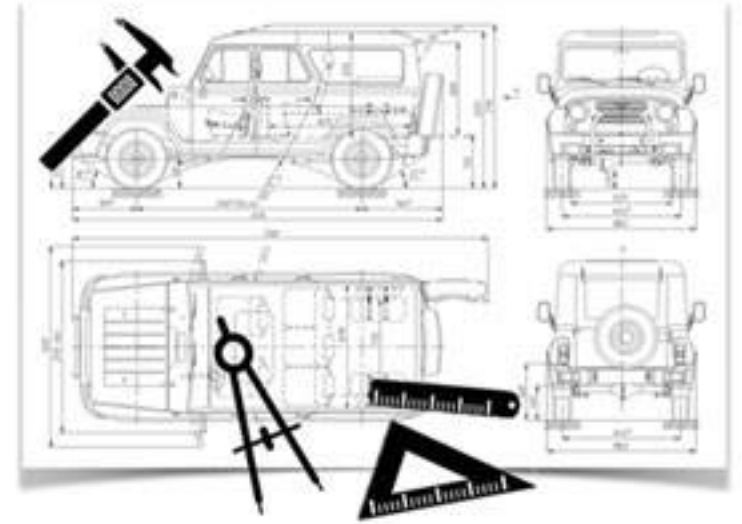


Drafting in 3D for Engineers - Background

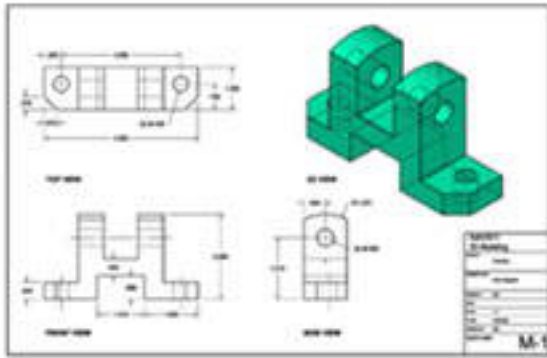


In the real-world of engineering, mechanical drawings are very important for the design process.

Each drawing is actually an official contract. Materials are specified. Parts are shown in different views to communicate every detail. Each dimension is very precisely measured and labeled. If the product design is not manufactured according to each one of these specifications, it will not work properly and will be rejected.

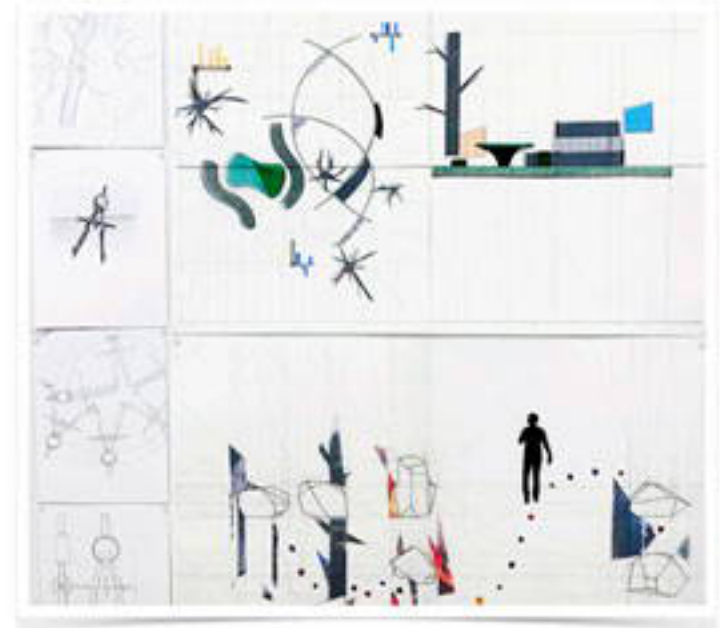


This looks really complicated. But if we break it down into simple steps and you have the right tools, you can create sketches like an engineer and then use your sketch to build real 3D models.



Architects need to learn the same drafting skills as an engineer but they often include an artistic flair in their designs.

