



BCATS

BUILDING, CONSTRUCTION
AND ALLIED TRADE SKILLS

Make a cupboard



Unit Standard 25921 (v3), Level 2

Make a cupboard with a drawer
as a BCATS project. **6** CREDITS

BCITO
buildingpeople

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(BCITO)**

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Introduction

This handbook gives you information to help you to make a cupboard with a drawer. You can use either solid timber or manufactured boards. The example in this handbook uses solid timber.

Cupboards with drawers come in many shapes and forms, each designed to meet a specific purpose. Think about what the cupboard will be used for. Talk to your teacher/tutor about the possibility of modifying a design to meet your needs. You might want to add another drawer for extra storage, or a door fitted with glass to display the cabinet's contents, or make some other change.

What finish you use will depend partly on personal preference and partly on the material you use. Finishes range from oils, stains, varnishes, or paint to achieve the desired finish. Many cupboards made from manufactured boards have a veneer finish.

Remember:

The cupboard and construction methods detailed in this handbook are an example only. There are different processes, machinery, and tools that could achieve the same or similar outcome. Your teacher/tutor will provide you with guidance on these for your particular cupboard.

How you will be assessed

You need to show your teacher/tutor that you can follow or adapt a design for a cupboard. The cupboard must have at least one drawer and one door. Your teacher might give you a work diary to help you record how you make it. If you can, take photos of your project, including a photo of it completed.

You will need to:

- complete a cutting list for a cupboard with a drawer
- mark out, cut and machine the required materials to an acceptable standard
- assemble the required components (parts) to an acceptable level of accuracy
- finish the cupboard
- complete everything safely
- keep your work area, tools, and equipment clean and tidy.



Glossary of terms

Term	Meaning
Arris	The sharp edge formed at the intersection of two surfaces.
Arrissing	Arrissing the timber is removing the arris with a plane, sand paper, or router.
Carcass	The body of a joinery unit.
Cutting list	A list of components.
Dry fit	Checking for accuracy of fit before joining/fixing components permanently
Flush	Flat, level.
Component	A part of the cabinet.
Hardware	Joinery fittings such as hinges, screws, adjustable feet, plastic or metal drawer runners.
Hinge mounting biscuit/plate	A biscuit/plate that screws to the cabinet carcass and onto which the hinge is clipped. Hinge mounting biscuit/plates allow cabinet door levels to be easily adjusted and the doors to be quickly removed and reattached.
Jig	A machining aid.
Machinist	A person who specialises in using joinery machinery.
MDF	Medium Density Fibreboard. A manufactured product made by reducing logs into fibre form and combining with resins. This is then compressed to create sheets.
Pilot hole	The hole into which the screw thread bites its way. It must be smaller than the diameter of the shank and at least the full length of the screw.
Pre- finish	The sanding of components and application of the interior finish such as staining/painting before final assembly.
Shank	The total diameter of the solid part of the screw (it excludes raised threads).
Specification	A set of written instructions that explains the job requirements.
Template	A pattern that is made to be used many times so as to ensure accuracy.

Health and safety

The Health and Safety at Work Act 2015 is designed to:

- prevent harm to employees at work
- promote good practices in health and safety management.

The Act puts responsibilities on everyone to take all practical steps to ensure your own safety and the safety of others.

One way you can help ensure your own safety is to use personal protection equipment (PPE). For this project you will need to use:

- hearing protection
- safety boots or covered shoes
- dust masks
- safety glasses (even if you wear prescription glasses, you must still use safety glasses)
- apron or overalls.

The machinery and other equipment you use can cause serious injuries. You **must** use appropriate guards and safety devices. You **must** not use any machine without the safety guards fitted correctly. You **must** receive training in the use of machines and equipment and apply it when you use them.



Use the machine guards



Set your machines up before beginning work

Before using a machine or portable power tool, check to see if all cords are in good condition. Also check that the compliance tags are current.



If you not sure that a machine is safe to use, don't use it. Ask your teacher/tutor to check it out.

Project overview

The example in this handbook uses solid timber as the main material for construction. With your teacher/tutor's help, you can adapt the guidance to use manufactured boards or plywood instead.

