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FLAT-PACK CARDBOARD BEACH OFFICE

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Posted Mar. 4, 2013 | <https://cdn.instructables.com/EXU44KA/HDOW6774/EXU44KAHDOW6774.LARGE.jpg>

First Prize in the
[Cardboard and Duct Tape Contest \(/contest/ducttape2013/\)](/contest/ducttape2013/)

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This project is an attempt to bridge my desires of being immersed in the beauty and aliveness of the outdoors, while still remain a productive citizen of the society. Living near the coast, the calling of the ocean is just irresistible. Since a lot of my work can be done on a laptop, to have a portable office to take to beach simply means a comfy chair and table that is lightweight, sturdy, portable, and easy to assemble.

This set of table and chair are made of cardboard and duct tape only, and weigh less than 4 pounds together. They can be easily put together and taken apart, and every component opens up into a flat piece. The 2 table legs become the carrying case when opened.

I took inspirations from many cardboard furniture and packaging designs, went back and forth between designing in Sketchup, and testing the structures with cardboard. Through this process I became more and more appreciative of cardboard as a construction material.

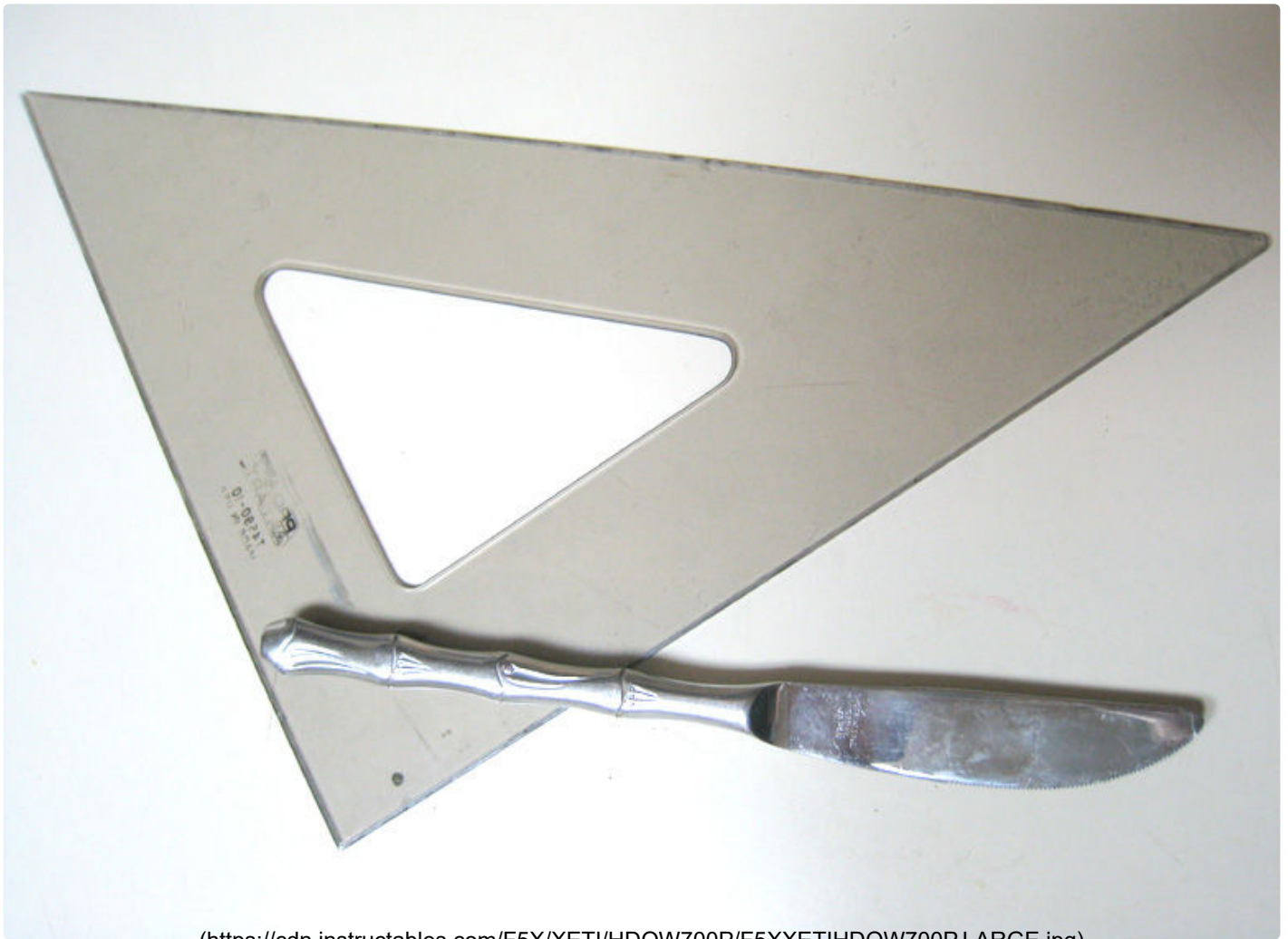
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Step 1: Material and Design



