



# WOODWORKING

## Project Guide

LEVEL 1

## **The 4-H Motto**

*“Learn To Do By Doing.”*

## **The 4-H Pledge**

I pledge

My **HEAD** to clearer thinking,  
My **HEART** to greater loyalty,  
My **HANDS** to larger service,  
My **HEALTH** to better living,  
For my club, my community and my country.

## **The 4-H Grace**

(Tune of Auld Lang Syne)

We thank thee, Lord, for blessings great  
On this, our own fair land. Teach  
us to serve thee joyfully, With  
head, heart, health and hand.

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## **Published by**

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# LEVEL ONE OBJECTIVES

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Members will be able to:

- Work safely with wood to produce personal projects made of wood.
- Identify and use woodworking tools and supplies in a safe manner.
- Challenge themselves with variety of projects and varying levels of complexity of tasks in woodworking.
- Work cooperatively with others in a workshop environment.
- Develop skill in decision making, leadership, problem-solving, finances and communication.





# ACHIEVEMENT DAY REQUIREMENTS

## Level One

- Completed Record Book.
- Make and display a cutting guide and a sanding block.
- At least two projects that you made this year.







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# ADDITIONAL RESOURCES

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## People

- local woodworkers
- teachers
- family members
- other 4-H members or leaders

## Places, Events and Organizations

- local woodworking clubs
- exhibitions and fairs that have a woodworking class
- colleges that offer woodworking, design, or similar courses
- displays
- museums sometimes have displays with wooden articles

## Books

- ***Workshop Tips and Techniques***. Editors of Cy DeCrosse Incorporated, in cooperation with Black and Decker. Minnetonka, Minnesota: Cy DeCrosse Incorporated, 1991.
- Starr, Richard. ***Woodworking with Your Kids***. Newton, Connecticut: The Taunton Press, 1990.
- McGuire, Kevin. ***Woodworking for Kids***. New York, New York: Sterling Publishing Co., 1993.
- Lento, Robert. ***Practical Woodworking Techniques***. New York, New York: Sterling Publishing Co., 1999.
- Peters, Rick. ***Controlling Dust in the Workshop***. New York, New York: Sterling Publishing Co., 2000.

## Magazines

- Woodworkers Journal
- Canadian Home Workshop
- Wood Magazine
- American Woodworker

## Web sites

[www.thewoodcrafter.net](http://www.thewoodcrafter.net)  
[www.leevalleytools.com](http://www.leevalleytools.com)  
[www.woodworkershop.com](http://www.woodworkershop.com)  
[www.intheworkshop.com](http://www.intheworkshop.com)  
[www.uniqueprojects.com](http://www.uniqueprojects.com)  
[www.am-wood.com](http://www.am-wood.com) (Amateur Woodworker)  
[www.northpolechristmas.com](http://www.northpolechristmas.com)  
[www.tdc.ca/ewebster.htm](http://www.tdc.ca/ewebster.htm)  
[www.feesa.ab.ca](http://www.feesa.ab.ca)  
[www.woodlinks.com](http://www.woodlinks.com)