As you create your cupboard, make sure you work methodically. Work through the project one step at a time. The order in which you will work is:

1. Make sure you understand the drawings and specifications. If you're not sure, ask your teacher/tutor.
2. From the drawings and specifications, identify and select the correct materials.
3. Create a cutting list.
4. Produce the components for the cupboard.
5. Sand and pre-finish the components ready for assembly. When and how you do this may be different from the example if you're using different materials.
6. Assemble the components.
7. Finish the cupboard.

You should complete your cupboard without any problems if you follow the process above. If you are not sure, refer back to the appropriate section of these notes or ask your teacher/tutor for help.

Your work area must be kept clean and tidy throughout the project.

You will need to safely use a variety of hand tools and possibly a variety of portable power tools and fixed machinery. Make sure all the tools/machines are available and ready for use when needed. Remember to put the battery on to charge after use if you use battery power tools.

Most importantly, enjoy what you're doing in a safe manner.

The project – Common resources

Getting started

The first step is to get the job specifications and drawings from your teacher/tutor. These will include the size and design of the cupboard and the materials to be used.

If you change the design or develop your own you will need to develop your own working drawings before creating a cutting list.

What tools and equipment will I need?

You will need to use a wide range of hand and portable power tools and fixed machinery. The actual range will depend on the approach taken and the machinery available.

LIST OF TOOLS AND EQUIPMENT USED FOR SHOWN EXAMPLE

Hand tools	Portable power tools	Fixed machinery
→ steel ruler	→ plunge router	→ table saw
→ set square	→ orbital sander	→ surface planer
→ combination set square	→ battery drill	→ thicknesser
→ hand screwdriver	→ impact driver	→ drum sander
→ F clamps	→ biscuit/plate jointer	→ compound saw
→ sash clamps		→ horizontal borer
→ mitre saw box		→ vertical drill press
→ sanding block		

Depending on your school's policy, you might not be able to use some fixed machinery on your own, such as a table saw. If this is the case, you must still set up the machine for your teacher/tutor to use and be on hand to be talked through how to use the machine safely as well as seeing the process completed.

Remember that the processes and machinery you use may be different from the ones used in these example projects.

Prepare a cutting list

A cutting list provides us with accurate information to start turning the drawing and specifications into reality. It can be quite long because it lists every timber component of the project as well as hardware. Often a notes section is included to record important points about each component.

The total amount of material required can then be used to cost out the materials. If the materials cost more than is allowed in the budget, you can go back to the drawings to see what can be changed.

The project - Common resources

When designing and making a solid timber piece of furniture, take into account the width of the material available. This will help you make the best use of it, which reduces wastage. Keeping to one common size whenever you can also reduces production time. The cupboard in this example uses 40mm x 20mm timber for a number of components.

The cutting list below outlines the requirements for a carcass of a 600mm high x 400mm wide x 300mm deep unit only. These sizes will come from 150mm x 25mm rough sawn timber, such as Radiata Pine or Macrocarpa. The cutting list for the drawer and drawer would normally follow directly below the carcass.

Note:

A template for a cutting list is available in the resources for your use. It be downloaded and completed as an Excel document or printed off to complete by hand.

Project cutting list

Client:	P. Smith	Job number:	0909/065
Date required:	30 September 2020	Finish:	water based stain & waterbased varnish
Description:	Cupboard with single draw		
	Manufactured from Radiata Pine finished with dark oak stain and satin varnish		
	Hardware: 50mm flush butt hinges, magnetic catches, pull handles		

Component	No.	Material	Length	Width	Thickness	Note:
Carcass						
Top	1	Radiata Pine	450	360	20	Laminated sections using biscuit joints
Bottom	1	Radiata Pine	400	300	20	Trim to length after checking overall width
Sides	2	Radiata Pine	600	280	20	Laminated using biscuit joints, rebate back edge to accept 3mm MDF back panel
Cross connecting rails	2	Radiata Pine	400	40	20	Trim to length after checking overall width
Front return rails	2	Radiata Pine	600	40	20	Dowel jointed to side panels
Bottom rail	1	Radiata Pine	320	40	20	Screw from back underside of cabinet
Top and drawer frame front packers	2	Radiata Pine	320	20	20	
Back panel	1	MDF	600	390	3	Prefinished stained and varnish inside
Top and drawer support frame front and back rails	4	Radiata Pine	360	40	20	
Top and drawer support frame side rails	4	Radiata Pine	300	40	20	Pre-finish support frames except for front face as packers will be glued to this face

