

# Working With Wood



A Kid's Introduction  
To Hand Tools

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# Introduction To Woodworking

It is my hope that this book will get you started in the wonderful hobby of woodworking. There are many other books and web sites on this subject and I hope that you read as many of them as you can, more importantly I would hope that they will become part of a library that will be with you throughout the rest of your life.

Ask any group of woodworkers how to do something and you will likely get as many different answers as there are people in the group. The amazing thing is that each of them will be right in their own way, just different paths to obtaining an end result.

What I offer to you in this book is one way of doing things, as you work on the projects you will discover other ways of accomplishing the same objective. This usually happens when you find that you don't have the tool or material recommended in the plan so you have a choice to make. You can either stop working and go the store and buy what is needed or innovate.

It is this innovation that adds character and distinction to your work, what kind of a world would this be if everybody steadfastly followed the plan for the original table and chair set that was built?

I have included several projects for you to make, these are intended to act as a springboard for other ideas of your own. After walking you through each of them the first time I hope that when you build a second one your imagination will catch fire and a new creation will have been born.

Often this may be no more than making a part longer or shorter, do what pleases your eye, we all see things in a different perspective.

One thing I must mention is that I have used standard dimension lumber for the projects to make it easier for you to get started. As convenient as this is these dimensions may not always be esthetically pleasing to the eye.

# Working Safely

Accidents are usually caused by carelessness, not paying attention to what you are doing, working at a project when you are tired or not feeling well. This is supposed to be fun, don't let it become work.

Sharp tools are necessary to make clean accurate cuts, therefore much caution must be observed when using any cutting tools. Always have the material you are working on secured so it can't move, if it takes two hands to use the tool, use a clamp or vise to anchor the work piece. Use gloves when carving with knives or chisels.

Safety glasses and dust masks should be worn when necessary, don't make exceptions, take that extra few seconds to put them on, better than regretting it for a lifetime.

Before using any power tool become familiar with it, read the manual and only use it under adult supervision until that adult gives you permission to do otherwise.

Keep your work area clean and tidy, it is more fun to work in an organized environment.

Don't be afraid of your tools, respect them. If you are not comfortable using a tool then find another way to do the task, as you gain experience your confidence will grow.

# Your Tool Box

You will need some basic tools to build the projects in this book, it is possible that some or all of them may already be in your home. It is not necessary to have all the tools listed below, they are a sample of what might be in a woodworker's tool box. Each of the projects has a list of the tools needed to build that particular project.

If you need to purchase a tool it is not necessary to get the most expensive one, nor is it always a good idea to buy the cheapest one, try for good quality mid range tool.

Buy real tools, avoid the toy tool kits, remember you will have a lot of these tools for the rest of your life.

## Adjustable Wrench



This will be used to tighten bolts used in the projects, this is a one size fits all tool.

The lower jaw is movable, it is adjusted by turning the knurled worm gear, always make sure the jaws fit tightly on the bolt head.

## Clamps



You will use clamps to hold parts together until the glue dries. You may also use one to hold material when you are sawing if you don't have a vise.

There are many types of clamps, the one shown is a bar clamp which is adjustable by sliding the jaw with the screw handle along the bar. Use thin pieces of scrap wood between the jaws of the clamp and your wood to prevent marks from the clamp.

## Drill & set of drill bits



You will be using a drill to build several of the projects, a small set of bits up to 1/4" will be adequate.

Before using a drill read the manual so you are aware of the safety precautions that must be taken. Remember the larger the battery on a cordless drill the heavier it is, I would not buy less than a 12 volt model, this will give you adequate power yet will be light enough to handle. You will find that your drill is used to drive screws as often as it is used to drill holes.

## File



You will use a file to remove sharp edges from metal.

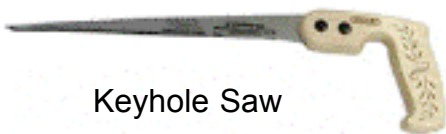
There are flat files, round files, square files, triangular files to fit the different contours that you may have to work with. A flat file is a good choice to begin with.

## Fret Saw or Keyhole Saw



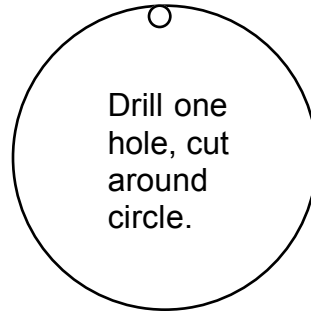
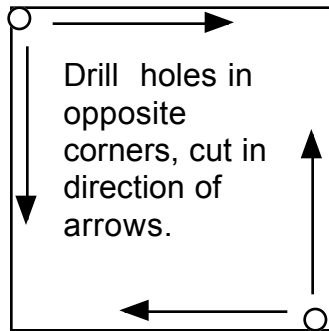
Fret Saw

To make curved cuts you will need either one of these saws, the fret saw will cut around a smaller radius than the keyhole saw.



Keyhole Saw

To make an inside cut a hole must be drilled for the blade to enter to start the cut.



### Hand Plane



Planes are used to smooth the surface and straighten the edge of boards.

A smoothing plane such as a #3 or #4 Stanley is a good choice for a first plane, your next choice would probably be a low angle block plane. Plane in the direction of the grain otherwise tear-out will occur.

Plane in this direction



## Hand saw



A hand saw will be used to make straight cuts in wood. Select a saw with about 8 teeth per inch.

Make sure that the wood being cut is held securely, use a square to mark a straight line to follow. Use a box or table about the height of your knee to saw on, if you are right handed lay the board on the top of the table, place your right knee on the board to hold it. With the saw in your right hand place it on the mark to cut at about a 45 degree angle, place your left hand on the board with the outside of your thumb against the center of the saw blade. Gently push the saw forward a few inches so the teeth cut into the corner of the board, repeat this several times until the cut is started. Move your left hand forward to grip the front edge of the board and begin your cut. The saw only cuts on the forward stroke, ease up on the back stroke.

## Hack saw



A hack saw will be used to cut metal. It is also used to cut wood occasionally, especially dowels.

Fasten the material you are cutting securely, use slow firm strokes. Hold the saw with both hands, one on the handle the other on the top end of the frame.

