

## Student Activity: Make a 3D Die

Using the software, you are to draw a single die that you will assemble on the screen. The dimensions of the die will be 2" cubed. The die will consist of six separate pieces. However, the top/bottom (1 and 6), two sides (3 and 4), and two ends (2 and 5) will each be the same size (Figure 2).

Figure 3 shows the dimensions of the three pieces you will need to create. The thickness of the material will be  $\frac{1}{8}$ ". After the three pieces have been created, you will save a copy of each and then change the number of dots to represent the missing sides of the die.



Figure 2

**Note: ALL male tabs (see below) will be .02 larger, so that when the die is laser cut it will fit snugly without any glue.**

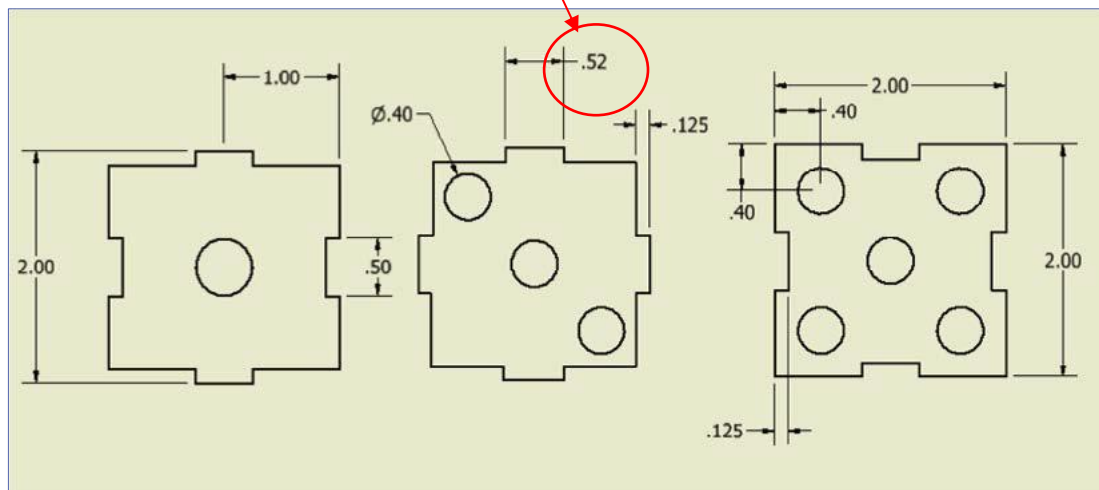