Here is an example of a project done by the 3DuxDesign co-founder, Ayana Klein in her architecture class at Washington University, St Louis. It has just as many details as an engineer's draft but it also depicts how the structure(s) would be used by people and how the structures will interact with nature and the surrounding space.



more draft work by Ayana Klein

MEDIUM: COLLAGE, ACRYLIC PAINT AND PRINTED PHOTOS



MEDIUM: WATERCOLOR AND PEN



MEDIUM: COLLAGE, WATERCOLOR AND SHARPIE

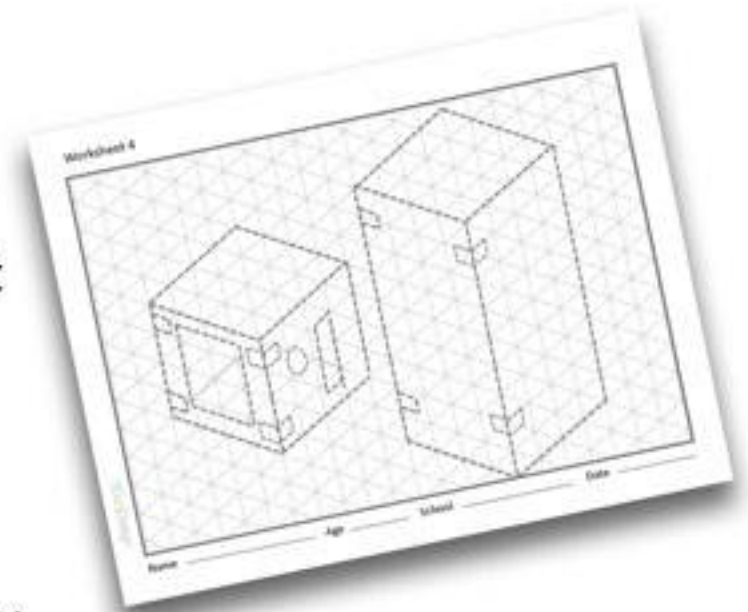




Drafting in 3D for Engineers - Build

Many engineering drawings are done in isometric view, a type of **perspective** drawing that shows objects in 3D. They are done on isometric graph paper. This type of paper has lines going 2 directions diagonally (making a lot of diamond shapes)

By connecting the dots or tracing the lines on the printable worksheets below, you can create realistic 3D drawings of simple cubes, furniture, buildings, and more. And, if you color them in by shading, your drawings will be amazingly life-like. Let's get started:



Build a simple cube

Use your 3DuxDesign connectors and 6 square cardboard panels to create a cube 4 walls, one top, and one bottom. You will need to use your right angle (or 90 degree) connectors. They are the red, yellow or blue ones in your set. Put 2 connectors on each side for stability. You can also draw a square or rectangle window and door if you like but avoid round features (it will make sketching your house harder).

This one was decorated for Valentine's day.



Drafting in 3D for Engineers - sketching



Sketch the cube in 3D

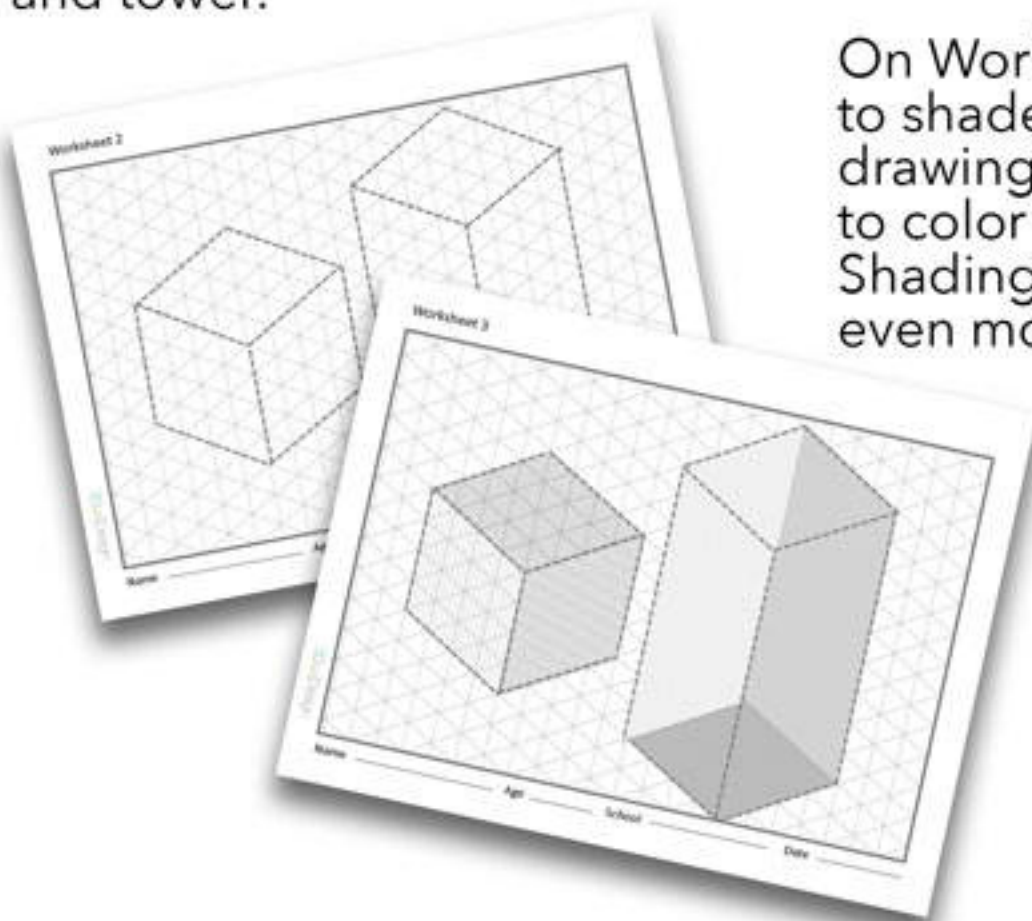
You will use a type of graph paper that engineers like to use. **Isometric graph paper** has slanted lines and it makes lots of diamonds on the page. It may seem weird to you now but just wait till you finish this activity, you are in for an amazing surprise! Print worksheet 1 and follow the directions below