## Hammer



A claw hammer will be used to drive nails, a 16 ounce head is usually preferred for general use.

Drive a nail by swinging the hammer down so the head of the hammer strikes the head of the nail straight on, otherwise the nail will bend. Stop before the head is below the surface and use a nail set to finish driving it. The claws are made to pull nails, use a scrap of wood under the hammer head so as not to damage the surface of the wood.



## Nail Set



A nail set drives the head of a nail below the surface.

Nail sets come in different sizes to fit the nail head so that the hole it makes in the wood will be as small as possible. After driving the head below the surface of the wood the hole is filled with wood filler or putty.

## Pliers



You will use slip joint pliers to help you hold small parts when you are drilling them.

The jaws may be adjusted to hold larger objects by opening the handles fully and slipping the bolt in the handle into the other hole.

## Safety Glasses



Safety glasses are the most important tool in your box, use them.

There are many different types, ones that fit over glasses and even styles that are ground to your eyeglass prescription.

## Sandpaper



Sandpaper is used to smooth the edges and faces of wood. It is available in assorted packs.

Start with just a coarse enough grit to cut the fibers of the wood, too coarse of a grit will leave deep scratch marks in the wood so more sanding with finer grits will be required. Too fine of a grit to start with will not take enough of the wood off quickly enough.

## Screwdrivers



A set will include flat, phillips and square drive bits.

Though you will likely be using your drill to drive most screws, there are still times when it is necessary to do it by hand.

## Square



You will use a square to mark straight perpendicular lines on your boards.

There are many types of squares, a combination square is a good style to start with. In addition to marking perpendicular lines for cross cutting it will measure 45 degree angles for miter joints, most have a built in level and they can also be use as a depth gauge.

## Wood Chisels



Wood chisels are used to remove layers of wood.

Wood chisels come in different widths, they are used to make hinge mortises, rabbets and shaping wood. Fine cuts can be done by pushing the chisel with your hand, a wooden mallet is used to strike the chisel for deeper cuts.

# Assembling Projects

Any project with more than one part will have some kind of joint to hold the two parts together.

There are many ways of making joints and fastening them together. Fasteners generally will include glue, and some method of holding the parts together until the glue dries such as nails, screws, biscuits or dowels.

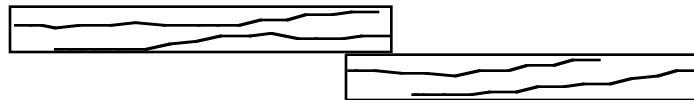
The most common metal fasteners are nails and screws, nails are cheaper than screws so are used in low end products and in residential construction. Screws have greater holding power than nails so are use in situations where stress will be put on the joint.

Dowels are being replaced by biscuits, which are small oval disks that fit in a slot cut by a special tool. The glue causes them swell inside the slot to make a tight fit.

No matter what type of fastener you use it is the glue that bonds the wood together, the fasteners only hold the pieces together until the glue sets. Joints are much stronger when glue is applied to the surfaces of the wood where the fibers are running in the long direction so joints have been designed to take advantage of this.



Glue has poor strength because it is applied to cross grain surface.

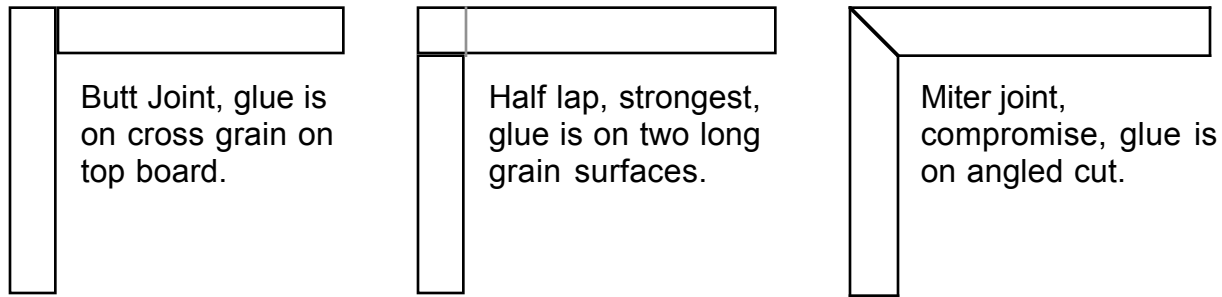


Glue has greater strength because it is bonding the long grain wood on the faces of the wood.



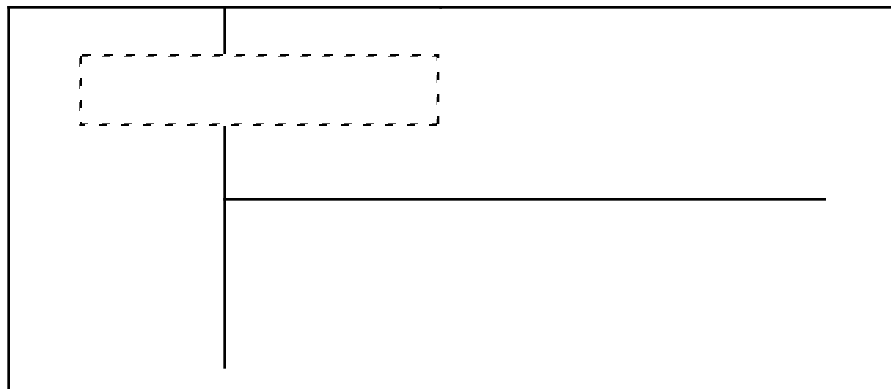
The boards at the top joined lengthwise end to end have little strength because the glue is applied to the gross grained cut. The two boards glued together with one on top of the other, a full lap joint, are much stronger because the glue is on the long grain surface of the wood, to make the same profile notches are cut in the boards to create a half lap joint.

When boards are joined at a right angle the same principle applies, in this case you have one board with glue on the long grain and one with glue on the cross grain when you use a butt joint.



Using a half lap joint is the strongest way to make the joint, but the more common way is to make a cut at a 45 degree angle splitting the difference by putting glue on longer fibers than a cross cut.