Figure 3

## Procedure for Creating the Sides of Your Die

1. Open a new imperial part from the Application menu or from the Get Started tab on the ribbon (Figure 4).

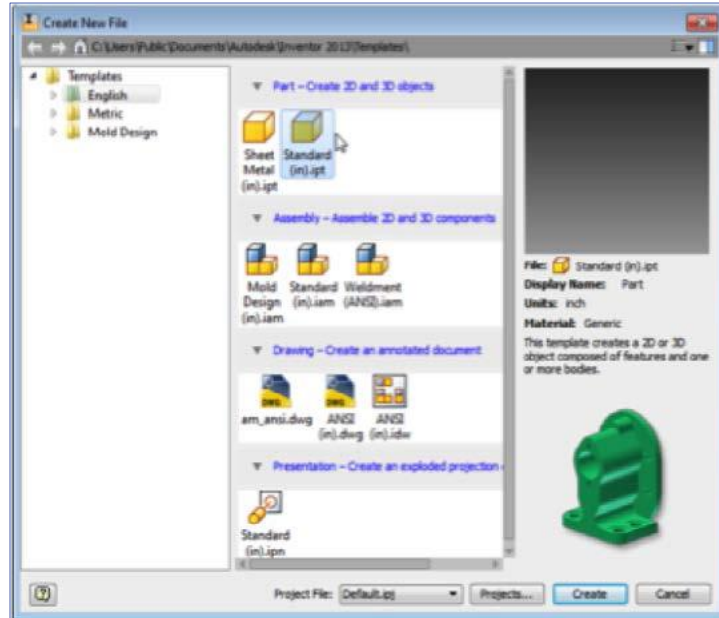


Figure 4

2. Create a 2D sketch and highlight ANY plane. The program will now enter into the sketch environment (Figure 5).

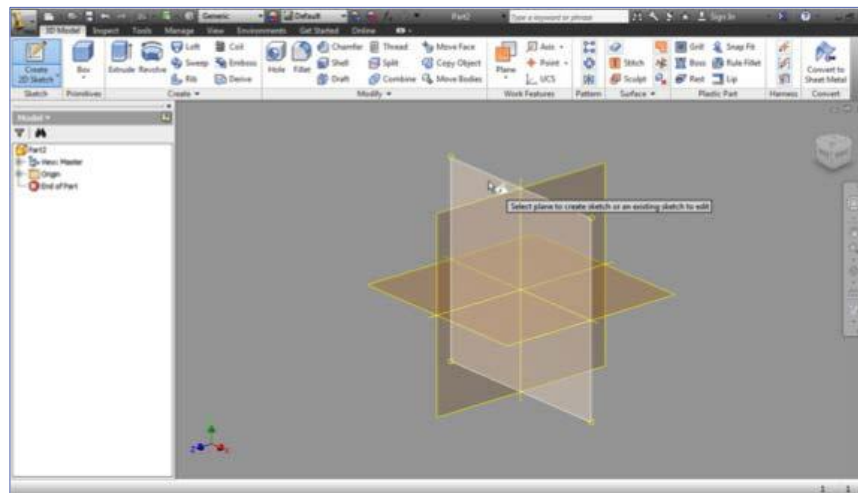


Figure 5

3. In the sketch environment, create a 2" by 2" square using the Rectangle command (Figure 6).

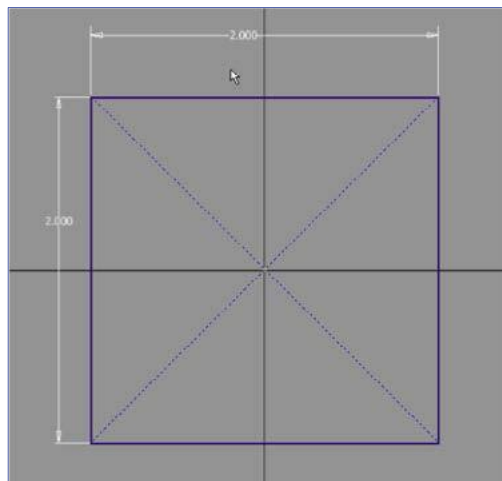


Figure 6

4. Offset or draw a line that is .125" in from one of the edges. Draw the start of a tab by drawing 2 lines that are .25" either way from the centre line as shown in Figure 7.

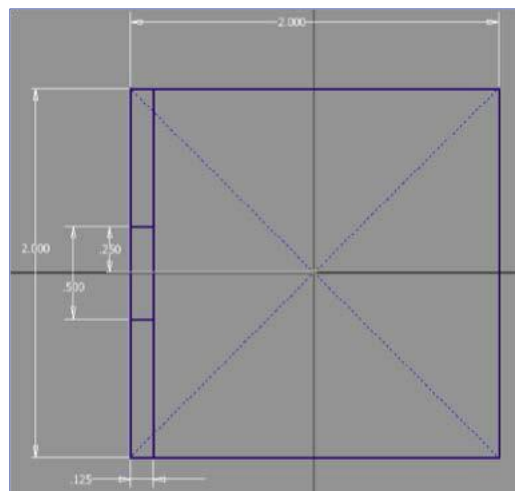
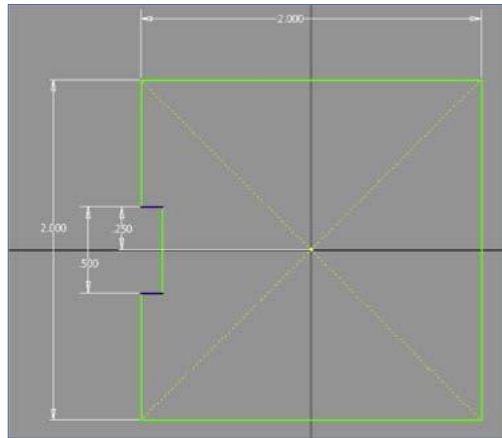


