

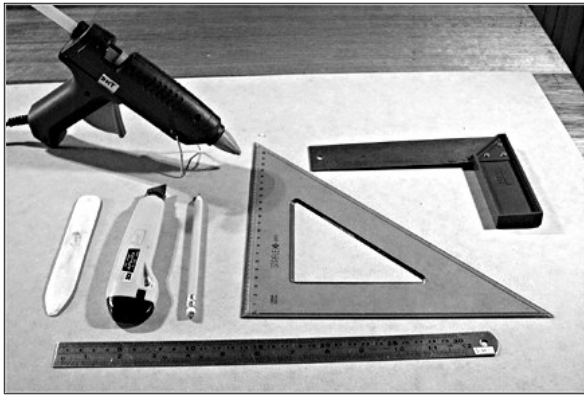
## Making a Box with Lid - Version 2

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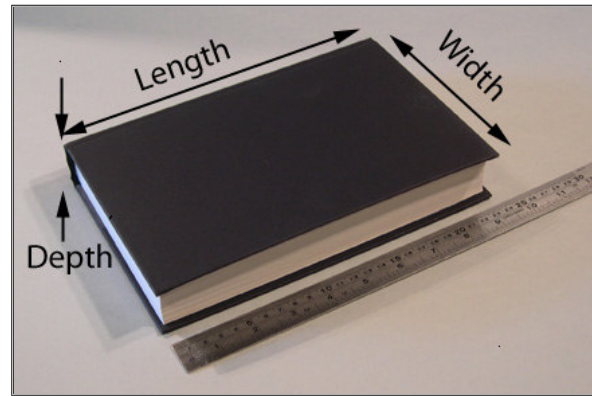


This box with a separate lid is reasonably quick and simple to make using only basic craft tools. Its design can be readily adapted in shape and size to accommodate a wide range of objects. For the purposes of these instructions the box is shown as being sized and shaped to hold a hard-back book.

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[1] The tools required are quite simple - a craft knife, a steel rule, a set-square or carpenter's square, a pencil and a bone folder for creasing and folding card. As a substitute for the bone folder a table knife with a rounded blade end, or a pate knife can be used. To glue the box together you can use hot glue from a hot glue gun or archival-quality PVA adhesive, available from art shops and suppliers of archival materials. Hot glue dries quickly (in a matter of seconds) but this can be a disadvantage at times if you don't get things quite right in positioning the pieces to be joined. PVA glue gives you more time to adjust things yet still dries quite quickly. If you are not familiar with working with hot glue it might be better to use PVA, at least for your first boxes.



[2] Begin by measuring the object for which the box is being made. Here we are using a book as a convenient object example. Measure the length, width and depth of the object, making sure that your measurements include any projecting bits and pieces. If the object has an irregular shape you will need to decide what you are going to measure as its length, width and depth.

Box inside length,  $l$  :  
 $l = \text{Object length} + \text{clearance}$

Box inside width,  $w$  :  
 $w = \text{Object width} + \text{clearance}$

Box inside depth,  $d$  :  
 $d = \text{Object depth} + \text{clearance}$

Box marked-out length,  $L$  :  
 $L = l + 2 \times \text{board thickness}$

Box marked-out width,  $W$  :  
 $W = w + 2 \times \text{board thickness}$

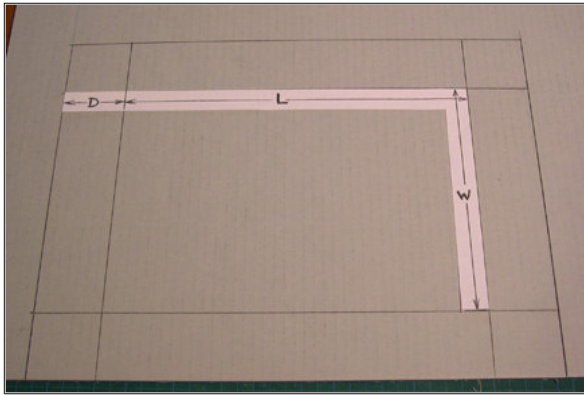
Box marked-out depth,  $D$  :  
 $D = d + \text{board thickness}$

