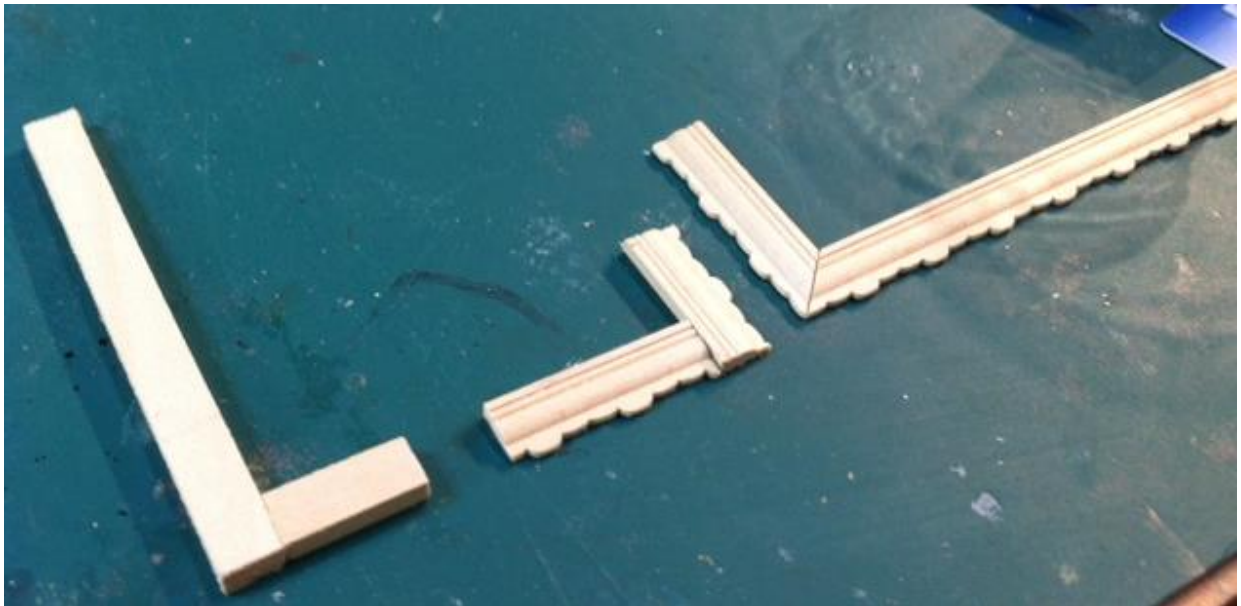


Workshop - Framing and Mitring

This booklet uses the general term framing, although mitres are also used in many other situations which do not result in a frame, such as installing baseboards or cornice mouldings, edging a tabletop with inlay or a different wood, or building a medallion for inserting into a floor. The phrase "shaped wood" refers to any piece of wood that does not have a flat profile.

Reasons for Mitring

When working with flat strips of wood, they can be "butt-joined" without difficulty, by just lining up one piece of wood with the other, at 90° to each other. However, when wood is shaped, like baseboards, picture framing, cornice moulding, etc. the wood needs to be mitred in order to have the various levels of wood line up with each other. The following picture illustrates:



The wood on the left is butt-joined. The two pieces in the centre show the effect of butt-joining shaped wood, and the right join is mitred.

Mitring is not difficult, but if you are stuck without a mitre cutter or protractor, or you just hate cutting angles, you can still create an effective frame using shaped wood and corner blocks.

The frame on the right was constructed using four square blocks (cut to the width of the framing material) embellished with embossed paper stick-ons, then painted gold and finished with satin gloss acrylic paint. This technique is really only useful with square or rectangular frames.



Tools and Supplies for Mitring

1. Mitring Tools

Most mitring tools are fairly simple to use: achieving straight lines and clean angles is their most critical purpose. The picture to the right illustrates a few useful items:

- protractor for measuring and marking angles
- a sanding block with 45° angles for straightening cuts
- a four way clamp for gluing. A good gluing jig, preferably with magnets can serve the same purpose,



The picture above shows a number of ways of cutting mitres, including (from the left and top):

- two "choppers", which use single edged blades to slice through framing material
- two hand-held mitre cutters, one with a moveable fence to cut specific angles
- a basic mitre box for cutting 90° and 45 ° angles, and
- a scroll saw with an adjustable fence with markings for various angles.

