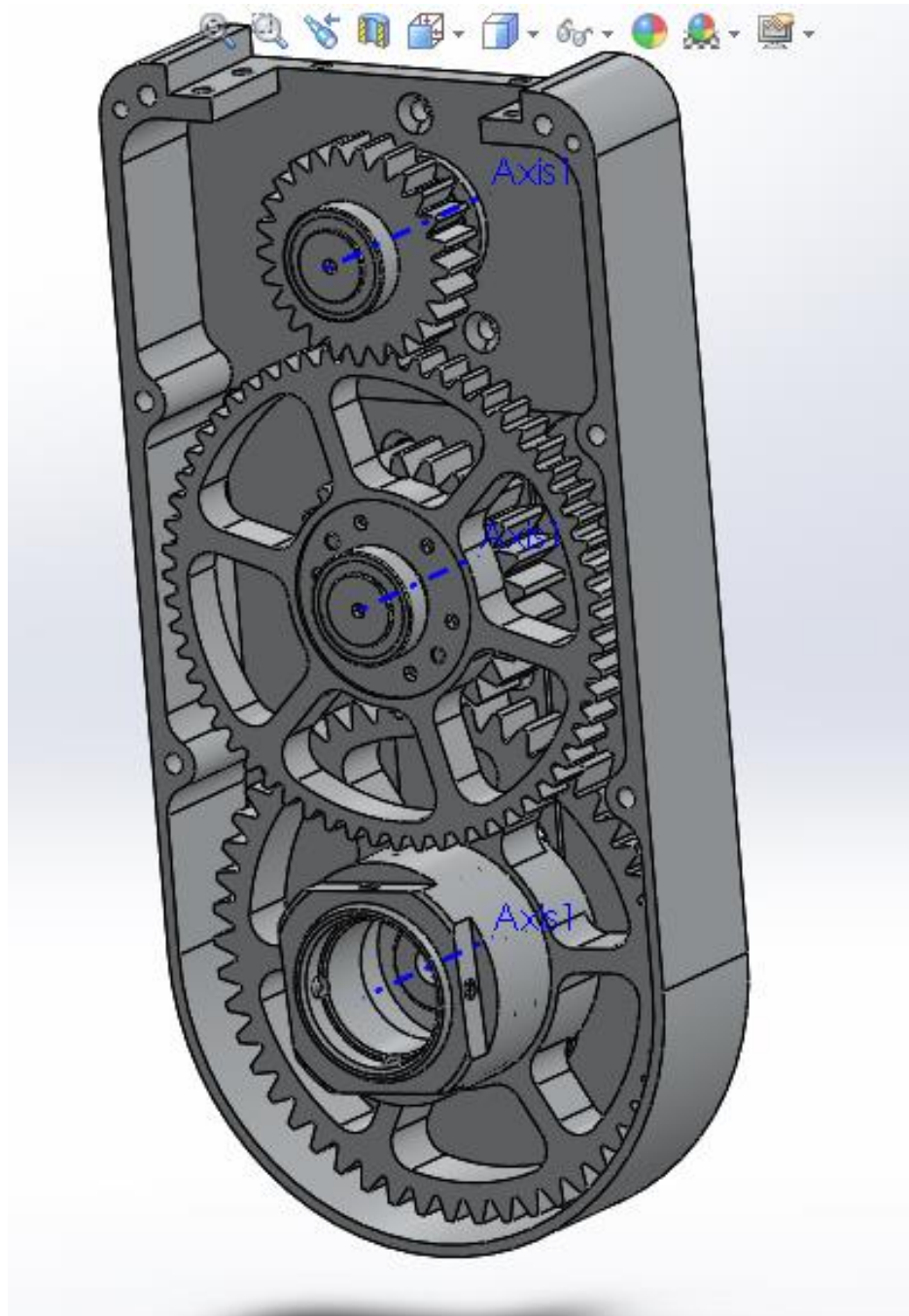


# Lesson 8: A Compound Spur Gear Train



- Goal:
- Create Assembly
  - Create Proper Gear Mates
  - Create Motion Study
  - Graph Angular velocity of Output Gear

## **MAKE SURE YOU ARE IN MILLIMETERS FOR THIS EXERCISE**

### Creating Assembly:

Parts List:

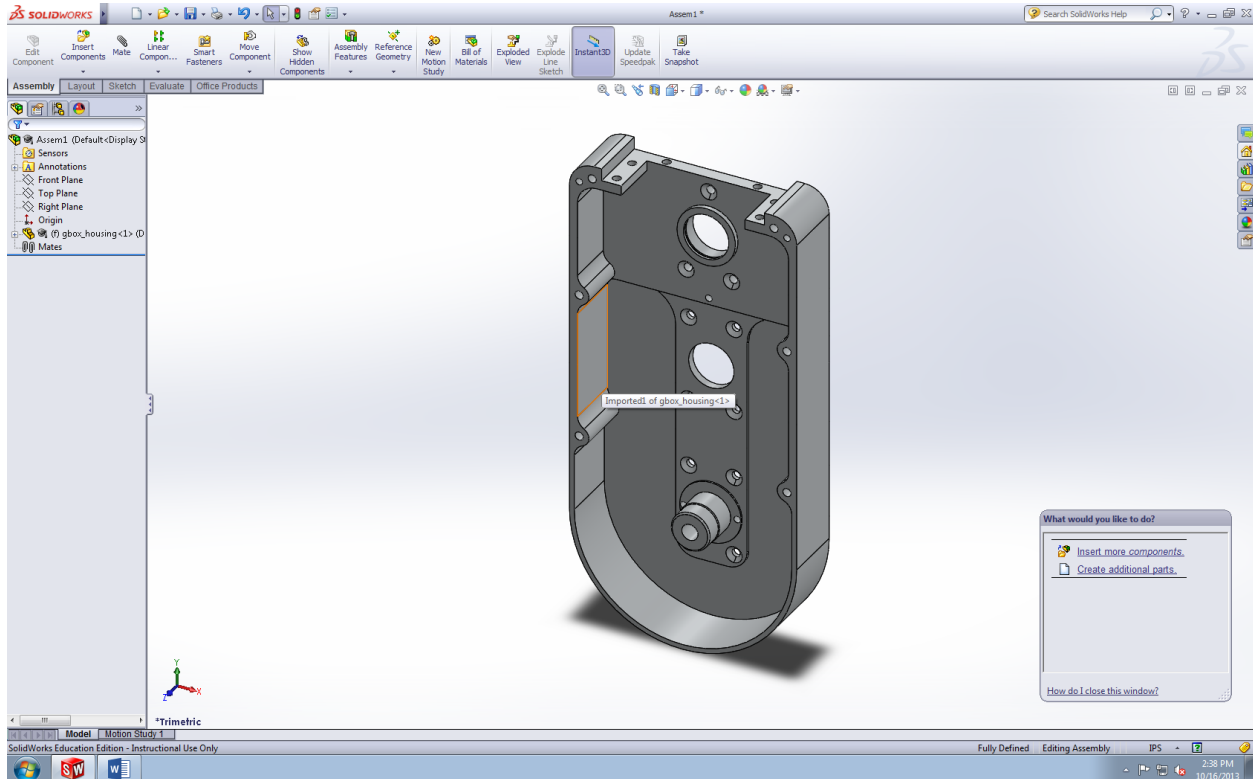
gbox\_housing

gbox\_input

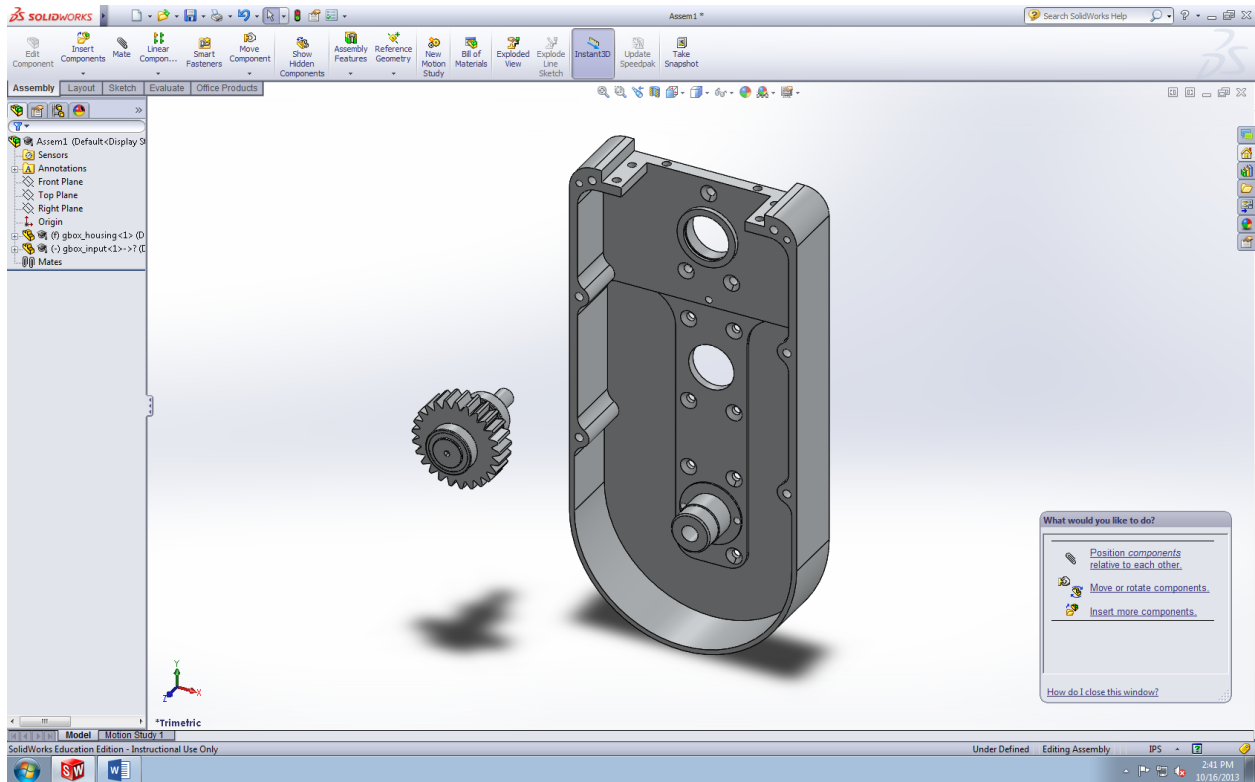
gbox\_middle