# SAFETY IN THE **WOODWORKING PROJECT**

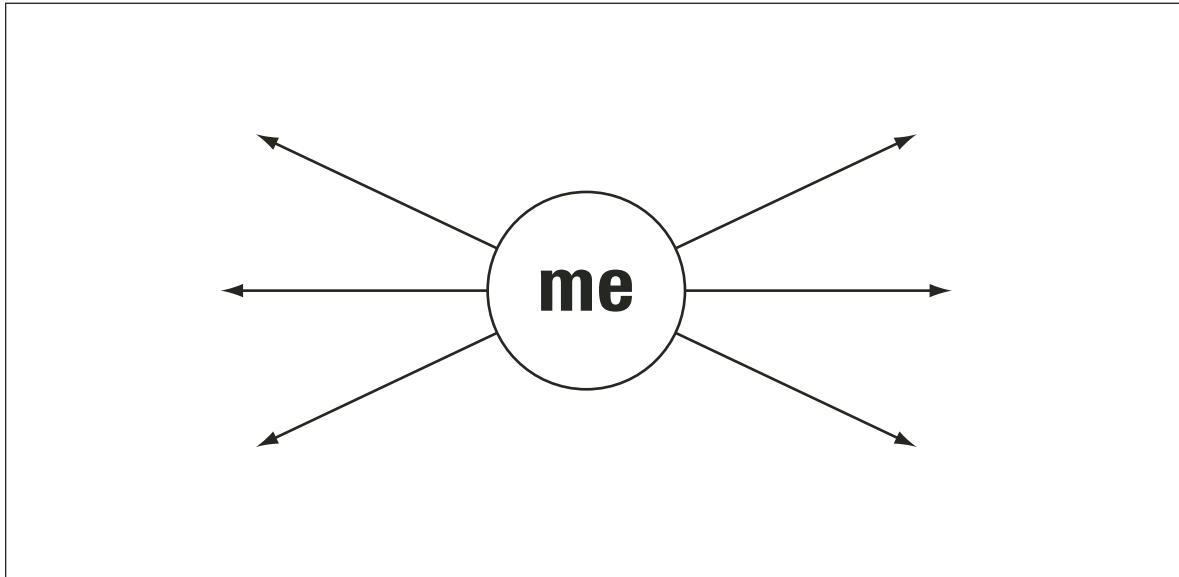
List as many preventative actions as you can for the following risks:

AT RISK	RISK	PREVENTATIVE ACTION
<b>EYES</b>	Flying chips Dust Splashing finishes Splinters from breaking tools Fumes Compressed air used improperly	
<b>EARS</b>	Exposure to loud noises	
<b>LUNGS</b>	Exposure to very tiny dust particles (less than 10 microns) Exposure to fumes from finishes Inadequate ventilation	
<b>SKIN, FINGERS, LIMBS, HANDS AND FEET</b>	Punctures, rips from tools and rough wood. Crushing Pinching Exposure to chemical finishes Abrasions Burns from hot tools	
<b>BACK</b>	Lifting too much Falls from tripping over materials Turning incorrectly Lifting incorrectly	

*You must purchase your own personal safety equipment for the 4-H woodworking project.  
Eye protection must be worn.*



## Who does an unsafe worker affect?



### Safety Steps

1. Name the risks.
2. Safeguard the work area.
3. Wear necessary protective equipment.
4. Use the right tools.
5. Follow correct procedure.
6. Monitor work habits.
7. Correct as necessary.

### Ensure all helpers follow safe procedures

- Where are the First Aid kits kept at your 4-H meetings?
  - Where are all the First Aid kits at home?
  - Who has First Aid training in your 4-H club?
  - Who has First Aid training in your family?
  - What phone number do you call for emergency help?
  - What are the directions to drive to your meeting place? (In case you ever had to give them to emergency people)
  - What are the directions to get to your home? (In case you ever had to call emergency people)
- Post these by all the phones in your home or shop.

### Contents for a Basic First Aid Kit

A variety of bandages; antiseptic; tweezers; First Aid booklet; cotton swabs; sterile gauze; First Aid tape; needles (to get out slivers); eye drops.

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# SAFETY CONTRACT

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## I Will:

- identify risks of activities
- take actions to eliminate or reduce risk
- ask for help when needed
- select the correct tools, equipment and materials for activity
- watch for and allow for closeness to other people
- stop work and move back when ask to
- exit work area on command (in case of emergency)
- return tools and supplies to storage after use
- follow safe disposal procedure
- dress appropriately for club activities
- share responsibility for safety in the club