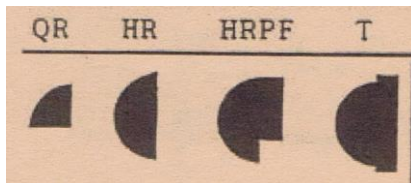
2. Commercial Framing Material

One of the best suppliers of shaped wood is S. G. Goode & Sons (<http://shgoode.com/>). Although more expensive than other sources, they offer their mouldings in a variety of woods, including cherry, alder, walnut, maple, mahogany and other more exotic woods.

The wood is cut to your specifications after the order is placed and paid for.

The diagram to the right shows the wide variety of mouldings that are available. Notice that the column of mouldings on the left are specifically shaped for picture framing, with a small notch on the back side of the moulding to insert the item being framed. The column of mouldings on the right are for use as architectural or furniture embellishments.

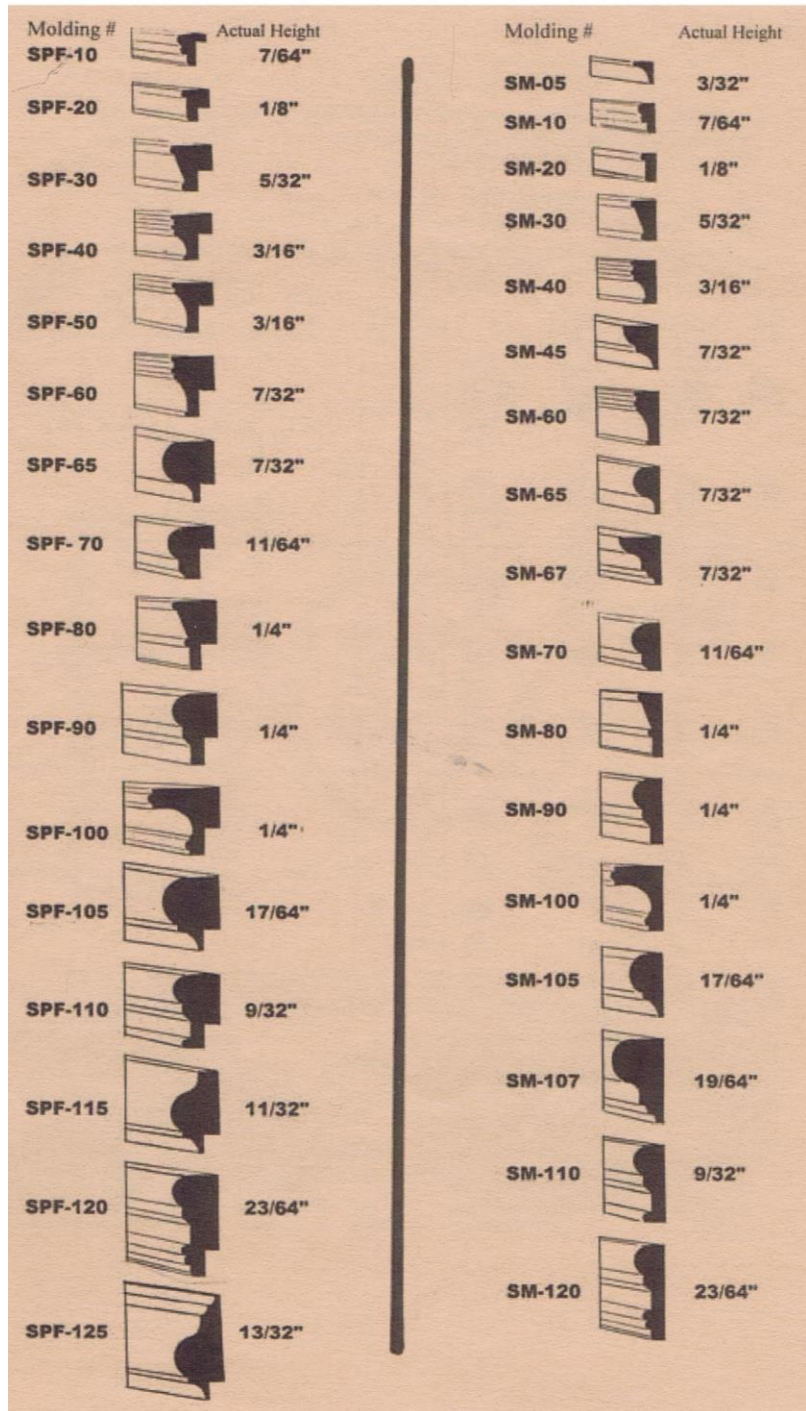
In addition, very basic shapes such as quarter round, half round, half round for framing (again notice the notch on the back) and torus shapes are available.