Solid timber cupboard with drawer - Example

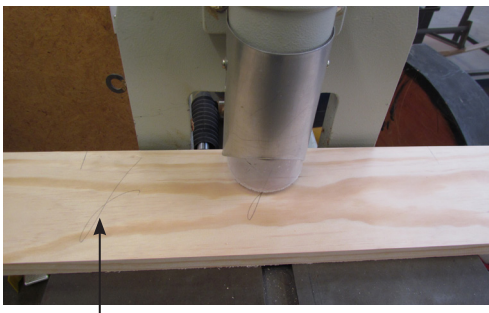
This example includes a range of images to show the major steps in constructing a comparatively simple solid timber cupboard. A range of processes, joints, and techniques are used.

These notes do not provide every detail of how to complete the project. Your teacher/tutor will provide this guidance. They may also have other techniques and processes that will help you to complete your particular cupboard.

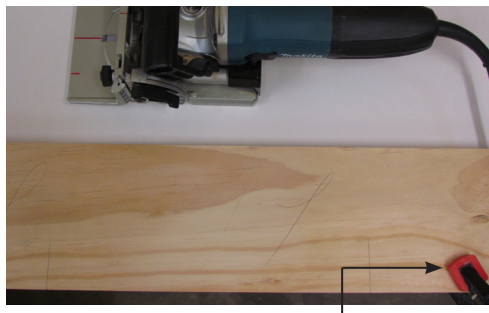
Construct the carcass

1. Actual construction of the cupboard begins with dressing the timber. In this example, the rough-sawn timber needs to become 20mm x 140mm. Your teacher will talk you through how to dress the timber to the size needed for your project.
2. The next stage is to cut the sections required for the carcass to length, leaving at least 10mm extra. Refer to the cutting list - you will need to prepare two sections for each side and the bottom. For the top you need two sections at 140mm wide and one at 70mm to obtain the required overhang. Select and mark the best side as being the face side.
3. Laminating (joining panels) to make solid timber furniture is common practice. The carcass sections can now be laminated together. Before you do this, ensure the two face edges come together tightly by placing the panels in a sash clamp. This process is known as dry fitting. If there are gaps address these by using a hand plane to remove high spots and check again.

When using a plane, use a set square to ensure the edge remains at 90 degrees to the face. Always leave the plane on its side when checking so as not to dull the blade, and put away after use.



Note: It is important to always have the face side up when using a horizontal borer for doweling or a biscuit/plate jointer. This ensures the position of the hole or slot is consistently positioned from the same side.



Safety Note: Always clamp both ends of the timber when using a biscuit/plate jointer.

Construct the carcass

4. Now you can join the carcass panels together using sash clamps. Sash clamps provide a flat base for the panels to sit on.
5. Run a line of PVA glue across the entire face and in the holes or slots for the biscuits or dowels before inserting them. Clamp the panels together.

Take time to ensure the panels are sitting flat on the base of the clamp before tightening. Tighten the sash clamps lightly – the panels can bow if the clamps are over-tightened. Place a ruler or straight edge on top of the panels, checking to ensure there are no air gaps, and adjust the clamps if the panels are not flat. Although not pictured, you may also want to apply clamps from the top as well as the bottom to help ensure the boards don't bow.



Note: Keep both face edges up as you join the panels. This will help keep the panels flat because the dowels or biscuits will be in alignment.

6. Wipe off any excess glue with a damp cloth and leave to dry for a least 4 hours. The panels can be trimmed to length when they are dry.
7. You can now create a rebate for the back panel. The depth of the rebate will depend on the thickness of the material being used for the back panel (in this example, 3mm MDF.) The depth of the rebate should not exceed 1/3rd of the thickness of the material to which the back is being fixed.



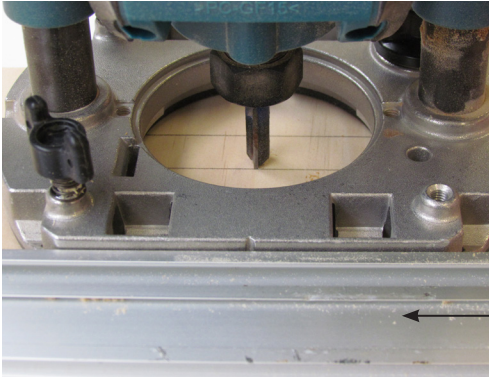
Important: Routers work at high speed and are very dangerous machines if not used correctly. If you have not used a router before, or are unsure about any part of its operation, ask your teacher/tutor.

