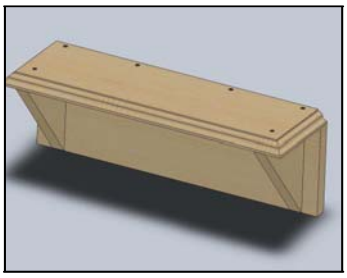
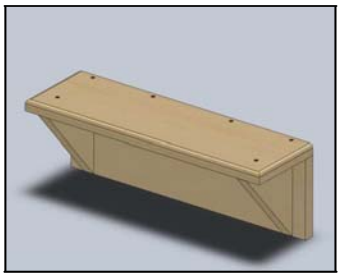
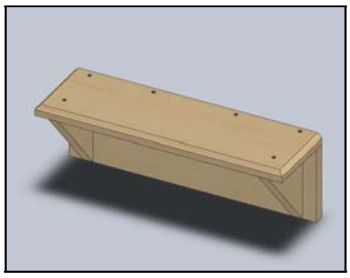
Wood Bookshelf

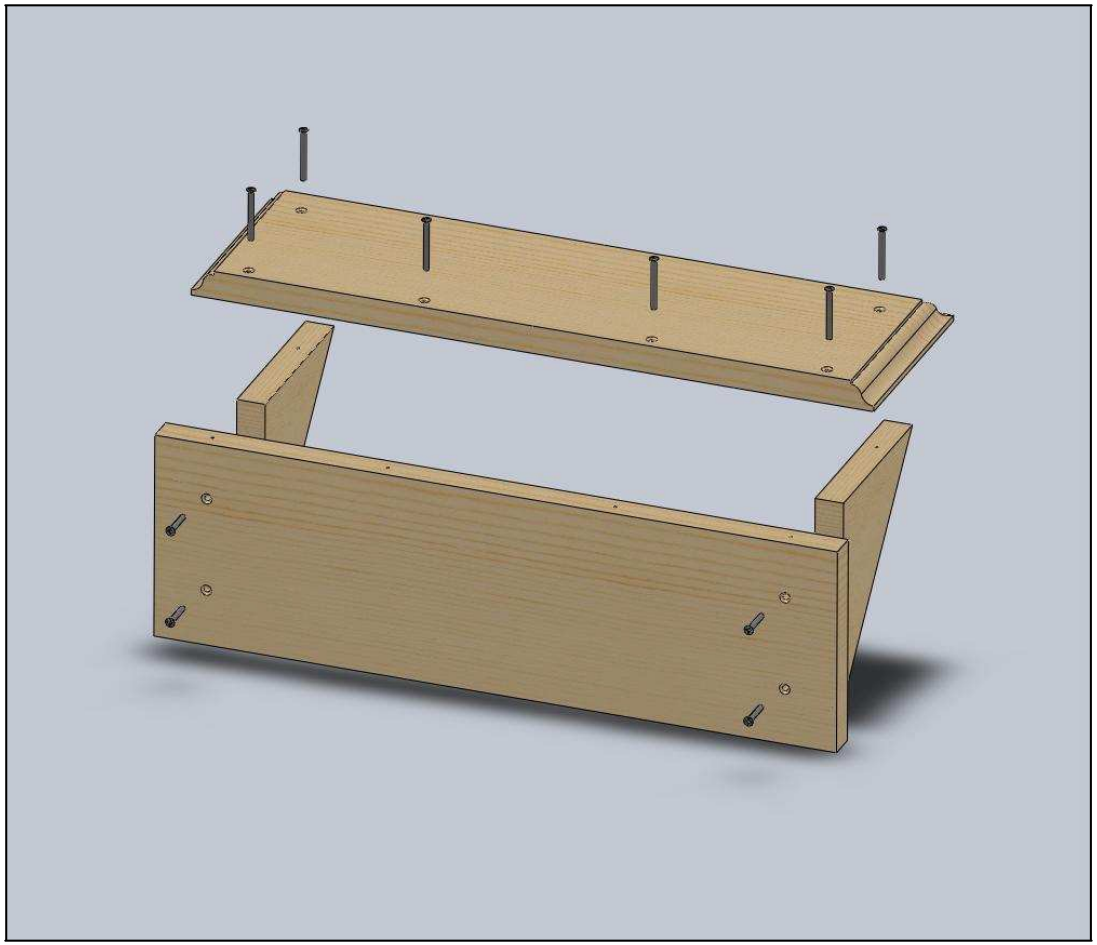
Equipment

A. Safety Glasses
B. Speed Square
C. Miter Saw
D. Drill Press
E. Router Table
F. Palm Sander
G. Phillips Head Screw Driver
H. Tape Measure
I. Torpedo Level