gbox\_output

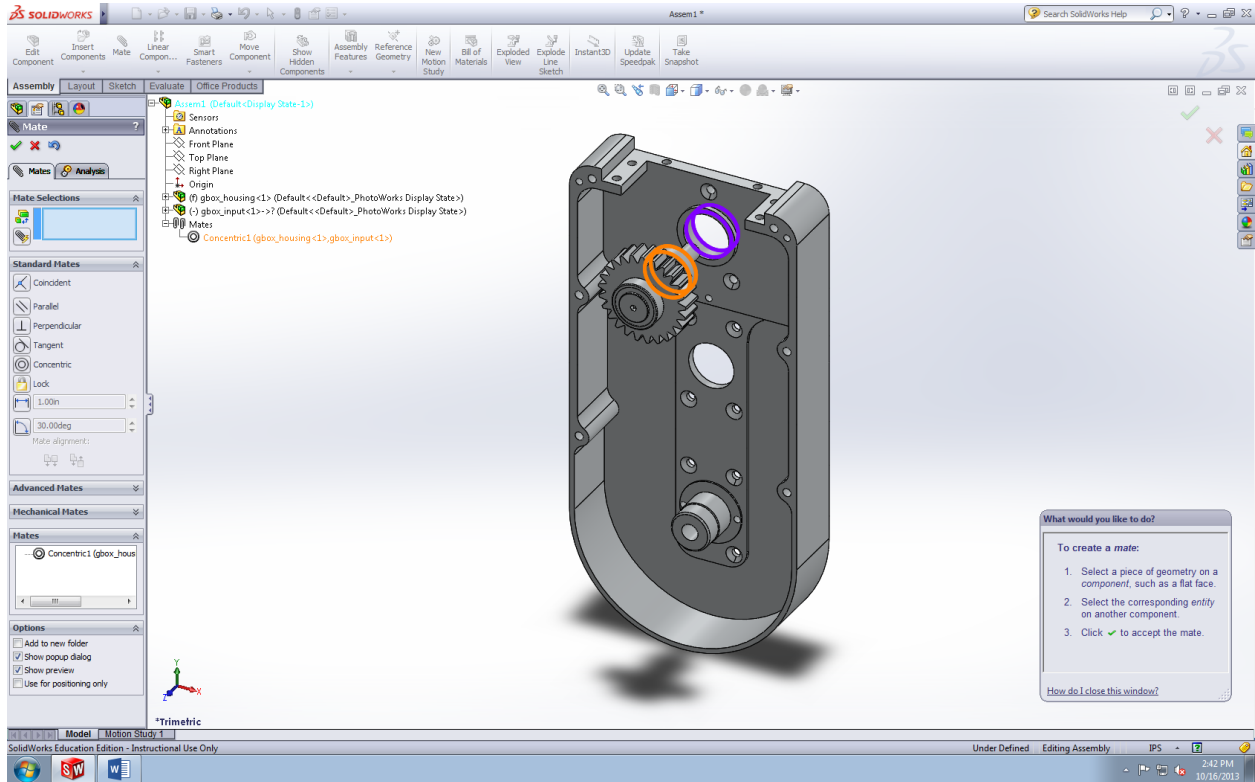
To start off, make the gear housing your base part. Labeled (gbox\_housing)



