## Building a 3D objects from 2D views and isometric drawing.

During our last Club we looked at objects from different sides and drew what it looks like. Today we will do the opposite: we will build the object from its projections and also try to draw our 3D objects.

If we have 3 projections of an object (plan, front and side) and each of them looks like a square what could the object
 be? Right, it is a cube!

Who can draw a cube? Let us draw the cube on a piece of paper so that anyone can tell that it is a cube, and not just some square. We have some good cubes, some so-so cubes and some pictures that are not really a cube at all.

How can we draw a perfect cube? To draw a perfect cube we will need a special tool: a piece of isometric paper.

Isometric drawing is way of presenting drawings in three dimensions. In order for an object to appear three dimensional, a 30 degree angle is applied to its sides. So, when we drawing a cube in isometric projection cube's sides will look like diamonds, not squares.

So, from 3 projections we will first build an object from cubes and than draw it on an isometric paper.


Front


## Side




Let us now think about simple shapes and their projections, and how confusing they can be. If we know that the front projection looks like 2 squares joined side-by-side, what could the 3D object be? OK, it could be 2 cubes joined side-by-side. But is that the only option? How about 2 cubes, but standing separately, apart from each other? Is that even possible for them to look like 2 attached squares in projection? Looks like it is possible, if we just rotated them together so that their edges line up on each other making them appear joined side-by-side.

Not only cubes: let us now graduate to 3D shapes that aren't made of just cubes. We have various shapes: our simple cube, various parallelepipeds and several triangular prisms. Let us now see if 2 very different objects can have the same exact projections when viewed from some angle. Can a cube and a triangular prism look exactly the same when viewed from one of their sides? Looking from the top (plan view) at a triangular prism that is sitting like a roof of a house, we see a simple rectangle! How about a parallelepiped and a cylinder? Of course that can happen! A side view of an upright cylinder is a rectangle, just like a side view of a parallelepiped.


Let us now play a game: we will have a small white room with 3 of the wall showing 3 projections of some unknown collection of objects in black. Our task is to figure out which set of objects, made out of our regular shapes produced the projections. Make sure all 3 projections match up with the object you put in the room!


See you next week!