Other suppliers of commercial mouldings include:

- The Little Dollhouse Company, a Canadian company operating out of Toronto, offers free shipping for orders over \$100 (<http://www.thelittledollhousecompany.com/>)
- Victoria Miniland is also Canadian and ships from Victoria, B. C. (<http://miniland.ca/>)
- North-eastern Scale Lumber (do not confuse with North-eastern Scale Models) operates out of Massachusetts, USA (<https://www.northeasternscalelumber.com/>)

There are a number of British suppliers as well, but shipping out of the US or UK will be more costly since mouldings are shipped in 24" tubes.



3. Making Your Own Framing Material

Basswood strip wood is available from Michaels: (do NOT buy balsa wood - it is too soft to hold a true edge) in the following sizes, among others:

1/16" x 1/16"
1/8" x 1/8"
1/4" x 1/16"
1/4" x 1/8"

There may be other sizes available from train stores like Hobby Wholesale. Mini-dowels in 1/16" and 1/8" (kitchen skewers are about 1/8") are also useful. These strips can be used with butt-joints to make simple frames.

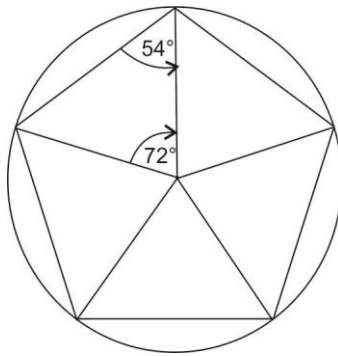
Boring Math Stuff

Based on two trigonometric statements, we can derive the angles for mitring various frames.

Given that there are 360° in a circle, and given that the sum of the interior angles of a triangle add up to 180°, then

$$MA = \frac{\left\{ 180 - \frac{360}{N} \right\}}{2}$$

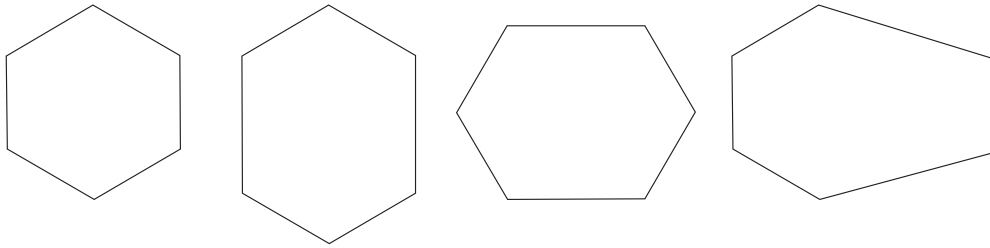
where MA = Mitre Angle and N = Number of sides in the frame. For example, to find the mitre angle for a five sided frame, 360° divided by 5 (Number of sides) = 72°. 180 - 72 = 108. 108 divided by 2 = 54°. Thus, the mitring angle is 54 degrees. The following diagram illustrates this.



To simplify your life, here are the standard angles for the various frame shapes.

Number of Sides	Angle of Mitre
3	30°
4	45°
5	54°
6	60°
8	67.5°
10	72°

Luckily, the mitre angles stay the same if you extend two opposite sides. The following six-sided figures all use a 60° mitring angle. The last figure does not (because two non-opposite sides were extended)



A Primer on Framing

What needs to be framed? Nearly all items that hang on a wall, or stand on a table top benefit from having a frame. This includes paintings, drawings, photographs, needlework of various kinds, shadow boxes displaying collections, etc.