**Member**

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**Parent**

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**Leader**

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**Date**

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# SAFETY WORD SEARCH

L	D	I	O	A	H	A	M	M	E	R	A	O	S	U	B	T	M
I	A	L	A	A	E	V	T	L	T	O	E	T	R	A	T	O	R
B	P	H	I	B	B	V	E	T	I	I	B	E	A	S	T	I	P
O	T	E	L	R	A	A	G	N	E	U	D	R	M	E	T	O	A
S	O	L	S	A	N	R	W	S	T	N	E	A	U	N	T	R	C
D	N	H	C	S	D	N	R	C	A	I	T	F	S	I	T	A	T
R	X	O	R	I	A	I	A	S	W	P	L	I	E	E	S	V	Y
T	E	R	A	O	I	S	P	N	T	U	D	A	O	G	F	E	E
I	E	S	T	N	D	H	I	U	E	N	L	P	T	N	O	N	L
E	L	E	C	T	R	I	C	A	L	C	F	R	A	I	O	E	A
M	T	P	H	N	C	O	N	D	I	T	I	O	N	H	O	E	I
S	T	L	P	I	A	U	A	E	H	U	E	T	P	J	A	N	S
T	F	A	O	E	C	R	F	E	U	R	L	E	I	R	E	P	D
N	A	Y	W	A	E	W	I	T	D	E	L	C	E	L	M	T	R
E	R	A	E	E	G	N	N	I	G	E	E	T	F	W	E	E	U
A	I	O	R	H	I	F	G	E	T	K	E	I	R	E	R	N	E
H	I	H	K	E	A	S	E	E	E	W	V	V	H	E	A	H	A
H	H	N	K	A	S	U	R	P	R	I	S	E	E	T	I	O	E

ABRASION  
ATTENTION  
BANDAID  
BRUISE  
CONDITION

ELECTRICAL  
FINGER  
HAMMER  
HORSEPLAY  
POWER

PROTECTIVE  
PUNCTURE  
SANDER  
SCRATCH  
SURPRISE

TELEPHONE  
TOE  
VARNISH  
VENTILATION  
WRAP

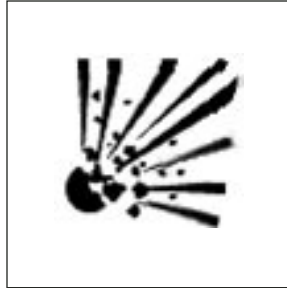


## Safety Logos

*Flammable*



*Explosive*



*Crushing Hazard*



*Electrical Hazard*



*Poison*



*Ventilation Required*



## Hazard Hunt (Things to look for)

1. General tidiness of work area. Is everything in its place or is there a jumble of things to trip over?
2. Is wood stored so that it will not fall on someone?
3. Are tools in good condition?
4. Safety equipment available and appropriate to tasks? (Eye protection, hearing protection, dust protection etc.)
5. Fire equipment available and ready to be used?
6. Is ventilation appropriate?
7. Are there trash cans for wood scraps and other waste?
8. Is lighting adequate?
9. Is work surface smooth and free of snags?
10. Are chemicals stored safely?

### My suggestions for improvements: List three

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# WOOD

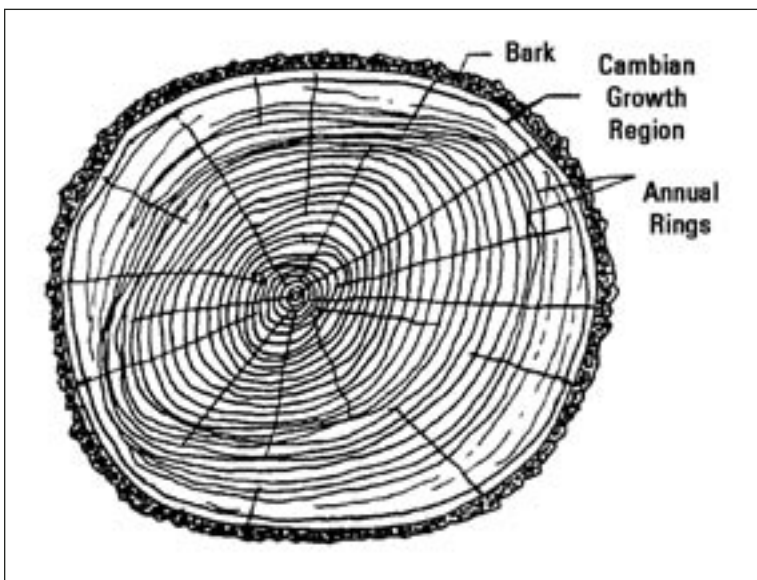
Wood is a versatile and challenging material that is readily available to us. It is relatively easy to shape and it can be grown and harvested like other crops. The forestry industry has played an important role in Canada's history and economy.

If properly cared for, wood will last for thousands of years! The more you know about it, the better you will be at using it.

