

# Pegboard Toy

## Purpose

When you receive a toy, what is the first thing you wonder about it? Do you wonder how it works? Have you ever wondered who designed it or who may have made decisions about its color or the materials that were used to make it? Being a toy designer may seem like it would be easy, but would it?

Designing a toy can be a challenging but fun process. You must consider many factors, such as safety, materials, and appropriate use. In addition, you have a chance to try out ideas and experiment with what you think might be fun. However, you must design something that is useful and will be enjoyed by kids the toy is appropriate for.

Learning how to design is a process that requires time and opportunities to explore and learn. In previous lessons and activities, you have been taught different aspects about design, sketching, and 3D modeling. In this activity, you will see how a pegboard with matching mallet is designed. You will learn how to test the pieces to ensure that they fit appropriately and that they are easy for a young child to enjoy.

## Equipment

- Computer with 3D modeling program

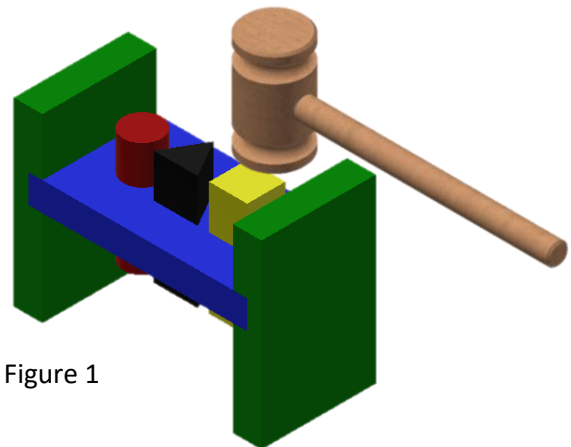


Figure 1

## Procedure

As a new employee of Tattered Toy Company, you have been asked to learn more about their best selling toy, the Pegboard (See Figure 1). Your supervisor, Mr. Duggle, states that you need to know how the pegboard was designed. He wants you to learn as much about the design process as possible while working on this project.

“You will need to keep track of your work, so be sure you keep notes and check off your work as you complete each step,” explains Mr. Duggle. “I will be checking your work and watching how you work with others.”

As Mr. Duggle leaves you to work, he calls back to you, “Good luck! Be sure to save all of your work so that we can review it later.”

## Directions

Read each step, perform each operation, and check them off after completion.

### Create a New Project Folder:

- Click on Projects from the Get Started Screen
- Go through the process to create a Project and New Folder called “Pegboard Toy”
- See Figure 2.
- All files for this project will be saved in this new folder

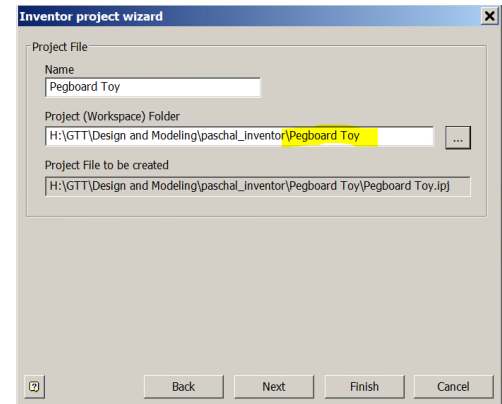


Figure 2

### Begin Creating Parts:

- Open a new Part File.
- Create a round part 1 in. diameter and 3 in. long.
- Save as **ROUND PEG** (.ipt). See Figure 3.

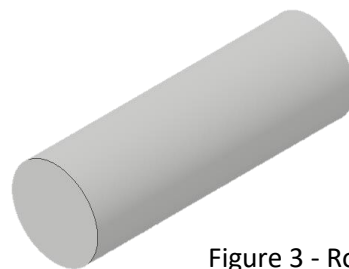


Figure 3 - Round Peg

- Open a new Part File.
- Create a square part 1 in. x 1 in. x 3 in. long.
- Save as **SQUARE PEG** (.ipt). See Figure 4.