Larger items that are not thought of as "art-work" also require some of the same skills. Others things that need "frames" are fireplaces, floors, rooms (think baseboards and cornice mouldings), door ways, windows, etc. These types of frames may not have all sides complete. For example, windows are framed on all sides of the opening, but doors are only framed on three sides. The remainder of this handout will address artwork type framing, but the general principles apply to all types of frames.

1. Choosing the Frame

If you intend to paint your frame an opaque colour (like black), and if you are using flat wood, you may be able to get away with butt joints, especially if the picture will be some distance away from the viewer. If you are building a butt jointed frame, make sure you sand the joints thoroughly, and even use a wood filler to conceal the crack.

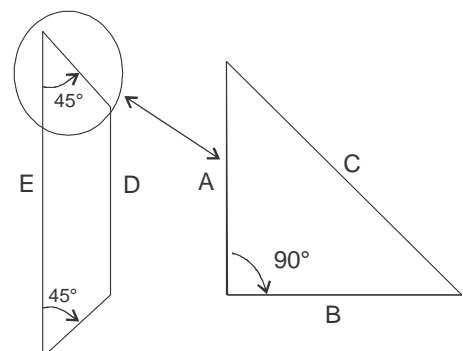
However, if you are using shaped wood, then mitring is a necessity. Even if you are using flat wood, and you intend to stain or paint with a relatively opaque paint, where the shape of the wood beneath will show though, then mitring is required to maximize the look of the piece.

Generally speaking, small pictures need narrow frames, while large pictures need wide frames. Simple items can carry elaborate frames, whereas complex, busy pictures benefit from a fairly simple frame. This can vary, depending on the effect you are trying to achieve. But, adding a matt to a picture is a relatively modern phenomenon. So, if your room or vignette is pre-1950's, you probably will not need to matt your item.

2. Measuring the Frame Size and Determining Length of Framing Needed

It is useful to know the total length of the framing material needed before you start your framing project. If it were a simple matter of determining the perimeter of the object to be framed, then all that would be required is a ruler and some measuring skills. However, because the frame itself has thickness, and angle cuts will be made, a little more math is required.

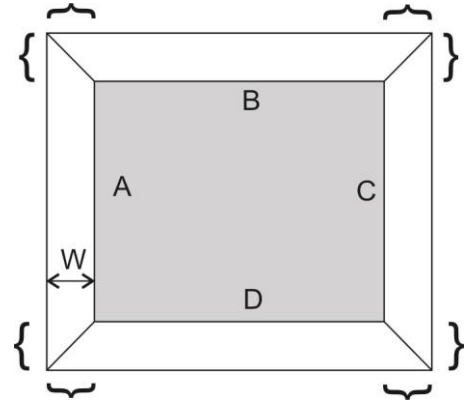
Side "D" in the diagram is the side or top of your painting and can be measured. But this is the only thing that can actually be measured. Side "E" is the length of the outside



of the frame, and that is the length we are trying to figure you. You will remember from the Pythagorean Theorem (yeah, right...) that the length of the sides in a right angle triangle are equal. That is, in the diagram, sides "A" and "B" are equal in length. Now, side "B" is actually the width of the framing material. Thus, side "E" is side "D" plus twice "B". In other words, for a square or rectangular object, the length of framing material required equals the sum of the four sides of the object to be framed, plus eight times the width of the frame itself. The diagram to the right illustrates.

Thus, the length of the strip of framing material needed is: $A + B + C + D + (8 \times W)$. Although the math adverse may want to start framing without checking whether there is enough material to finish the job, it is well worth the minute it takes to calculate the framing requirements. Most framing material are available in 24" lengths. If you have a picture that is 2.5 inches by 3 inches, and your frame is 1/4" wide, then you will need at least 13" of framing material to complete the frame. And this does not account for errors!

Generally speaking, if your item to be framed is larger than 5" by 6" then two lengths of framing will be required.