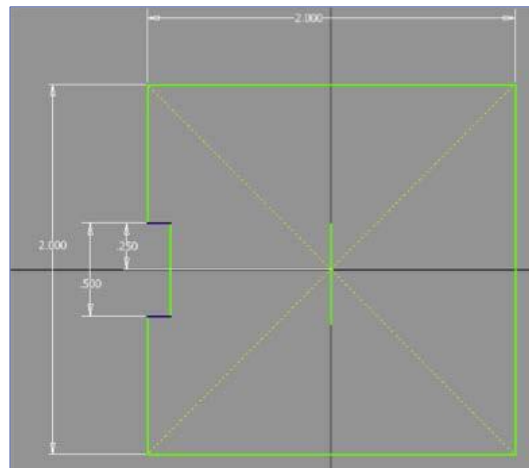
Figure 7

- Trim out the excess lines that are not needed to form the “female” part where a tab will join later (Figure 8).



**Figure 8**

- Add a mirror line on the y-axis so you will be able to mirror the female tab to the other side (Figures 9 and 10).



**Figure 9**



- Using the Mirror command, select the parts you want to mirror and then select the mirror line. The end result will be that the tab ends up on the other side. Trim out the excess to make it look like Figure 10.

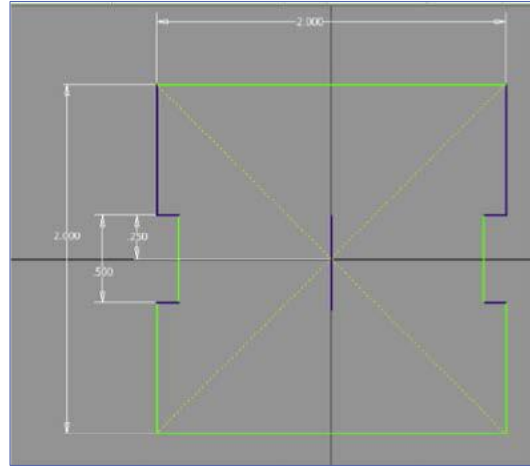


Figure 10

- Using the knowledge from step 7, create the “male” tab at the top as shown in Figure 11.

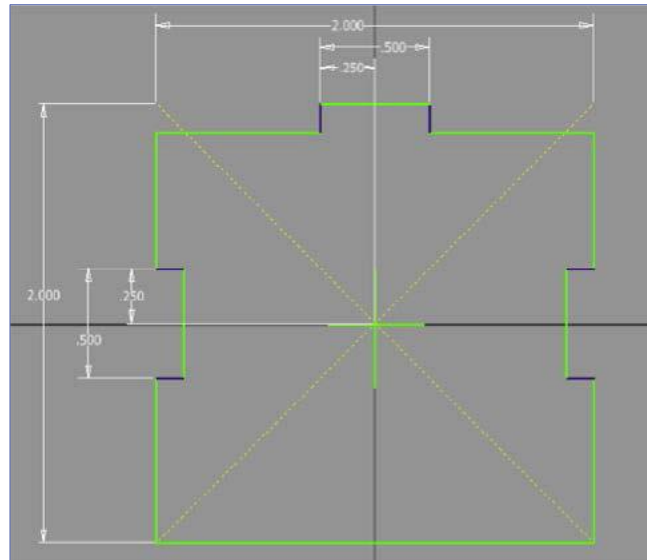
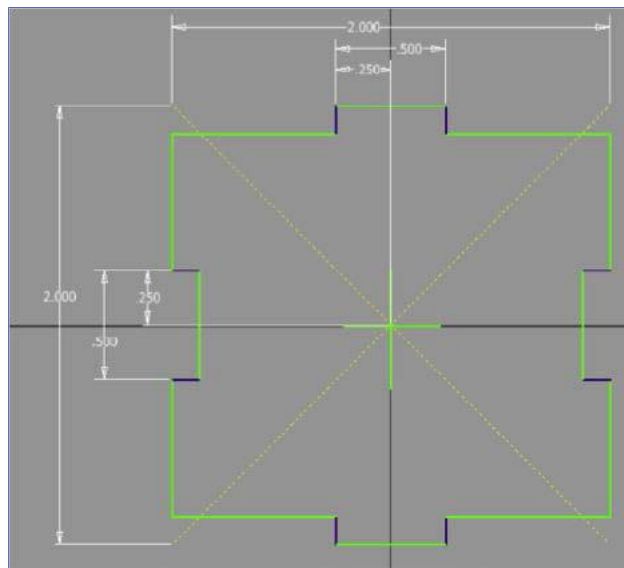