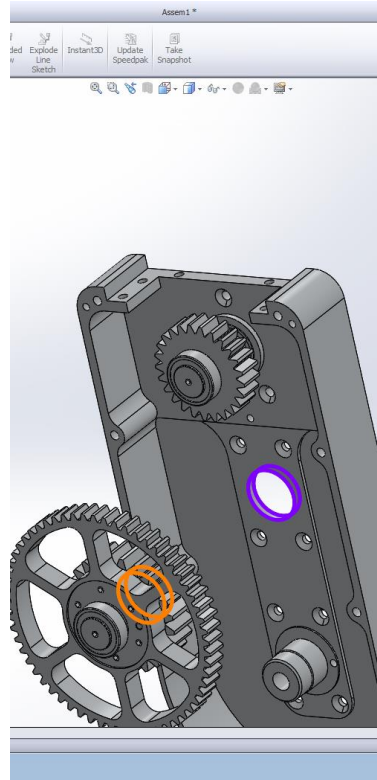
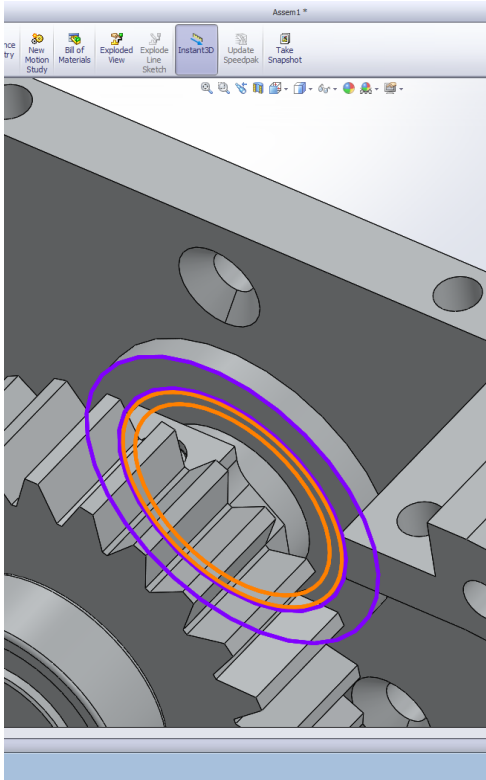
Next, mate the gbox\_input to the gbox\_housing



Create a concentric mate with top hole



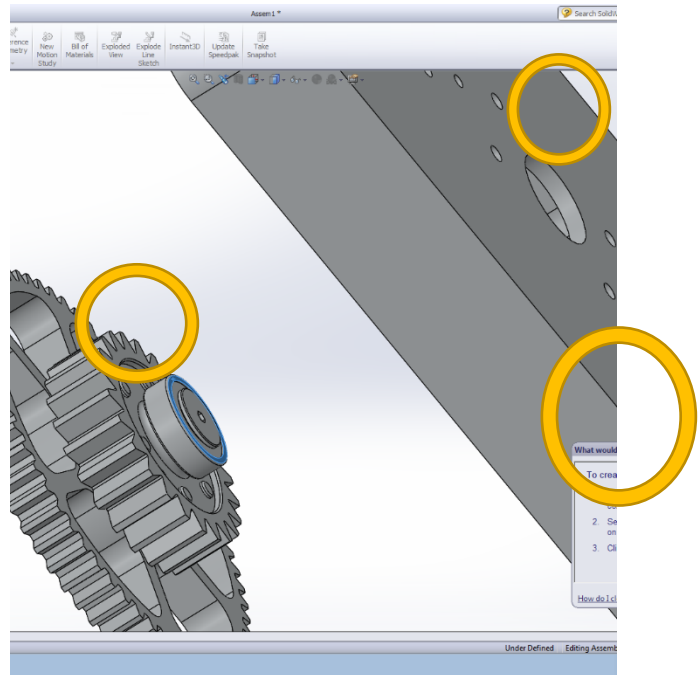
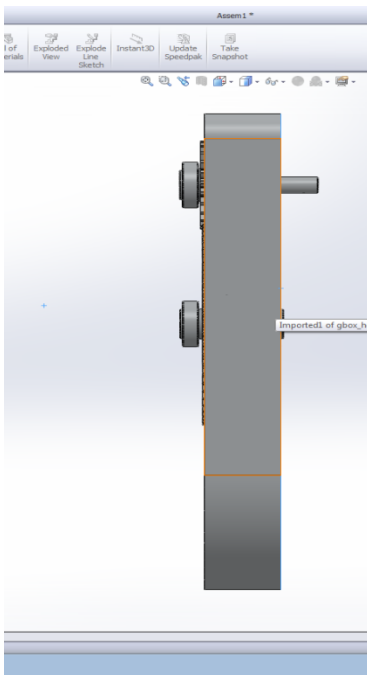
## Create a coincident mate