PPE to use includes medium velocity safety glasses, dust mask, and earmuffs.

Clamp the materials to the bench securely.

Construct the carcass

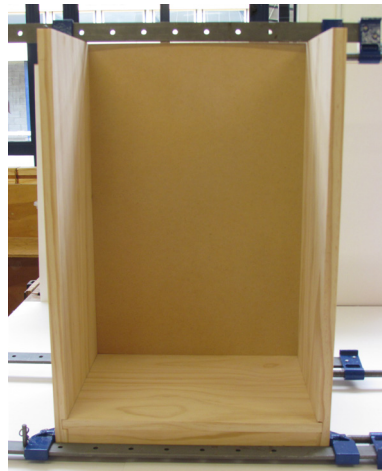
8. The housing joint to accept the back panel can be made by:
- using a hand held router, as show below
 - setting a depth stop on a compound saw.



Safety: Ensure work is clamped securely to the bench. Use additional clamps to ensure the guide bar does not move.

You can now fix the back panel with a panel pin in each corner as part of the dry fitting process.

Dry fitting is an important aspect in furniture making. It allows you to check for accuracy of joints before committing to sanding and finishing components. It also allows you to check that the dimension specifications have been met.



9. The next step is to pre-finish the interior surfaces ready for assembly. It is far easier to complete the inside of the project in full prior to assembly. Pre-finishing also ensures that glue cannot dry under the stain/varnish and show through. It is best to use two coats of the selected finish, paint/oil/stain.



Note: The rebate near the bottom of the side panels which accepts the bottom panel is left raw. This allows the glue to bond.

Construct the carcass

Fixing the rails

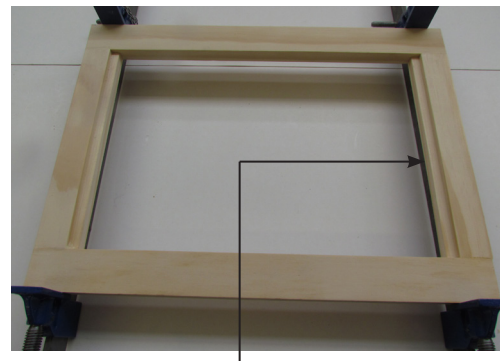
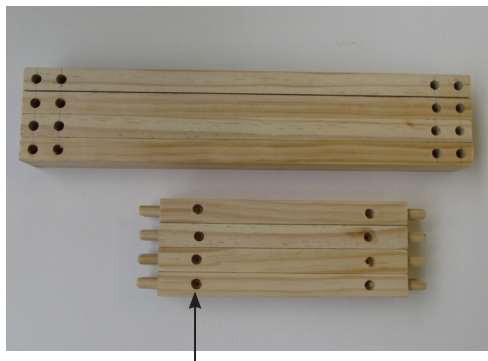
10. Two cross rails are required at the bottom of the cabinet. The front rail is fitted flush while the back rail is fitted flush with the inside of the side panel rebate. This allows the back panel to extend over the rail. Before attaching these permanently, check again that the overall width of the cabinet is as specified.



Cross connecting rails, front and rear, dowel jointed or screwed from the outside if dust rails are to be fitted at a later stage.

Support frames

Two sets of frames are needed - one to attach the top panel, the other to sit the drawer on. One way of achieving a high degree of accuracy is to cut and dry fit the rails on the floor of the cabinet before completing the joints. Suitable joints for the frames include the dowel joint or a $\frac{1}{2}$ lap joint.



Countersunk pilot holes face inwards when assembling top and drawer support frames.

11. Calculate the length of the screw required and then screw the top frame in place.
12. Fit the prefinished top of the cabinet by screwing from the underside. Once again, calculate the length of the screw first. You do not want the screws to come through the top!

