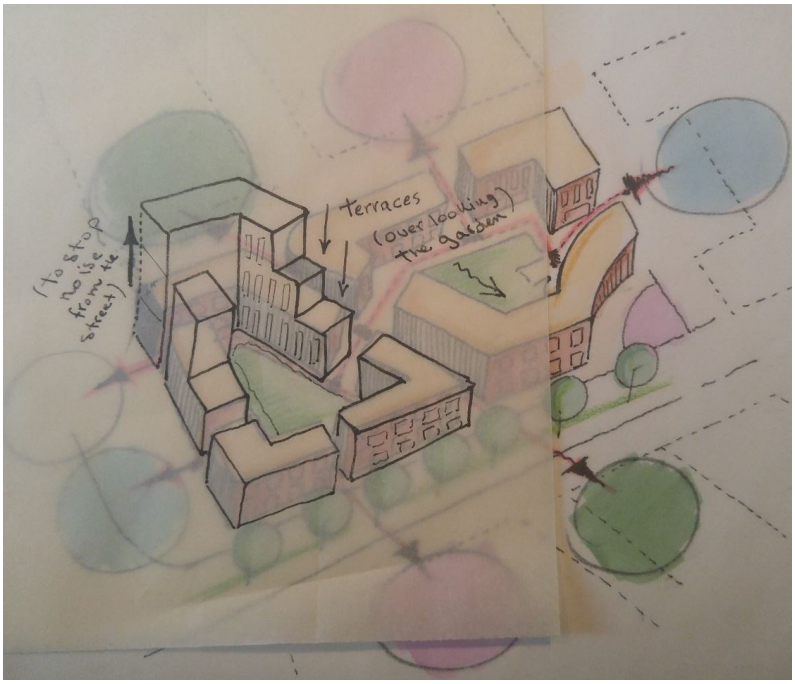
Using pencil colours and pens you can give surfaces different colours and textures.



The result is a 3D projection of the layout. You should use it to explore design options and different building heights. In the example below, additional tracing paper is used for the 3D design purpose. The first option suggests rising up the height of the right corner blocks as an alternative.



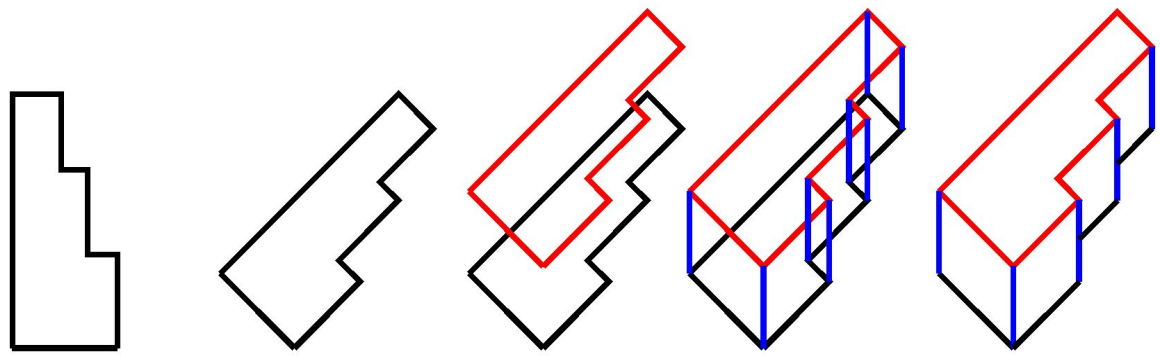
Option two below suggests rising up the left part of the building instead of the right corner. It suggests a stepped design to create terraces to overlook a garden. Whether option one or two is better depends on many aspects including the surrounding context, streets width, proposed density, design code and the original design concept. Those new layers represent an essential design tool to justify design, to show intellectual spatial analysis and to show how the design was developed.



4- DRAWING AXONOMETRIC PERSPECTIVE WITH CAD

While CAD is capable to generate complex 3D perspectives, it can also be used to draw axonometric perspectives. This is especially useful when you need to draw perspectives correct to scale. In order to do this, we will be drawing in 2D to create 3D shapes. Because of this, you should not expect that CAD would extract other 3D distances and areas, display objects from different viewpoints, or remove hidden lines automatically. There is more than one method to do this, and we will use the easiest method in this handout, basically the same of the hand drawing method.