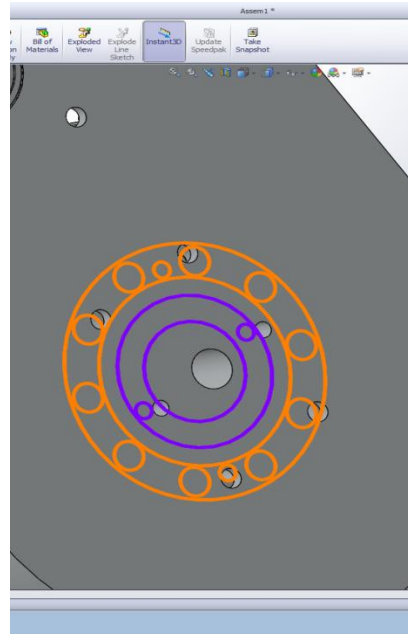
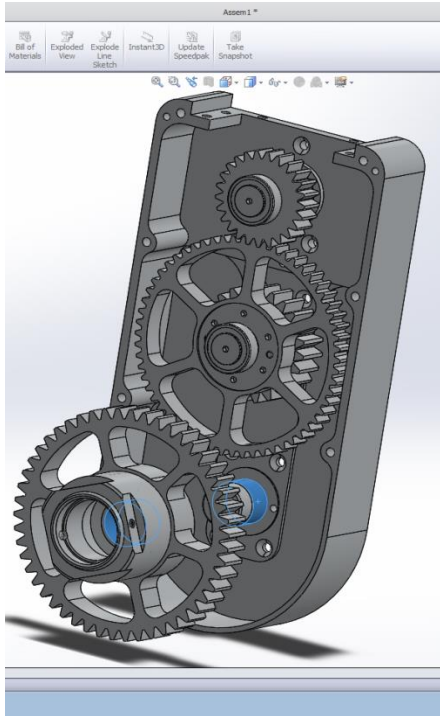


Select the part gbox\_middle and repeat the mates for its corresponding hole

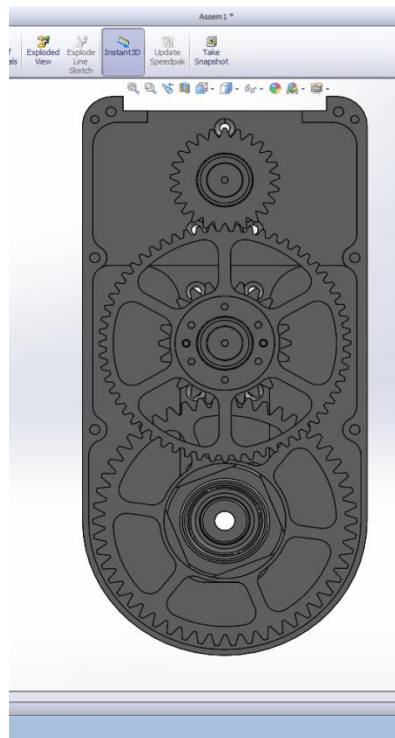
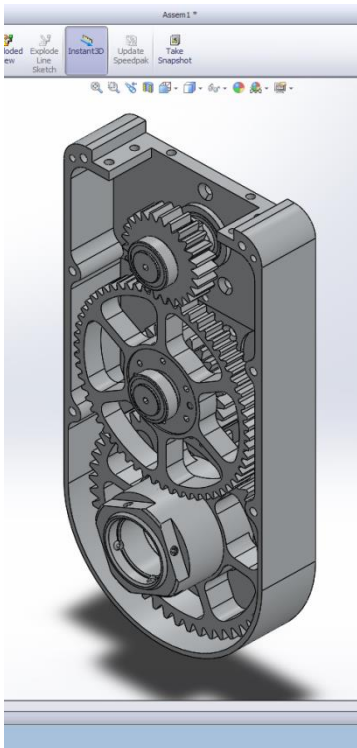
Note: For the middle gear make sure the back of the housing is mated correctly and not with the outer most edge. When mated correctly, the gear should protrude out the back a little bit (see below)

Next, insert the output gear with a corresponding coincident and concentric mate.



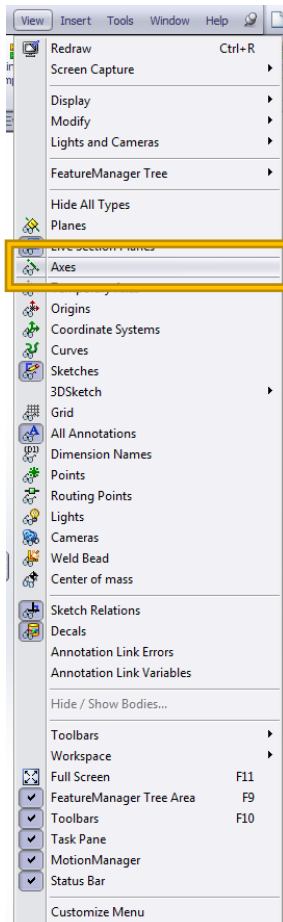
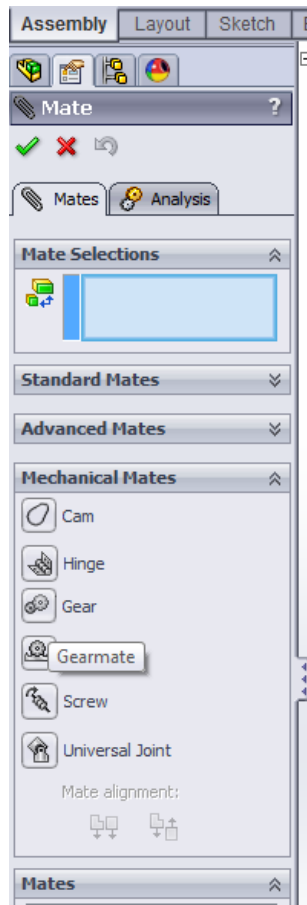
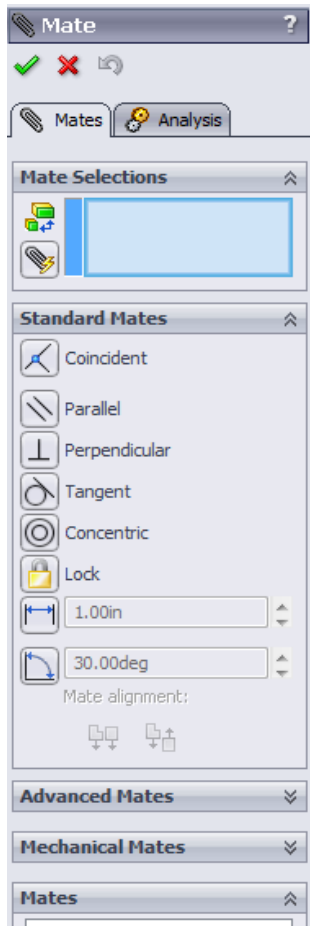


