Lesson #2: Cutting Board Project (10 Days)

Objectives

Students will be able to…

- Apply geometry math concepts angles, lines, triangles, and angles formed by transversals into real world project
- Build a cutting board.

Common Core Standards

LS 11-12.6
RSIT 11-12.2
RLST 11-12.2
Writing 9-10.5
Problem Solving/Critical Thinking 5.4
Health and Safety 6.2, 6.3, 6.6, 6.12
Responsibility and Leadership 7.4, 9.3
Residential and Commercial Construction Pathway D2.1, D3.1, D3.7
CCSS.MATH.PRACTICE.MP6
CCSS.MATH.PRACTICE.MP2
CCSS.MATH.PRACTICE.MP1

Materials

Cutting Board Project Instructions
Materials Listed on Cutting Board Project Instructions
Bill of Materials
Cutting Board Project Self-Evaluation
YouTube video https://www.youtube.com/watch?v=9-7HLAVD7b0

Lesson Sequence

- Pass out and review the ***Cutting Board Project Instructions***. Review instructions with students. Watch YouTube video run time 9:57 https://www.youtube.com/watch?v=9-7HLAVD7b0

- Have students fill in their ***Bill of Materials.*** Once checked off allow students to begin their project. Support students throughout the process as needed. (10 days)
- When students have completed their projects ask students to set their projects out and have students walk around the room to look at one another's projects.
- Have students fill out their ***Cutting Board Project Self-Evaluation.***

Assessment

Informal assessment throughout the project.
Use student's self-evaluation forms and project completion to assess student work.

Accommodations / Modifications

One on One Support
Extra Time as Needed
Math Support with Project

Cutting Board Project Instructions

Wood Preference

Use hardwoods one color for the board and another for the inlay.

Video

Router Inlay Practice run time 9:57 https://www.youtube.com/watch?v=9-7HLAVD7b0. In this woodworking demonstration a diamond shaped veneer of maple is being inlaid into a scrap piece of a walnut veneer panel.

Materials

Finished cutting board dimensions: 11-3/4″ x 12″ x 1-1/2″

- hardwoods one color for the board and another for the inlay
- 9 wood strips at 1-1/2″
- inlay pieces determined by the design
- Titebond II or Titebond III Glue or non-toxic and water-resistant glue
- Varied sandpaper with grits 80,120, and 240
- Tungoil to oil the board or other oil that is food save

Examples

Order of Construction

Step 1: Cutting to Size

- Determine the length and width of your finished product. The width may be contingent upon the size of the planer you'll be using.
- Cut the pieces of lumber to size using a miter saw.

Use and Safety Tips for the miter saw*: Start the blade, then enter the board with the blade spinning, and saw through. Allow the blade to completely stop spinning before you lift the blade and put it back into place in the resting position. Listen to the sound of the saw; if the wood begins to pinch, the sound of the saw will change.*

- First square up the end of the board. To begin cutting the boards, make sure the straightest side is toward the rail when the board is lying flat.
- Cut all the boards to length on the miter saw, then move on to the planer.

Step 2: Planer

You will need one square, smooth side to place against the table saw fence when cutting the boards into your 1 -1/2" cutting board pieces.

- Choose the best edge of your board and begin creating the edge using the planer. The planer should be set up to take off approximately 1/16" of material on each pass. Take as many passes as you need until the board is square, smooth, and without defects. YOU ONLY NEED ONE EDGE TO BE PERFECTLY SMOOTH.
- Use the planer on all the boards.

Step 3: Cutting Strips

Use and Safety Tips for the table saw: *Always use your push stick. On the last piece or as the boards get smaller, use only the push stick not your hands. Keep your thumb on the lower left corner of the board and always keep your hands behind the blade. Wait until the blade stops spinning before you remove any material away from the blade. Know where the kill switch lives.*

- This cutting board will be 1-1/2" thick. Set the fence at 1-1/2" from the blade. Place the smooth edge against the fence and use the push stick to run the boards through the table saw. Cut all the boards to the desired size.