Construct the carcass

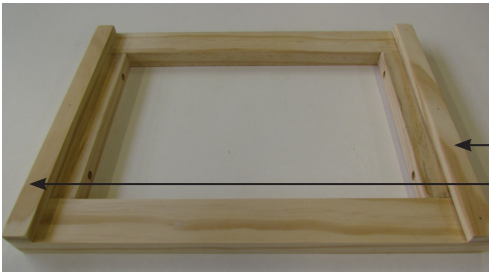
13. Fit the drawer support rails. To keep measurements accurate, turn the cabinet upside down and use a template to keep the drawer support frame at the correct opening height as you screw the frame in place.



Note: All interior components in this example are pre-finished with 2 coats of stain prior to assembly.

The edges facing the front of the cabinet are left bare because the front fascia rails will be attached to form the drawer and door opening.

Note: Using templates helps to keep the drawer support framing parallel as you connect the frame to the carcass



If you are not fitting drawer runners then attach drawer guides to the drawer support frame. Ensure the width between the rails is the same as the opening with the fascia attached.

If you are using drawer runners, see page 18.

14. Now that the drawer support rails have been fitted you can make and fit the skirting. In this example the side and bottom rails are 20mm thick. The rails on each side are connected to the carcass using 6mm dowels. The bottom rail can be glued and screwed from the front if skirting is to be fitted. Otherwise, this rail will need to be screwed from inside the base.
15. The two cross rails at the top are 20mm square and are glued directly to the support frames to complete the flush finish to accept the door and drawer.

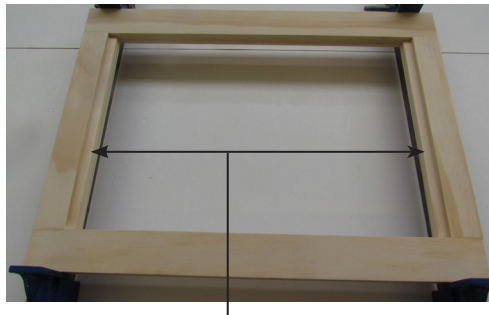


Door construction

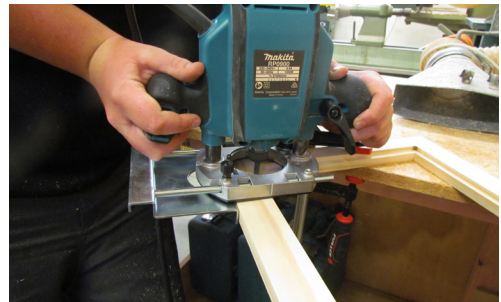
You have created two flush openings. The lower opening will accept the door, the upper the drawer.

You can now start constructing either the door or drawer. In this example the door will be completed first. While you could make a solid door, this cabinet uses a framed method of construction with a rebate that allows the thin panel to be inserted from the back, leaving a tidy edge on the front. As with the carcass, finish the components in full prior to assembly.

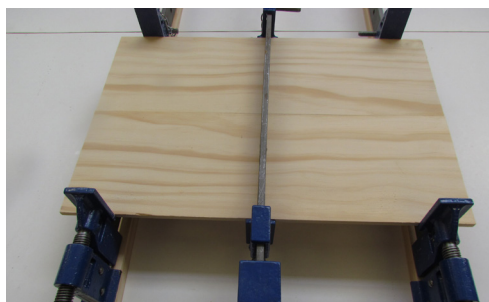
16. Measure the opening and cut your framing rails accordingly and check before joining the framing sections. In this case dowels are used as the method of jointing. Other possible joints include the $\frac{1}{2}$ lap joint and mortise and tenon joint.



Short framing rails may be rebated to accept panel prior to assembly. Alternatively, complete the rebating using a plunge router.



Plunge router with guide being used to rebate side door rails to accept panel. Ensure work is secure. In this photo, a corner bench is being used with the door framed clamped at both ends allowing for an uninterrupted run when using the router.



7mm thick door panels - use a top clamp or similar device to keep the panels flat while the glue is drying.



The frame and door panel are stained separately before joining. Apply masking tape to gluing surface areas before staining to keep a bare surface for the glue to bond.