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Materials

- Cardboard: upcycle all those boxes! This project utilizes single wall corrugated board, but some improvement can be achieved by using double wall corrugated board. Will discuss that later.
- Duct tape: your choice of colors

Tools

- Box cutter or Xacto knife, and good cutting surface
- Scissors for cutting slots (shown in next step)
- Measuring tape
- Drawing pen for marking the cuts and folds
- Straight edge and a butter knife to make creases

Cardboard as a construction material:

The humble cardboard contains some genius structural engineering. When placed

vertically on its ends, the corrugation / flutes form vertical columns, capable of supporting considerable amounts of weight.

In this project the components that support lots of vertical weight, such as the structure beneath the chair, is made with the corrugation running vertically.

Human proportions in furniture design

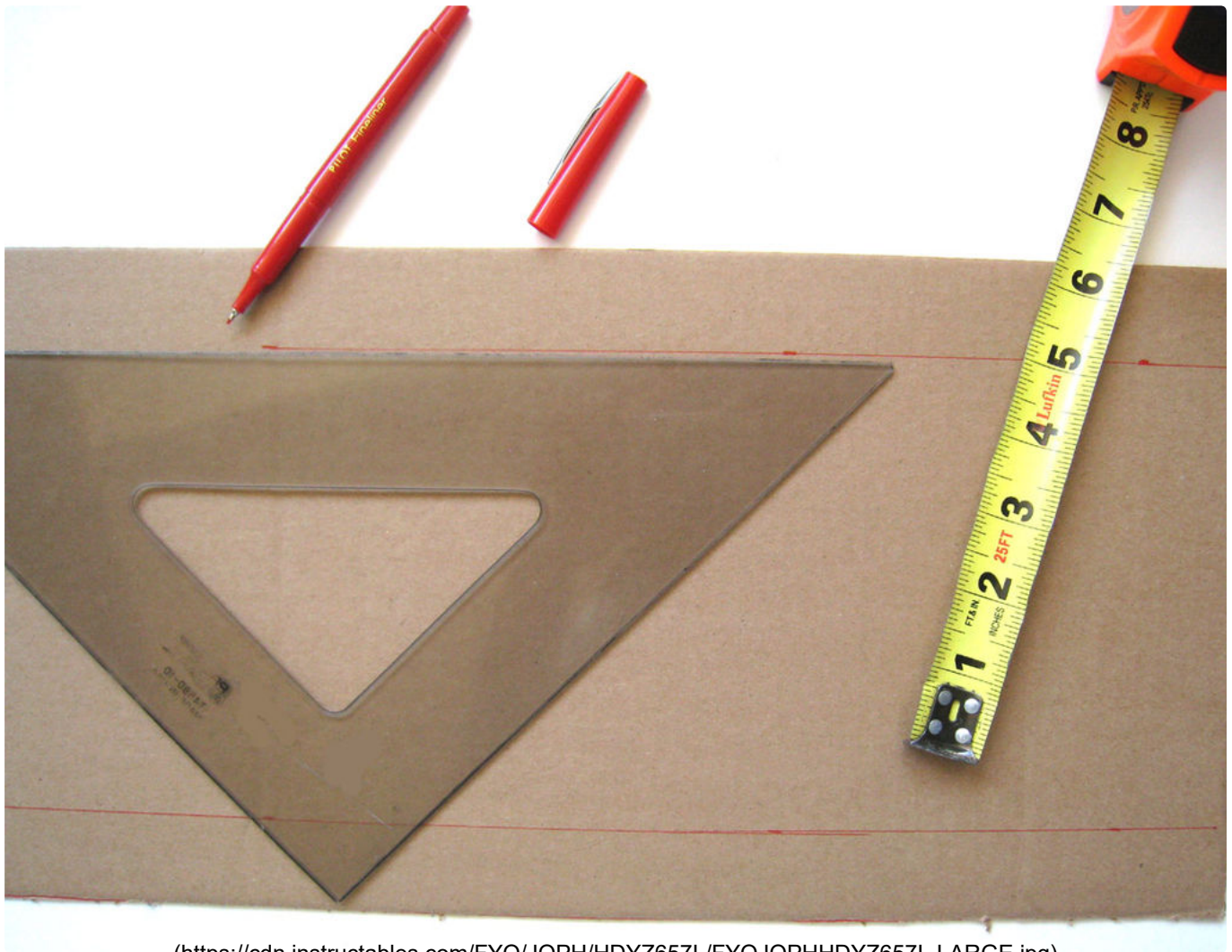
Mass produced furniture are designed to correspond to the average proportions of their intended users. Yet each of us has different body height and proportions. When we custom design a piece for ourselves, and create it with an easy to shape material like cardboard, it is quite fun to test what is the most comfortable dimension for the unique person.