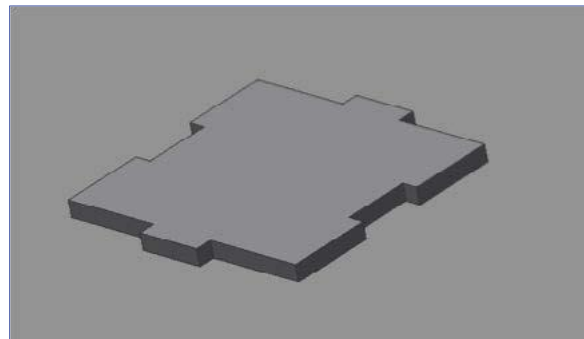
Figure 11

9. Mirror and trim out the bottom tab to complete the sketch as shown (Figure 12). Then exit sketch mode.



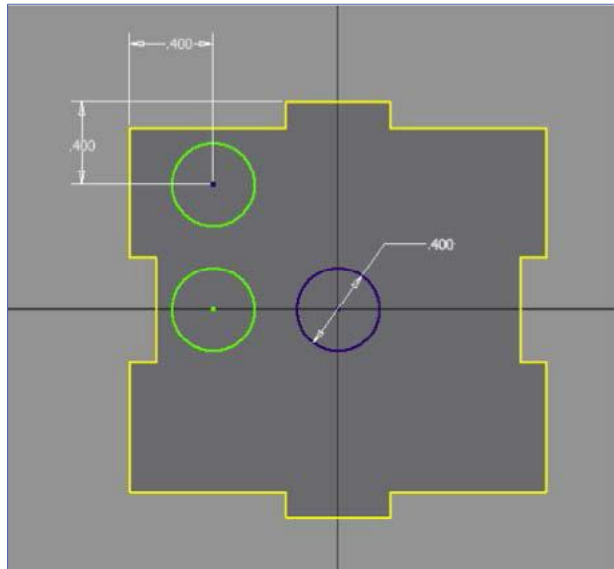
**Figure 12**

10. Extrude the sketch to .125". The end result will be a part looking like the one shown in Figure 13.



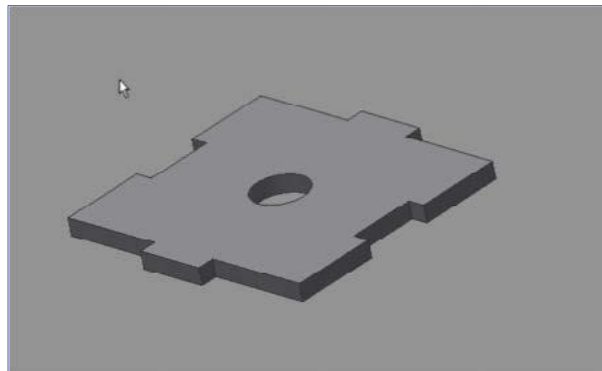
**Figure 13**

11. Add the holes or indents for the dots. To do this, select “Create 2D Sketch” and then select the surface you want. You will enter into sketch mode again. Each dot on the die will be .4" in diameter. They will ALL be .4" from the outside edges or in the centre of the die as shown in Figure 14.



**Figure 14**

12. Once the dot(s) is/are complete for the side of the die you're working on, finish the sketch (Figure 15). Save your work as *Side 1 – Die*.



**Figure 15**

13. You have completed one of the sides of the die. Now you must complete the other five sides using what you have learned above. To create the other sides of the die, you can either start a new drawing and copy and paste the sketch from one drawing to another, OR “Save As” the first drawing to start the next side of the die.