It is much easier and quicker to make butt joints, so in order to strengthen them dowels or biscuits would be used, this puts the long grain of the fastener in contact with the long grain of the wood.



The type of glue you use depends upon the conditions the finished product will be used in. White or yellow carpenters glue will work just fine for indoor projects where they will not come in contact with moisture. Cutting boards for example require a waterproof glue because they will be exposed to water when they are washed. Any outdoor products will also require a waterproof glue. There are many brands on the market made for particular applications, there are glues that are both waterproof and food safe for instance.

# Finishing Your Projects

You may finish your projects with paint or get a more natural look with clear or tinted oils and varnishes.

There are indoor finishes and outdoor finishes, be sure to use the appropriate type for your project.

Before coating the surfaces they must be smooth, start with a coarse grit of sandpaper and remove the worst ridges and rough spots, now go to a finer grit and continue, this will begin to remove any scratches from the coarse grit. As the surface becomes smooth to the touch it then becomes a matter of eliminating the remaining scratches, use finer and finer grits until the surface is perfectly smooth.

You will likely have started with about an 80 grit paper, if you are painting the project you can stop when you have got down to about 200 grit. It is not an advantage to make the surface extremely smooth, paint needs something to grip to.

If you are applying a clear finish or a stain then you will have to get the surface really smooth, these finishes accentuate any marks on the wood.

Latex paint is much easier to work with than oil based paints and the quality of it is very good now, when you are done you can wash your brush with soap and water.

Oil finishes are also easy to apply, just wipe them on, wait for the time on the directions, then wipe off the excess.

Varnishes are more difficult, it takes a bit more practice to get a good finish with them, runs and dust can be a problem.

# Make A Wooden Mallet



You will use this mallet to tap parts into place and to strike a chisel. It is made by gluing and clamping five rectangular pieces together.



## Material List

**1 ea. - 3/4" X 3/4" X 1 1/2" hardwood**

**2 ea. - 3/4" X 2 1/2" X 1 3/8" hardwood**

**2 ea. - 3/4" X 2 1/2" X 3 1/2" hardwood**

**1 ea. - 1/4" X 2 1/4" hardwood dowel**

## Assembly

Make sure all the wood is the same thickness, particularly the handle and the two 1 3/8" long parts.



Glue one of the 1 3/8" long pieces to the handle, use a clamp to hold them together, make sure they line up.



Glue second 1 3/8" piece to handle.

Carefully scrape any glue from the joint lines with a chisel or knife blade, the surfaces should all be lined up perfectly.

Glue one of the longer 3 1/2" long pieces on top of the two shorter pieces, secure with a clamp until glue is dry, then glue second piece on other side.

Drill a 1/4" hole through the side of the mallet head, squirt some glue in the hole and drive in the dowel.

Round the sharp corners of all the edges of the head, this will prevent the wood from chipping off when the mallet is used. Round the corners on the handle so that it is comfortable to grip.

If you wish you may coat the mallet with a clear finishing oil, do not use a varnish or paint as it will chip off.

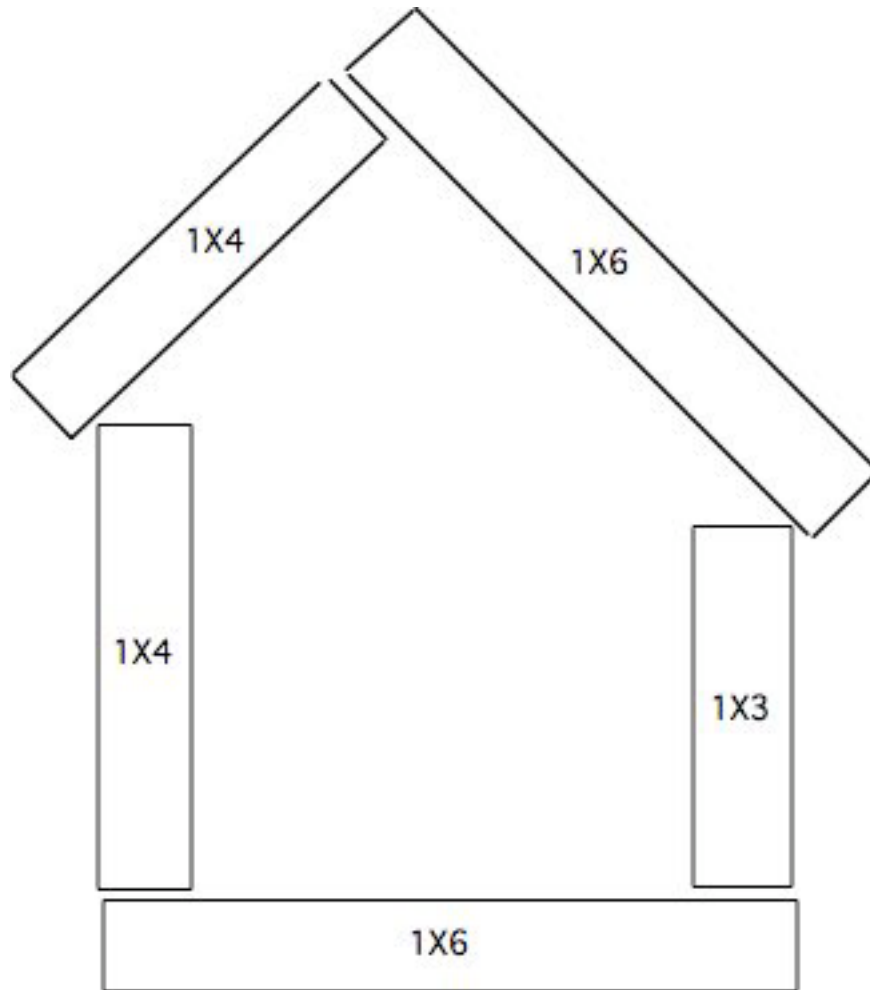
You will notice that when you purchase packages of ready made dowels they are fluted to allow the excess glue to escape from the hole and also to leave room for a film of glue to bond the wood fibers.

If you cut your own dowels from long lengths of stock you can flute them by using a pair of slip joint pliers and squeezing them in the jaws.