[3] Next you need to decide how much space you need to leave around the object when it is in the box. For example, will you be able to lift the object from the box by handling only the top of the object (it might have a handle), or will you need to be able to get your fingers or hands down to the base of the object to safely lift it? If it is a heavy or very fragile object, will two people have to be able to get their hands to the base of the object? If the object is fragile, there might need to be room for padding, particularly if the object is to travel.

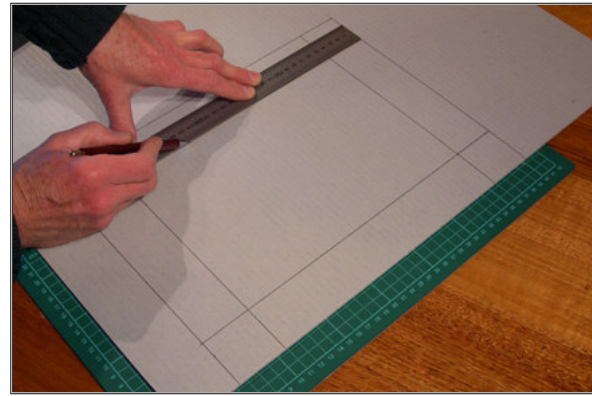
Once you have decided the clearance you need you can do the simple maths shown above to work out the inside length ( $l$ ), inside width ( $w$ ) and inside depth ( $d$ ) of your box.

[4] Another (and last) simple calculation before you start to draw lines on your board. To allow for the thickness of the board when you fold it into the shape of the box, you need to add twice the board thickness to the length  $l$ , and to the width  $w$ . You need to add one board thickness to the depth  $d$ . Thus the final marking out dimensions are as shown above.

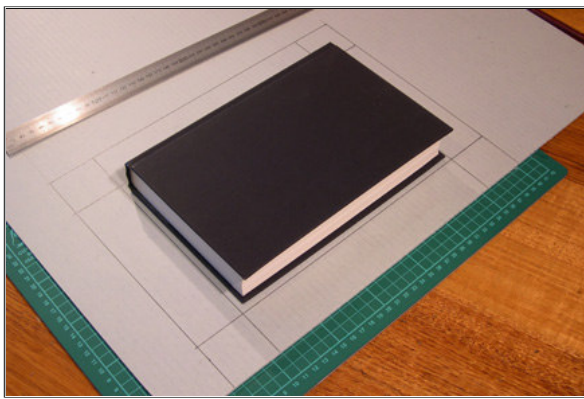
The material used to make the box is blue-grey archival corrugated cardboard. For most purposes the single-wall board is more than adequate. It is 3 mm thick and is available in sheets of several sizes. So using this board, you need to add 6 mm to  $l$  and  $w$ , and 3 mm to  $d$  to give your marking out dimensions of  $L$ ,  $W$  and  $D$  respectively.



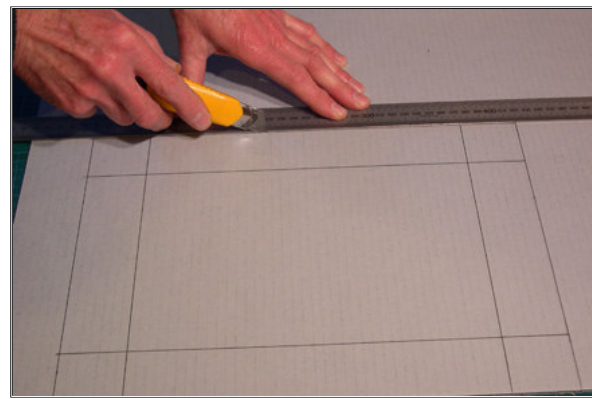
[5] This picture shows what the marked-out box should look like, ready for cutting and folding. The dimensions L, W and D are indicated.