All the diagrams here are based on what I felt most comfortable. If you decide to make these, make sure to test and adjust the dimensions for yourself, and be surprised what a difference 1 or 2 inches can make you feel.

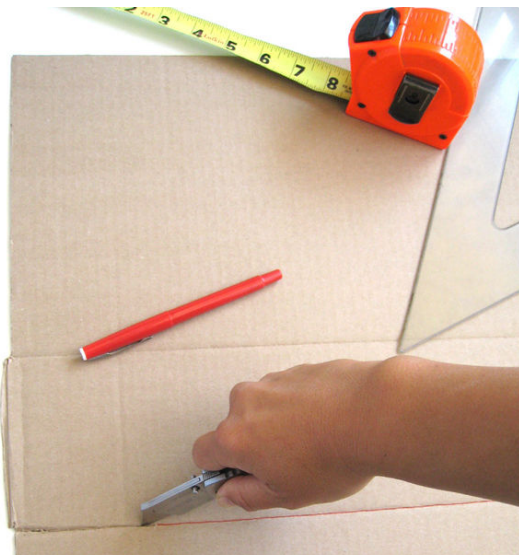
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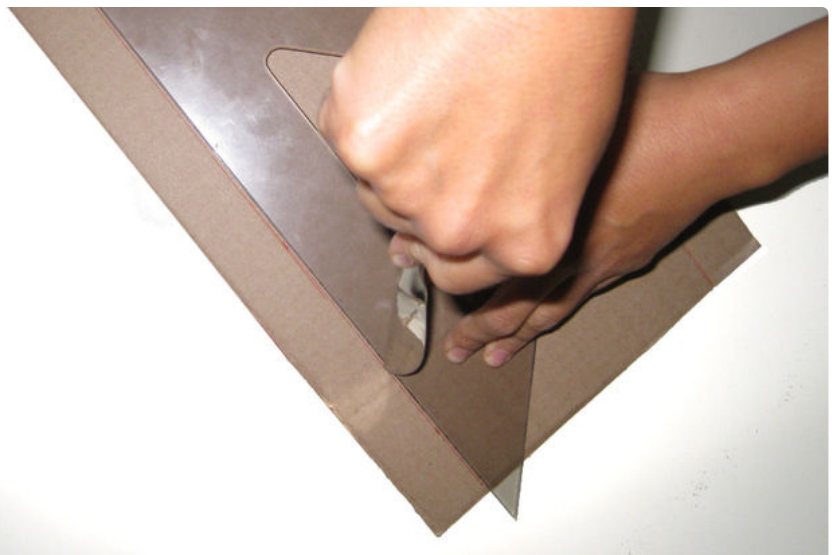
Step 2: The ABC of Cardboard Construction