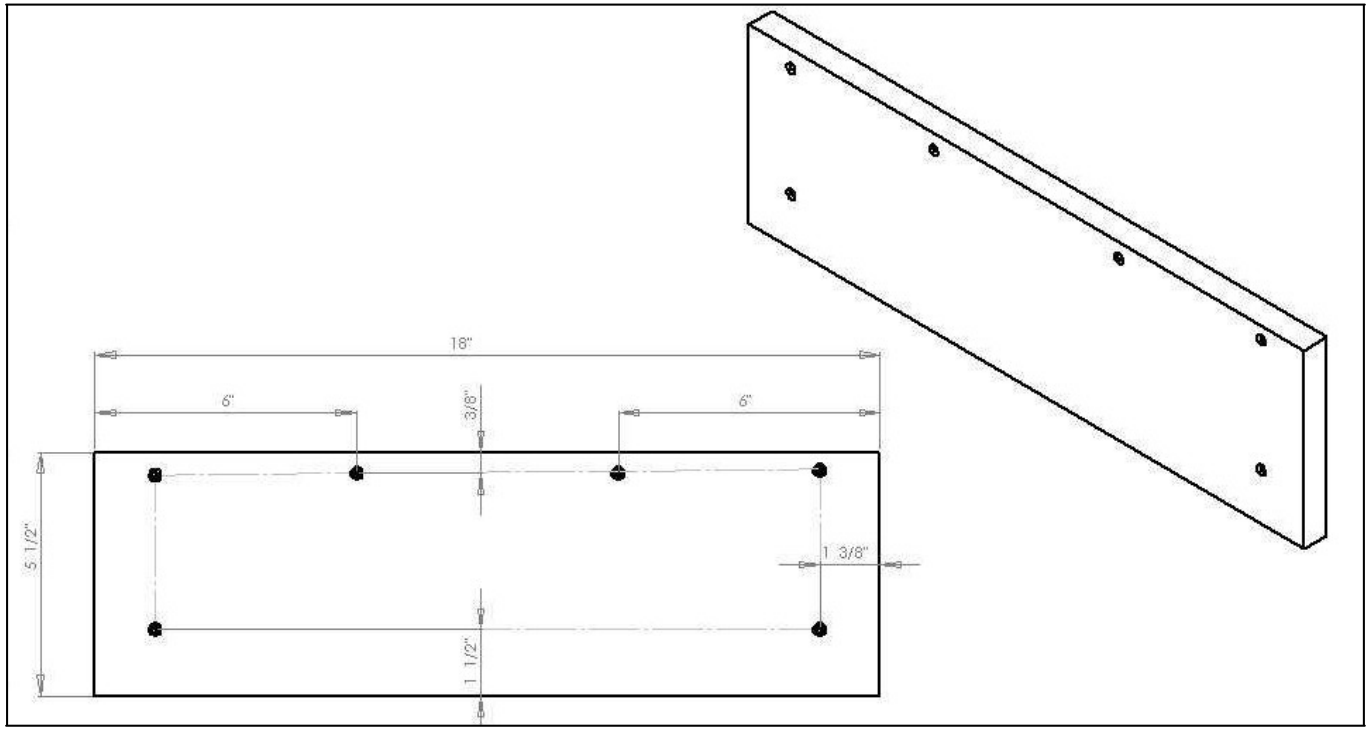
Materials

A. 1/16” Drill Bit
B. #6 Counter Sink
C. Choice of Router Bit
D. 1 1/4" #6 Screws
E. 1”x6”x5’ Pine Wood

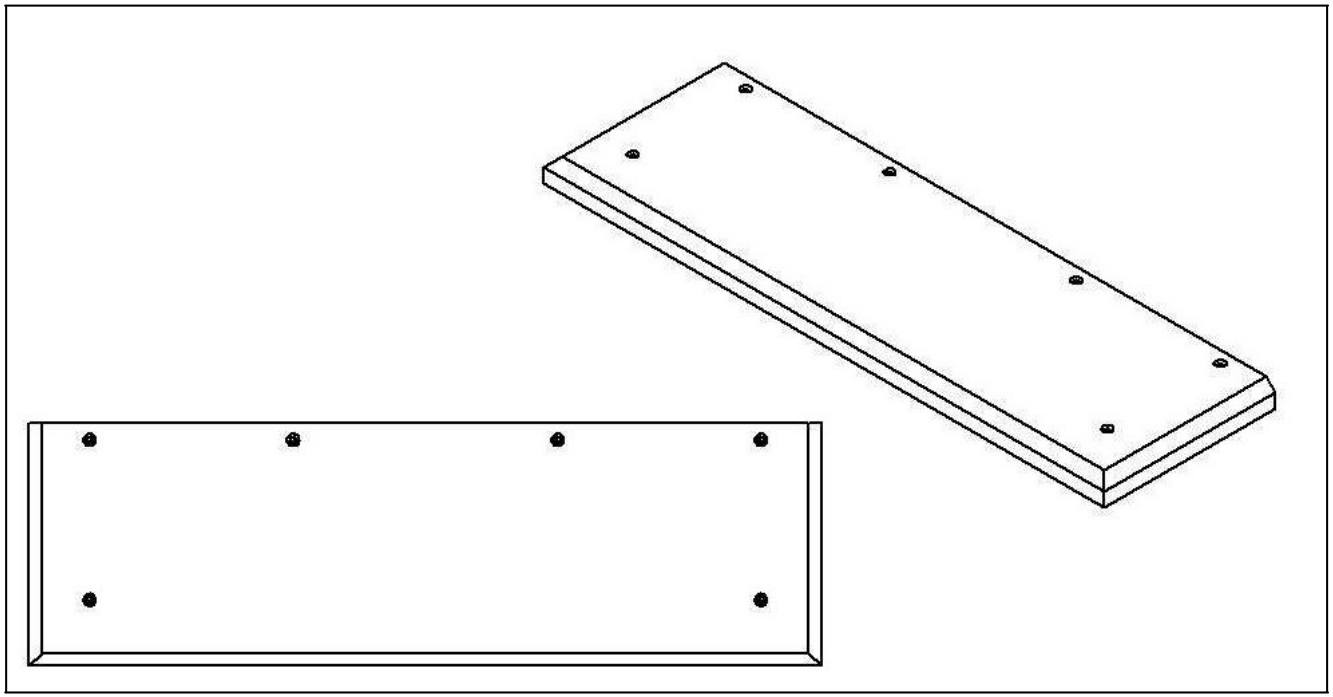
Drawing1: Exploded View



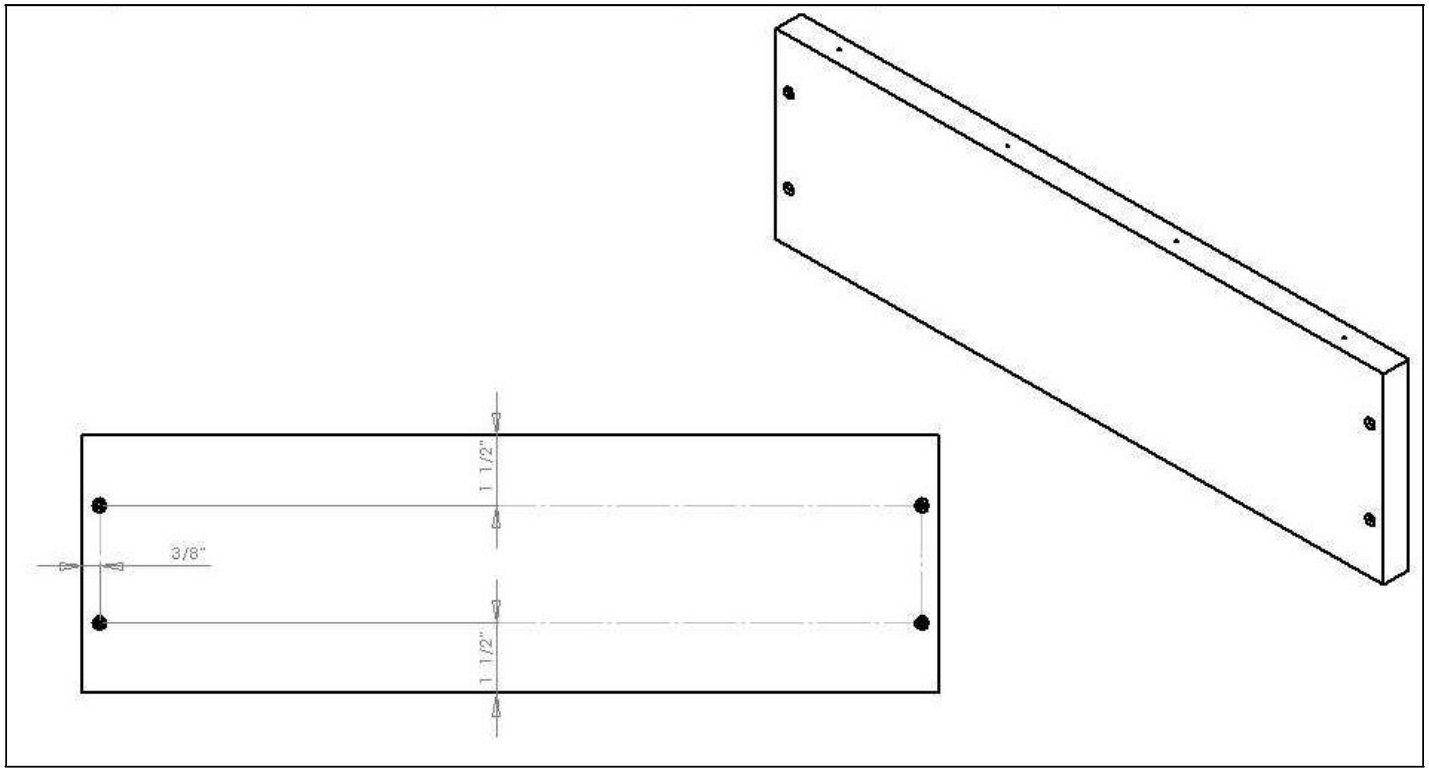
Drawing2: Top Piece Dimensions



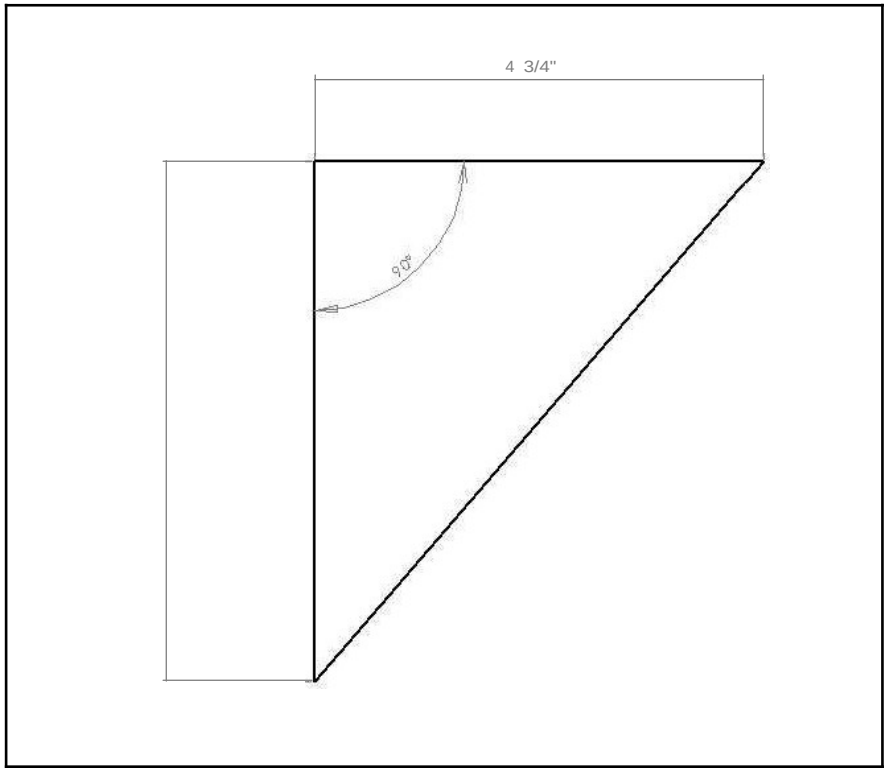
Drawing3: Top with Chamfer



Drawing4: Back Piece Dimensions



Drawing 5: Gusset Dimensions



Step 1: Lay out one 1”x6”x18” board using a **Tape Measure**, **Marker**, **Speed Square**, and the dimensions found in **Drawing 1** (page 4).

A. Use the tape measure to put a small mark on the edge of the board 18” from tone end. Then use a **Speed Square** to make a perfect 90º mark with the edge of the board.