Wood is made of cells, which can swell when they absorb moisture, and then shrink when they dry. The cells swell and shrink across their diameter much more than along their length. This explains why wood will expand and contract more across the grain than it will from end to end.

Wood also tends to split parallel to its fibres. When people are splitting firewood, they always split it parallel to the log's length (or else they are out there a really long time!).

Trees grow a new layer of wood under the bark each year. We call these layers annual rings.

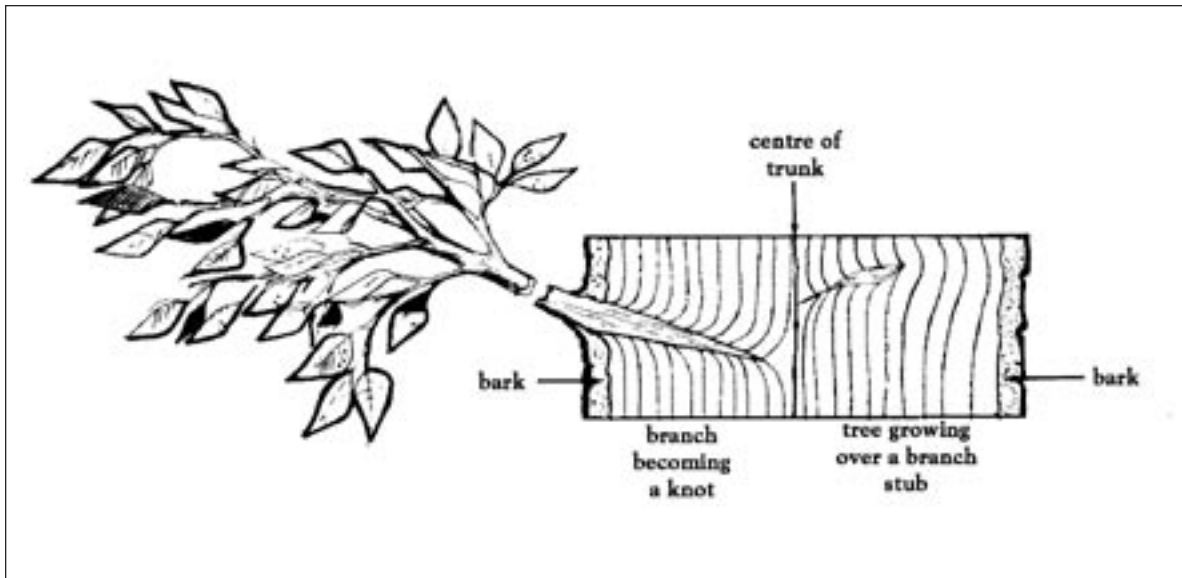


You can count these rings on a log or stump and figure out the actual age of the tree. Foresters are able to calculate the approximate age of trees without felling them with a tool called an increment borer.

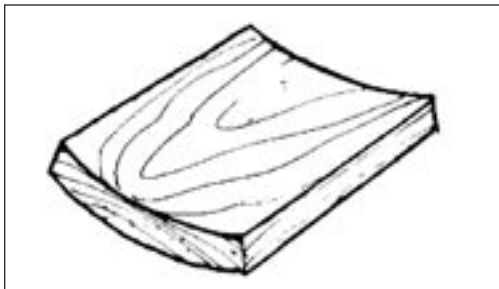
When a tree is cut into planks, the pattern of these annual rings produce what we call grain in the wood. Each type of wood has its own special grain. Woodworkers can identify most woods by their grain. You will learn this skill too.

Different types of trees have different colours of wood. Experienced woodworkers can identify many woods by their colours. Woodworkers enhance these natural colours by applying various finishes.

Wood has natural defects. The knot is the most common one that woodworkers have to deal with. Knots form where tree branches grow. Knots can be quite hard. If you hit them with a nail, the nail will often bend or bounce off. Knots also absorb finishes differently than the rest of the wood. If possible, avoid wood with knots for your projects.



Warping is the bending of wood as it gains or loses moisture. Wood can warp in many directions. When selecting wood for your project, check for warping wood and avoid it.



Wood comes in various grades. The higher the grade, the more expensive the wood.