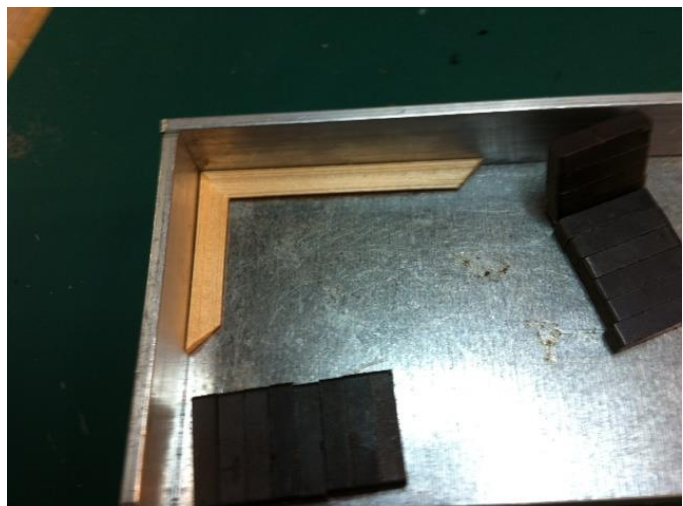
3. Framing a Square or Rectangular Object

The first step in framing is to determine which side of the framing material is the bottom (the side that will go the wall). Sounds silly, right? However, particularly with narrow frames, it is very easy to confuse angles when cutting and end with mitres that do not match, and you have no idea why. So, first... determine the bottom - on commercial framing material, there is a small notch on the back side which covers the edge of the item to be framed, and which provides for a gluing surface to secure your framed item. It also means that if you are looking at a framed painting from the side, you cannot see the edge of the painting.



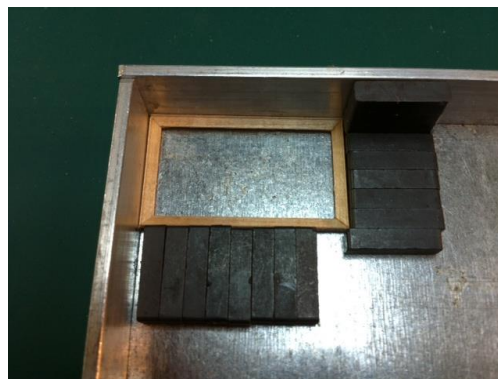
Take a felt marker (I like red) and draw a line down the entire back side of the framing material. Now, when you use your mitre cutter or saw, always place the red line against the base of the cutter. Your mitres will always line up. If you can see any red, your framing material is not properly positioned in the cutter.

Now, place you framing material on the cutter, with the red line down, and the notch on the bottom towards the cutter's guide, and cut a 45° angle at one end of your framing material. This will start your frame. Measure the length of one side of your item to be framed remembering to leave a border to slide into the notch on the back side. Mark your frame with this length on the side opposite the 45° angle. Cut another 45° angle with the angle going in the opposite direction. This is your first side. Check this against your item to be framed. The short side of the



length of angled framing material should be exactly the length of the item to be framed. Cut another side, identical to the first (or three more sides, if this is a square). Then repeat the process for the alternate side. Glue two adjacent sides together into an "L", then glue the remaining two sides. Finally, glue the two L-shaped frames together.

Congratulations, you have just completed your first frame!



4. Framing Other Regular Polygons

Regular polygons either have all sides an equal length (for an odd number of sides) or opposite sides the same length, for even numbers of sides. When framing other regular polygons, five-sided, six-sided, eight-sided, etc. the process is much the same, but the angle of cut is different. A mitre box only has slots to cut 45° angles, so use of a mitre cutter or chopper is required.

Using the chart on page 4 of this handout, determine the appropriate angle for your polygon. Then, find the same angle on whatever tool you are using. Draw your red line, make your first angled cut, and proceed as for a four-sided figure.

One difficulty is making frames with more than four sides, is that they do not include even one right angle. This means you cannot jam them into a LEGO corner, or gluing jig to stabilize the frame while the glue is setting. Rather, you will have to use magnet to position the sides and hold it in place on a flat surface while the glue sets.

5. Framing an Irregular Object

In some ways, framing an odd shaped object is the easiest way to frame anything. The technique described below works for all shapes, even square, rectangular and other regular polygons.