## Procedure for Assembling Your Die

1. On the Application menu, select “Create New File,” and this time choose “Assembly.”

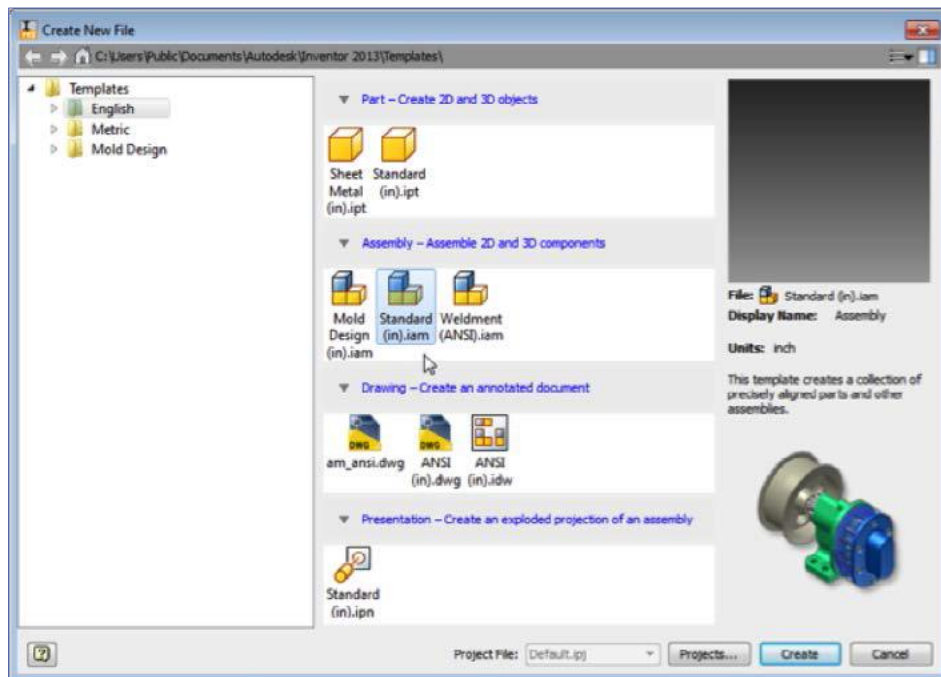


Figure 16

2. If you have done everything above correctly, you should have a directory containing the six files listed in Figure 17. When you select a file, the Preview window should show a part that corresponds to the file name you've selected (Figure 17).

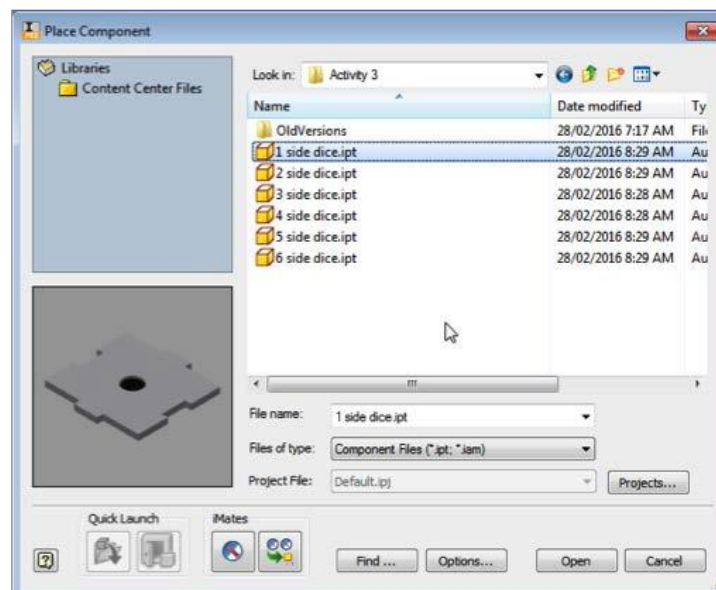


Figure 17

- Place the first part on the screen (Figure 18). This part can be called the grounded part. It is the part that every other piece is connected to. All other pieces will be based off it.