# Basic Bird House



This bird house is made from standard dimension lumber, that can be purchased at any building supply store.



Tools required: Hand saw, square, sandpaper, hammer, drill and 1" spade bit or fret saw if you don't have 1" spade bit.



When you go to the building supply store to purchase your wood you will find that a 1X4 is actually smaller than it says it is, it is only 3 1/2" X 3/4", this is standard in the lumber trade. The board was rough cut at the mill about one inch thick by four inches wide, then run through a planer to make it smooth. Because material was taken away the board is now thinner and narrower, but still called a 1X4. The 1X6 you will need is actually 5 1/2" X 3/4", the 1X3 is 2 1/2" X 3/4".

#### **Material list**

**1 X 6 - 2 Lineal feet**

**1 X 4 - 2 Lineal feet**

**1 X 3 - 1 lineal foot**

**1 1/2" galvanized finishing nails (about 30)**

Ask at the building supply store if they have any "shorts", these are ends that have been cut off from boards when customers wanted shorter lengths.

Print these instructions and follow them as you build the bird house.

Start by cutting the pieces for the ends from the 1X6, make sure the end of the board you are starting at is square, use a carpenters square for this. If you do not have a square use the corner of one of the sheets of paper you printed the plans on.

Mark the distances on the wood as shown on the pattern, make your cuts, then drill a 1" diameter hole in the front end section. If you don't have a drill bit that large you can saw the hole with a fret saw.

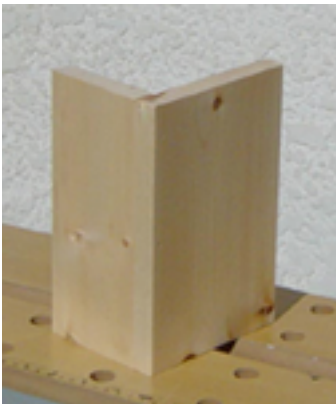
Cut the two side pieces from a 1X4 and a 1X3, make them 5" long. Then nail the end pieces to the side pieces.



Cut the piece for the base 8 1/2" long from a 1X6, nail it to the bottom of the end and sides. You may find this easier if you support the peak of the roof between two lengths of scrap material that are clamped or nailed to a base.



Cut the two roof pieces from a 1X6 and a 1X4, both 8 1/2" long, nail them together, then place on bird house and nail into ends.



The wood you select for this will be determined by the finish, cedar is the most resistant to the elements and can be finished with oil or stain.

If it is to be painted then pine or fir would be a better choice.

Depending on the color scheme it may be easier to paint the parts before it is assembled.

Sand the edges and any rough surfaces before assembly.

# Actual dimensions of parts

Base & Roof  
2 ea.  
5 1/2" X 8 1/2"  
  
From 1 X 6

Ends  
2 ea.  
5 1/2" X 5 5/8"  
  
From 1 X 6

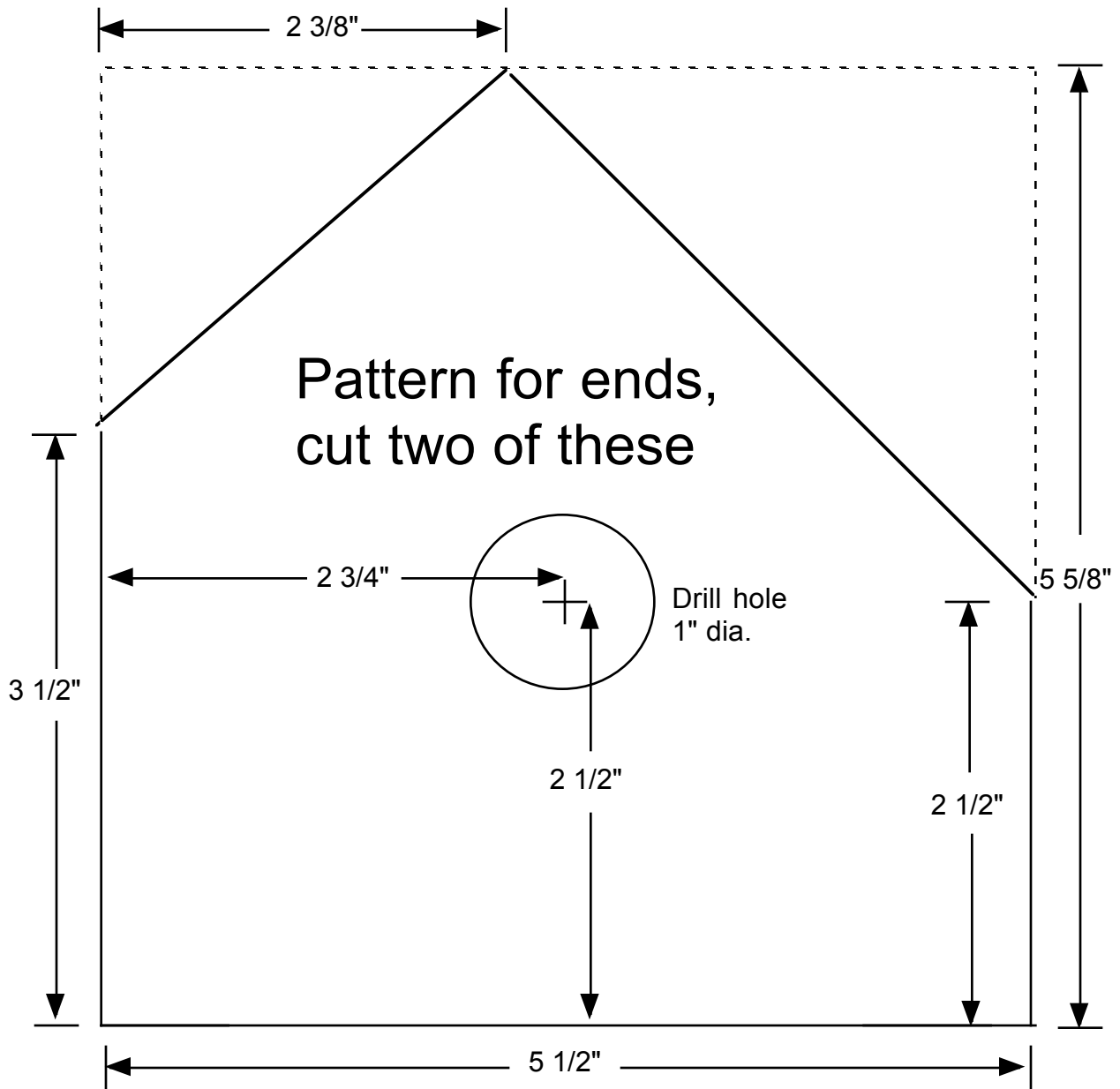
Roof  
1 ea.  
3 1/2" X 8 1/2"  
  