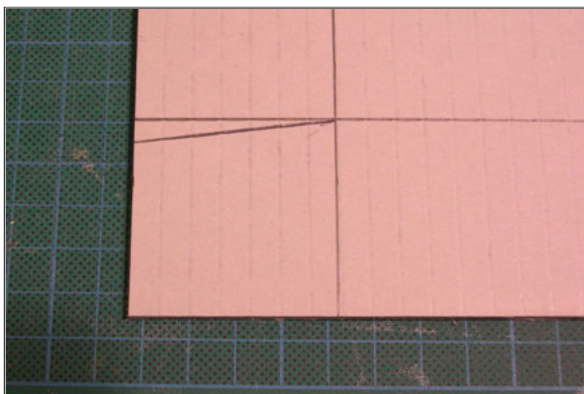
[6] Go ahead with marking out, using ruler, pencil and set-square.



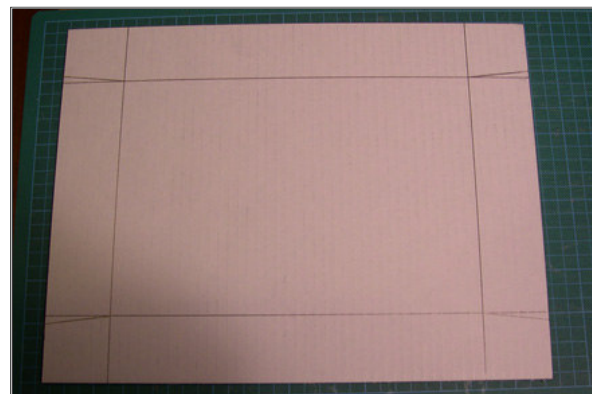
[7] Once you have marked out the box on the board, check that your object will fit inside the lines defining the bottom of the box. Do this **BEFORE** you start cutting! Always remember -- measure twice, cut once!



[8] Once you've checked the fit of your object, go ahead with cutting the outline of the marked-out box. Use a steel rule and a sharp knife - and make sure your fingers holding the rule stay well clear of the knife blade!

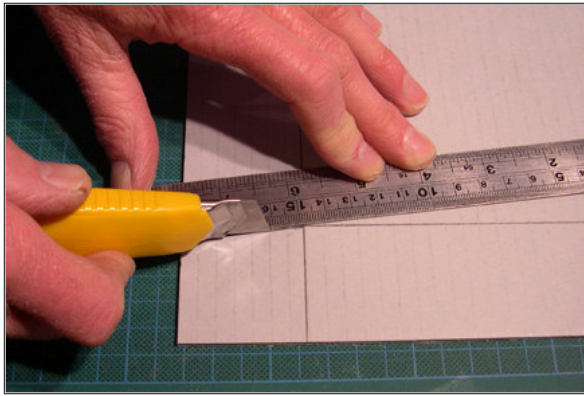


[9] Next we turn our attention to the corners of the box. The idea is to end up with a flap at each end of each side of the box which can be folded round the corner and glued to the end of the box. Start by marking the lower edge of this corner flap. In the picture above you can see how this is done, resulting in a slight taper to the corner flap. The amount of the taper is not critical. In the example here the outer end of the corner flap is tapered by 5 mm. Repeat for the other corners, making sure that the tapered corner flaps are at opposite ends of the box sides.