Place your worksheet in a **horizontal**, or sideways position so the word "name" is on the bottom left. Copy the dotted lines to draw a picture of your 3DuxDesign cube on the isometric graph paper. Then draw another cube next to the first one, following the isometric lines on the graph paper and using the first image as a guide. If you position your cardboard cube at an angle like the one in this photo, you will see how the sketch you drew looks very much like the cube.



Try different shapes

Now build a taller tower with 4 long cardboard rectangles and one square panel on top and the bottom. (if you are cutting your own cardboard, make the length double the width on these rectangles) On Worksheet 2, copy the dotted lines to draw a cube and a tower to match your 3DUXDesign cube and tower.



On Worksheet 3, use three different colors to shade in the three "faces" of the cube drawing. Then use three different crayons to color the bottom and inside walls. Shading helps make the drawing look even more three-dimensional.

Shading on the cube shows the outside faces, while the shading on the tower gives you x-ray vision to see the inside walls and floor.



Drafting in 3D for Engineers - shading

Bring your drawings to life

You can do this by adding features and shading. Start by trying to draw the features like the door, window and even the connectors you put on your cube. You can use the isometric lines diagonal lines on worksheet #4 as a guide and watch the video for help. Give it a try...

Once you complete that, you can work on shading. For this, it will help if you put a lamp on one side of your cube. See how one side is much lighter than the other?



Take a moment to look around you at the things in your home. You will also notice that everything the light hits looks bright and everything that has no light hitting it looks darker. Your eyes and your brain are so used to seeing everything this way you may not even notice it unless you pay attention. Your own drawing will look more real if you use a shading technique to make it look more like the things you see in the real world. Watch the video again then try this on your picture.

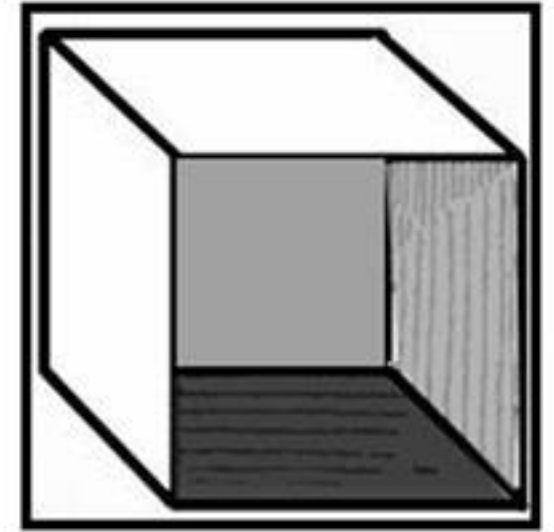
It WILL take practice, but don't worry, you can always print another sheet. If you do this a few times, you will notice each version probably gets a little better :)

Drafting in 3D for Engineers Take it Inside



Extra challenge

Try using worksheet 1b and shading the inside of a cube. Shade the walls in darker colors. Each wall should be a different shade to give it a 3D look. you can try adding furniture and other features if you feel like trying. Use the video below and the isometric lines to guide you.



Success! Time to celebrate!

Now it's time to build your mini-dream house using your 3DuxDesign architecture kit or 3DuxDesign connectors + recycled cardboard - get as creative as you want! Add a carport, patio, deck, trees, and maybe a chicken coop!

Super-Challenge

So far, you have been using your 3D model to help you create your draft. But professional engineers do the drawing and then build the structure based on their design. Can you draw a house using a large sheet of the isometric grid paper, and then build it using the drawing as your "blueprint"?

Be sure to send photos and videos of your projects!