From 1 X 4

Side  
1 ea.  
3 1/2" X 5 "  
  
From 1 X 4

Not drawn to scale

Side  
1 ea.  
2 1/2" X 5 "  
  
From 1 X 3

# Pattern for ends



# Wooden Bulldozer



This bulldozer is made from standard dimension materials available at building supply stores. It also requires wheels and axle pins available at most craft stores.

Tools required: Hand saw, fret saw, square, hammer, drill, 1/4" and 7/32" drill bits, sandpaper, pliers, square.

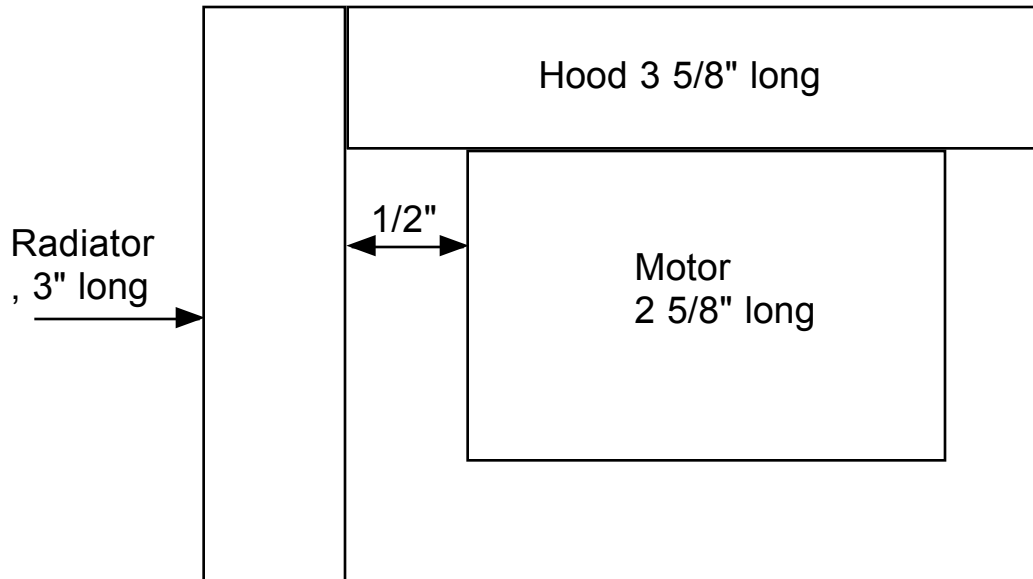
## Materials List

2 ea. - 3/4" X 3/4" X 8"  
2 ea. - 3/4" X 2 1/2" X 8"  
1 ea. - 3/4" X 2 1/2" X 7"  
1 ea. - 3/4" X 2 1/2" X 6 3/4"  
1 ea. - 3/4" X 2 1/2" X 3 5/8"  
1 ea. - 3/4" X 2 1/2" X 3"  
1 ea. - 3/4" X 2 1/2" X 2 1/2"  
1 ea. - 1 1/2" X 1 1/2" X 2 5/8"  
1 ea. - 1 1/2" X 1 1/2" X 2 1/2"  
4 ea. - 1/4" dia. x 1" long dowels  
1 ea. - 1/2" dia. X 1" long dowel  
4 ea. - 1 1/2" diameter wooden wheels  
8 ea. - axle pins  
1 1/4" finishing nails  
Wood glue

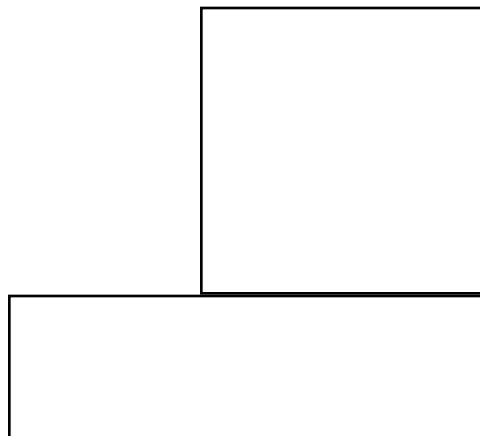
Cut all the pieces to size according to the materials list, sand all edges smooth.

Drill the two 7/32" holes in the base following locations on the pattern. To gauge the depth of holes wrap some masking tape around the drill bit 1/2" from the tip.

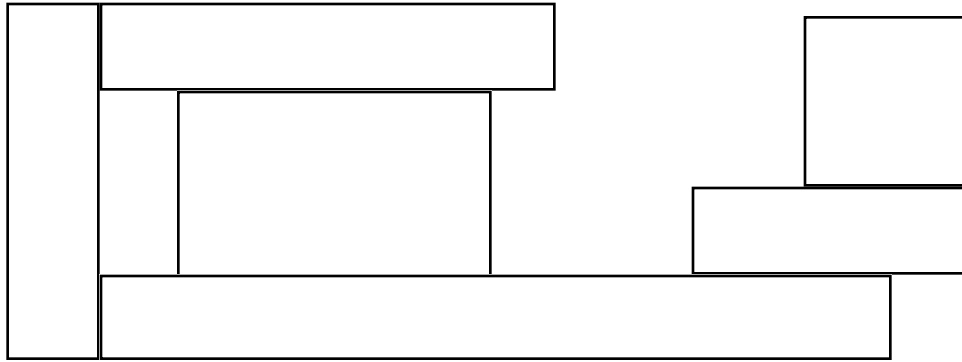
Glue and nail the radiator to the hood and the hood to the motor.