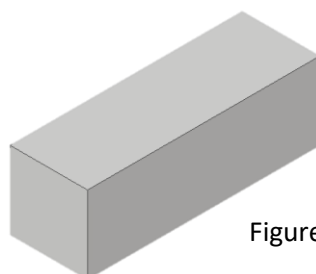


Figure 4 - Square Peg

- Open a new Part File.
- Label the front, top, and right side of the pegboard below. Think about the view you are drawing before dimensioning your rectangle.
- Create a pegboard part  $\frac{3}{4}$  in. (height) x  $5\frac{3}{4}$  in. (width) x 3 in. (depth) with holes that will accept the round and square pegs you designed. Both holes should be properly positioned both vertically and horizontally within the rectangular base.
  - Round hole center is 1.5" from the top and left side of the Pegboard
  - Square hole edges are 1" from the top and right side of the Pegboard
- Save as **PEGBOARD** (.ipt). See Figure 5.



Standard.ipt

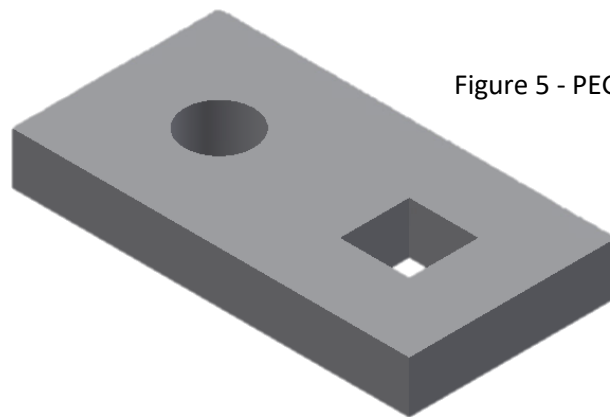


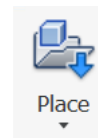
Figure 5 - PEGBOARD

## Create Assembly of Parts

- Open a new Assembly File.
- From the Assemble Menu, select **Place**.
- Place the **PEGBOARD, ROUND PEG, AND SQUARE PEG Parts**.
  - Hold the Ctrl key while click on each part to select them all at the same time.
  - See Figure 6



Standard.iam



Place

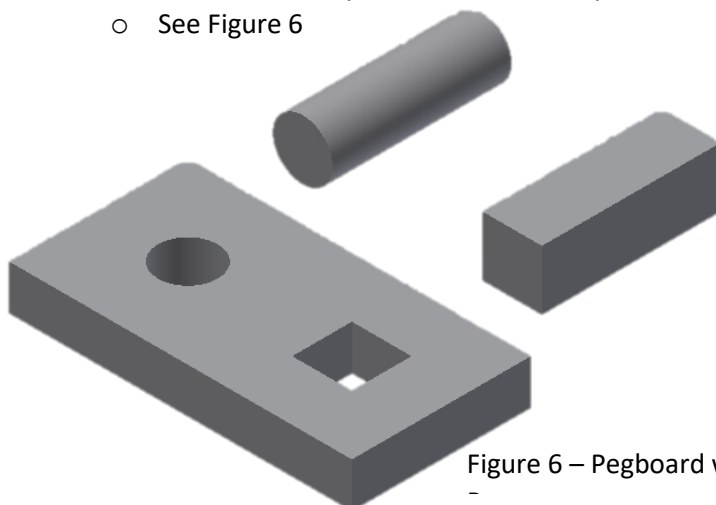
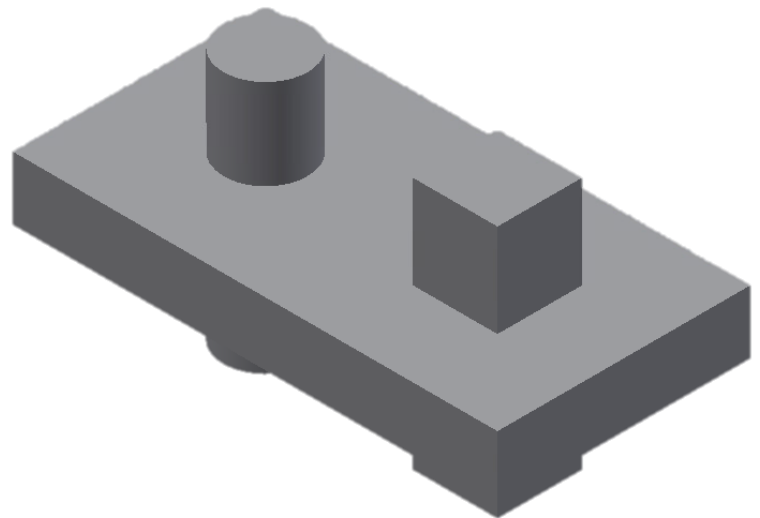
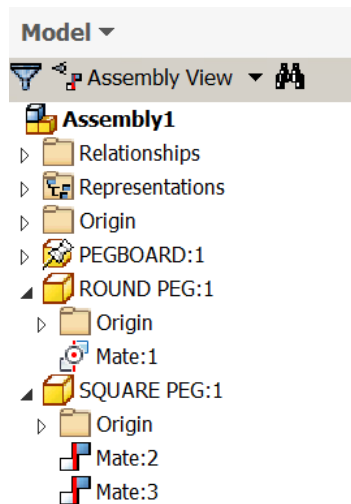