Drawer construction

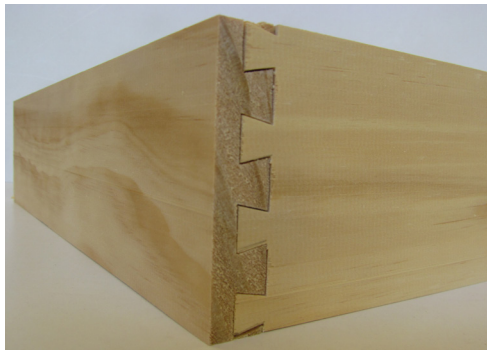
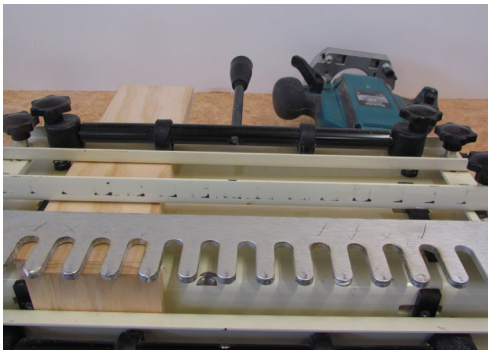
Two methods of drawer construction will be shown in this section - one with drawer guides and one with drawer runners.

A drawer with drawer guides

This drawer features blind dovetails connecting the front of the drawer to the sides. The blind dovetail has been chosen due to the inherent strength it provides. It is also an attractive feature joint. The drawer is put in position by using fixed guide rails attached directly to the drawer support frame.

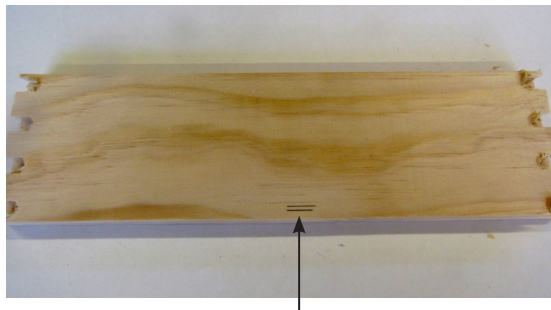
17. The first stage is to measure the width, height, and depth of the opening for the door and prepare the timber accordingly. In this example the drawer face is 18mm thick and the sides and back 12mm.

There are range of jigs available to help you to cut dovetail joints. No matter which one you use, it is important set it up accurately. Take the time to complete test joints using the same gauged timber before you commit your production pieces. Any adjustments can then be made before committing your drawer sections.



18. The rebate to accept the bottom of the drawer can be completed after the panels have been produced.

19. It is highly recommended that you assemble the drawer as a dry fit and mark the front, sides, and back of the drawer with two parallel lines to indicate the location of the rebate. This will reduce the risk of a mistake.



The marks indicate the edge that requires rebating to accept the bottom panel on the door face panel

Drawer construction

20. Once you have tested all the drawer components by dry fitting them, it is time to finish all the interior faces of the drawer prior to final assembly.

Use masking tape to seal off areas where glue will be used to bond the sections together. Peel off the tape when the selected finish is dried.

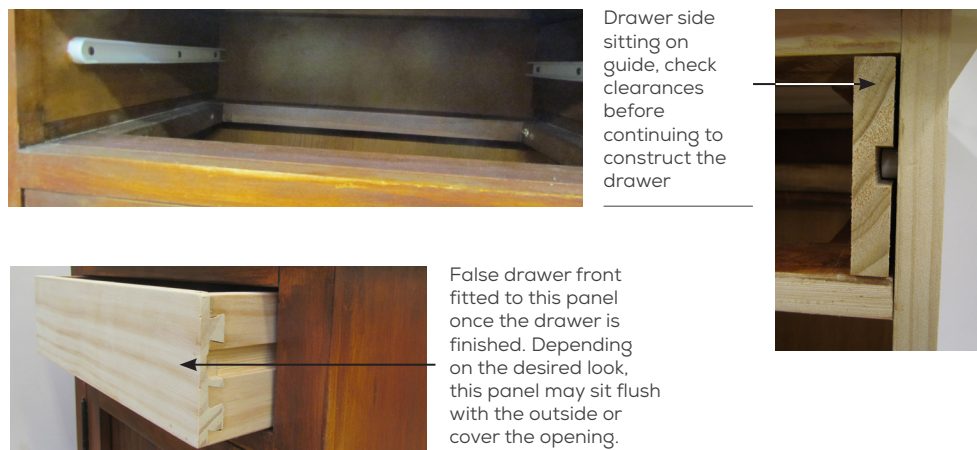


A drawer with guide runners

This construction method can take a bit longer than the first example. It has an advantage over the drawer guide method in that the drawer will reliably open and close easily.