Note: This step will be repeated twice. Two 18” sections are needed for the shelf, one for the top and one for the back of the shelf. Due to the width of the saw blade, if both lines are marked at once, the first cut will throw off the second mark by the width of the blade. In the next step you will cut the board and then repeat this step for the second board.

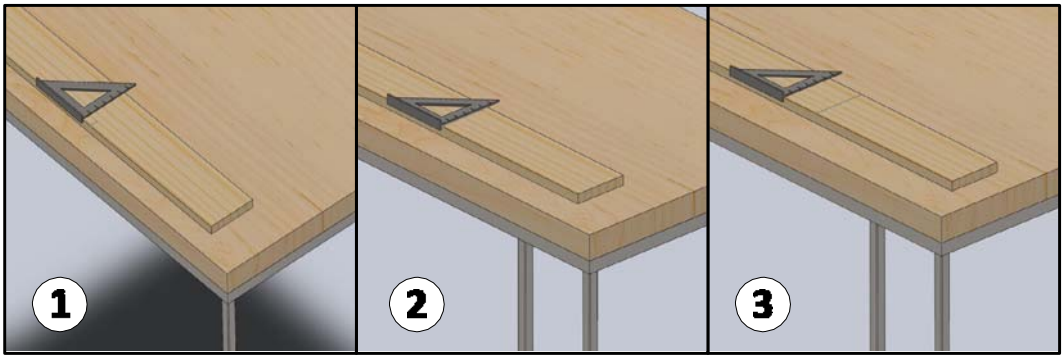


Figure 1: Layout of 1”x6”x18” piece- (1) Measure out 18” on board, make a mark. (2) Align the speed square with edge of board and mark. (3) Complete mark with aid of speed square.

Step 2: Cut the 18” section using the **Miter Saw**.

B. Place the board on the **Miter Saw table** so the 18” mark is close to the blade. Place a shim that is the same height as the miter saw table underneath the end of the board farthest away from the saw as shown in Figure 2.

Note: Putting a shim under this side of the board will allow the saw to make a 90º cut with the top of the board.

C. Next position the board so the 18” section is to the right of the saw. Then position the line drawn in Step 1 directly to the right of the blade as shown in Figure 3. If the line is positioned directly under the blade, the 18” board will be half a blade’s width short of 18”. Clamp the board snug against the back of the **Miter Saw**. This can be done with the clamp on the saw.

D. With all objects away from the blade and safety glasses on, turn on the saw and slowly lower it into the wood

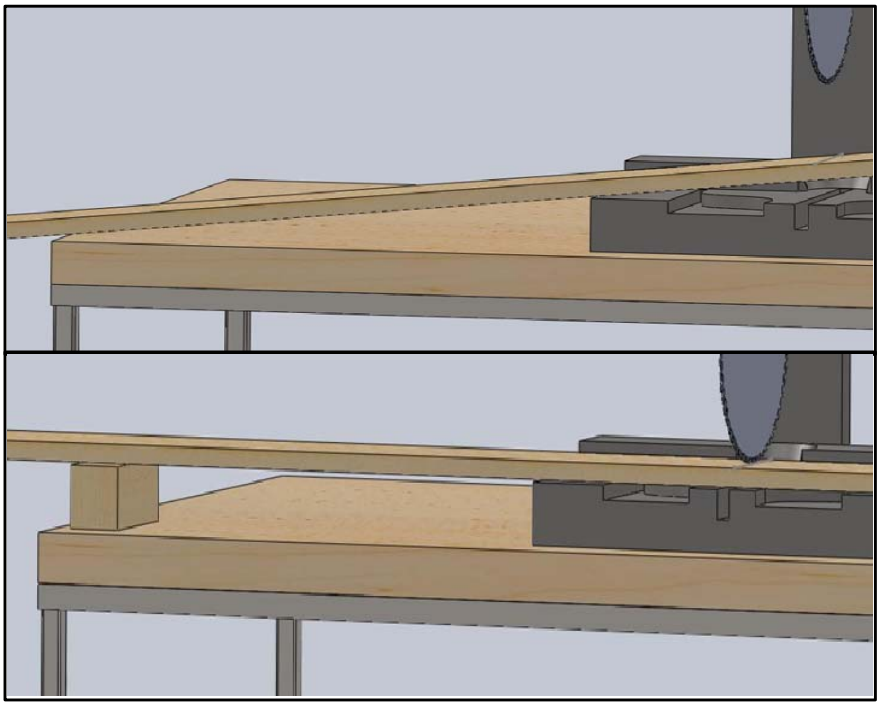


Figure 2: Shimming up the board on the miter saw.

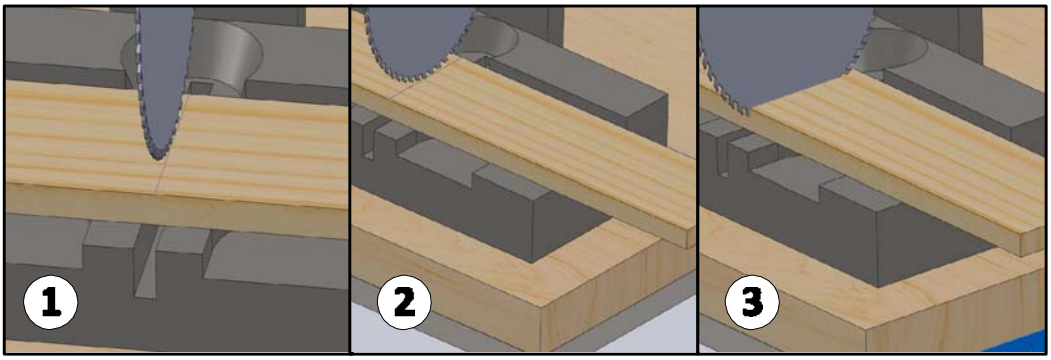


Figure 3: Making the cut.