Figure 6 – Pegboard with Round and Square

- Look in the Model Browser to see if the pegboard is grounded.
- This symbol means the part is grounded or tacked in place. Only one part in an assembly is usually grounded.
- **If the pegboard is not grounded, right click on its icon and select Grounded.** See Figure 7
- From the Position panel, select Constrain. Mate the parts. The parts should still be able to move up and down.
- If you expand the Round Peg part, you should see one **Mate** constraint. If you expand the Square Peg part, you should see two **Mate** constraints. Why do you think that is?
- Save as **PEGBOARD TOY (.iam)**.

Figure 7 – Grounded →



Next, you will add end legs to the Pegboard Toy. These legs will raise the pegboard up off of a table so that the square and round pegs may be inserted until they are flush with the top surface of the pegboard. The end legs will be assembled to the pegboard using a Dado Joint, a special joint that adds strength when joining two pieces of wood.

- Open your **Pegboard Toy Assembly File (.iam)**.
- From the Assemble menu, select Create. See Figure 8
- A Create In-Place Component pop up will appear. In the New Component Name dialog box, name the component **END**. **Be sure the New File Location is your Pegboard Toy folder and not another folder on the C:/ drive.** Check the box beside Constrain Sketch Plane to Selected Face. **Click OK.**

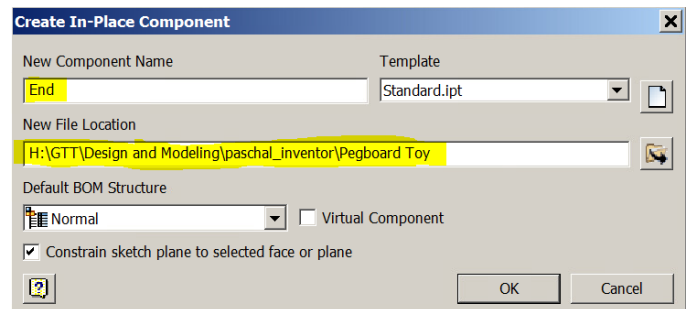


Figure 8 – New End part saved in the Pegboard Toy folder

- Select the front face of the Pegboard part to begin the sketch for pegboard leg. The pegboard and the two pegs should “gray out.”
- From the 3D Model Menu, select **Start 2D Sketch**, then click on the front face of the Pegboard again. Now select **Project Geometry** then click on the front face of the Pegboard on more time. This will project the four edges pegboard front face to the active Sketch Plane. See Figure 9.
- Sketch and Profile the End component. Make sure you apply dimensions and constraints when creating your **END**.
- The Dado Notch should be drawn exactly on the right edge of the Pegboard.