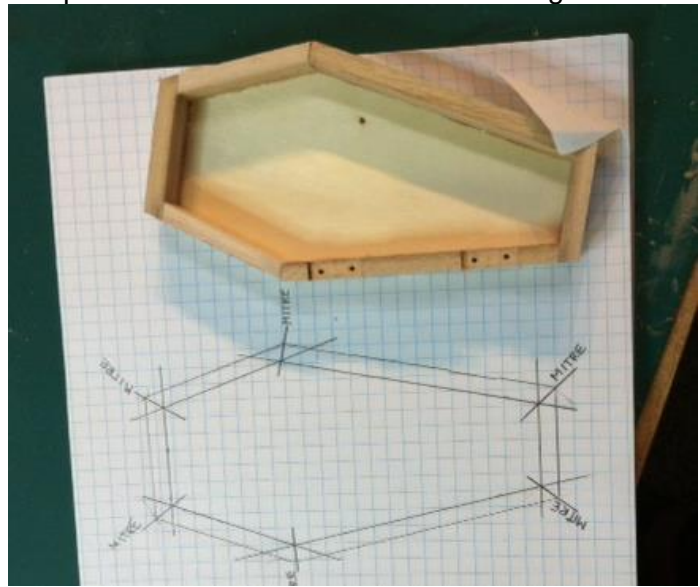
To illustrate this approach, the example chosen is turning a miniature coffin into a Halloween shelving unit, with a "glass" door. First, remove all hardware and sand the item, leaving the bottom half of the hinges on the larger half of the coffin.



Then, carefully, using the coffin as the template, draw the shape onto a piece of paper. Extend these lines several inches on either side of your template. Then, measure the thickness of the sides of the object. In this case, the wood was 1/4 inch thick. On the inside of your first drawing,

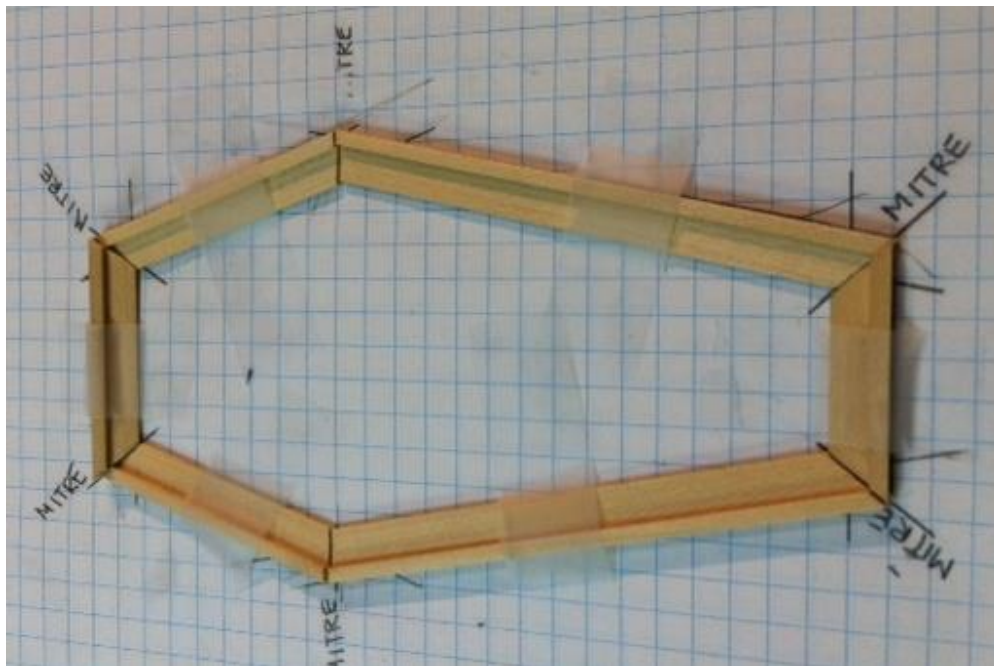
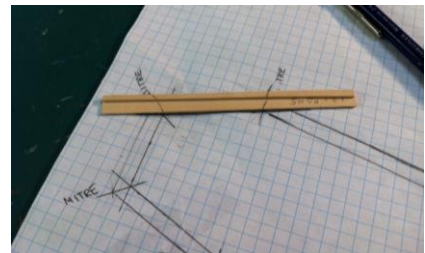
mark one quarter inch widths. Draw straight lines along all sides of the shape, again extending the lines by several inches outside the outer template. The result would look something like this:

Next, draw lines connecting the two points of the angles. These are your mitre angles. It is very important that these lines bisect the angles perfectly. Notice that in the picture, the top angle is not done correctly. This is what results: the mitre is imperfect.