Step 3: Repeat Step 1 and Step 2 for a second 18" board.

Step 4: Lay out and cut two gussets. Dimensions are found in **Drawing 5 (**page 7).

Make a small mark at the edge of the board 4 3/4" from the end as shown in Figure 5(1). Then use the speed square to draw the 45º needed for the gusset as shown in Figure 5(2). If you make your mark at exactly 4 3/4" the line should go right through the corner of the board Figure 5(3).

Note: Only draw and cut one gusset at a time for the same reasons as noted in Step 1A.

A. Set the **Miter Saw** blade to a 45º angle, and position the board so the line is directly to the right of the blade.

B. With all objects away from the blade and safety glasses on, turn on the saw and slowly lower it into the wood and cut the gusset.

C. Now with the first gusset cut, a 45º angle is already cut on the board. Use the speed square to draw the next gusset as shown in Figure 5.

Note: If the first cut is done correctly, it should already be the correct dimensions and a simple line with the speed square. If it is not done correctly, cut the already angled edge to a correct 45º angle, and then continue.

D. Set the **Miter Saw** to a 90º angle. With all objects away from the blade and safety glasses on, turn on the saw and slowly lower it into the wood and cut the second gusset.

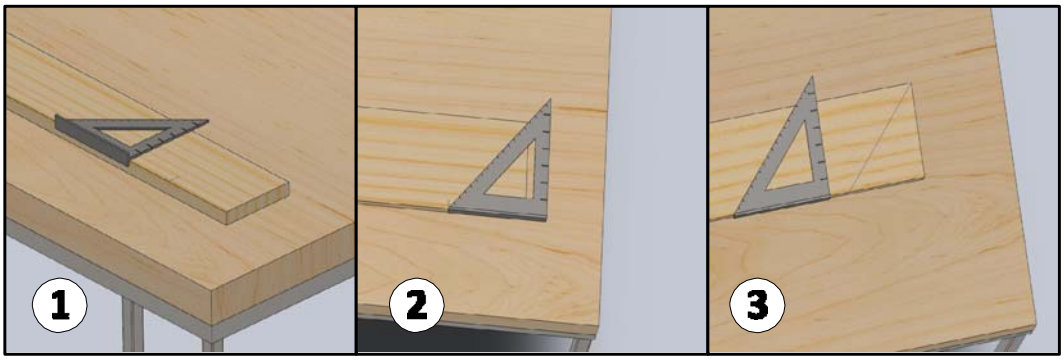


Figure 4: (1) Mark out the length of the gusset. (2) Draw the line. (3) Line should cross directly through the corner if done correctly.

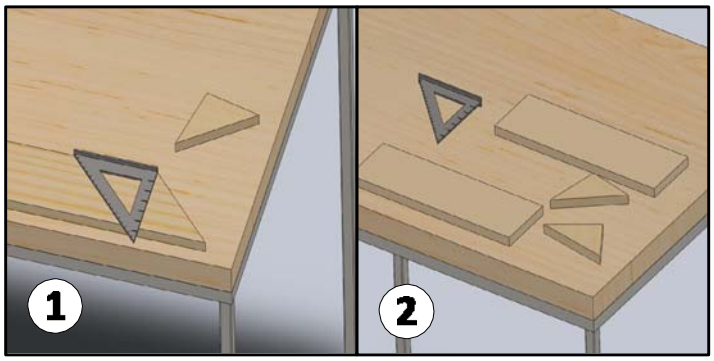


Figure 5: (1) Use the speed square to mark out the next gusset.
(2) Two gussets should be completed.

Step 5: Draw all the hole locations on the top and back shelf pieces according to **Drawings 2 and 4** using a **Tape Measure**, and a **Marker**.

Step 6: Countersink holes in the top and back shelf pieces using the **Drill Press**, **1/16" Drill bit**, **Bar Clamp**, and a **#6 Countersink**.

A. Chuck up the **1/16" Drill bit** into the **#6 Countersink** leaving about 1" of drill bit below the tip of the **#6 Countersink**. Then chuck the **#6 Countersink** into the **Drill Press**.

B. Before clamping material onto the **Drill Press** table, make sure the drill bit passes through the center of the **Drill Press** table as shown in Figure 6(1).

C. Adust the height of the tabel so when the chuck is all the way up, there is about 2-3" of clearance between the **Drill Press** table and the tip of the drill bit.

D. Clamp the boards onto the drill press table aligning the hole to be drilled with the drill bit as shown in Figure 6(2).

E. When drilling a countersink, allow the countersink to only go in as far as the taper. If you drill farther in than the taper of the countersink, the hole will be deep and the head of the screw will not be flush with the surface of the board

F. With all objects away from the drill bit and safety glasses on, turn on the drill press and slowly lower the bit into the wood.

A. Once the hole is drilled, raise the spindle and turn off the drill press.

B. Drill all holes in the top and back shelf pieces.

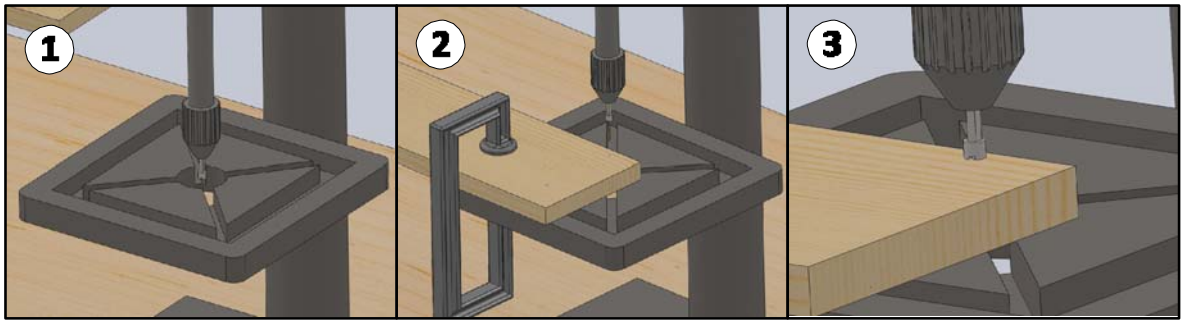


Figure 6: (1) Use the speed square to mark out the next gusset. (2) Two gussets should be completed.

