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Irvine Royal Academy—Technical Department

S3/S4 Graphic Communication

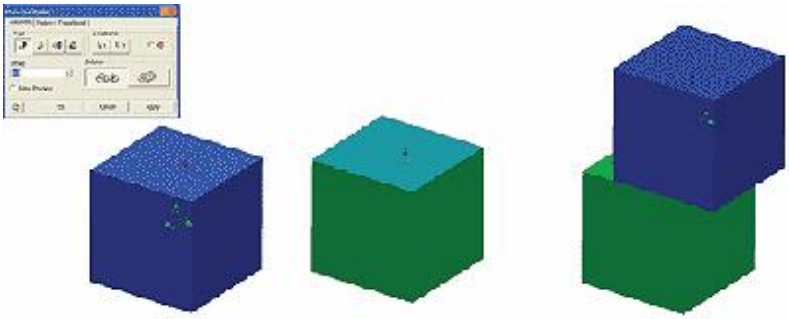
Constraints

Bottom Up Modelling

In Bottom Up Modelling, a CAD designer will draw different parts and save them. He will then create a CAD Assembly and place the different parts within it. To make sure these parts all join together and remain fixed, he will need to add **Constraints** to them. In National 5 there are three main constraints that you need to known.

Top Down Modelling

In Top Down Modelling, you will build your assembly by creating new parts on top of each other. When doing it this way, the programme will create the constraints for you.



Mate

Two surfaces that come together and touch each other are said to be constrained as a **Mate**. To do this on Inventor, the two surfaces are selected one after each other and the programme will lock them together. The two tops of the cubes on the left hand side have been selected and then Mate applied. This creates the blocks on top of each other on the right.

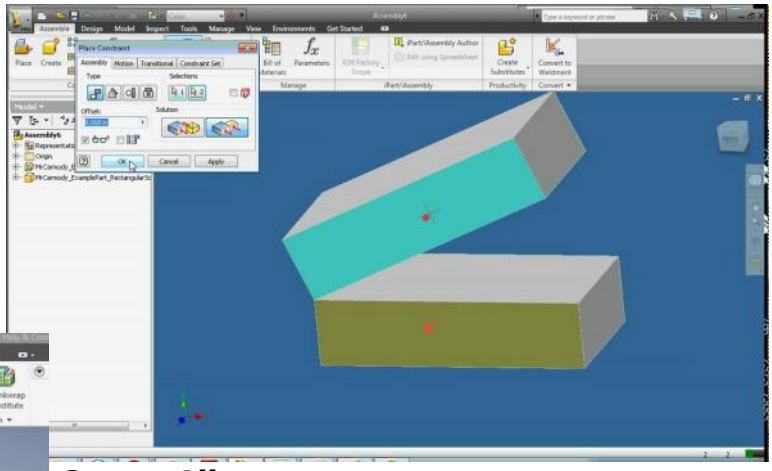
Note that you have only constrained the objects in one dimension—the two parts can still slide around each other, but constrained to the same surface. In your mind you probably had envisaged that the two cubes were going to line up with each other, but no necessarily so.

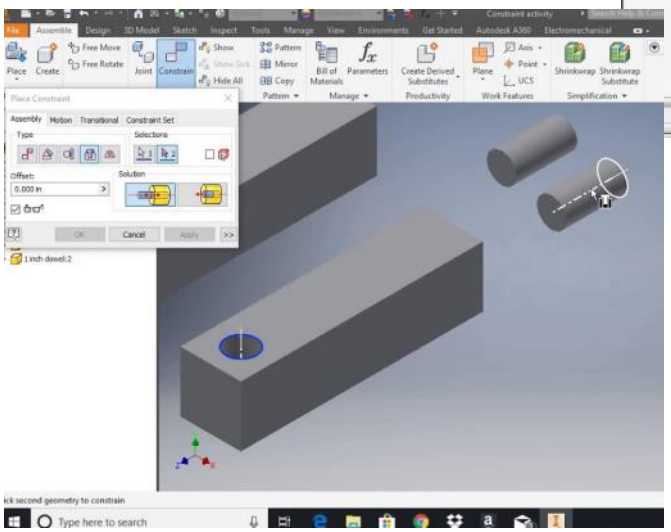
To ensure the parts are totally locked, you may need to apply three constraints to the objects (the world is in three dimensions!).

To add additional constraints, these will probably be **Flush** constraints.

Flush

A flush constraint is where two surfaces are in line with each other (imagine the front face of a brick being in line with the brick under it). In the picture, the two coloured surfaces have been selected to create a flush constraint.