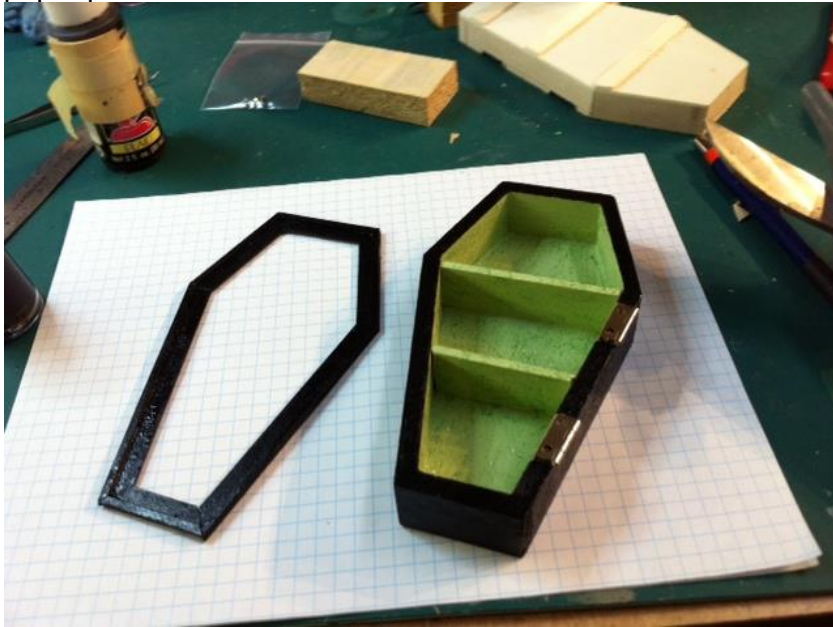
Use your protractor to make sure the angle is correctly split in half.

Now, lay your framing material (red stripe down) on top of your drawing and mark the angle of the cut (using a ruler, and doing a more accurate job than in the illustration). Place in your cutter, and cut the first piece of the frame. Repeat for each side, laying the pieces in place to check the accuracy as you go, as shown below. 0



This is also how you should cut the mitres for a complicated cove moulding, for example, putting cove moulding inside a four sided bay window. Make a paper template of the shape of the ceiling (most easily done with your box/house upside down). Of course in this case, you do not

have to worry about the thickness of the item you are framing. Then, cut your cornice on the paper pattern.



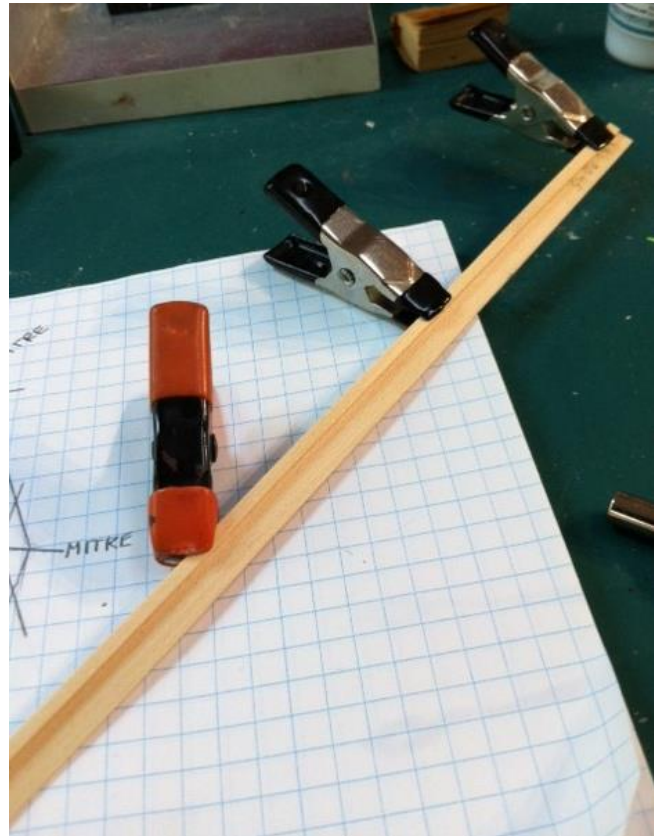
To get back to our coffin, To finish the door, glue the frame together, paint the frame, add the shelves, paint the box, glue the acetate on the inside of the door, glue the hinges back in place, and you have a wonderful Halloween display cabinet!