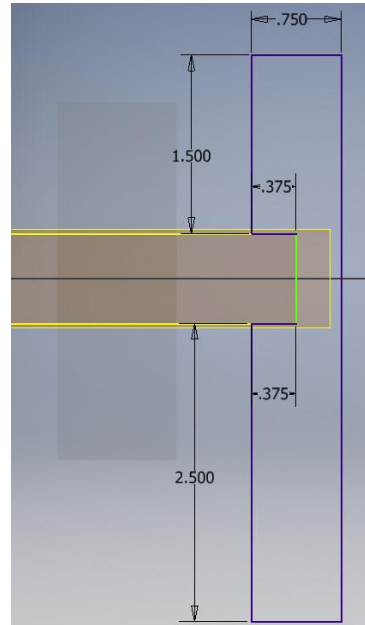
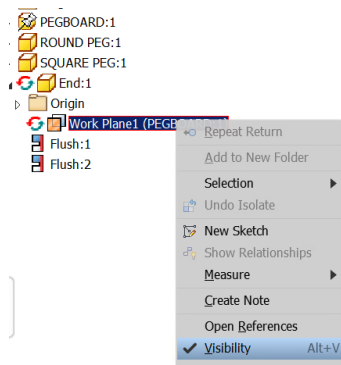
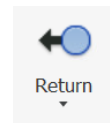


Figure 9 – End Profile with all dimensions

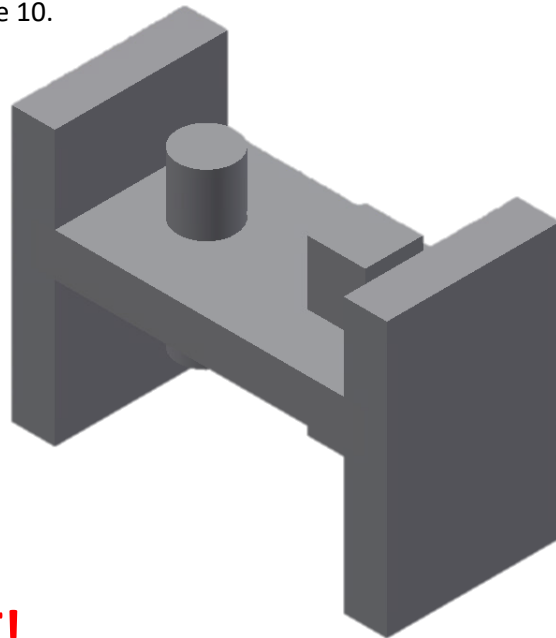
- Finish the sketch.
- **Extrude** the part to match the depth of the pegboard. **Pay attention to the direction of the extrusion.**
- Click on Return in the 3D Model Menu
- In the Browser, right click on Work Plane 1, and uncheck “Visibility”
- **Save** the assembly. You must save the assembly to make the initial save of the **End**.



- From the Assemble Menu, select **Place** and place and then add the End to the Assembly.
- Click the arrow next to End: 2 in the Browser. Uncheck “**Visibility**” for this End’s Work Plane as well.
- **Constrain** the other END to the Pegboard.
  - **2 Mate Constraints and 1 Flush Constraint are required**

- Save the assembly, but do not “Save As” and give it a new name.
- The updated assembly should look like Figure 10.

Figure 10



## ALERT!

You have now completed the first part of the 3D model of the Pegboard Toy. Like all toys, once an initial design is made, it must go before the design department.

The Tatter Toy design department has just finished with their review of your Pegboard Toy. They decided that the toy needs something else to make it more fun for children. After some discussion the design department team decided that the Pegboard Toy needs an additional triangular-shaped peg to improve the design.