Glue and nail the seat parts together.

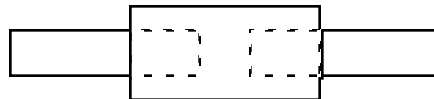


Fasten the motor assembly to the base, use glue and nails. Nail through the bottom of the radiator and up through the base into the motor. Fasten the seat to the base, note that it overhangs the edge by 3/4", nail up through the base into the seat.



Install the two axle pins that serve as steering levers, put a drop of glue in the hole, with a toothpick work it around the edge of the hole. Do not put too much glue in the hole just enough to coat the inside surface.

Drill a 1/4" dia. hole 3/8" deep in the top of the hood for the muffler, holding the 1/2" round dowel with a pair of pliers drill 1/4" dia. holes in each end about 3/8" deep. Assemble the muffler using two of the 1/4" X 1" dowels, then install on hood, use glue in all joints.



Mark the positions of the axle holes in the track assemblies, drill the 7/32" holes 1/2" deep on both tracks. Round the corners at each end, draw the curves with a compass set to 1 1/4" radius or trace around an object that is 2 1/2" in diameter such as most spray paint cans. Sand the curved edges smooth and install the wheels, you may have to cut the axle pins shorter, the stub should be just over an inch long.

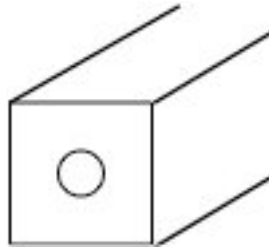
Fasten the track assemblies to each side of the base using nails and glue, the top of the tracks should be 1/4" above the surface of the base. The front edge of the track should be 1/8" back of the front of the radiator.

Drill a 7/32" hole in each of the track assemblies, 2" from the back of the track on the center line of the track.

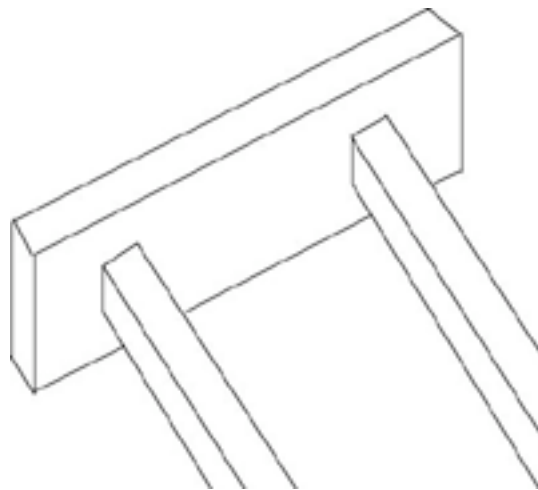
Drill a 1/4" hole 1/2" through the rear end of each of the push arms for the dozer blade.



Drill 1/4" holes 5/8" deep in the end of the front of the push arms.



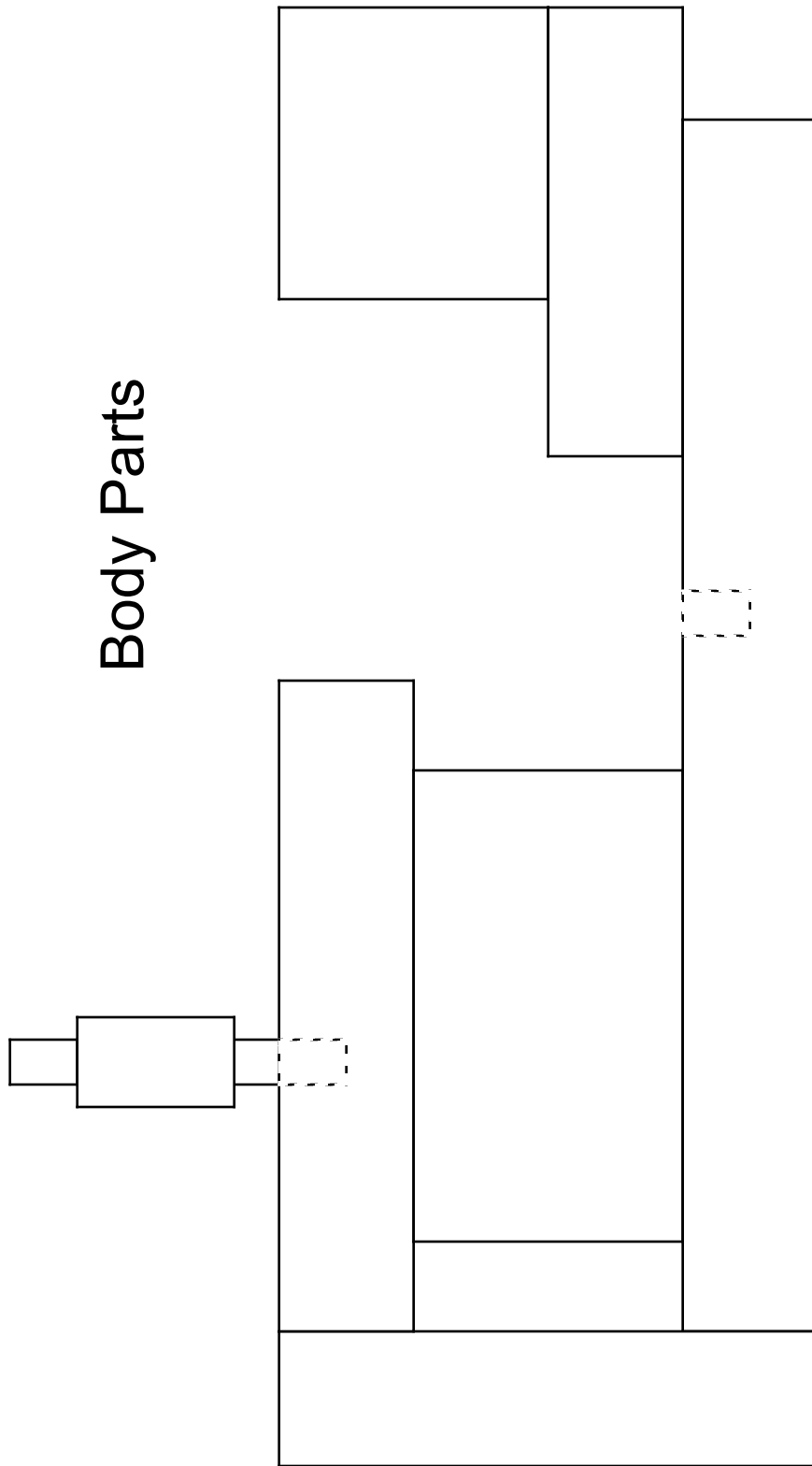
Drill the two holes in the blade at the locations on the pattern. Fasten the push arms to the blade with the 1/4" X 1" dowels using glue, make sure the holes at the other end are in a horizontal position. Fasten the blade assembly to the tracks with the two remaining axle pins.