When you're done it should look like this. **IMPORTANT NOTE:** Solidworks doesn't care if gear teeth don't mesh. The Simulation will run even if the gear teeth are going into each other. This is why we need to do gear mates so that we relate the rotation of one gear to another. So if you want the teeth to visually mesh (they won't mesh absolutely perfectly) just go in with your mouse and rotate the gears until you are satisfied.

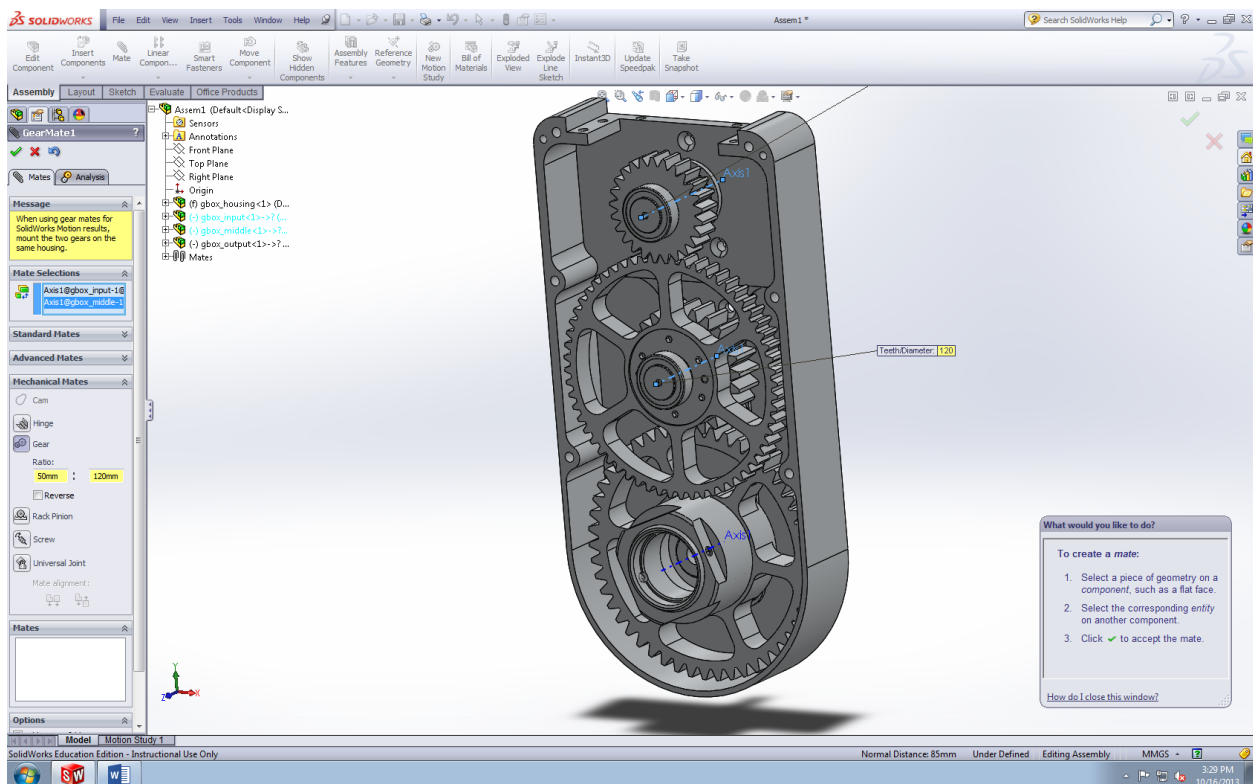


## Create Gear Mates:

Before starting, select view and underneath select the Axes option, this will show the axes of the gears. This is necessary for properly mating the gears. Now, select Mate and underneath the common mates are two tabs labeled Advanced Mates and Mechanical Mates, Select Mechanical Mates. Then Select Gear.



