

MITERED BOX

Cabinetry / Advanced Woods

Miter Saw · Table Saw · Dado Blade · Band Saw · Planer

Class	Cabinetry / Advanced Woods
Skill Level	Intermediate–Advanced
Est. Duration	4–6 class periods
Machines	Miter Saw, Table Saw (Dado Blade), Band Saw, Planer, Time Saver
Software	V-Carve (optional lid engraving)

INSPIRATION GALLERY

What You're Building

A hand-crafted mitered box with 45° corner joints, a sliding rabbeted lid, fitted bottom panel, and decorative splines. Add a V-Carve engraving on the lid for a personalized touch.



Student example — "Wood Shop 2022" engraved lid with splines visible on corners



Student example — open box / bottom panel



Student example — spline corner detail

PREREQUISITES

Before You Begin

Make sure you are comfortable with:

- Safe operation of the miter saw
- Safe operation of the table saw with dado blade stack
- Planer operation and feed direction safety
- Basic glue-up and clamp technique
- Band saw operation (for resawing)

LEARNING OBJECTIVES

What You Will Learn

- Cut precise 45° miter joints on the miter saw
- Cut a dado groove with a dado blade stack on the table saw
- Fit and size a ¼" plywood bottom panel
- Fit and glue a 4-sided mitered assembly using a strap clamp
- Cut and fit decorative corner splines
- Rabbet and fit a sliding lid
- Apply a Tung Oil finish

MATERIALS & TOOLS

What You Need

MATERIALS	TOOLS / MACHINES
• Hardwood stock of your choice (see cut list) • ¼" plywood for bottom panel • Wood glue • Sandpaper: 80, 120, 180, 220, 320, 400 grit • Tung Oil + applicator rag • Strap clamp or band clamp • Blue tape (test fit tape-up)	• Miter saw (45° capable) • Table saw with dado blade stack • Band saw • Drum / Time Saver sander • Planer • Router table (optional — for splines) • Hand sanders / sanding blocks

SAFETY

Safety Reminders

 WARNING

The dado blade removes a lot of material in one pass. Never run your hands near the blade — use a push stick and featherboard.

 WARNING

When cutting miters, the board can pull toward the blade. Keep the board firm against the fence and use the clamp if available.

 CAUTION

Dado operations create a lot of fine dust. Eye and ear protection required at all times.

 INFO

Sand the inside (dado) face RIGHT AFTER the dado cut — you cannot reach it once the box is assembled.

STEP-BY-STEP INSTRUCTIONS

Building Your Mitered Box

STEP 01 Mill & Prepare the Side Boards

- ☐ Cut and/or glue up 2 boards, each approximately 3.25" wide × 18" long × slightly over ½" thick. These are rough — you will cut them accurately into 4 sides later.
- ☐ Run both boards through the planer until they reach exactly ½" thick (0.5").

 INFO

Sand the inside (dado) face right after the dado cut in Step 2 — once the box is assembled you cannot reach it.

STEP 02 Cut the Dado Groove

- ☐ Install the dado blade stack on the table saw. Set the blade height to cut ¼" deep.
- ☐ Set the rip fence at 3/8" from the outside of the dado blade.
- ☐ Run both boards through with the INSIDE face up, keeping them tight against the fence.
- ☐ Check that both dados are the same width and depth — the bottom panel slides into this groove.
- ☐ NOW sand the dado side (inside face) ONLY — start at 80 grit and work up to 300 grit. This is the only chance you get to sand the inside of the box.