Hardwoods come from trees with broad leaves and which produce seeds from true flowers. Hardwoods include oak, elm, maple, cherry and teak. Softwoods come from trees with needles that produce their seeds in cones. Softwoods include pine and fir. Softwoods are less expensive than hardwoods. Most beginning woodworkers start with softwoods.

# MEASUREMENT & MEASUREMENT TOOLS

## Measurement

### Measure Twice. Cut Once

Measurement is one of the most important tasks done in woodworking. In rough carpentry, tolerances of 1/8 inch ( mm.) would be allowed. In cabinetwork, the minimum tolerance should not be more than 1/16 inch (Lento, Robert. Practical Woodworking Techniques.).

Officially Canada switched to the metric system in the 1970's, but the lumber industry did not. Changing over to the metric system would be very expensive and awkward and so lumber terms and measurements are often given in Imperial.

The common board used for construction in North America is the 2 by 4". However, it actually measures 1 1/2 by 3 1/2 inches, or 88.9 mm by 38 mm! When you are measuring for your woodworking, choose one measurement system and stick with it!



*It is important to choose one system and stick with it for a project for these reasons:*

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*Why is it important to be accurate and consistent in measuring for woodworking projects?*

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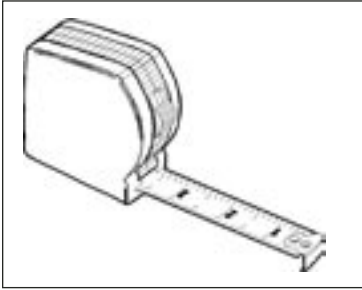
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## Measurement Tools

### Measuring Tapes

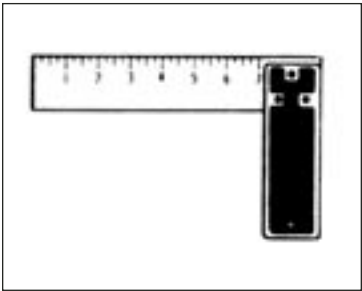
Measuring Tapes. These come in various sizes, colours and lengths. They are very handy and can even measure a curved surface. The tip of the measuring tape must be securely fastened, or it will give an inaccurate measurement.



For woodworking purposes, we recommend a measuring tape with both metric and Imperial measurement, as you will see many drawings and plans in Imperial measure. (Especially free project plans from web sites!)

### Try Square

This tool looks like a ruler with a handle attached at a right angle (90 degrees).

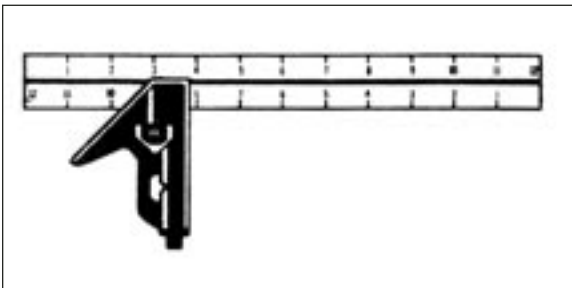


It is used to test if two surfaces are at 90 degrees. This is really important because most woodworking projects assume that parts are square to each other.

- Use a try square to see if the end of a board is square (cut at right angles to the boards edge).
- Use a try square to mark a new end of a board if the first one is not square.
- Use a try square to mark a square line for a project piece.

### Combination Square

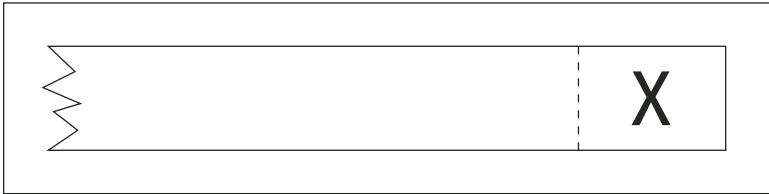
This has several uses: to check if a board is flat; to check for levelness; to check angles; to measure depth; to lay out a line parallel to the edge of a board.



## Care of Measurement Tools

### Tips about Measuring.

- Never measure when you are tired, angry or really hungry! Those are times when people make lots of mistakes! Take a break, then come back to it.
- Make a cardboard model of your project first.
- Use a long tape or ruler when measuring. (Rather than adding up several measurements from a small tape or ruler.)
- Mark the waste side of a cut with an X.