Embellishing Frames

Sometimes, you have to frame something in a hurry, and have no suitable framing at hand. Then, you can embark on a process of making your own framing material.

First, decide how wide you want your framing material to be, and whether you need an inset on the back side of the frame (not always necessary). If you need an inset, start building your frame with a strip of veneer that is 1/8" narrower than your finished frame. This is your base. Then, basically start piling various strips and shapes of wood on top of each other to develop a final frame shape. Once you have decided on your frame components, draw a rough diagram of how the pieces go together. Then, starting with your veneer base, add each length, clamping and gluing after each step.

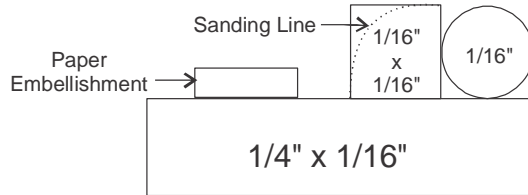
Sanding various edges, adding embellishments, using dowels or half/quarter round shapes can lead to some very elaborate frames.



Several examples will follow, but first, a very important rule: **always build an entire 24" length of framing**. Do NOT try to build a basic frame then add layers, mitring and measuring each one. It will not work, and will probably look messy.

1. Sample Frame 1

The first frame is made from a number of components and embellished using paper. Embossed paper can be found on notepaper, in paper doilies, in books of old wallpaper, or as purchased foil stick-ons (try the scrapbooking department)

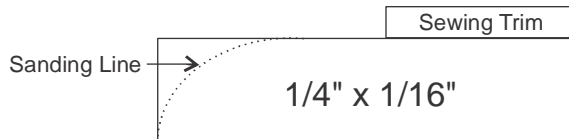


Frame 1



2. Sample Frame 2

The second frame very simple. It is merely a single piece of strip wood, with a sanded/rounded edge embellished with sewing trim. You could use lace, chain, rick-rack, or any other textured trim in this type of frame. Or, mix two different types. Colour doesn't matter since you will be painting the final result.

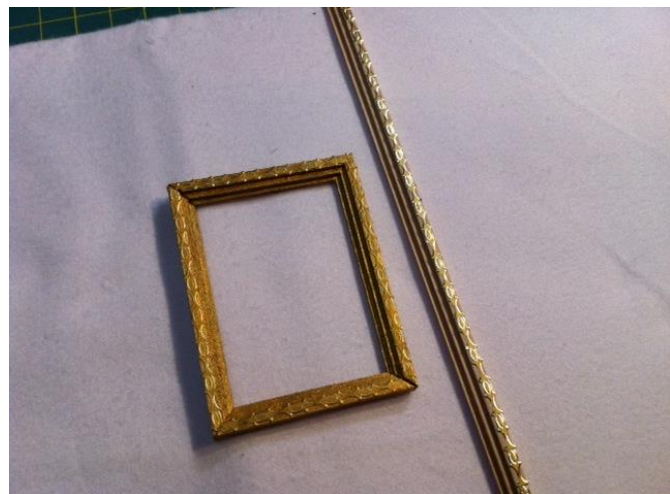


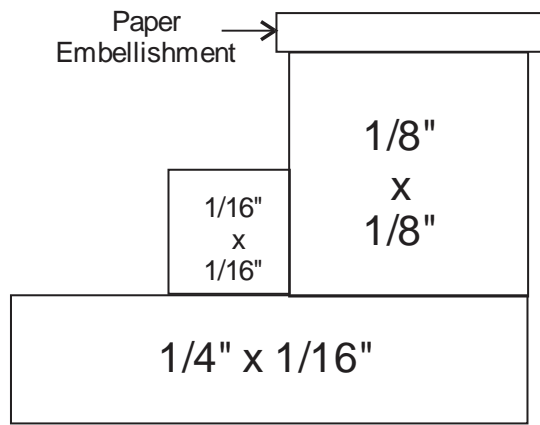
Frame 2



3. Sample Frame 3

The last example is just three stacked sizes of strip wood, with a paper embellishment that overlaps the edges.





Frame 3