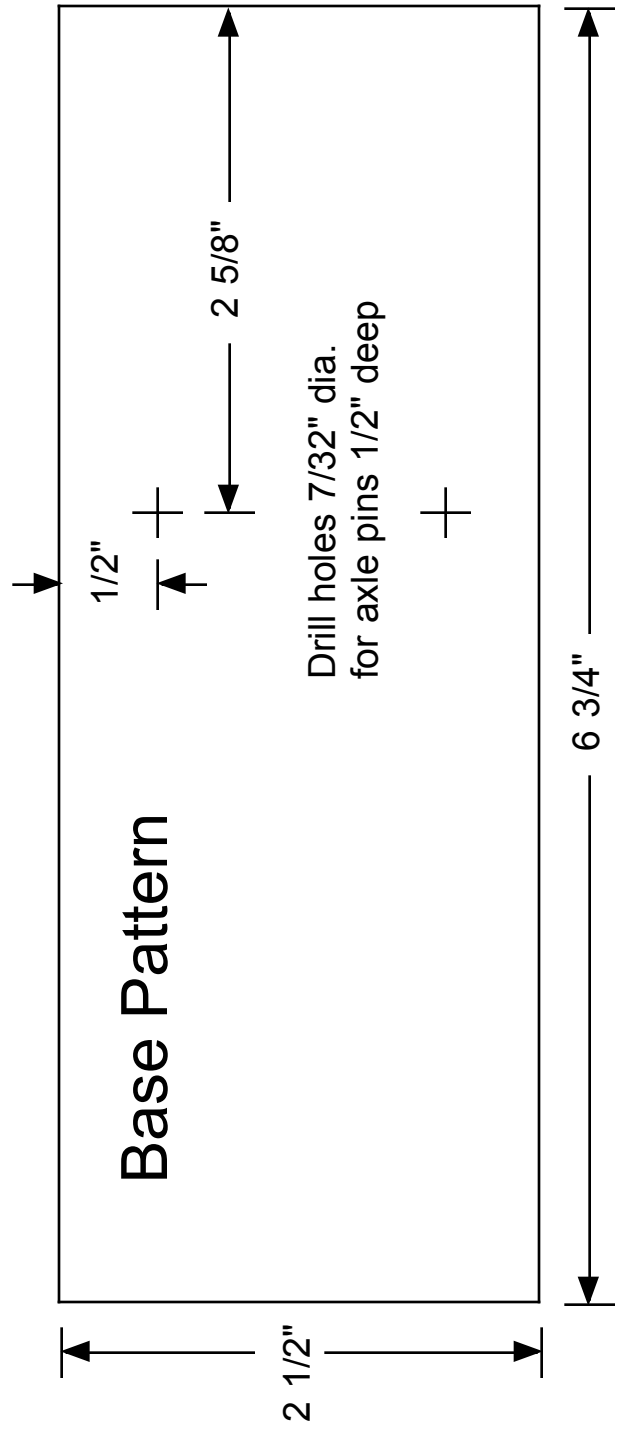
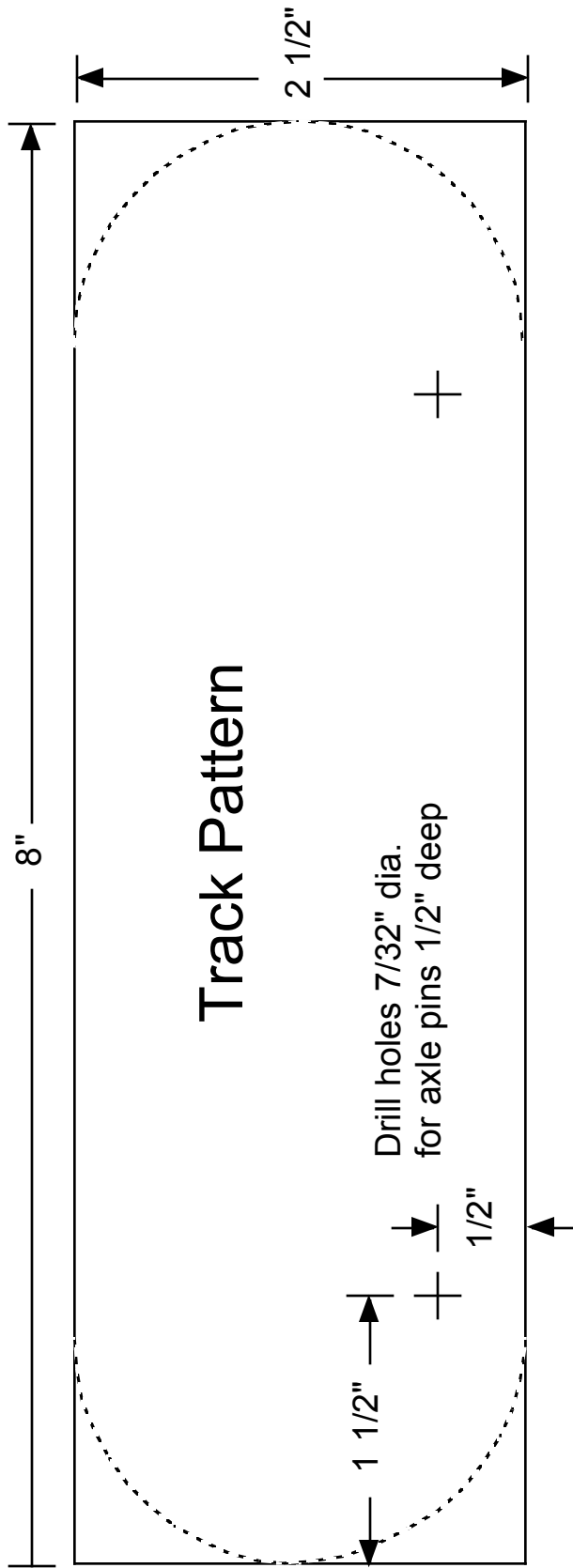