Step 4: Glue & Clamps

Use and Safety Tips: *Set up the clamps side by side. Use Titebond II or Titebond III Glue, which are both non-toxic and water resistant. Have a wet cloth ready. The glue will not stick to the aluminum clamps.*

- Stand the cut pieces on their edge so they all stand 1-1/2" high. The grain runs in different directions. The idea is you want to alternate those to minimize the warping in the board. Once you find a design you like, with a pencil make a #1 in the top left

corner and draw a diagonal line all the way across the board to the lower right edge, label that edge #2. If you would drop pieces or get out of order transporting to the clamps, you'll be able to reassemble the pieces in the proper order starting with #1 and following the diagonal line until the last piece #2 is in place.

- Set up the parallel clamps. Place the cut pieces flat on the clamps with the first piece flipped on edge against the stationary end of the clamps. With the first piece of wood in place, put glue on the second piece, which is lying flat.
- Squiggle a line of glue from end to end, roll or brush the glue on evenly. Flip the wood on its edge and press and wiggle against the first piece of wood already in place. Continue to quickly brush the glue onto each piece and flip into place until all the pieces are glued together.
- Try to keep the edges neat and aligned and the surface level as you are gluing.
- When finished, use a scrap board to press flush against the edge to realign the edges if needed.
- Clamp the pieces together until the glue squeezes out. Check for gaps and tighten the clamps to close the gaps. Fill any gaps you cannot press together with glue. Don't over tighten the clamps and squeeze out all of the glue.
- Wipe off the excess glue with a wet cloth. Wipe the top, bottom and edges. It is okay to flip the board over while in the clamps.
- Allow 24 hours for full strength bond before unclamping the board.
- Begin by unclamping the cutting board. Use a scraper to delicately remove the excess glue without gouging the wood. Just remove the big chunks of glue that pooled under the clamps.

Step 5: Flattening

- Cut the board to the desired size
- Block plane the top to make the uneven pieces as level as possible before sanding
- Sand first with grid 80 then grid 120, and finish with 240 grids.

Use and Safety Tips for the Planer: *The board goes into the planer with the grain; not against the grain. It is helpful to have a person on the opposite side catch the outbound material. The planer will make the top and bottom smooth by removing material that is raised. The board goes into the planer with the grain. Use the elevation crank (a.k.a handle or dial.) to adjust the thickness to meet the top of the board. Run the board through once. Lower the thickness by turning the elevation crank to the right. Run the board through the planer again. Continue this process until the cutting board surface is smooth and even.*

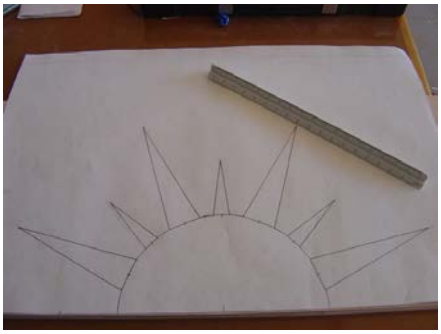
- To flatten the bottom, use the thickness planner. Make sure the top is level as possible before doing this.
- After a few trips through the planer our 1-1/2" thick cutting boards are now 1-3/8" thick.

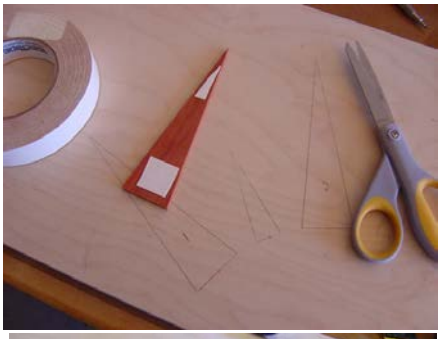
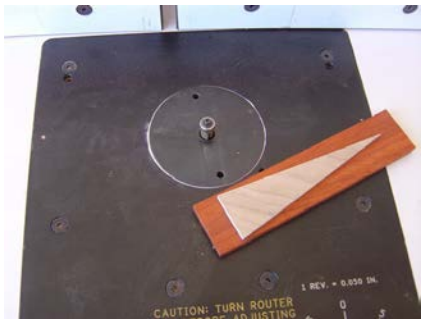
Step 6: Routing and Final Sanding

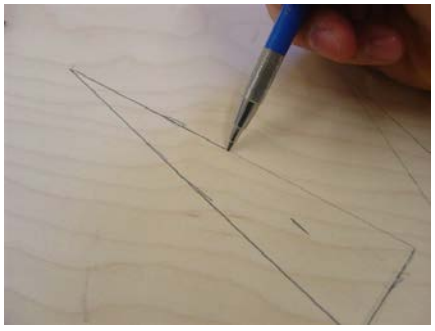
- Use a 1/4-inch round over bit in a router to knock off the edges and give it a more finished look.