We need to first relate the input gear to the middle gear. With the gear mate open, select the axis of the top gear and middle gear. On the left, two boxes labeled ratios, will turn yellow, this where you type in the nominal diameters of the gears. In this case we type 50mm and 120mm. Click OK.



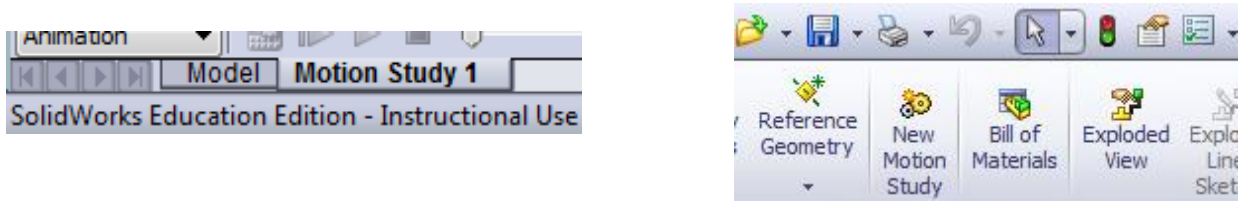
Now for the middle Gear and the output gear, select their axes and type in 60mm and 125 mm for their ratios. If you're wondering about which box to put which ratio, notice the labels on the gears in the model space, they will show what you labeled which. Click OK. You can now move the gear with your mouse if you want to visually see if the ratios are right.



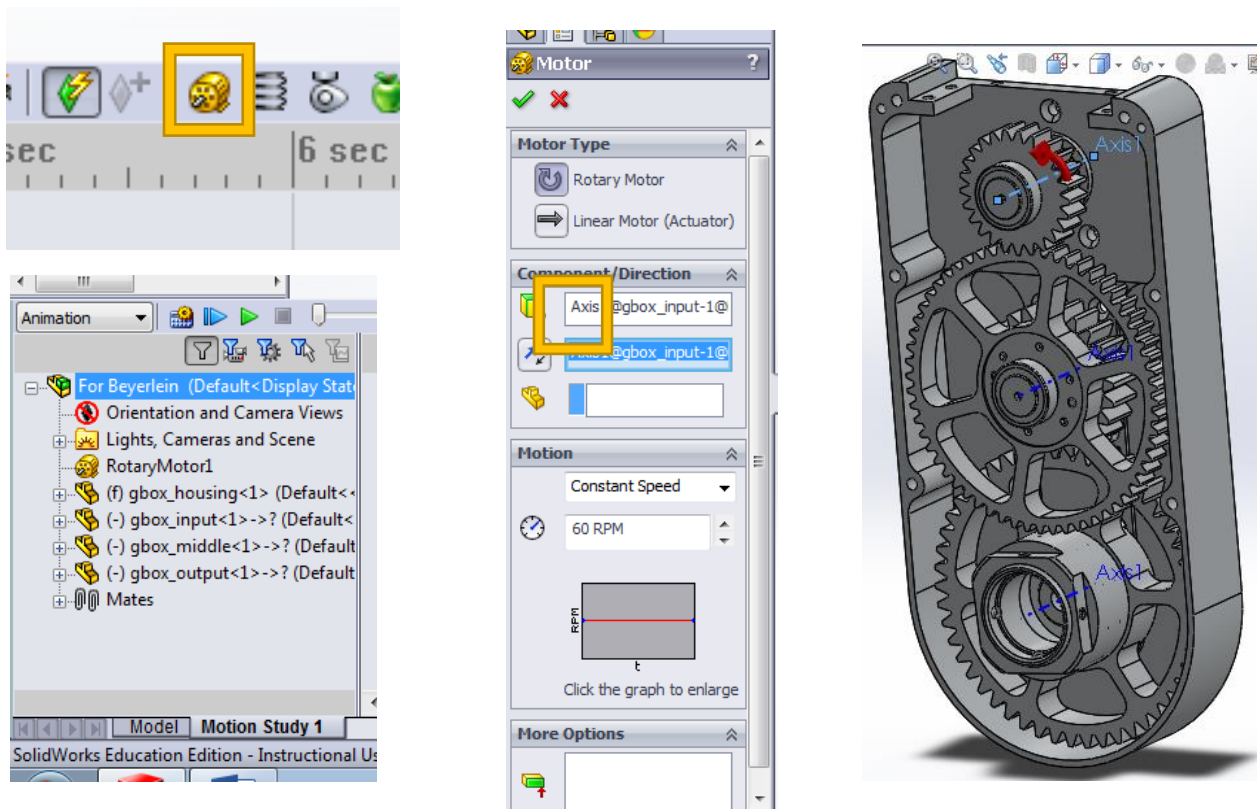
# Creating Motion Study

The goal now is to create a motion study in which you turn the input gear at 60 RPM for 1 second.