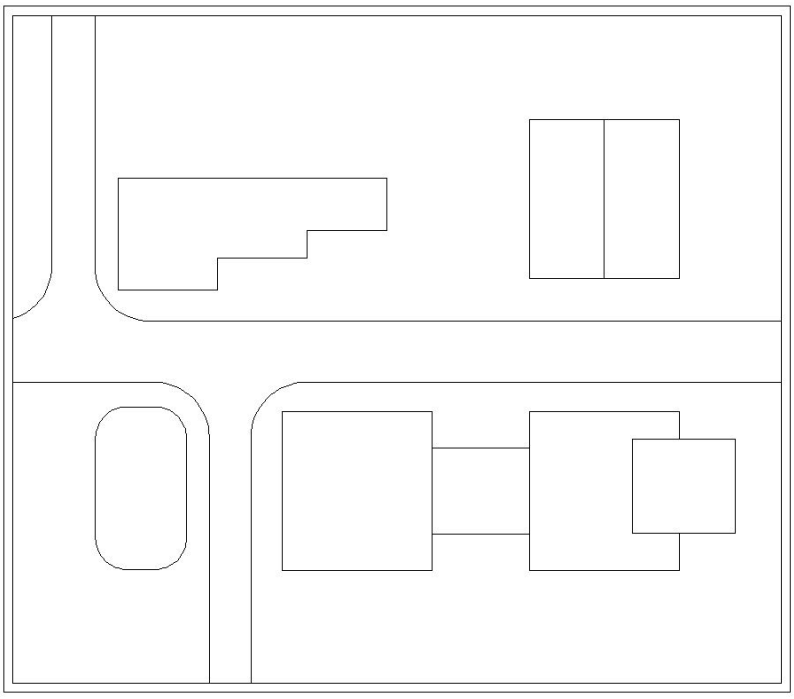
- Using Poly Line (P/Space) draw a simple 2D layout.
- Rotate it to 45 degree using the Rotate command: RO/Space - Select object/Space - specify base point using the mouse- type 45/Space.
- With Ortho on (F8) to restrict movement to only vertically or horizontally, Copy the object (Co/Space) vertically to the correct distance (the correct building height). In this method you are copying the ground floor to create the roof rather than drawing the rood manually.
- Draw one vertical line between two identical corners, and then copy it (Co/Space) to the rest of the corners. Make sure Osnap in on (F3).
- Using Trim command (Tr/space/space) and Delete, erase all the hidden lines to create a box.



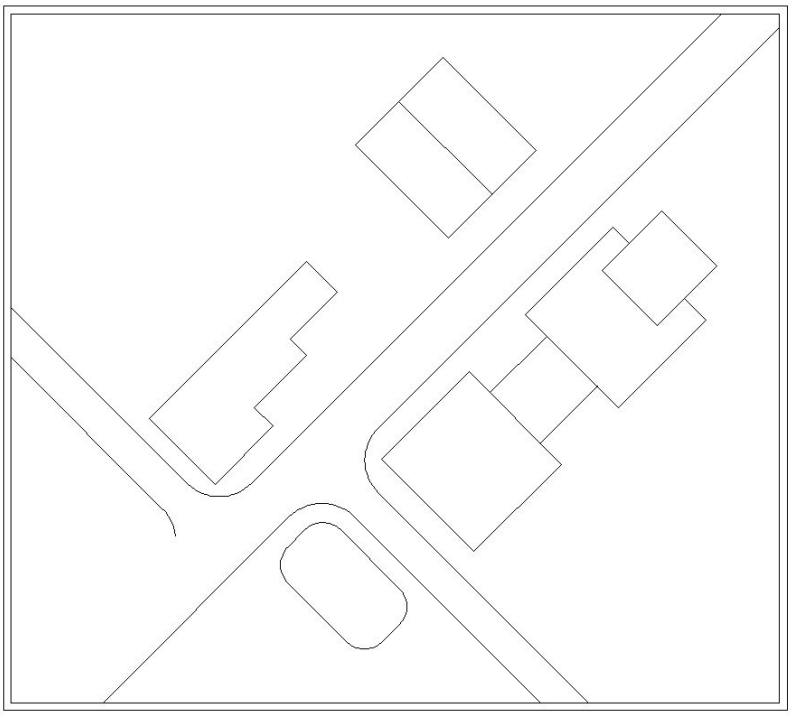
Once you are comfortable in using CAD you will be able to draw the shape above in less than a minute.