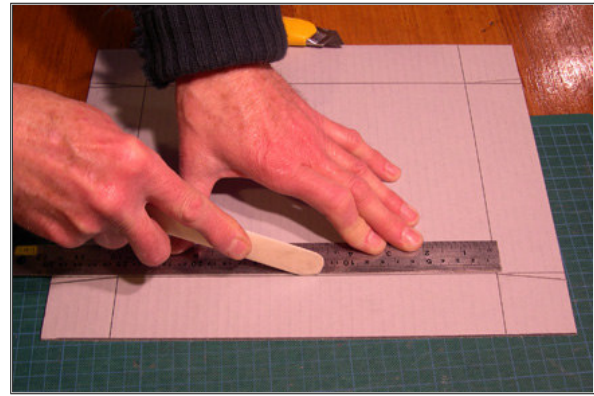


[10] When you have marked the corner tapers your board should look like the picture above.

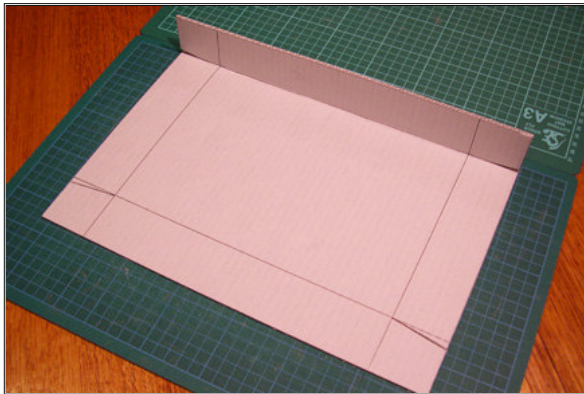




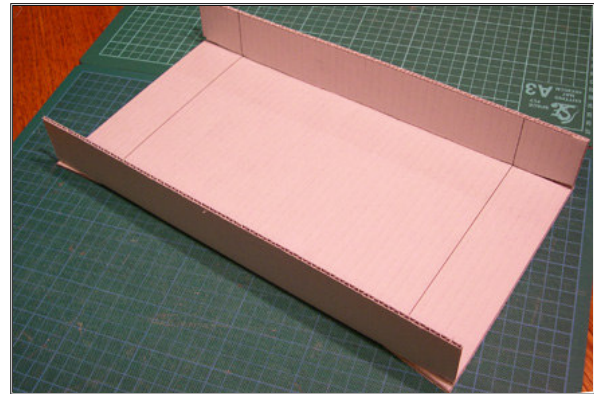
[11] Go ahead with cutting the tapering edge of a corner flap as shown. Repeat the process for the other corner flaps.



[12] Now you can start folding the box. Use a bone folder and a rule to score the line between the bottom of the box and one of the sides, as shown in the picture. Score the board firmly and quite deeply, without, of course, cutting it right through.



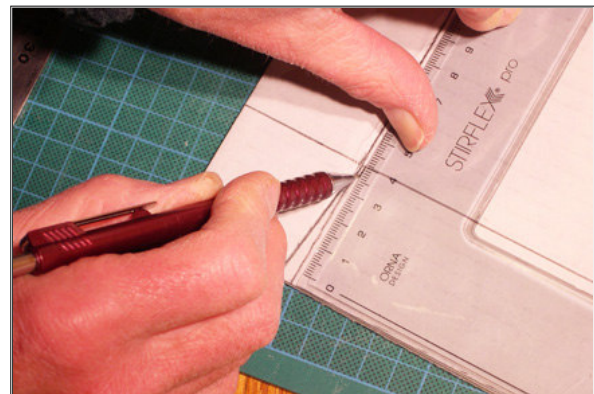
[13] Now fold up one side of the box as shown.



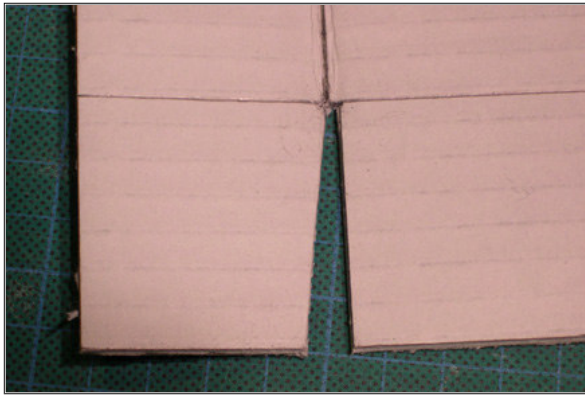
[14] Fold up the other side. Your box should now look something like the picture above.