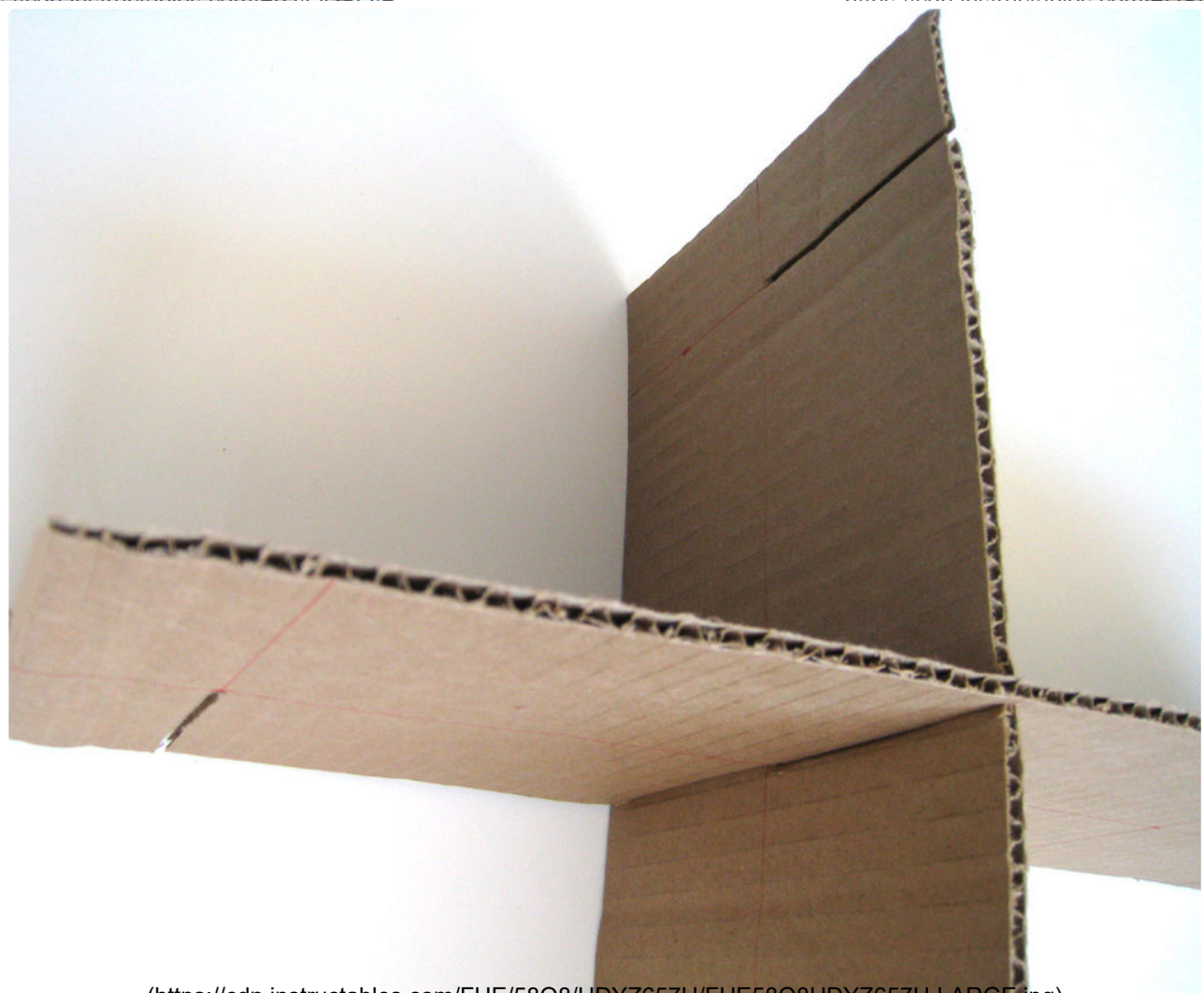
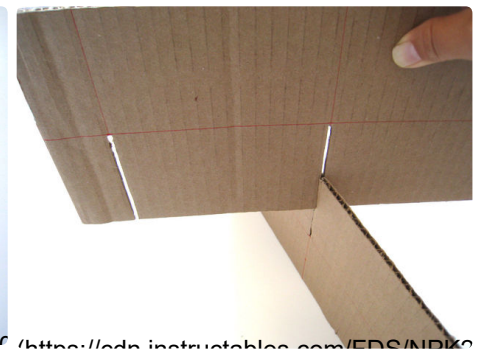
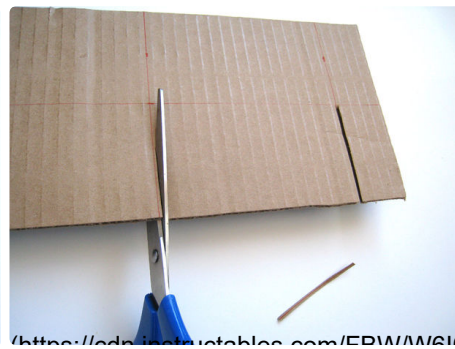