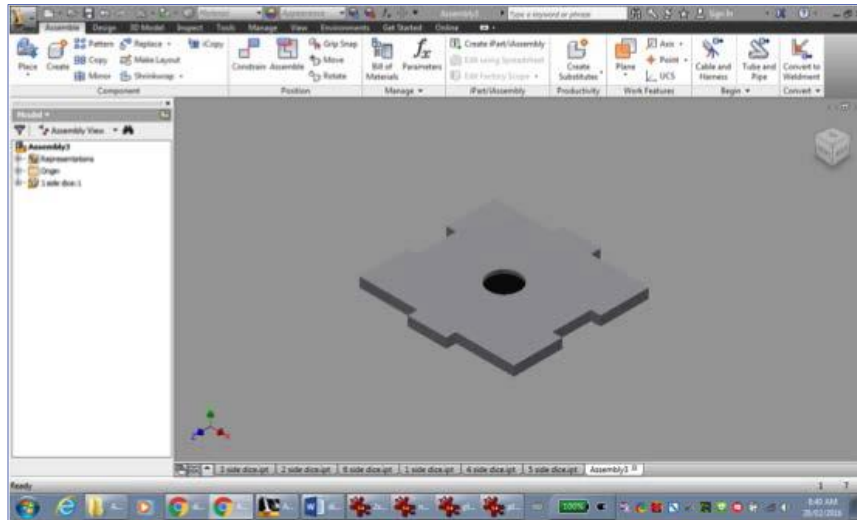


Figure 18

- Place the second part. On the Ribbon, select “Constrain.” The “Place Constraints” dialog box comes up, as shown in Figure 19.

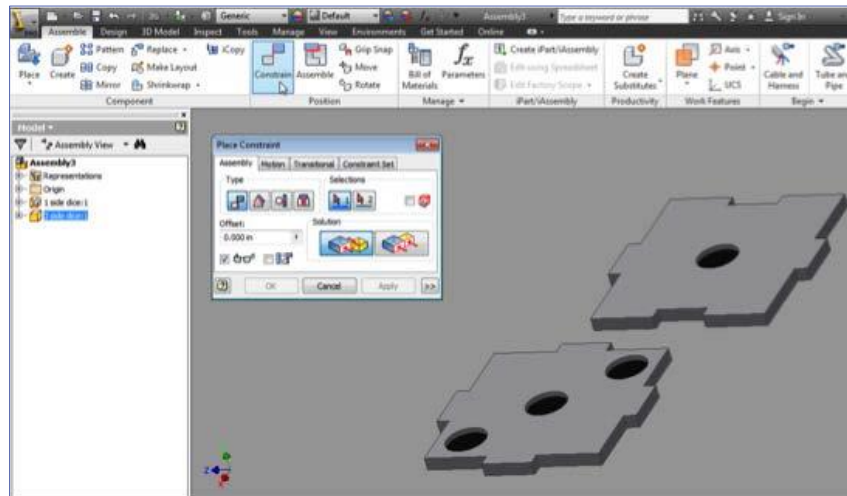


Figure 19

Remember which sides are opposite to each other:

- 1 is opposite 6
- 3 is opposite 4
- 2 is opposite 5

5. Select the two faces of the pieces as shown so that they are aligned flush, as shown in Figure 20. You may have to switch from “Mate” to “Flush” under the “Solution” in the dialog box to get the faces oriented the right way. Select “Apply” when they are lined up correctly.