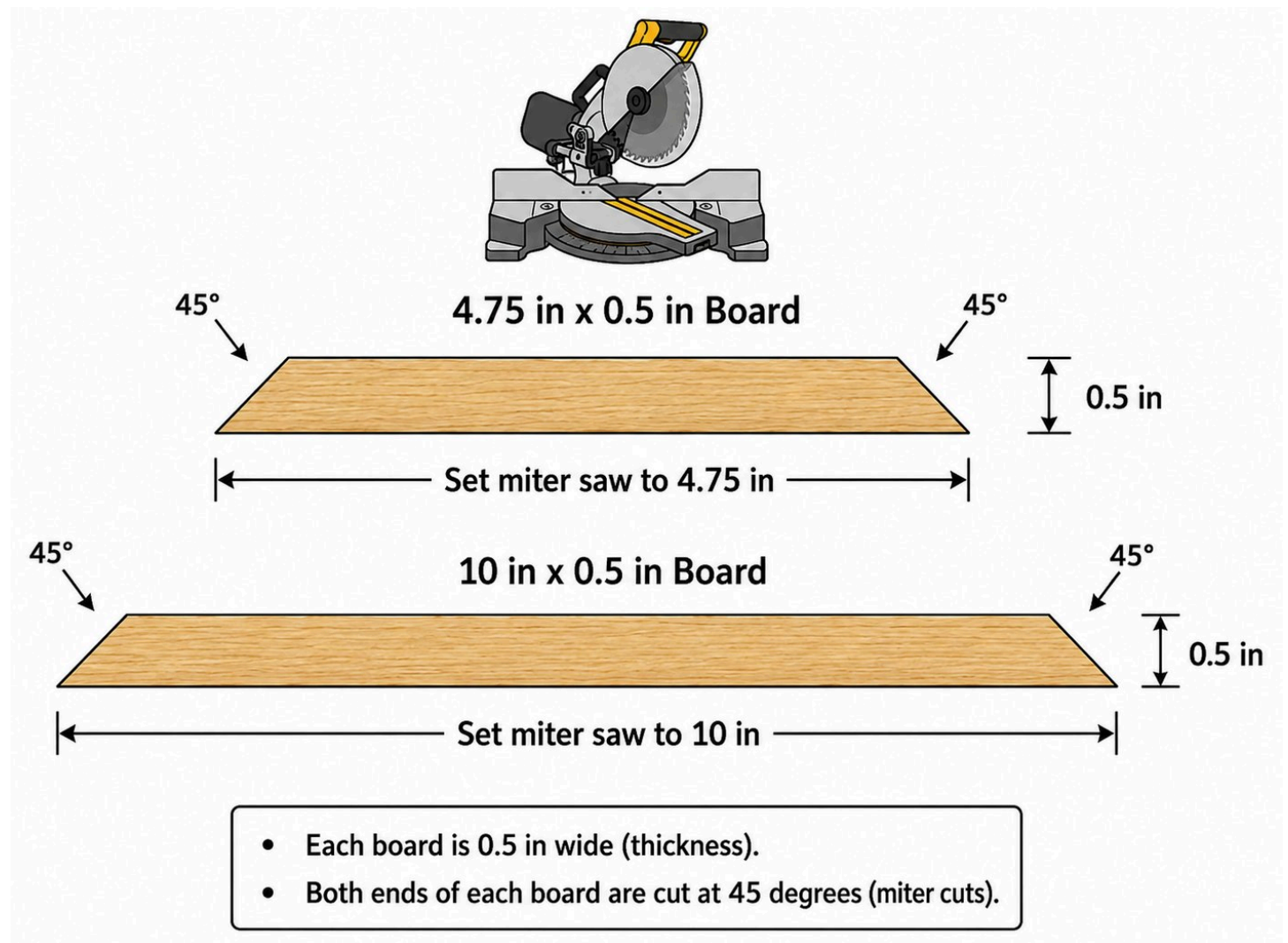
 Dado video

 WARNING

Use a push stick when running the board over the dado blade. Keep your fingers away from the blade stack.

STEP 03 Cut the 45° Miter Joints

- ☐ Use the miter saw to make your four sides — cut TWO boards at 10" and TWO boards at 4.75". See the diagram below.
- ☐ ALWAYS keep the dado side toward the fence when making miter cuts.
- ☐ Dry-fit all 4 pieces with tape. All 4 corners should be tight before gluing.



Scan to watch: [Miter Cuts video](#)

● WARNING

The miter **MUST** be square, or the box will not close properly. Always keep the dado side toward the fence.

STEP 04 Fit the Bottom Panel

- ☐ Get a piece of ¼" plywood from Mr. Semler.
- ☐ Size the bottom panel to fit your dado grooves — watch the "Sizing Bottom" video before cutting.
- ☐ Use the table saw to bring it to final size. Sneak up on the fit.
- ☐ Sand the bottom panel to 400 grit on both faces.