Step 7: Adding the Inlay

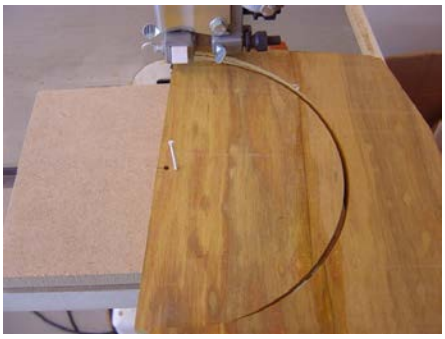
- Create your design.
- Trace the design onto the wood.
- Use a band saw or scroll saw to cut it out
- Stick the piece temporarily onto the base. Double stick tape the inlay piece to the substrate in the appropriate position and trace around the perimeter with an exacto knife.
- Once you have a nice deep scribe line, carefully remove the inlay piece.



- Begin routing with 1/8″ bit, staying away from your scribe lines for now. The depth should be set so that your inlay pieces will sit just slightly proud of the surface.

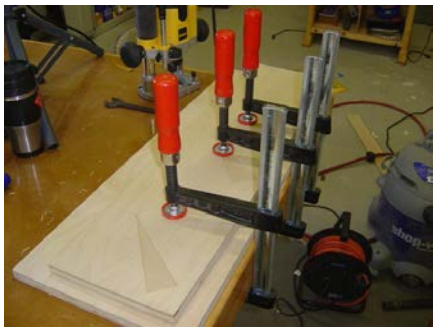


- Switch to your 1/16″ bit and use your magnifying headset to sneak right up to the line. Watch for the wood to fray and break away at the point when you've reached the scribe line. Be careful not to cut too deeply.

- Smooth the recessed area. Use a small piece of sandpaper to flatten out the base and edges after most of the wood is removed.

- Test fit the inlay piece and remove material where required. Also consider sanding a slight bevel into the inlay piece so that it fits somewhat like a cork in a bottle.

- Add glue to the recess and the veneer piece. Then, place a flat piece of hardwood, larger than the inlay piece, on the inlay and whack it with a mallet. One or two moderate blows should seat the inlay completely.
- If there are any gaps, thoroughly mix the sawdust you've created into the glue and fill any gaps to make them look like part of the original material.
- Once the glue is dry, use a scraper or block plane to remove the excess stock and then repeat the process
- If the inlay is slightly raised above the surface, sand it down until it's flush with the surface of the wooden base.



Step 8: Routing and Final Sanding

- Use 220 grit sandpaper or finer to keep the inlay nice and polished.
- Make a mortise on the side sections for a grip on the board.

Step 9: Finishing

- Finish the cutting board using Tungoil to oil the board or other oil that is food save.
- A mineral oil/beeswax mixture meant for butcher blocks, also works fine for cutting boards. Apply a thick, generous coat, and let it soak in for a few hours then come back and buff it to a shine (or almost a shine).
- To apply Butcher Block Oil simply flood the surface, allow the oil to penetrate, and then wipe off the excess. Re-apply when surface shows wear. The Butcher Block Oil will darken and bring out the contrast in the wood. It has a very rich.

Cutting Board Project Self-Evaluation

1. What I had learned from this project ...

2. Parts of the project I am most proud of ...

3. Safety practices I have been observing...

4. What I have learned that I should be doing, from this point on, to ensure any other projects have an excellent outcome.

BUILDING INDUSTRY TECHNOLOGY ACADEMY
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Project #1: Cutting Board

Bill of Materials

Part #	Description	Material Type	Dimensions (calculate footage)		Footage (bd/ft, lin/ft, sq/ft)	Quantity Of Parts	Unit Cost	Total Cost
				=				$-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-
				=				-

To calculate board feet with all measurements in inches: $\frac{T \times W \times L}{144}$

Total Cost: $-