Your challenge is to design the triangular-shaped peg and edit the Pegboard Toy so that it will remain the same size, have the two original parts, and include the new triangular-shaped peg. This process has been provided to guide you as you learn how to modify a design. Follow each step, performing the operation and keeping track as you complete each step.

- Open a new Part File.
- Create an equilateral triangle peg 1 in. high and 3 in. long
  - This does NOT mean that each side is 1 in. long
  - It DOES mean that from each peak of the triangle to the opposite side is 1 in.
- Save part as **TRIANGLE PEG** (ipt file). See Figure 11



Standard.ipt

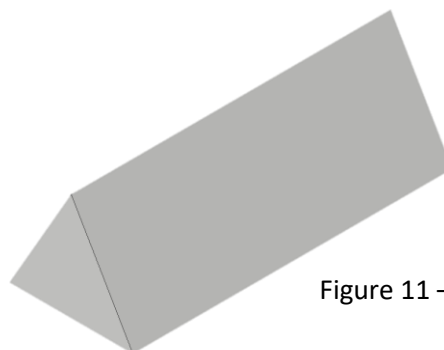
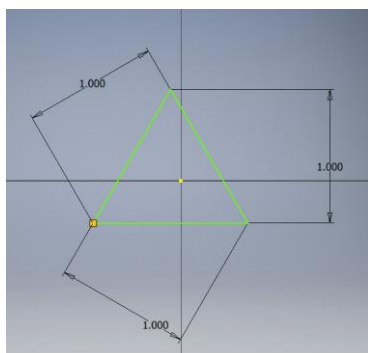


Figure 11 – Triangle Peg

- Open the PEGBOARD.ipt
- **Start a new 2D Sketch** on the top surface, **Project Geometry**, and Create hole to accept the TRIANGLE PEG.
- Constrain the triangular hole as show in Figure 12.
- **Save, but do not change the file name!**

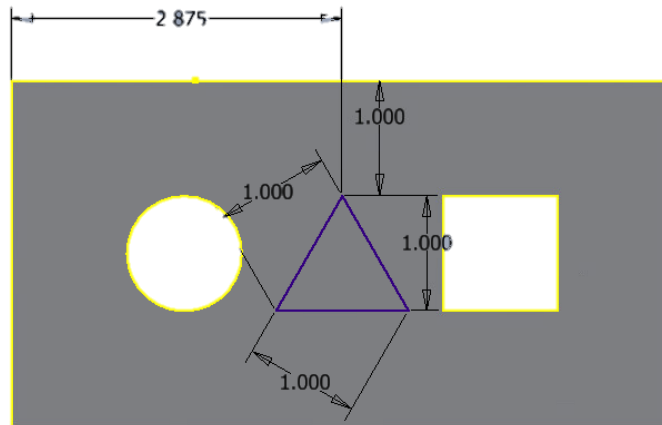


Figure 12 – Triangular Hole in Pegboard.ipt

- Open the PEGBOARD TOY (.iam).
- Update the assembly. The Triangular hole will show up automatically.
- **Place** and **Mate** the TRIANGLE PEG in the Assembly. It will be constrained in a similar fashion to the Square Peg in an earlier step.
- Change the color of the various components to make the toy more aesthetically pleasing. See Figure 13
- **Save.**

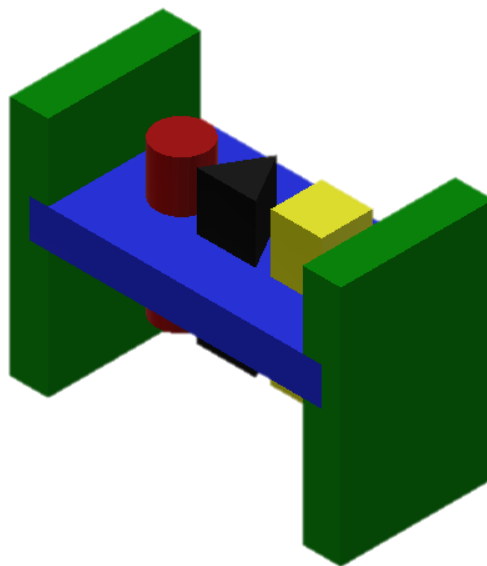


Figure 13 – Completed Pegboard Toy Assembly

## More Work to Be Done!

After you completed the update of the Pegboard Toy, the Tattered Toy Design Department reviewed your work and came up with yet another idea to help make the Pegboard Toy more fun.