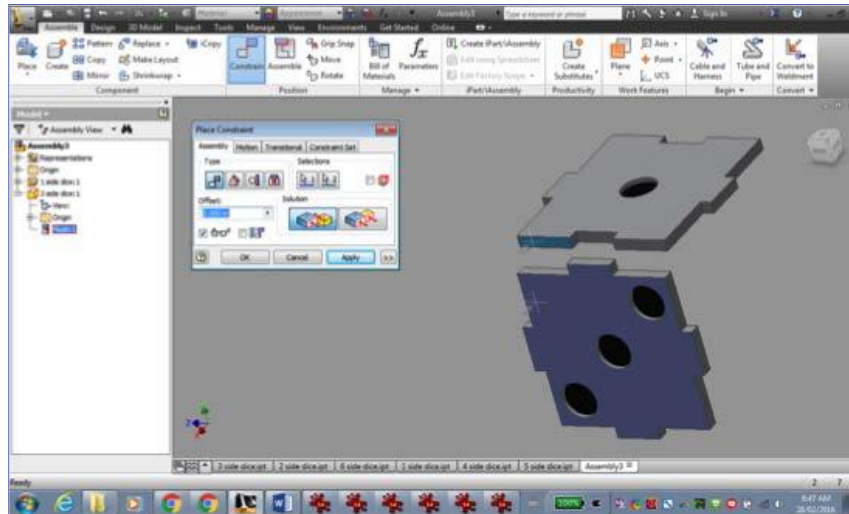


Figure 20

6. Select the next two faces of the pieces as shown in Figure 21 so that they are aligned flush. You may have to switch from “Mate” to “Flush” under the “Solution” in the dialog box to get the faces oriented the right way. Select “Apply” when they are lined up correctly.

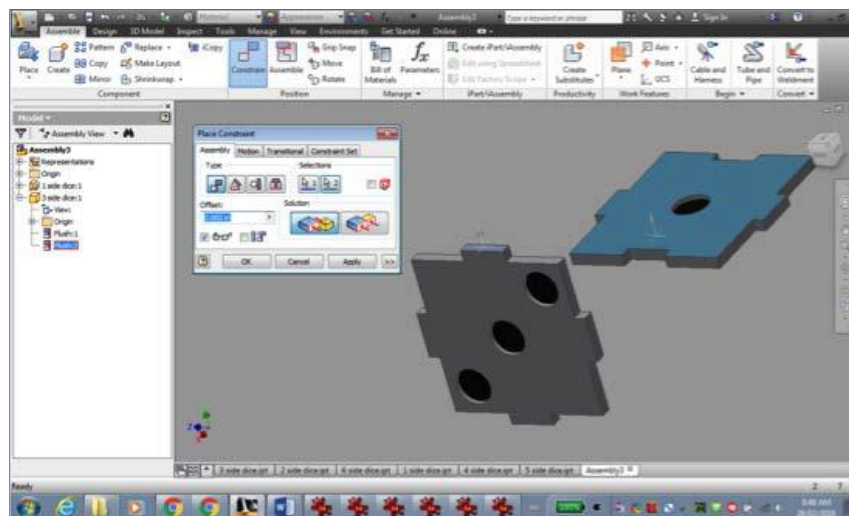


Figure 21

- To ensure the two parts are aligned “Centred,” this time you are going to align them to their planes. In the Browser, expand the parts to show their planes under “Origin.” Picking the planes will highlight them (Figure 22).

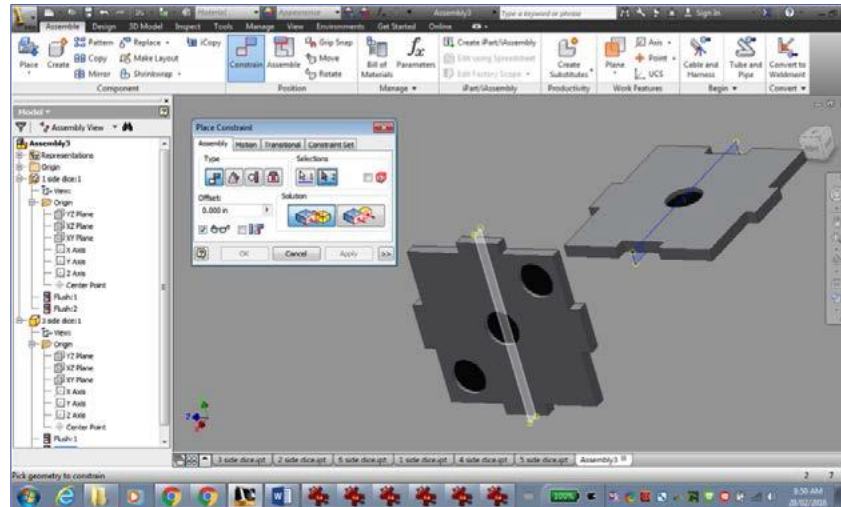


Figure 22

- Once both planes are picked, they will align so that they are mated. Select “Apply” (Figure 23).