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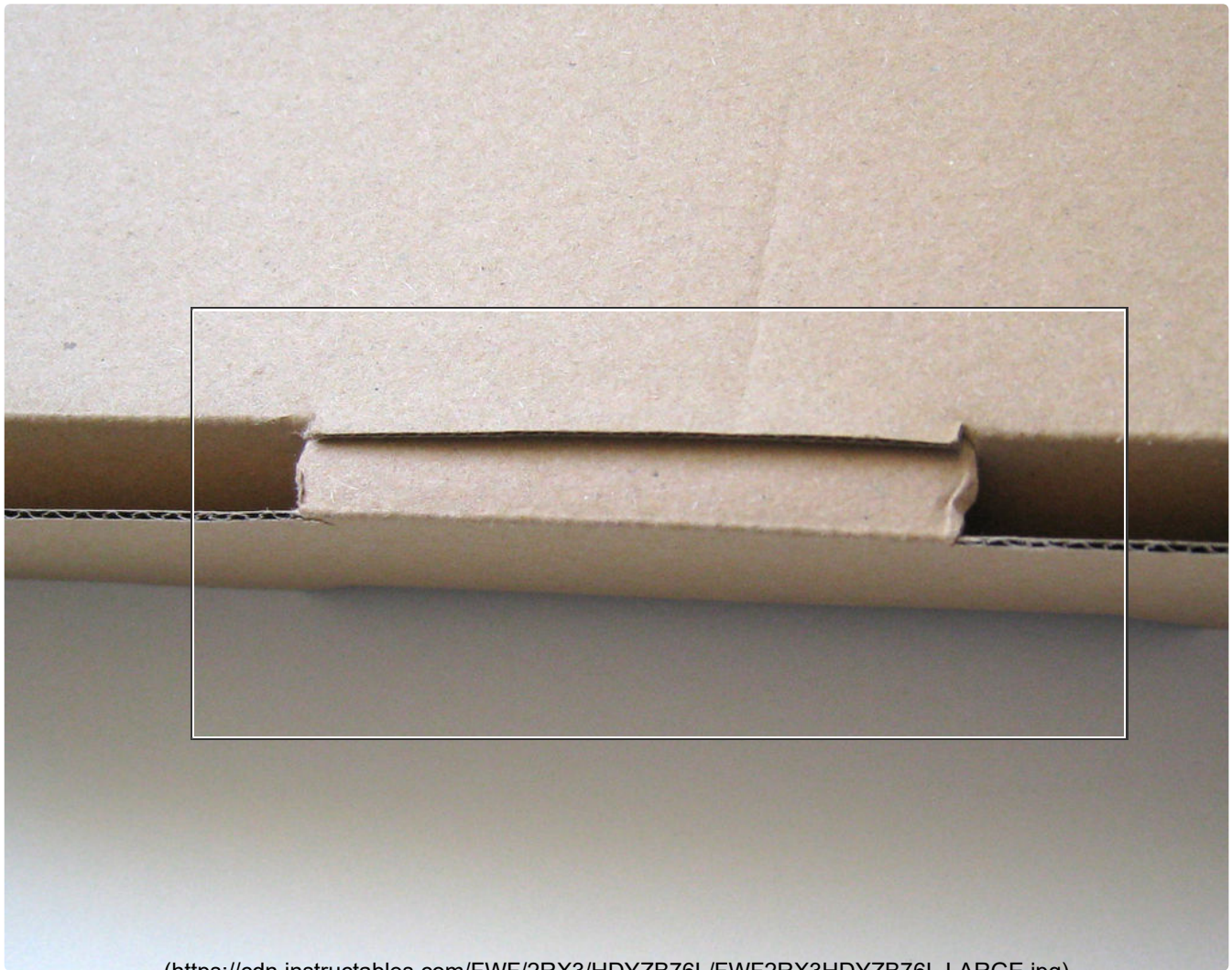


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If you are quite handy, feel free to skip this step. This step explains all the basic methods of how to cut, crease, fold, notch, & join cardboard, which will be used to create all the components in this project.

Precision is important when building a structure. Use tape measure, straight edge and fine marker to transfer the measurements onto the cardboard surface.

When cutting, I find it easier to make a shallow cut first, then go over it with a deep cut. If your hands are strong and steady, it might be different for you.

To create creases, use the dull side of a butter knife, and go over the marking with the help of a straight edge.

To join 2 pieces of cardboard in a 3D grid (used under the chair), notches are utilized