4-1. Example of Drawing Axonometric Perspectives by CAD:

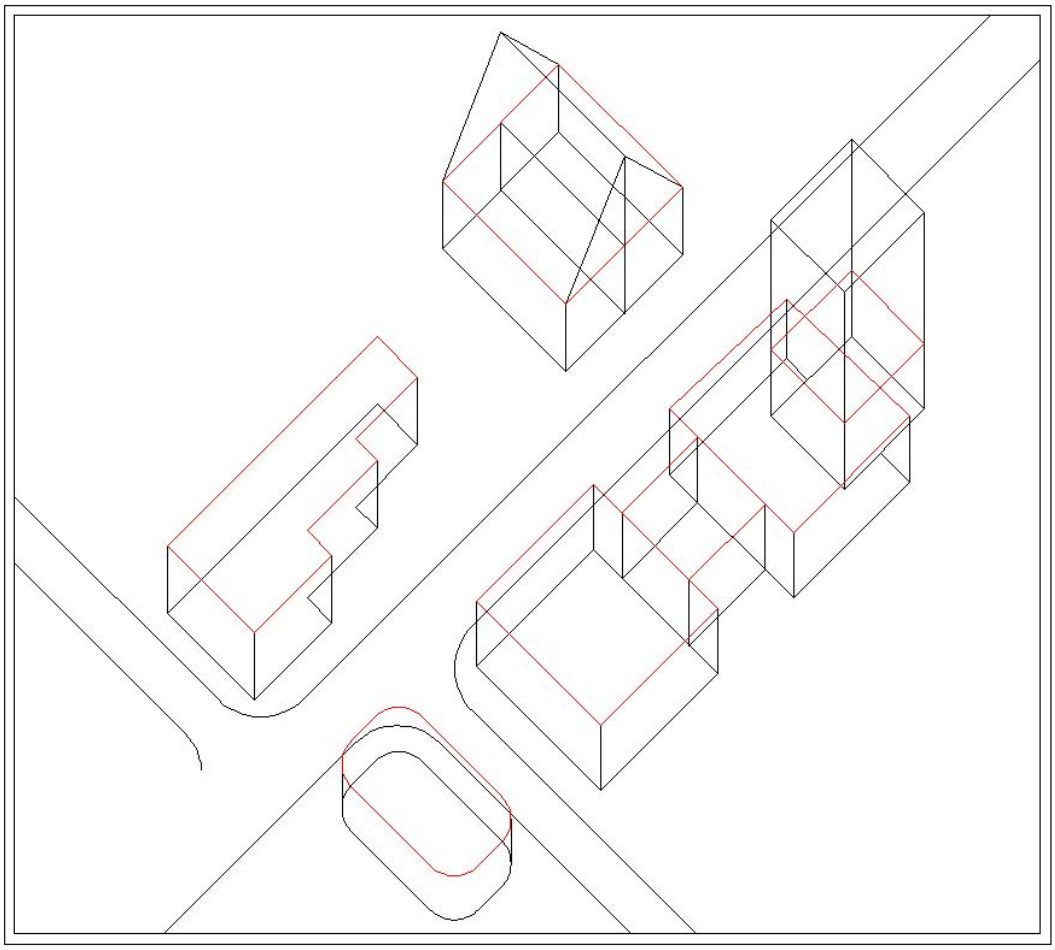
The first step is drawing a simple 2D layout. You can do this using PL/Space or L/Space



Step two is rotating the whole layout with the Rotate command (Ro/Space) 45 degree.