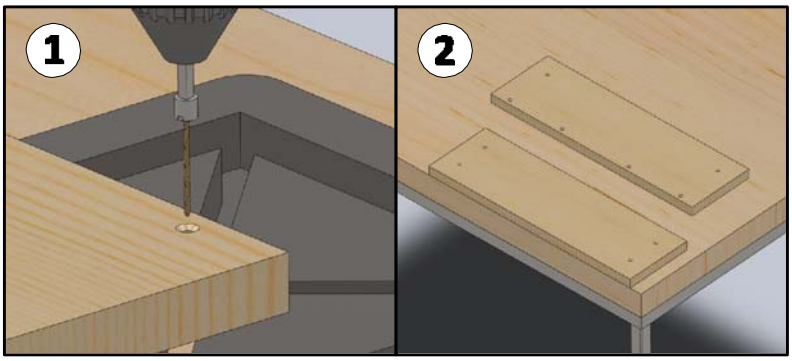


Figure 7: (1) Finished countersink. (2) Back piece and top with all holes drilled.

Step 7: Use the **Router Table** to route the edges shown in **Drawing 3 (**page 5). There is a choice of a **Chamfer, Fillet, Ogee,** bit for the edge type.

A. Use the wrench to open up the collet on the router and insert the bit.
B. Use the wrench to close the collet tight on the bit.
C. Set the height of the router bit so that it sticks above the table.
D. Align the fence.
E. Turn on the router and feed the board from right to left.
F. Turn off the router.

Note: Do not router the back piece, only router the top piece on the three correct sides as shown in **Drawing 3**.

Step 8: With all the pieces cut out, sand each piece smooth with the **Palm Sander**.

Note: Sand with the grain for best results.

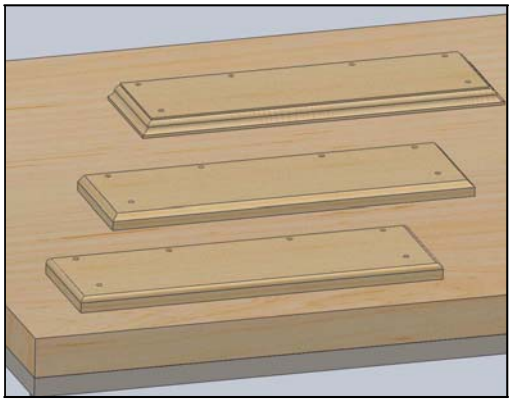


Figure 8: Examples of finished top pieces.

Step 9: Mark location of pilot holes on gussets.

A. Draw a small line on the gusset side (the side with out the countersink) of the back piece 1” away from the end as shown in Figure 9(1). The outside gusset edge will line up with this line.

B. Using a **Philips Head Screw Driver** start to run #6 1 1/4" wood screws into the pilot holes in the back piece to attach gussets. Place a screw into the pilot hole. Then using the screw driver, start twisting the screw in a clockwise direction. Continue this until the screw tip almost pokes out the other side of the board as shown in Figure 10.

C. Next, hold the gusset up tight to the bottom of the top piece, aligned with the both edges and the line drawn in the Step 9B, refer to Figure 11.

Note: This step may take more than one person to accomplish. One person should hold the gusset in place as described in Step 9C and another person will do the following step.

D. Gently screw each screw one or so turns with the screw driver. This will put a small dent in the gusset exactly where the screws will go. Mark each dent with a marker to mark where to drill. Do this for both sides.

Note: It is often wise to label which gusset goes on which side of the shelf. Minute errors in drilling the countersink holes can make each set of holes unique. If they are unique, there will be only one way to assemble the piece. Labeling the gussets is a fool proof way to avoid later confusion on which way the pieces are to be assembled.

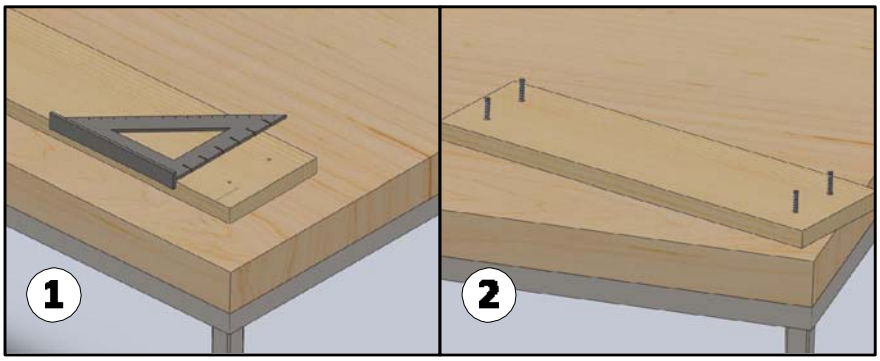


Figure 9: (1) Marking where the edge of the gusset sits. (2) Starting the screws in the back piece.

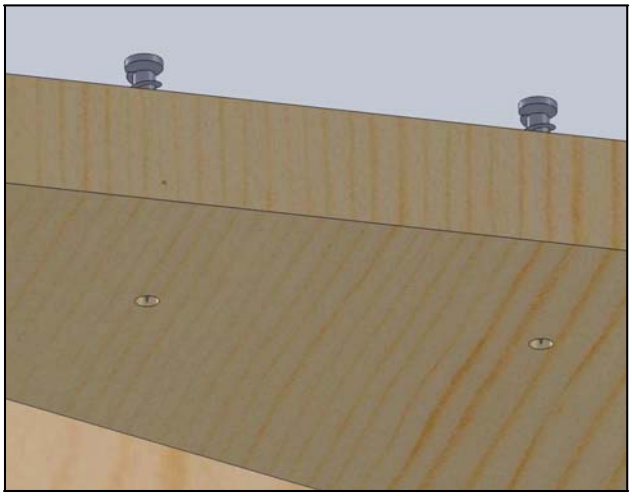


Figure 10: (1) Marking where the edge of the gusset sits. (2) Starting the screws in the back piece.