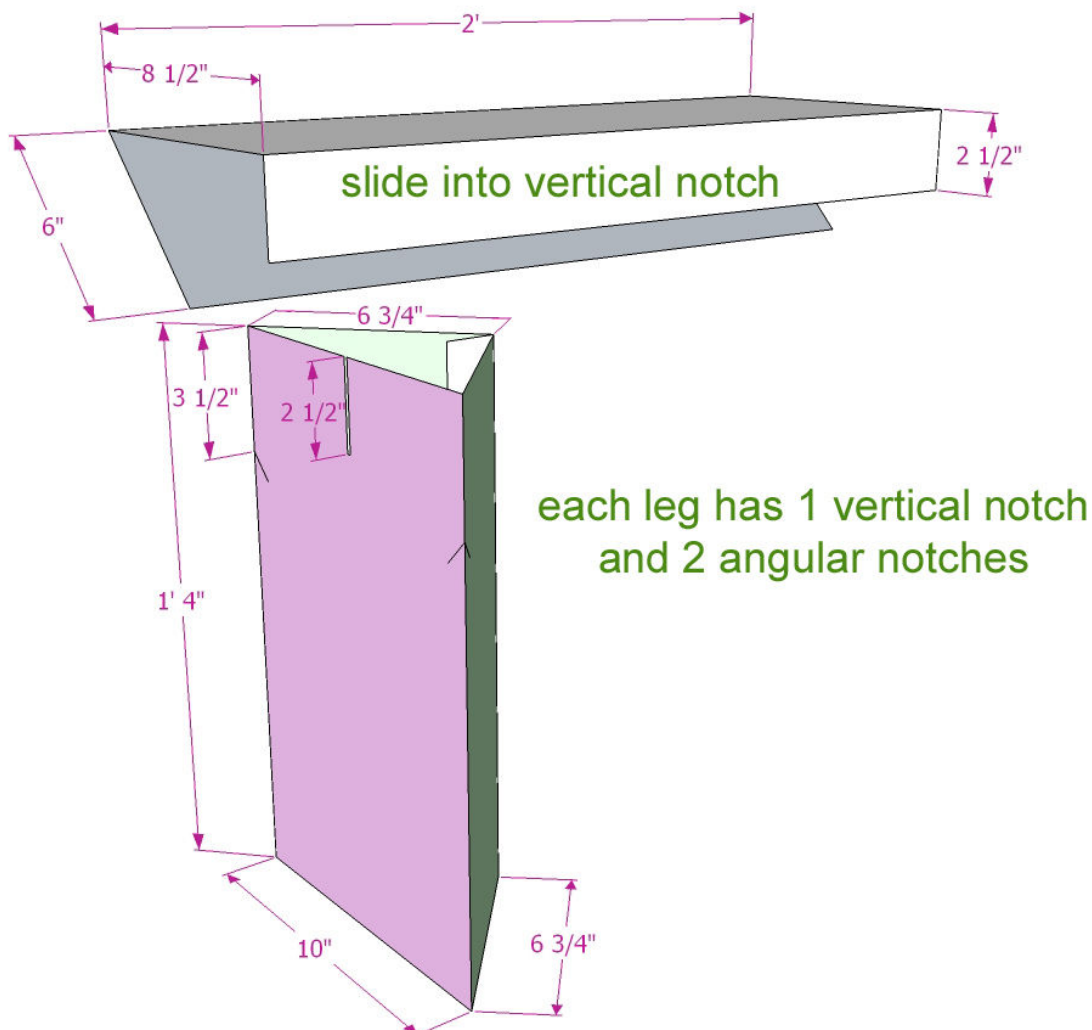
here. Draw lines where notches are going to be made on the 2 pieces, then draw another line through the middle. Use scissors to cut a notch about 1/8" to 1/4" wide centered on the line. This will allow the 2 pieces to fit neatly together.

Last but not least, another method of joining cardboard here is the slot and tab. Think about when you get a box of pastries, the lid remain closed because the tab is inserted into a cut slot. The size of the tab and slot can be somewhat flexible as long as they fit snugly.

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Step 3: Make the Table



(<https://cdn.instructables.com/EN3TMY7HD0U1WYS/EN3TMY7HD0U1WYS.LARGE.jpg>)



TIP: If you can't find a big enough piece of cardboard anytime during this project, you can tape 2 pieces where the creases are show.

The table consists of 4 pieces- 2 triangular legs at 16" high with notches, and 2 symmetrical top pieces which slide into the notches and make up a 24"x17" top surface. The first diagram shows one leg, one top piece, and all the dimensions.

To make one of the legs, cut out a piece of cardboard 16"x27". Make 4 creases as

shown, cut out the 3 notches, and a tab and slot to lock the triangular form together. The tab and slot can be any length between 4" and 6", and centered on the vertical length.