 Scan to watch: [Sizing Bottom video](#)

● CAUTION

The bottom panel should slide into the dado groove with light hand pressure — not rattling loose and not requiring force. Sneak up on the final size.

STEP 05 Prep the Top Panel

- ☐ Cut or glue up a board to approximately 12" long × 6" wide — rough size only.
- ☐ This piece is set aside for now. You will size and rabbet it after the box is assembled.
- ☐ If you want a striped or contrasting lid, watch the "Stripes" video before gluing.



 Scan to watch: [Stripes video](#)

● INFO

A striped or contrasting-wood top is a great design choice. Talk to Mr. Semler about wood combinations before gluing up the lid blank.

● STOP — Get Semler's approval before assembly. All 4 miters must be tight in dry-fit. Bottom panel must fit in dado groove.

Instructor sign-off: _____ Date: _____

STEP 06 Glue Up the Box

- ☐ Watch the "Mitered Box Assembly" video before opening any glue.
- ☐ Lay all 4 sides out, taped end-to-end, like an unfolded box.
- ☐ Apply glue to all miter faces. Fold the box up and apply a strap clamp.
- ☐ Slide the bottom panel into the dados BEFORE fully tightening the clamp.
- ☐ Check all 4 corners are tight and the box sits flat on your bench.
- ☐ Let glue dry fully — overnight is best.
- ☐ If corners are not tight after drying, watch the "Fix Loose Corners" video.



 [Mitered Box Assembly video](#)



 [Fix Loose Corners video](#)

● WARNING

Do not overtighten the strap clamp — it can bow the sides. Snug is enough.

● INFO

Work quickly! Once glue is applied, you have about 5–8 minutes of open time before it starts to grab.

STEP 07 Fix Corners & Cut Splines

- ☐ Before splines: inspect all 4 corners. If any miter joint has a small gap, rub a little glue into the gap, then use the rounded shaft of a screwdriver to press and roll the corner closed so the miters meet tight. Let dry.
- ☐ Watch the "Splines" video before starting.
- ☐ Set the table saw to 1.25" to cut the spline slots on all 4 corners using the spline jig.
- ☐ Cut matching spline pieces from a contrasting or matching wood — slightly oversized.
- ☐ Glue splines into the slots. Let dry fully.
- ☐ Once dry, cut and sand splines flush with the box surface.
- ☐ Sand all outside surfaces of the box up to 400 grit.



 Scan to watch: [Splines video](#)

● INFO

Splines add both strength and a decorative detail. Use a contrasting wood species for visual impact.

STEP 08 Size & Rabbet the Lid

- ☐ Use the miter saw to cut the lid to rough length, then the table saw to rip it to width. Do NOT use the band saw or edge sander to size the lid.
- ☐ Size the lid so it is just barely bigger than the opening of the box — about 1/16" overhang per side.
- ☐ Watch the "Rabbet Your Top to Fit" video.
- ☐ Set up a rabbet cut at 1/4" depth on the router table or table saw. Sneak up on the fit — check after every pass.
- ☐ Check all 4 sides and both ends after each pass — the rabbet must be consistent.
- ☐ The lid should slip on and off smoothly with slight resistance.
- ☐ Sand the lid to 400 grit on all surfaces.



 [Size Your Top video](#)



 [Rabbit Top to Fit video](#)

● CAUTION

Sneak up on the rabbet — $\frac{1}{4}$ " is the target depth but check the fit after every pass. Too deep and the lid will be sloppy.

STEP 09 Optional: False Bottom

- ☐ Size the false bottom panel to $\frac{1}{8}$ " narrower and $\frac{1}{8}$ " shorter than the inside of your box.
- ☐ This creates a hidden compartment between the false bottom and the real bottom.
- ☐ Sand all faces to 400 grit.

● INFO

The false bottom creates a secret storage compartment — great for a jewelry or keepsake box!

STEP 10 Engrave the Lid (V-Carve)

- ☐ Find a "Box Lids" design or create your own in V-Carve.
- ☐ Watch the "Vcarve Box Lids" video.
- ☐ Set up the CNC with the appropriate V-bit for your design.
- ☐ Run the toolpath on your lid — make sure the lid is securely held down.
- ☐ Sand lightly after engraving to remove any fuzz from the cuts.