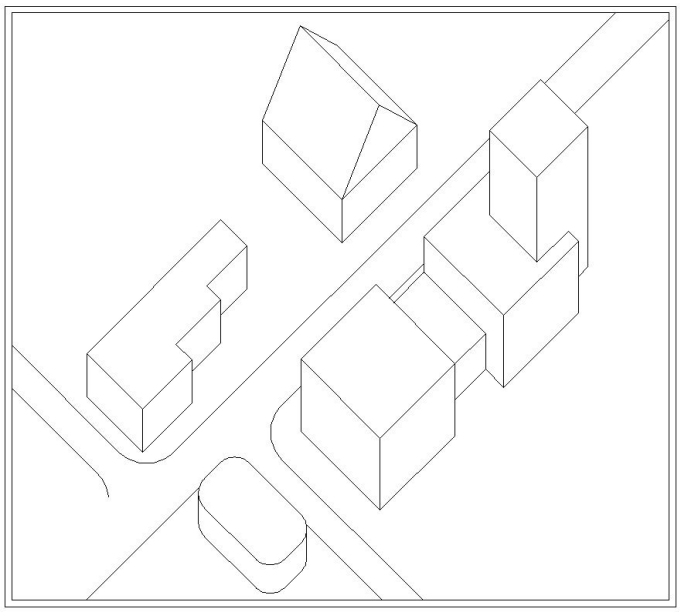
With Ortho on (F8), copy all buildings plans vertically to their correct heights. You can give them a distinguish colour to distinguish them from the original lines. connect the two durfaces with vertical lines. The vertical lines are mostly identical so you can draw one and copy it to the rest of the corners. Follow the same axonometric concepts discussed above to create the gable roof.



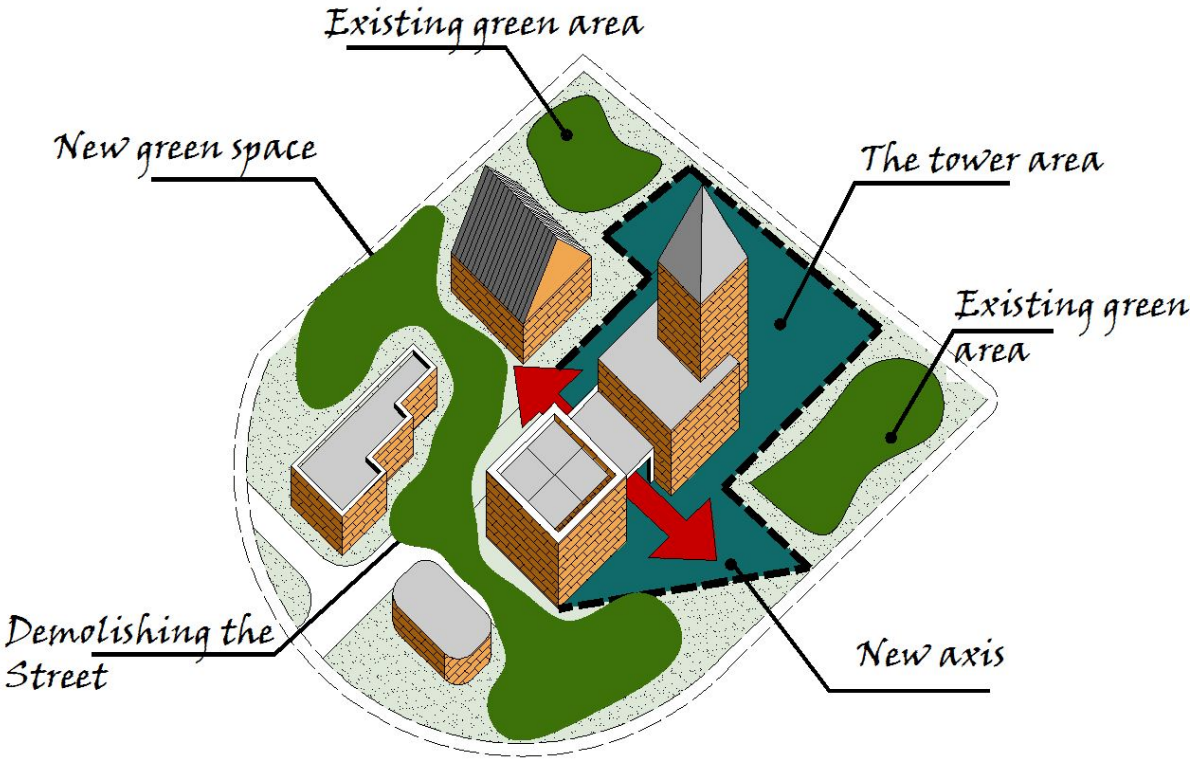
Tips:

- You might need to turn the original layout into a Block (B/Space) so you can move it or copy it easily as a one group. You can Explode it again when you want (X/Space)
- You can copy the layout somewhere vertically (in which the copy version becomes far from the original) and then give it a distinct color. This makes selecting it as a whole easier. Once you finished you can turn it into a Block and put it on its correct positions. You can put it on its position using a correct to scale vertical line drawn on a random corner on the original layout. Make sure the copy version is situated exactly above the original version.

Delete and trim the hidden lines using Trim/Space/Space and Delete

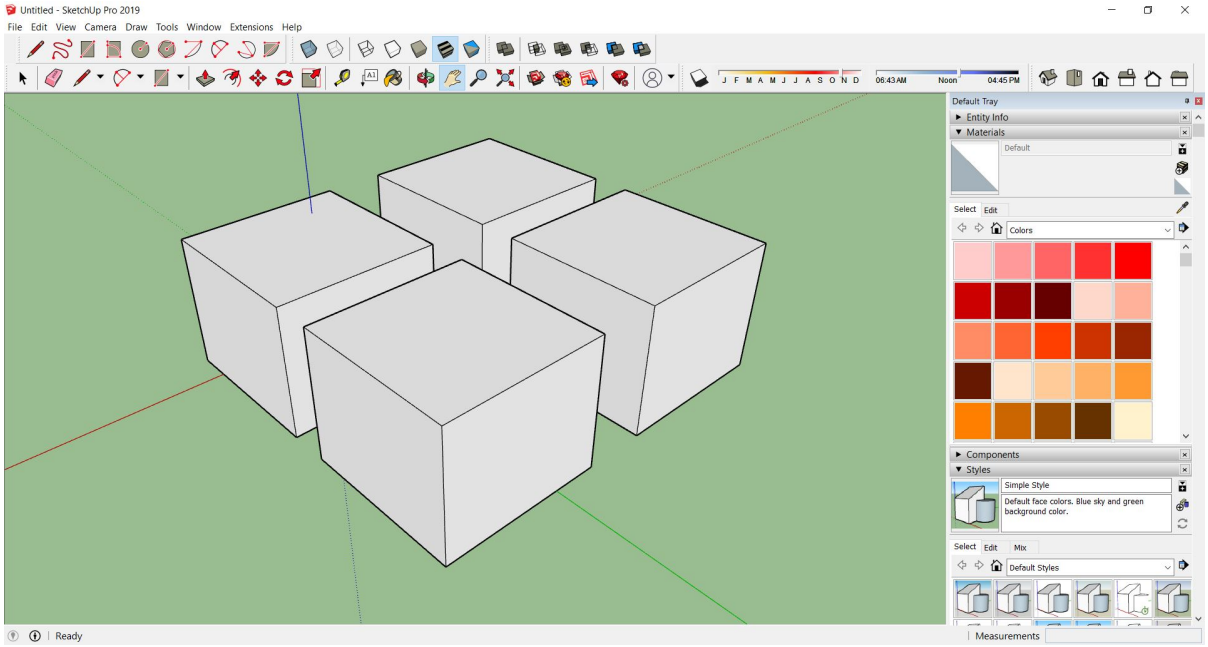


Finally, add colours, textures, arrows, surfaces, shades, coloured zones, text and other aspects to illustrate your design concept and to support your argument.