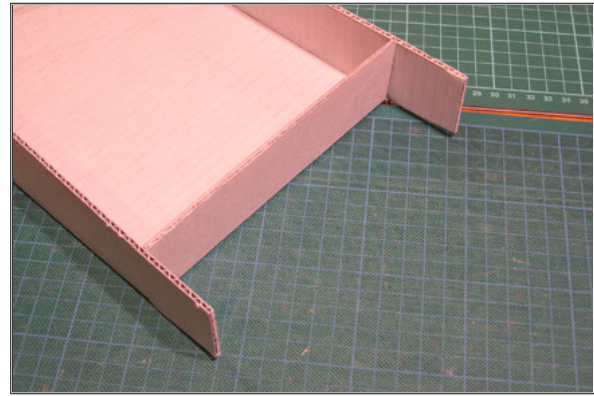
[15] Before folding up the box ends they need to be trimmed to fit properly between the box sides. With a side folded up and held in position, carefully mark on the box end the point directly below the inner surface of the box side, as shown above.



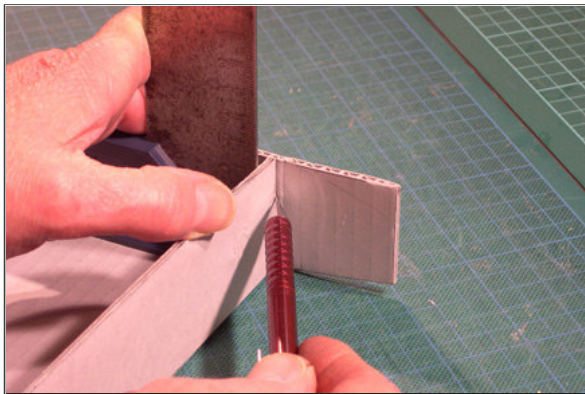
[16] Now draw a line perpendicular to the board edge and passing through the point you marked in step [15].



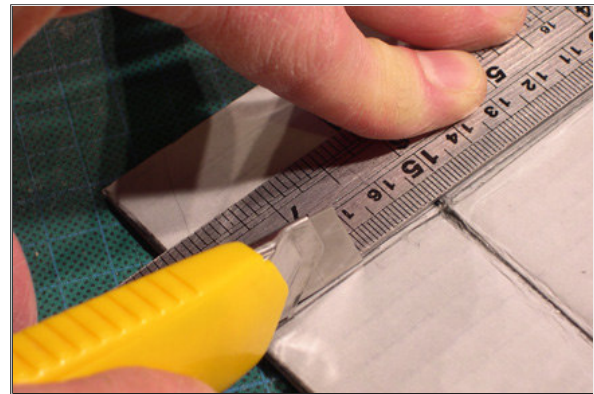
[17] Cut carefully along the line marked in step [16] using a steel rule as a guide. Remove the triangular piece of board to give the result shown above. (You will probably have to make a small additional cut at the apex of the triangle to free the piece of board). Repeat this process for the other corners.



[18] You can now score the fold between the box bottom and one end, as you did with the sides, and fold up the end as shown. Repeat for the other end.