 [Scan to watch: Box Lids / V-Carve video](#)

● INFO

Engraving a name, date, or design makes this box truly personal. Look at the finished box photo on page 1 for inspiration!

STEP 11 Break Edges & Apply Tung Oil Finish

- ☐ Break all sharp edges inside and outside the box and lid using 220-grit sandpaper.
- ☐ Double-check sanding on all surfaces — get it approved by Mr. Semler.
- ☐ Apply Tung Oil: wipe on, let penetrate 10–15 minutes, wipe off excess.
- ☐ Apply 2–3 coats, lightly sanding with 400 grit between coats.
- ☐ Let final coat cure fully before handling.



 Scan to watch: Tung Oil video

● INFO

Dispose of oil rags safely — wet oil rags can spontaneously combust. Lay flat to dry before throwing away.

● STOP — Final approval required — sanding complete, lid fits, splines flush, finish applied. See Mr. Semler before calling it done.

Instructor sign-off: _____ Date: _____

CUT LIST

Final Dimensions

All measurements in inches. Rough-cut stock slightly oversize before milling.

Part Name	Qty	Width	Length	Thickness	Wood Type
Sides	2	3.5"	17"	½" (.5")	Student Choice
Ends	2	3.5"	8.5"	½" (.5")	Student Choice
Top	1	5.25"	13.5"	¾" (.75")	Student Choice
Bottom	1	—	13.5"	¼" (.25")	¼" Plywood
False Bottom (Optional)	1	—	—	¼" (.25")	Student Choice
False Bottom Rails (Opt.)	2	¾"	3"	½"	Student Choice



 Scan to watch: Order of Operations document

COMPLETION CHECKLIST

Before You Turn It In

☐	All 4 miter joints are tight — no gaps visible
☐	Bottom panel fits flush in dado grooves
☐	Splines are glued, flush-sanded, and symmetrical
☐	Lid fits smoothly — slides on and off with slight resistance
☐	All surfaces sanded to 400 grit inside and out
☐	All sharp edges broken (inside and outside)
☐	Lid engraving complete (if applicable)
☐	Tung Oil finish applied and cured
☐	Mr. Semler has signed off on final quality

GRADING

Grading Rubric

Criteria	Points Possible	Points Earned
Miter joints tight and square on all 4 corners	20	
Dado cut clean and consistent — bottom panel fits flush	15	
Splines cut, glued, and sanded flush	15	
Top rabbeted properly — fits snugly without gaps	15	
Sanding complete inside and out (up to 400 grit)	15	
Lid engraving (V-Carve design, aligned correctly)	10	
Finish (Tung Oil applied evenly, sharp edges broken)	10	
TOTAL	100	

INSTRUCTOR NOTES

Teaching Notes & Common Issues

Common Mistakes

- Miter saw not at exactly 45° — gaps appear at corners. Check with a reliable square before class.
- Inside face not sanded right after dado — impossible to fix after glue-up. Remind students Step 2 is the only chance.
- Glue squeeze-out inside box — wipe immediately before it dries or it will clog the dado groove.
- Bottom panel too loose or too tight — test with scrap at the dado step before students run their real boards.
- Lid rabbeted too deep — sloppy fit. Emphasize ¼" target and sneaking up one pass at a time.
- Oil rags not disposed of safely — brief safety moment before every Tung Oil session.

Timing Notes (Approximate)

- Period 1: Mill sides, cut dados, sand inside faces.
- Period 2: Cut miters, fit bottom panel.
- Period 3: Dry-fit, glue assembly, let cure overnight.
- Period 4: Fix corners, cut splines, outside sanding, prep lid blank.
- Period 5: Rabbet lid, optional V-Carve engraving.
- Period 6: Break edges, apply Tung Oil, final inspection.

Adaptations

- Beginning students: Skip splines and false bottom. Focus on miter accuracy and basic assembly.
- Advanced students: Challenge with striped lid blank, decorative inlay splines, or finger-joint variation.
- If limited on time, pre-mill stock to ½" before class to save a full period.