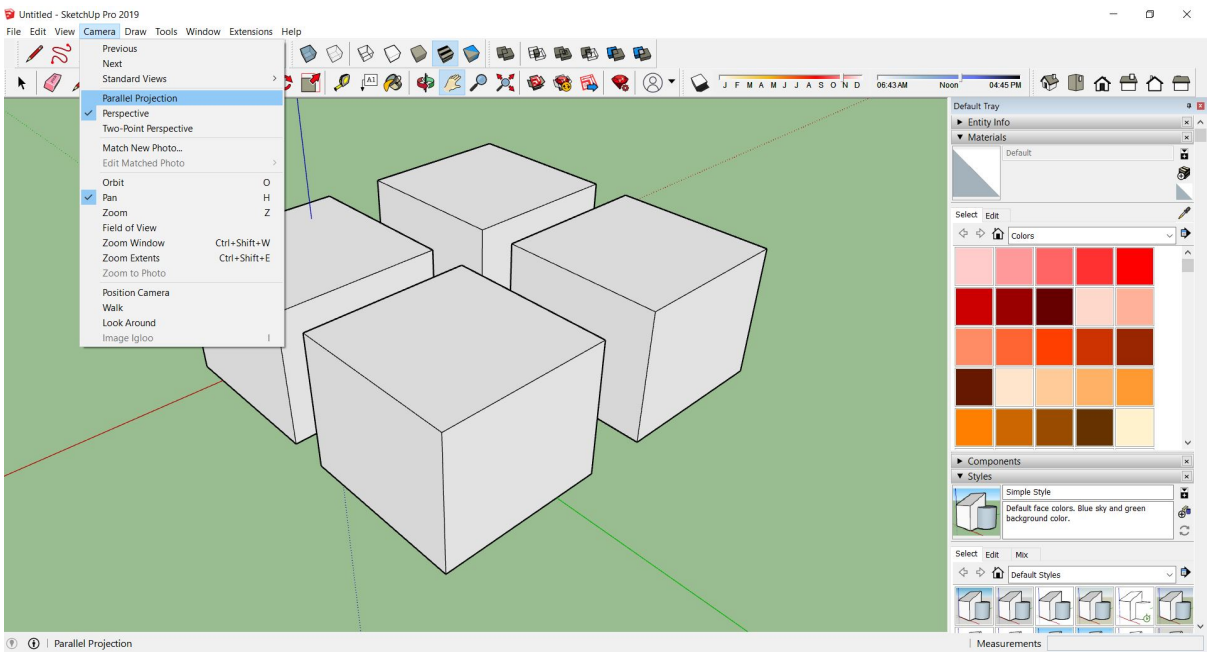


5- DRAWING AXONOMETRIC PERSPECTIVE WITH SKETCHUP

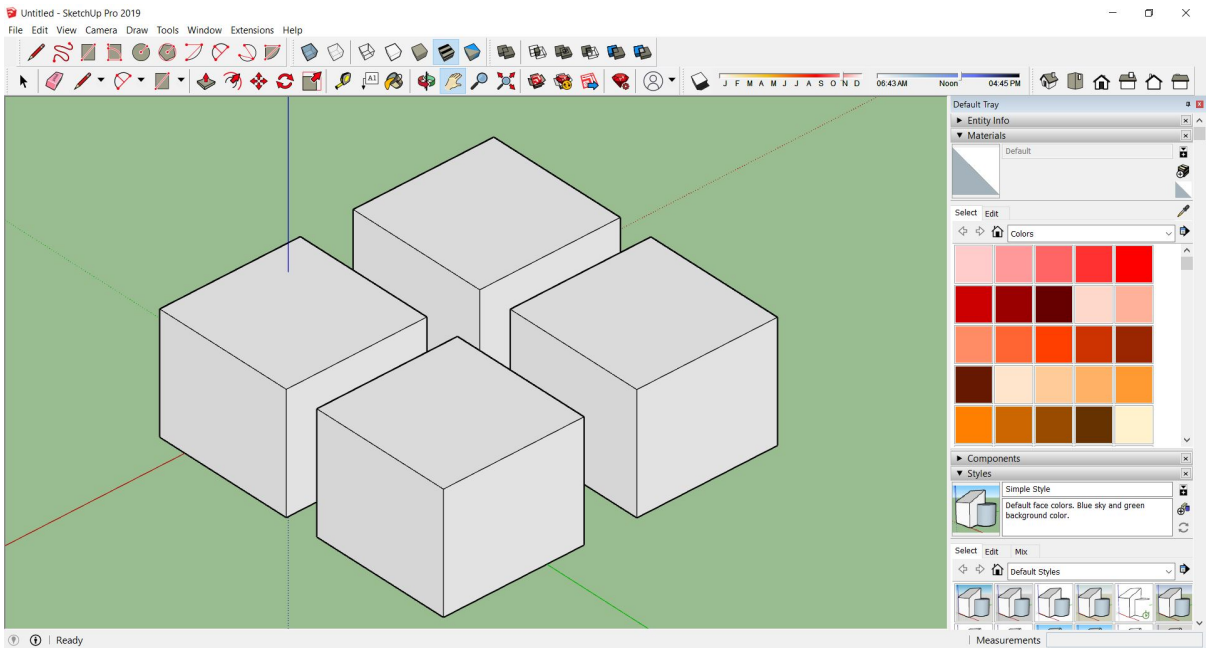
SketchUp is the software we use to draw perspectives. However SketchUp draws perspectives (i.e. vanishing points projections) rather than axonometric by default.