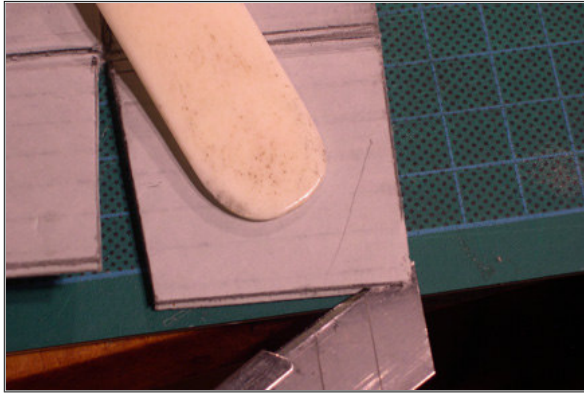


[19] Now to fold and glue the corners. The object here is to remove the inner wall and the corrugations of the corner flap to leave only the outer wall to be folded around the corner and glued to the end. To start, fold the box end up into position and hold the box side pressed against the end. The picture above should indicate the set-up. If you have enough fingers or can get some help, it is good to have a set-square or carpenter's square in position to ensure that the box end is perpendicular to the box bottom. When everything is in position, run the pencil along the edge of the box end to mark a line on the inside of the corner flap.

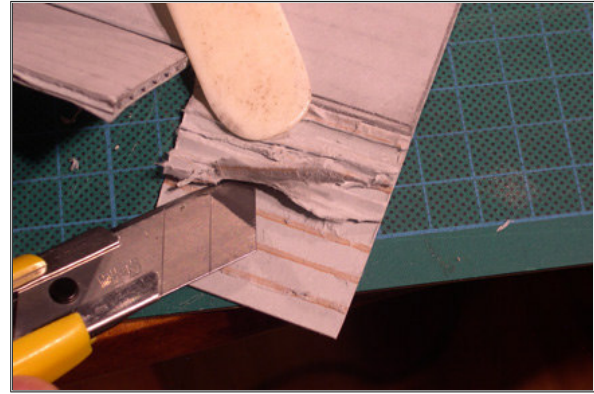


[20] Now for the tricky bit. Using the knife and steel rule, carefully cut along the line you've just marked on the inside of the corner flap. You want to cut through only the inner wall of the board so take it slowly.

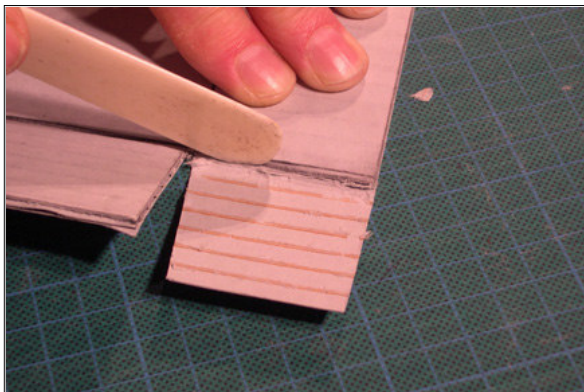




[21] Another tricky bit. Position the corner flap close to the edge of your table or bench. Hold the flap in position using the bone folder, as in the picture above. With the knife, begin to split the flap by cutting through the corrugations between the inner and outer walls. Be very careful to keep your fingers well away in case the knife slips. As you cut through the corrugations you will be able to peel back the inner wall. (NOTE: You might like to practice this splitting process on some scrap before tackling the corner flap.)



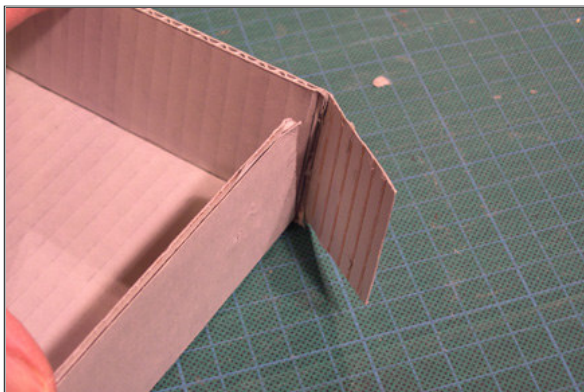
[22] Here the splitting has progressed. The inner surface of the remaining wall of the corner flap can be cleaned up by gently scraping with the knife blade to remove traces of the corrugations.