The first step is to go into motion study, you can either select Motion Study 1 from the bottom of the screen or select New Motion Study from the Assembly tab between Reference Geometry and Bill of Materials.



The Motion Study will pop up on the bottom of your screen. Now to create the 60 RPM at the input gear. Select Motor (the yellow icon) and then select Axis 1 and type in 60 RPM under the motion section. A red arrow will appear showing the direction. In the Component/Direction box, there is a button with two arrows. Clicking this will switch the direction of the 60 RPM if you select it. Click OK. Once that is done, click the Recalculate button (blue/yellow icon) and watch the gears turn.

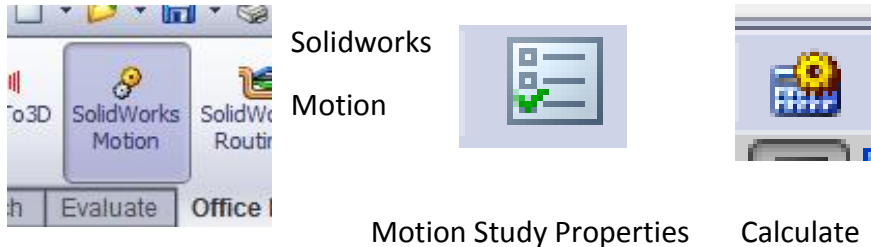


If the animation seems a bit choppy, select the Motion Study Properties button and raise the frames per second (for example 60 fps).

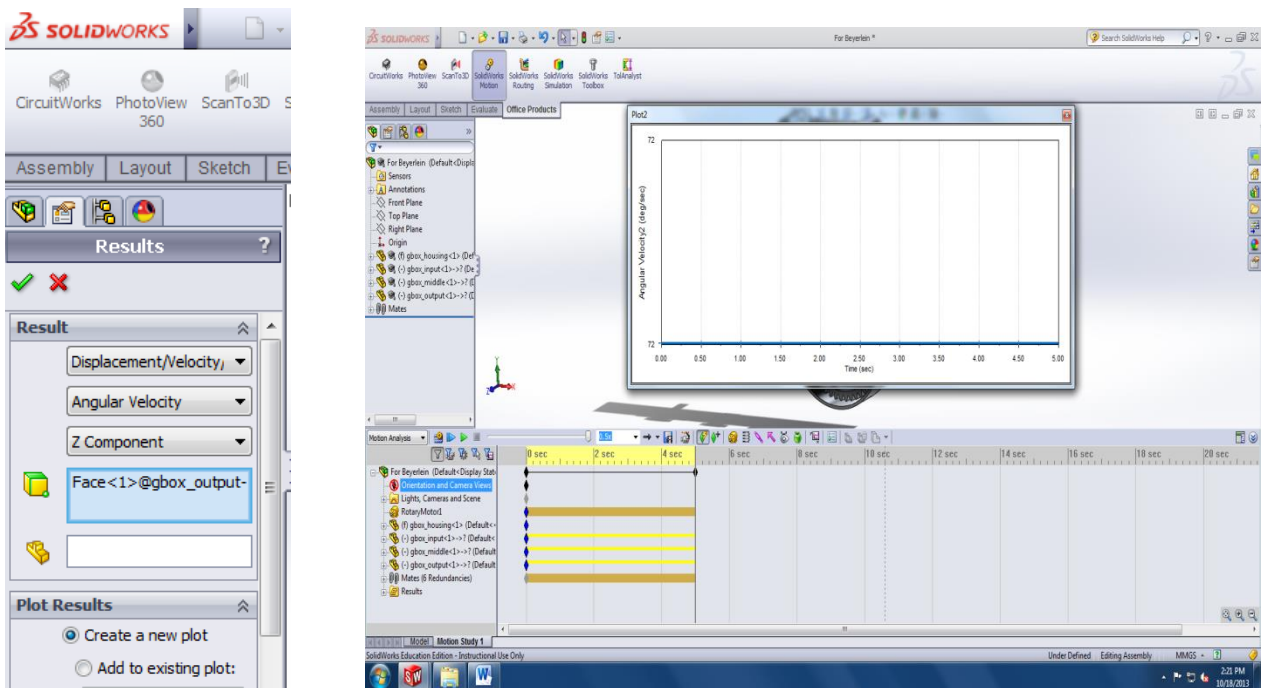
## Graph Angular Velocity of Output Gear

Start by Selecting Solidworks Motion from the Office Products tab at the top of the screen. This will ensure that certain options are available for graphing to work.

First, we need to make sure the frames per second are at 60. Do this by selecting Motion Study Properties and changing fps to 60, then click calculate.



Next, Right click on the output gear in the Motion Manager Tree (Bottom Left) and click the option Create Motion Plot. A menu will appear (shown below). Fill in the information as seen in the below picture and click OK. A plot will appear showing the angular velocity which is 72 degrees per second.



This concludes Lesson 8