- Cut on the waste side of a cutting line. The saw cut (kerf) uses up part of the wood and could make your good piece of wood too small for the project.
- Do not mark all your measurements on a board at once. Each cut will take off the width of the saw cut (kerf) and it is too tricky to try to figure that in, when measuring ahead of time.
- Double check your measurement before cutting.

## Practice in Measurement

### Supplies

Several small rectangular pieces of wood, table or similar piece of furniture, tape measures, small rulers, pencils, paper.

### Procedure

- Choose a piece of wood. Measure it accurately, using both the measuring tape and the ruler.
- Make a quick drawing of the piece of wood and note its measurements on a piece of paper.
- Have your group leader check your results.
- Which tool did you prefer for measuring this piece of wood, the tape or the ruler?
- Choose a table, bookcase, or other structure with rectangular or square shape. Measure one surface, draw it and note its measurements on the drawing. Use both your measuring tape and a ruler.
- Have your group leader check your measurements.

*Which tool did you prefer for measuring this time? Why?*

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*What did you do to ensure your measurements were accurate?*

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## Practice Using a Try Square to Mark a Line on Wood

### Supplies

A piece of wood 30cm long and 20 cm wide (approx.); tape measure; straight edge; sharp pencil; try-square

### Procedure

- Hook the end of the tape measure on one end of the wood and extend it to the other end of the board. Lock the tape measure.
- Hold the tape straight with one hand. Mark the wood at 15 cm and at 20 cm , exactly.
- Use the straight edge to draw a line as straight as you can at the 15 cm mark.
- Place the calibrated side of the try square at the 20 cm mark, with the other side of the try square snug against the edge of the board. Draw a line across the board at the 20 cm mark (parallel to the first line drawn at the 15 cm mark).
- Which line looks straighter? (Which line looks like it is at 90 degrees to the edge of the board?) It should be the one drawn with the try square.

### Practice at Home

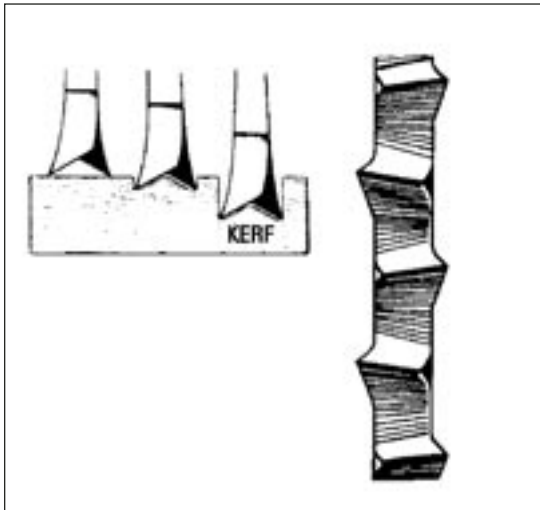
- Practice measuring and drawing various objects around home, using both your tape measure and a ruler. Show your drawings to someone to see if they can understand and follow them easily.
- Practice drawing lines across scrap wood using a try square. Remember to keep the try square snug up against the edge of the board.



# TOOLS

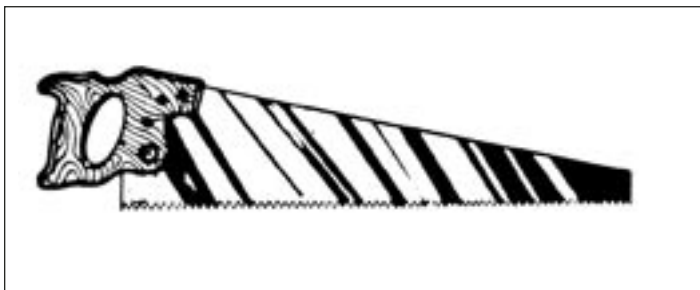
## Hand Saws

Hand saws have a metal blade with teeth and a handle made of wood or plastic. The teeth cut a path (kerf) through the wood. Saws have set teeth. This means that the teeth are bent alternately from side to side, so that the kerf is wider than the actual saw. This helps prevent the saw getting stuck when cutting wood.