The Design Department team decided to have you create a mallet for the Pegboard Toy. When creating the mallet, you will need to demonstrate how well you can sketch and create 3D models.

Because you are a new employee, the Design Department team decided to give you a few ideas to help you with your design of the mallet.

## Create the Mallet

- Open a new Part File.
- Sketch a profile of one-half of the mallet head. This profile will be revolved in order to create a full image of the mallet head.
- Your sketch should look like Figure 14

## Revolve

- Finish the sketch and switch to Home view.
- From 3D Model menu, select **Revolve**.
- Use Revolve pop up or on-screen selection tags to create the revolution.
- The Profile should automatically be selected, and you will select the left edge of the shape as the Axis around which to Revolve the profile. See Figure 15.

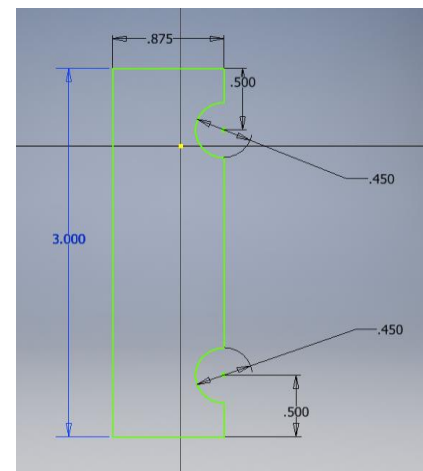


Figure 14 – Mallet Head Sketch

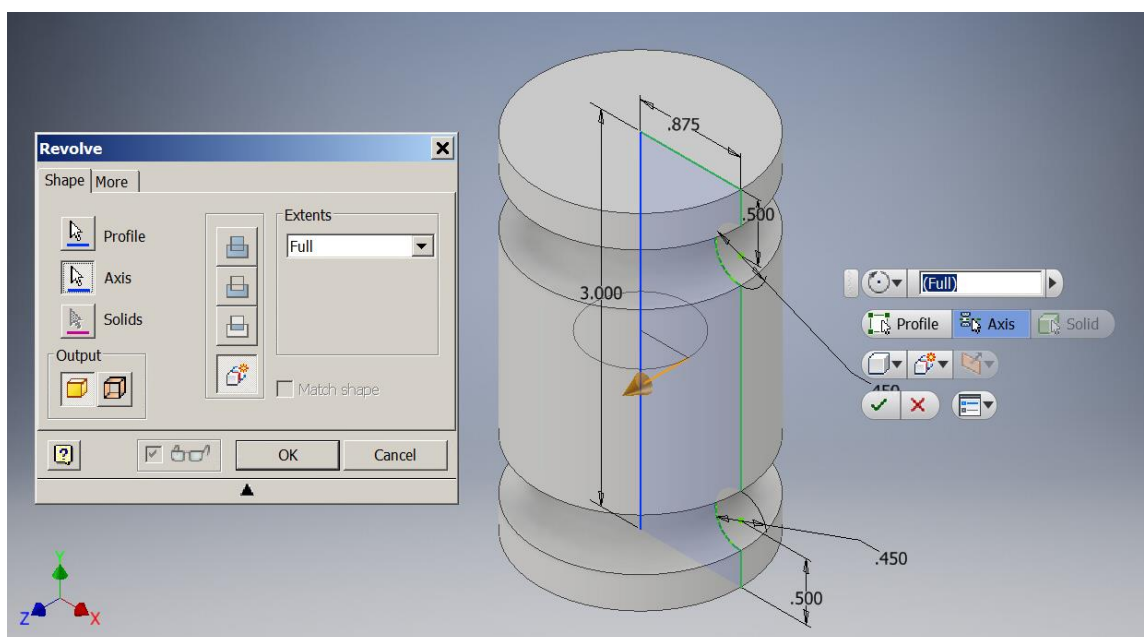


Figure 15 – Revolved Mallet Head



### Work Plane on the YZ Plane

In order to place a Work Plane on the YZ plane and tangent to the circumference of the mallet head, follow the directions listed below:

- From the Work Features panel, select **Plane**.
- In Model Browser, find and expand the **Origin Folder** and then left click on the **YZ Plane**.
- **Click on the circumference** of the mallet so the work plane will be made tangent. See Figure 16.

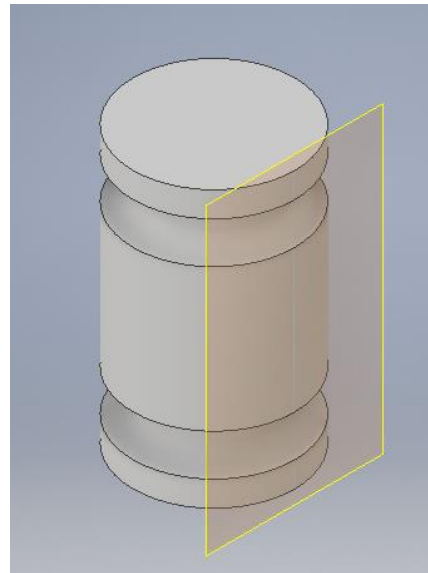
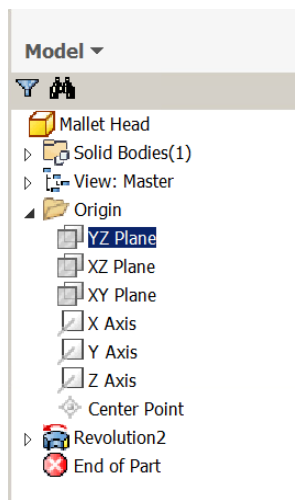
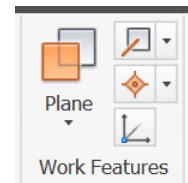
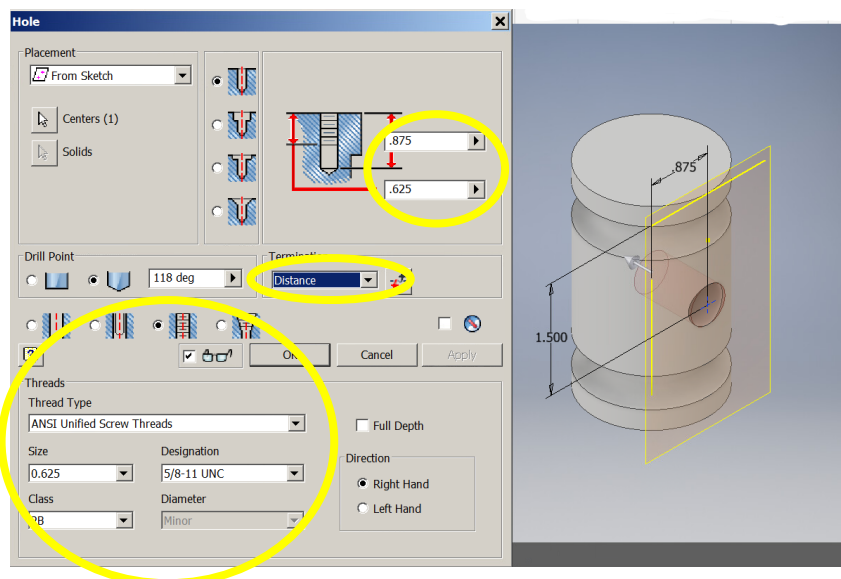


Figure 16 – Work Plane Tangent to Mallet

- Place a **Sketch Plane** on the work plane you just created. Click on the edge of the work plane to place the sketch.
- Left click on the Right side of the view cube.
- **Project Geometry** the height and width edges of the mallet head details onto the Sketch Plane.
- From the Sketch menu select **Point**. Place and locate the Point in the middle of the mallet.
- Use **Hole** from the Modify panel to create a drilled and tapped Hole Feature. See Figure 17.