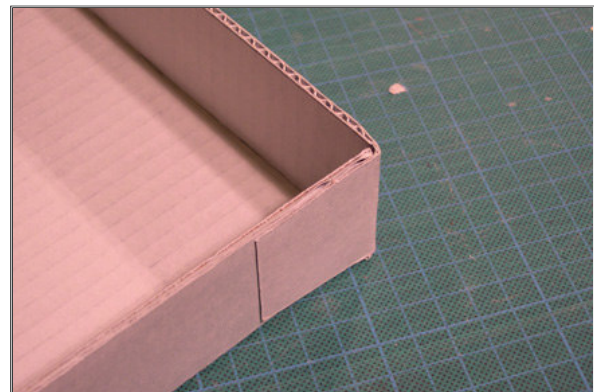
[23] When you have finished removing the inner wall and corrugations from the flap, lightly score the flap along the line where it meets the box side, as shown.



[24] Repeat the splitting and cleaning process for the other corner flaps. The box is now ready for gluing and should look something like the picture above.



[25] With the box side and box end raised to their correct positions fold the corner flap on to the end. Glue it in place using PVA adhesive or hot glue.



[26] The completed corner should look like this. Repeat the process for the other corners.



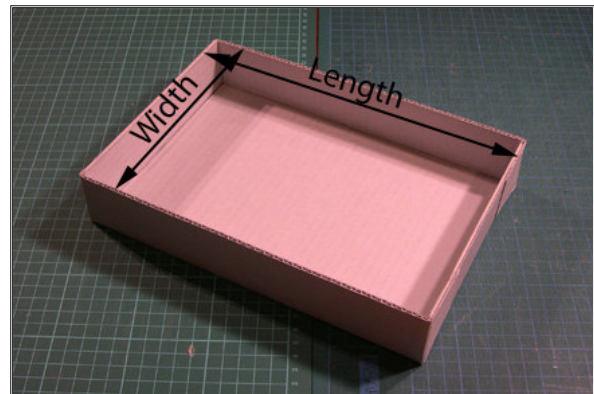
[27] This is the completed box.



[28] Now the acid test . Check to see if your object fits in the box.



[29] Success!



[30] Now for the lid. This is made in exactly the same way as the box, only now the box is the object. Begin by measuring the overall length and width of the box, as shown above. Measure across the corners of the box. Measure at both ends and at both sides as there may be slight differences in the length and width dimensions at opposite sides and ends of the box. Take the larger of the length and width measurements as your object length and object width. The depth of the object can be the depth of the box for shallow boxes (say less than 50 mm deep). For deeper boxes you might want to make a shallower lid, say 40 mm deep.

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Lid inside length,  $l$  :  
 $l = \text{Box length} + \text{clearance}$

Lid inside width,  $w$  :  
 $w = \text{Box width} + \text{clearance}$

Lid inside depth,  $d$  :  
 $d = \text{Lesser of box depth, or } 40 \text{ mm}$

Lid marked-out length,  $L$  :  
 $L = l + 2 \times \text{board thickness}$

Lid marked-out width,  $W$  :  
 $W = w + 2 \times \text{board thickness}$

Lid marked-out depth,  $D$  :  
 $D = d + \text{board thickness}$

[31] With your measurements from the last step you can work out the inside dimensions of the lid as shown above. The clearance can be small in this case since it only controls whether the lid is a loose fit or a tight fit. For your first boxes, a clearance of 2 mm should be enough (it's probably to have a lid slightly loose than a lid slightly tight.) With practice, you may find you can reduce the clearance or even leave it out altogether. As mentioned in the last step, the depth of the lid is not critical.

[32] Finally, work out the lid dimensions  $L$ ,  $W$ , and  $D$  and proceed to make the lid just as you made the box. Don't forget to check the fit of your box inside your marked-out lid BEFORE you start cutting! Remember the cardinal rule - "Measure twice, cut once."



The final product, complete with lid.