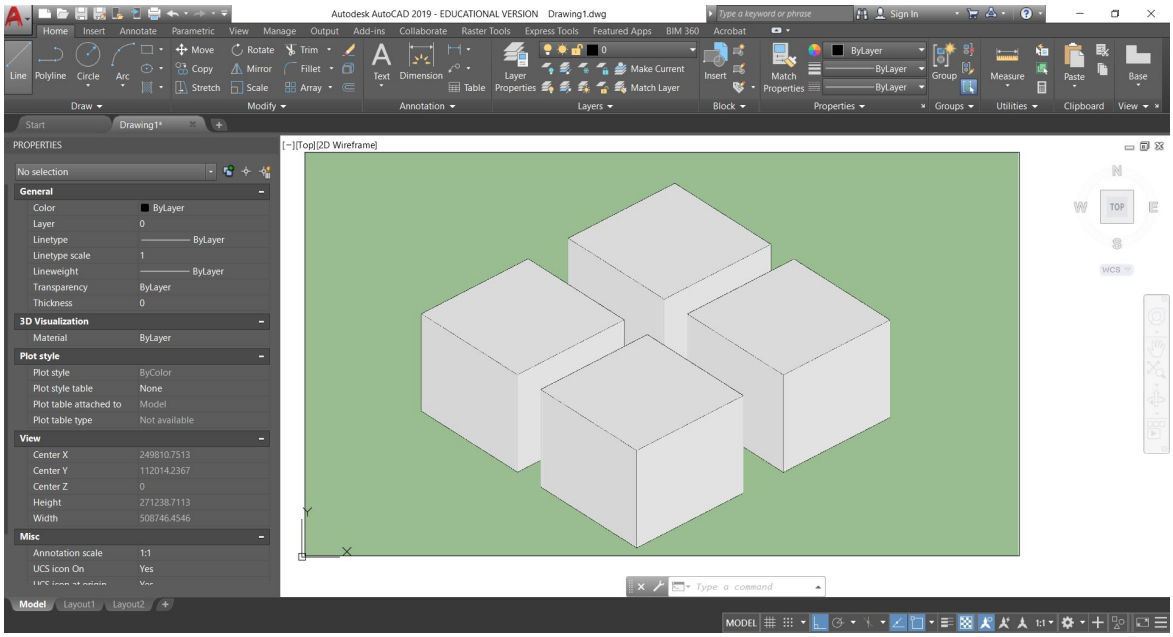
In order to show your graphic in Axonometric style: Go to Camera and select Parallel projection.



You will end up with this. This is however a not-to-scale graphic. So this cannot be used as a scaled axonometric unless we scale it in AutoCAD. Save this image as JPEG and open it in CAD.



Open the image in AutoCAD to scale it (you should know at least one actual dimensions in your image such as a height/width)



Use the **Scale to Reference** method to scale the graphic correctly. Please refer to CAD handbook for a detailed tutorial on ow to use scale objects. The image is now scaled and can be used to show measurements.