Figure 17 – Create the Hole in the Mallet Head.

Select the Thread size 1<sup>st</sup>!



- In the Model Browser, right click on **Work Plane** and uncheck **visibility**.
- Place 1/16 in. **Chamfer** on each end to give the mallet its characteristic look.
- Save part as **MALLET HEAD** (ipt). See Figure 18.

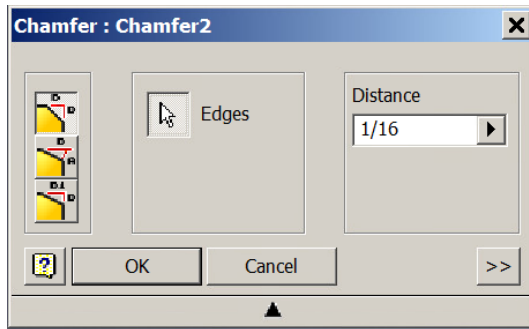


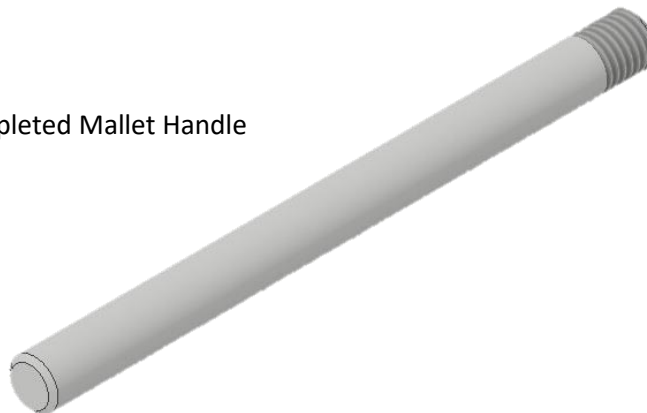
Figure 18 – Completed Mallet Head

## Creating the Mallet Handle

- Open a new Part File.
- Create a part 5/8 in. diameter and 8 in. long.
- Save file as **MALLET HANDLE** (ipt).
- Place 0.0625 **Chamfer** on each end.
- Select **Thread** from Modify panel. Use thread specifications from mallet head to place threads on one of the handle. See Figure 19.
- **Save.**



Figure 19 – Completed Mallet Handle



## Assembly of Mallet Head and Handle

- Open a new Assembly File.
- From Component panel, select **Place**.
- Place the **MALLET HEAD** and the **MALLET HANDLE** in the graphics window.
- Right Click on the **MALLET HEAD** in the Model Browser. Select **Grounded**
- Place an Insert Constraint between the head and handle.
- Be sure to offset the handle 0.250 in. to allow for the bottom part of the hole in the mallet head that was not threaded. See Figure 20.
- Change the Assembly from Default to a wood material.
- Save Assembly as **MALLET ASSEMBLY** (iam). See Figure 21.



Figure 20 – Insert the Mallet Handle into the Mallet Head

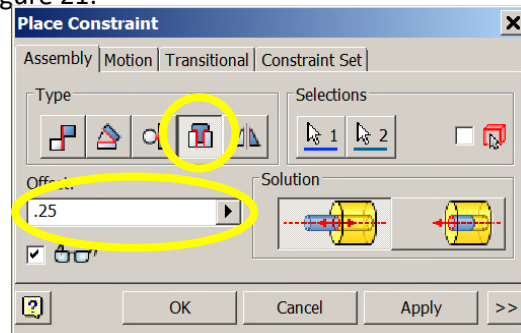


Figure 21 – Completed Mallet Assembly