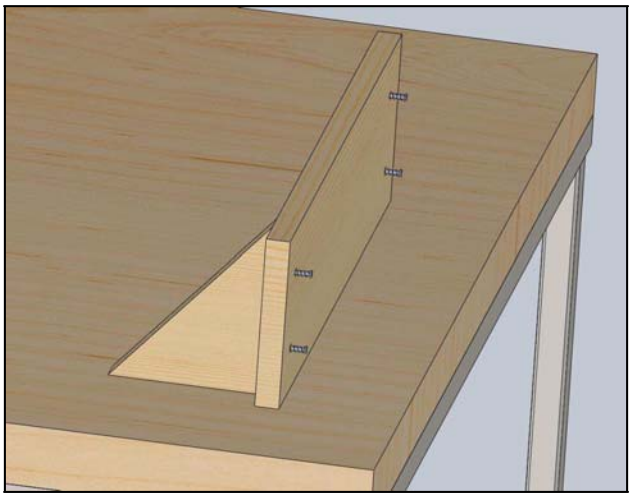


Figure 11: (1) Hold the gussets tight and aligned with line to mark holes.

Step 10: Use the **Drill Press**, **1/16" Drill Bit**, **Drill Press Vice**, **Bar Clamp**, and **Torpedo Level** to drill the pilot holes in the gussets.

A. Chuck the **1/16" Drill Bit** into the **Drill Press** chuck. When tightening the chuck, make sure the chuck jaws are not clamped onto the flutes. Have the jaws clamp onto the solid shank as seen in Figure 12.

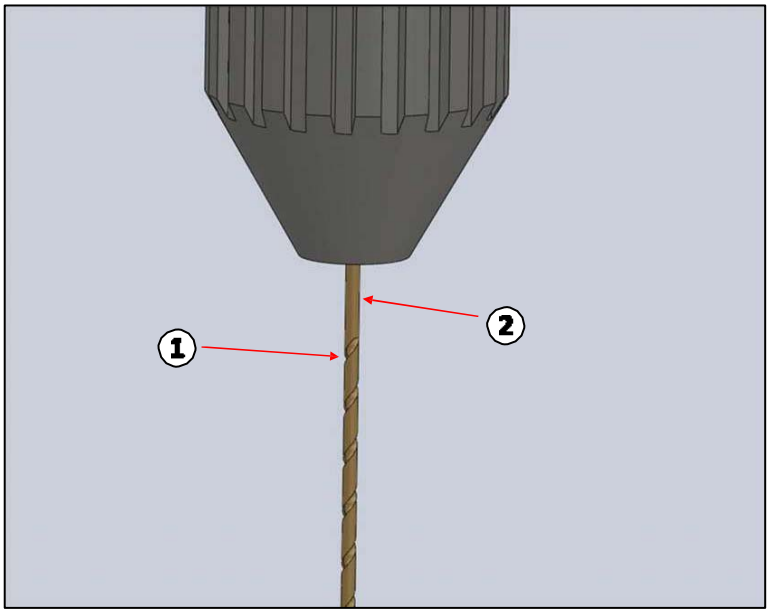


Figure 12: (1) Flutes. (2) Shank.

B. Clamp one of the gussets into the **Drill Press Vice** with the marked dents facing up. Use the **Torpedo Level** to make sure the table is level and that the gusset is level with the table. This will ensure the drill bit enters the wood at a 90º see Figure 13. It is always wise to check to make sure the drill press table is level as well.

C. Position the hole marking directly below the drill bit. Then clamp the vice to the table with the **Bar Clamp** as shown in Figure 13.

D. With all objects away from the drill bit and safety glasses on, turn on the drill press and slowly lower the bit into the wood. Each hole should be drilled about 1/2" deep.

E. After drilling of the first hole is complete, reposition the vice and clamp and drill the second hole.

Note: It is unnecessary to remove the gusset from the vice. If the gusset is removed from the vice, it will be necessary to use the torpedo again.

F. Repeat steps **B-E** for second gusset.

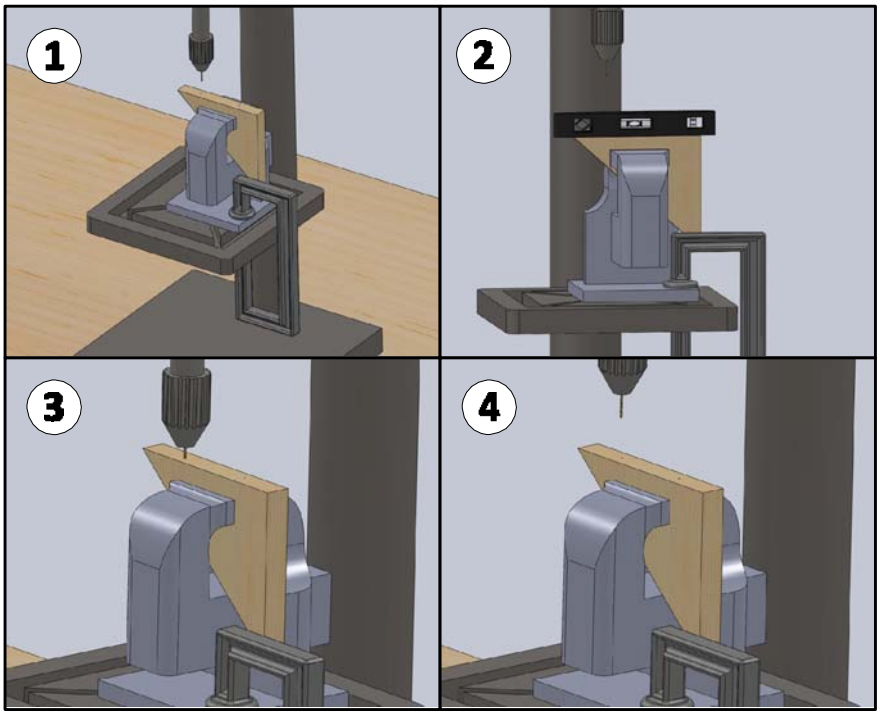


Figure 13: (1) Align the bit and the first hole. (2) Make sure the gusset is level and secure clamp. (3) Slowly drill the pilot hole. (4) Finished hole.