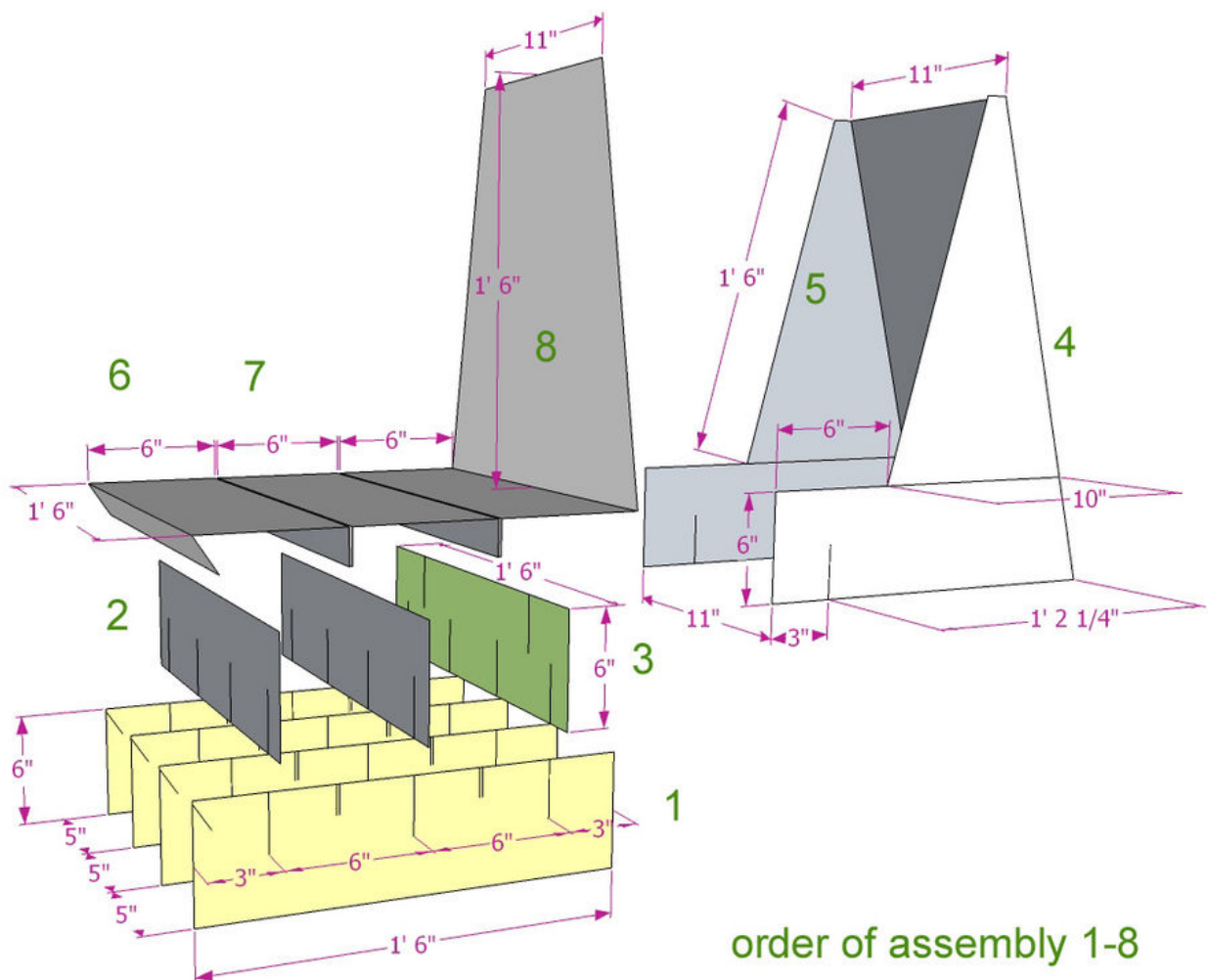
To make half the table top, use a 24"x17" piece, make 3 creases as shown in the dimension diagram,

Once all 4 pieces are made, put the 2 table legs about 18" apart, slide the top pieces into the notches and that's it!