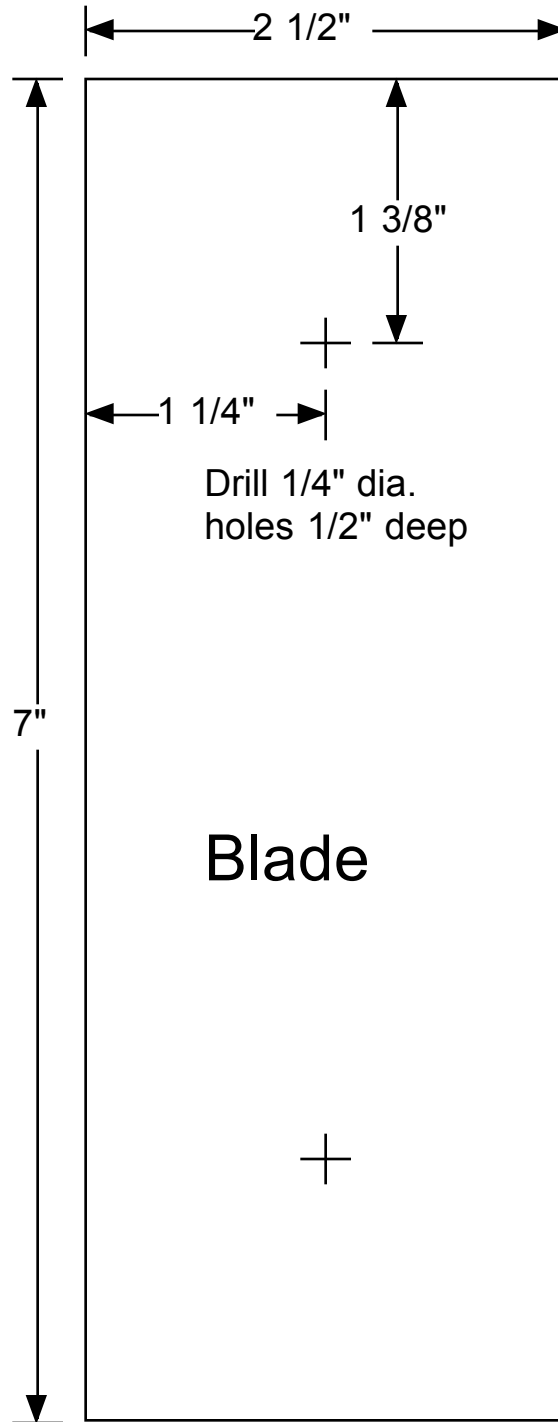
This bulldozer may be painted or coated with a clear finish. It will be easier to paint the parts before assembly.



# Body Parts







# Make A Pair Of Stilts



Stilts give one a whole new perspective, see the world as a person much taller would see it. Start at the lowest height and as you master them raise the footrests up a notch at a time.

## Materials List

**2 ea. - 1 1/2" X 1 1/2" X 7' fir or pine**

**1 ea. - 1 1/2" X 5 1/2" X 8" fir or pine**

**2 ea. - 1/4" X 2 1/2" lag bolt**

**2 ea. - 1/4" X 3 1/2" carriage bolts**

**2 ea. - 1/4" nuts**

**2 ea. - 1/4" flat washers**

Tools Required: Drill, 1/4" and 3/16" drill bits, adjustable wrench, hand saw, fret or keyhole saw, hacksaw, file, square.

## Assembly

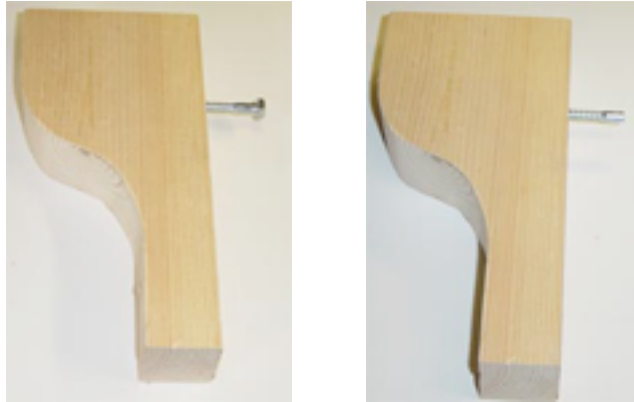
Print the pattern for the footrests, this is what is called an ogee, I think they called it this because "Oh Gee, I only have to make one cut to get two pieces" comes to mind every time I see one.

Trace the pattern on to the 8" long section of 1 1/2" X 5 1/2" wood, mark the positions of the holes to be drilled as well.

Make the cut to divide the two pieces with a fret saw or keyhole saw, then drill the 1/4" and 3/16" holes at the locations indicated on the pattern.

Smooth the edges of all the wood pieces with sandpaper, if you wish you may put a coat of spar varnish or clear outdoor finish on them.

Thread the lag bolt into the 3/16" hole and turn it in with a wrench until it bottoms out in the pre drilled hole.



Cut the heads off the lag bolts with a hacksaw, smooth the sharp edges of the cuts with a file or emery paper.



Measure 15" from the end of each of the 1 1/2" square uprights and drill a hole 1/4" in diameter at that location.



Set the footrest on the upright with the lag bolt shank in the hole, drill a hole using the hole in the footrest guide, then move it down and drill a second hole.

Secure the footrest to the upright with the carriage bolt.

You may find it easier to use the stilts if you stand on a platform about the height of the top of the footrests and step off it .

# Footrest Pattern