The main difference in manufacturing the drawer is the inclusion of the rebate on each side. These rebates are for the runners fitted on the inside of the cabinet. In this example a packer has been fitted and the drawer runner fitted directly to this.

Note that the guide is not flush with the outside of the cabinet. This is in case the designer wishes the drawer to be flush with the front rails. If this is decided, the depth of a false front must be allowed for.



Finish the exterior of the cabinet

21. Now that all but the skirting has been completed, you can focus on finishing the exterior of the cabinet. Ensure all preparation is completed thoroughly before applying the exterior finish.

If using varnish it is recommended to raise the grain with a hot cloth after the first coat. Leave for 24 hours before giving it a very light sand. This will assist in obtaining a smooth finish. Apply a final coat of varnish.



Leave bottom unstained if fitting skirting. Skirting provides the cabinet with a level of protection from knocks.

Fitting skirting

As with the cross rails and drawer support rails, the plans for this cupboard specifies the skirting be made out of 40mm x 20mm timber. The mitre joint was selected as the preferred method because this provides a clean, crisp joint and does not leave exposed end grain.

It is tempting to simply measure and cut off both ends of the front rail at 45°. However, this method is not recommended - it is too easy not to achieve the level of accuracy required.

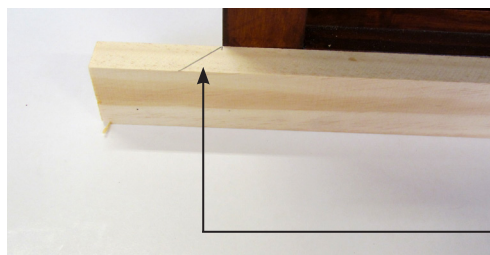
22. The best method is to add a tolerance of at least 30mm to each section and cut and fit one corner (front and side rail) first. Then mark the other end before cutting.

23. Finally the back of the side rail can be marked and cut at 90° as shown below.

Note that a rail is not added to the rear. This is so that the cupboard can be pushed flush against a wall.



Mitre one corner only, check joint accuracy before proceeding

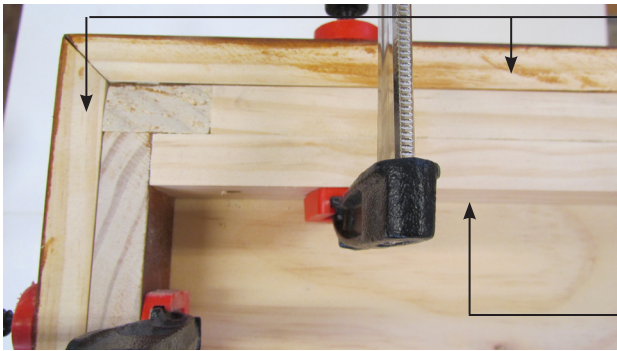


Use a combination set square to mark the other end of the front dust rail.



Ensure the mitre corner is accurately completed before marking and cutting the back corner at 90°

24. The skirting should be sanded and finished before being glued and screwed in place from the underside of the cabinet. Ensure sufficient glue is applied on each face of the mitre joint during this process.



Skirting

The skirting is glued and screwed in place from the underside of the cabinet.

Protect the top of the cabinet with card or a similar material to prevent scratch marks. Clamp rails in place and check for accuracy before screwing in place.

Completing the cupboard

25. The final stage includes fitting the door, catches, and magnetic door catch before applying a final coat of varnish. If the cupboard components have been oiled instead of stained then an oil/varnish blend can be applied to increase the durability of the product.



In this example flush butt hinges have been used to fit the doors. These hinges have been selected because no rebate is required. Pull handles have been fitted to the drawer and door. The door is retained by means of a magnetic catch. Your teacher/tutor will advise you of suitable alternatives.

As was stated in the introduction, this is only one example of a cupboard complete with a drawer. Your teacher may give you a different design or you might be able to choose your own. However, to achieve this unit standard, it must include at least one drawer and door.