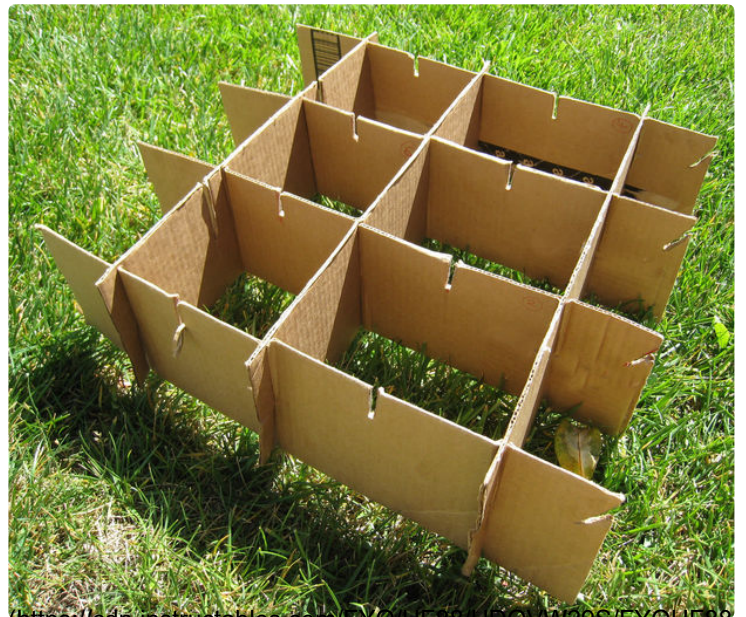
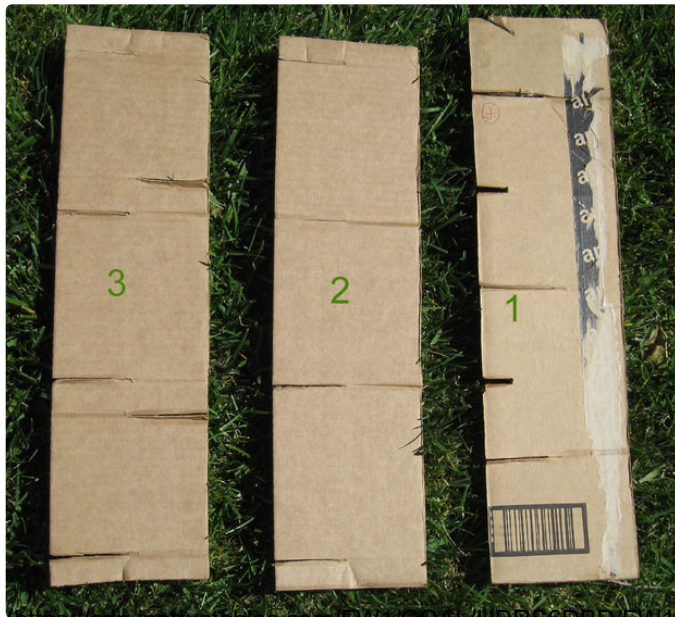
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Step 4: Make the Chair



(<https://cdn.instructables.com/EKCD347/HDY71280/EKCD347HDY71280.LABCE.jpg>)





Please refer to Step 2 for detailed explanation on creating notches, etc, and look through the picture and tags here first before reading, since language can make a simple process seemingly complicated. =)

Start with the structure underneath the seat. In the diagram and the pictures, the green numbers refer to different pieces.

Pieces #1, 2 and 3 are all made with 6"x18" cardboard, and make sure the corrugations are running vertically. Cut notches where lines are drawn, and they will fit nicely into a 3D grid.

Once the grid is put together, the order of assembly for pieces #4 to #8 can be quite flexible.

Pieces #4 and #5 give the back of the seat a 15 degree angle, which is what I found to be comfortable, and the triangular shape transfers weight from the leaning point, aka our shoulder, directly to the ground. This was one of the aha moment after testing various ways to support the back of the chair- the magic of triangles!

These 2 pieces connect to piece #3 on the grid, lock together with a tab and slot cut similar to the table legs.

Pieces #6, 7 and 8 form the top and back of the seat. Each has 2 ceases which create folded flaps to slide into the notches of the grid. The flaps and notches are about 1.5" long.

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Step 5: Duct Tape and Carrying Case



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The duct tape here plays 2 roles: functional and artistic.

It provides protection from the moisture of the beach sand, and adds a lot of extra strength to the cardboard pieces. All the pieces that touches the ground are taped at least 2" up.

I also realized that some pieces are much stronger if made with double wall corrugated board. Because I only had single wall boards to work with, I doubled some pieces when applying the duct tape. More on this in the final part.

When it comes to artistic designs, sky is the limit. I went with the geometric look of double and single tape stripes.

To create the stripes design, make sure to overlap each stripe slightly. On larger pieces, it helps to have a friend holding one end of the tape, and stretch it as you tape it onto the boards.

The 2 legs of the table, when opened up, will turn into a carrying case. Make duct tape ribbons by folding a 6' to 8' long into half, and make 2 of these. Thread the ribbons through the triangular notches, and sandwich all the other pieces in between, tie the ribbons together at the top. Please refer to the last picture and tags for more details.

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Step 6: Beach Calling



(<https://cdn.instructables.com/ETK/STT74DQW70CH/ETK/STT74DQW70CH.LARGE.jpg>)



Each one of us has a "beach" in our heart. Perhaps it's under that flowering tree, or on that green grassy patch at the park...

Working through this project really inspires me to learn more about cardboard structures and furniture designs. The following are a few starting points-

- I doubled the seat top , back and table top surface, and find them much stronger.
- I want to explore ways to make a really big table, like 4' by 6' table top.
- Although the chair is quite sturdy, I hesitate to jump up and down on it. There must be ways to make the grid structure better.

The possibilities for improvements are endless.

"On the beach you'll find them there
In the sun and salty air..."

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