Step 11: Use the **Philips Head Screw Driver** to attach both gussets to the back piece

A. Use the same method of holding the gusset to the back piece used to find gusset pilot hole locations to screw gussets to back piece.

Note: If there is a gap between the gusset and the back piece when the screw starts to enter the gusset: stop, back the screw out, eliminate the gap, and start again. Once a gap is formed while the screw is being installed, the gap will not close unless it is started over.

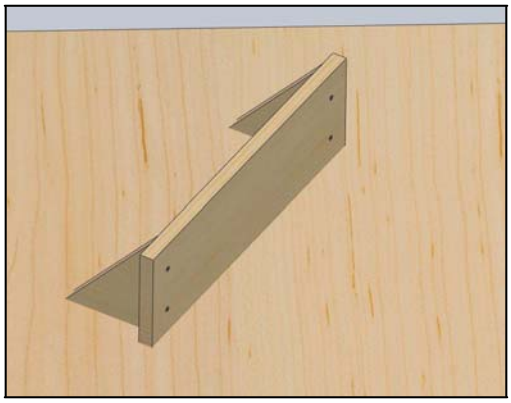


Figure 14: Hold gusset tight against back piece while it is being screwed together.

Step 12: Use the **Philips Head Screw Driver** to locate pilot holes for screws in the top piece.

A. Use the same method of finding the gusset pilet holes in Step 9 with the top piece, see Figure 15.

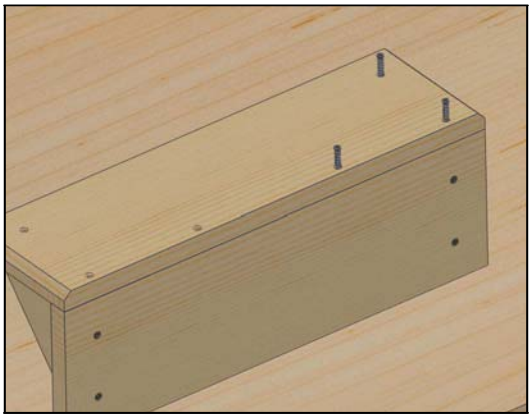


Figure 15: Hold the top piece tight against the bottom assembly to mark pilot holes.

Step 13: Use the **Drill Press**, **1/16" Drill Bit**, **Drill Press Vice**, **Bar Clamp**, and **Torpedo Level** to drill the pilot holes in the bottom assembly.

A. Using the same method described in Step 10, drill all six pilot holes in the bottom assembly. See Figure 16**.**

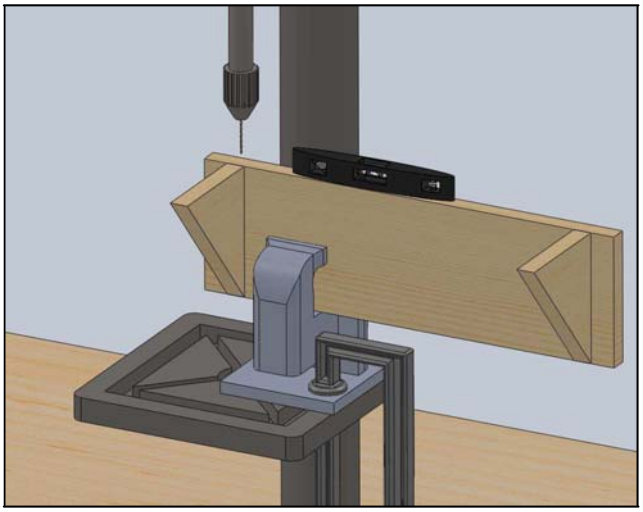


Figure 16: Following method of Step10, pilot holes are drilled in the bottom assembly

Step 14: Use the **Philips Head Screw Driver** to attach the top piece to the bottom assembly.

A. Use the method described in Step 11 to attach the top piece to the bottom assembly with #6 1 1/4" wood screws to finish the assembly.

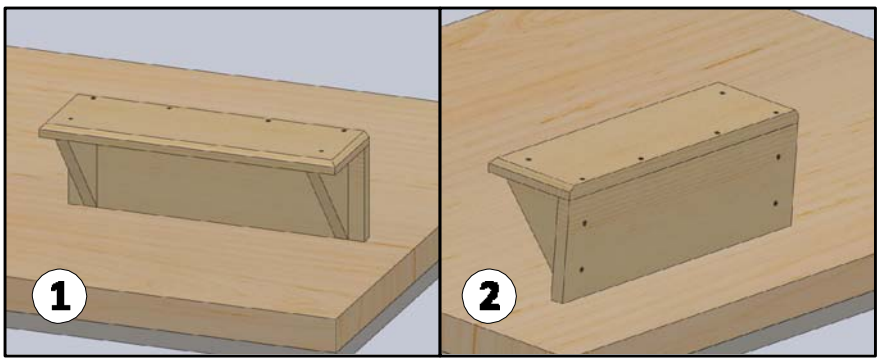


Figure 17: (1) Final assembly front. (2) Final assembly back.