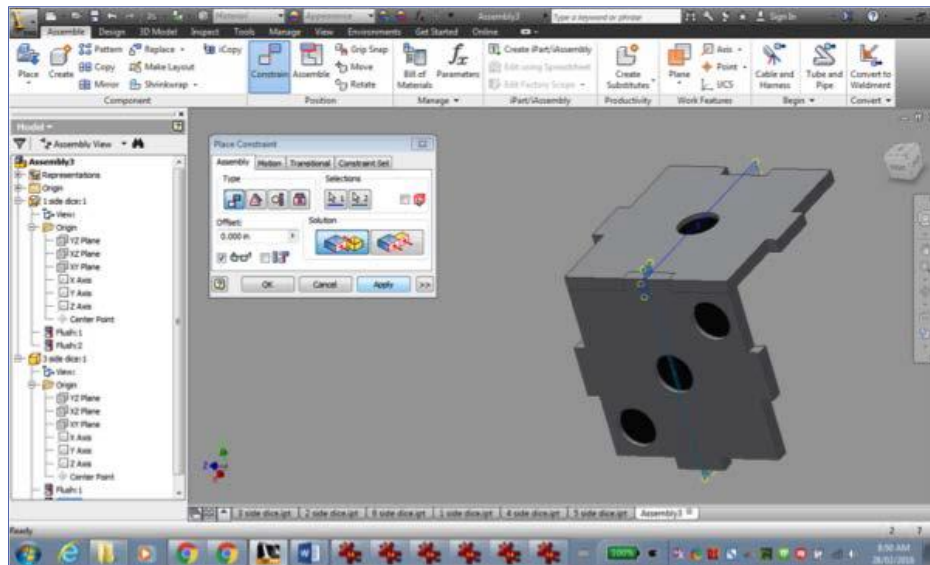


Figure 23

- Continue the process of constraining each part (Figure 24).

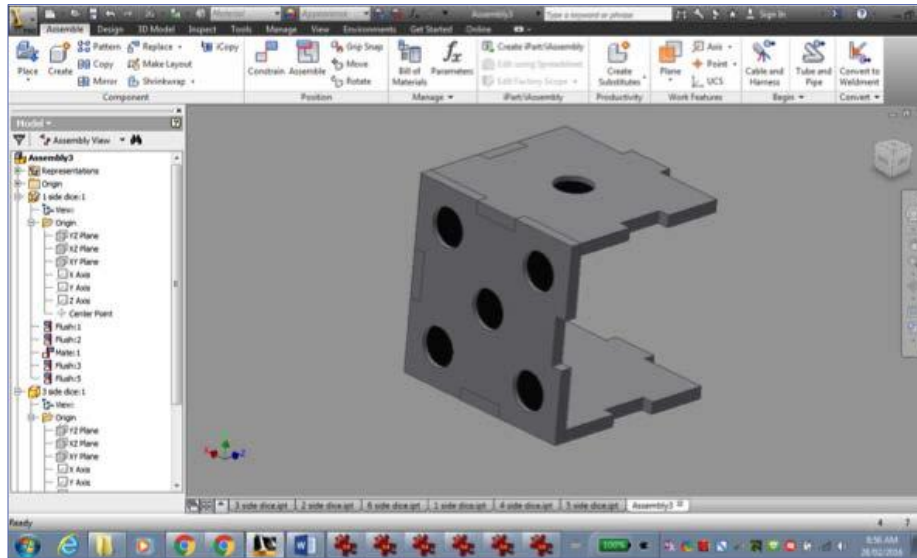


Figure 24

- Once you have placed all the parts and constrained them, you should end up with the completed die as shown in Figure 25. Save your work.

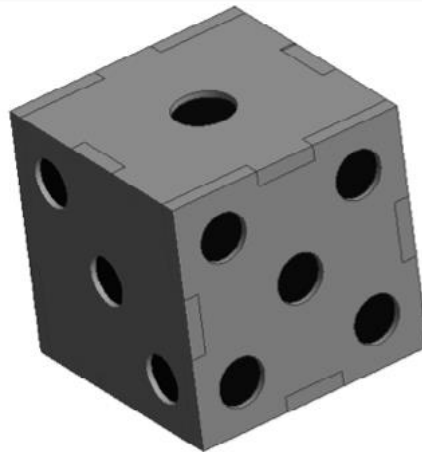


Figure 25