Centre Align

If you are constraining two round things (eg a pin in a hole) then use Centre Align constraint. This is known as Insert on Inventor, but you must use Centre Align when answering examination questions).

On item one, select the centre line of the round part, then select the centre line on the second part. The constraint will place them on the same axis.

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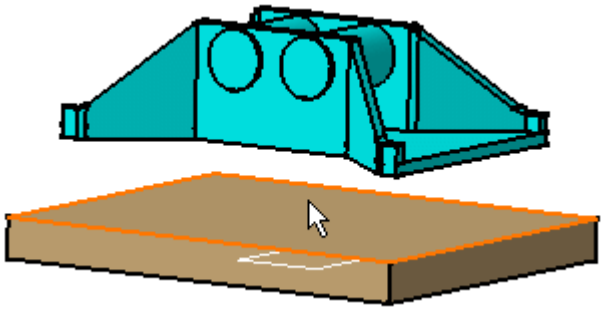
More on Constraints

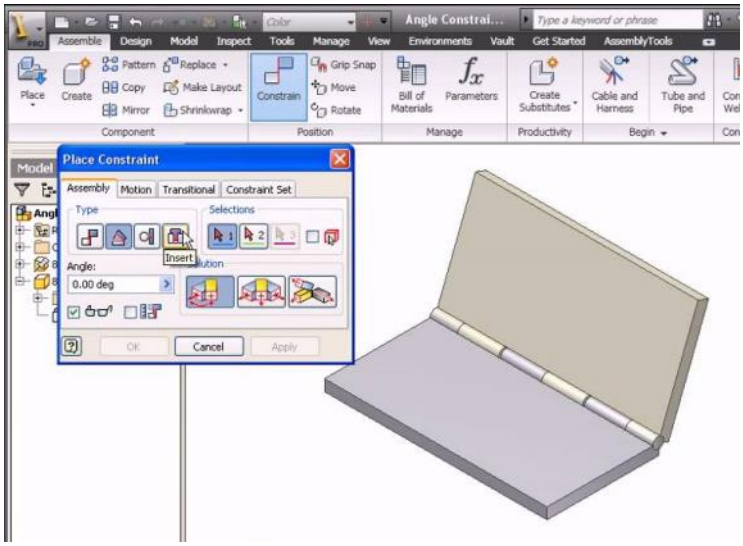
Additional Information

The following notes on constraints will not be needed for examination questions, but you may need to know about them when doing some CAD models with Inventor.

Offsets

It is possible to add an offset constraint to Flush and Mate constraints. Basically this means that instead of touching, you have specified a distance that the two objects will be apart—this distance is locked. In the picture, the space between the two parts is the offset.



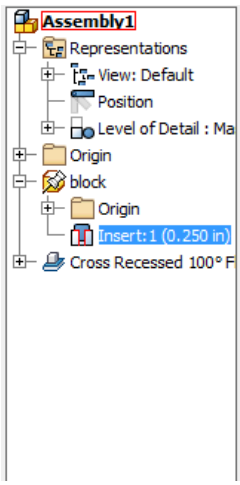


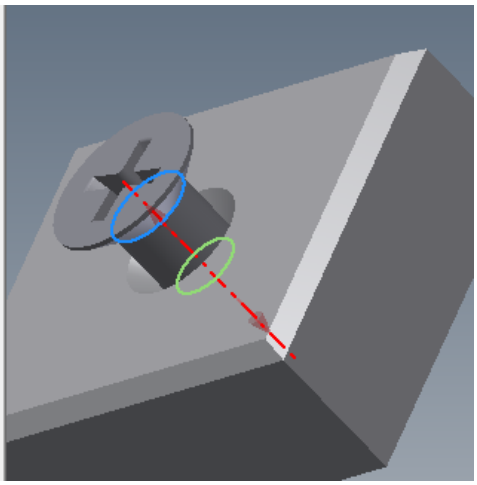
Angular

An surface constraint can also be set to an angle. This would position two surfaces at a fixed angle to each other.

Edge Constraint

Instead of selecting a Face to create a Flush constraint, an Edge can be picked. This will result in the chosen edges being constrained together. If there are no other constraints applied, this can create a hinged action.





Halo

When using a Centre Align constraint, Inventor offers the option of using a halo. This allows the third dimension to be identified at the same time when constraining the centre axes. The axes will align, and so will the two haloes. This is useful when determining how far into a hole an axle should go. In this example, the two haloes have also had an offset applied, making the screw remain in this position.

Direction

Sometimes when applying constraints the parts do not join the correct way round. Sometimes you will need to change the direction in the window to get it the correct way round.