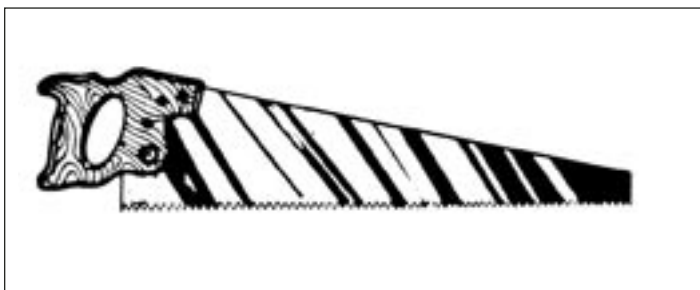
## Common Saw

Has about eight teeth per inch (2.54 cm.). Use this saw to cut across the grain of a board.



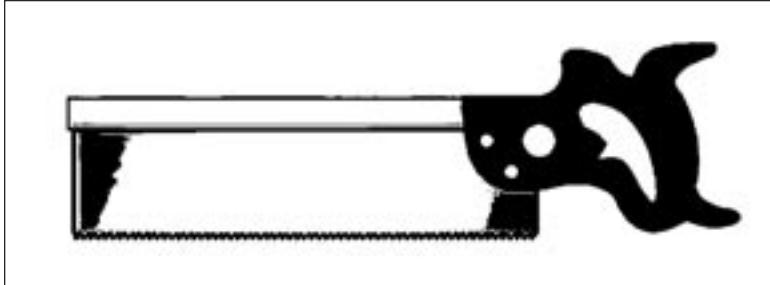
## Rip Saw

Has half as many teeth than the common saw. Use the rip saw to cut along the length of a board.



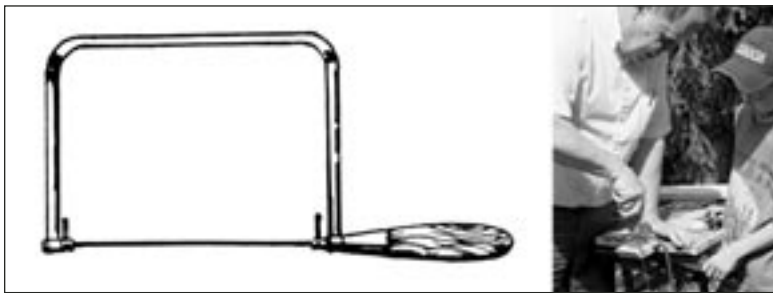
## Backsaw (Mitre Saw)

A rectangular blade, with a stiffening metal strip on the top edge. Used with a mitre box to cut exact angle cuts.



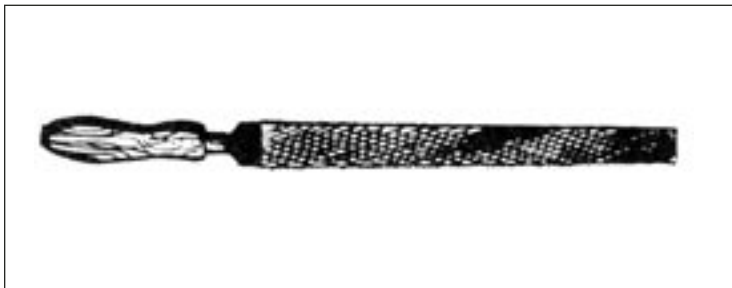
## Frame Saw

Used for making curved cuts. A frame holds the fine blade firmly. The coping saw is the most common type of frame saw.



## Rasp

Woodworkers use rasps to shape wood and smooth rough surfaces. Rasps look like a coarse file with a handle on one end. Rasps quickly remove excess wood with their coarse teeth. A rasp only removes wood as it moves forward. Pick it up and lift it back to the start, to take another stroke. Rasping is done before sanding.





## Nails

Nails come in different sizes and materials. Nails work by pushing wood fibres aside. The wood fibres then push back against the nail and help keep it snug. A nail driven into the edge or face of a board will hold better than a nail driven into the end of a board. The larger and rougher the surface of a nail, the better it holds the wood.

### Common Nails

These have quite a big head and are quite thick.

### Finishing Nails

These have a smaller head than a common nail and are thinner. Finishing nails are usually set into the wood, then the hole is covered up with putty, so that it does not show.

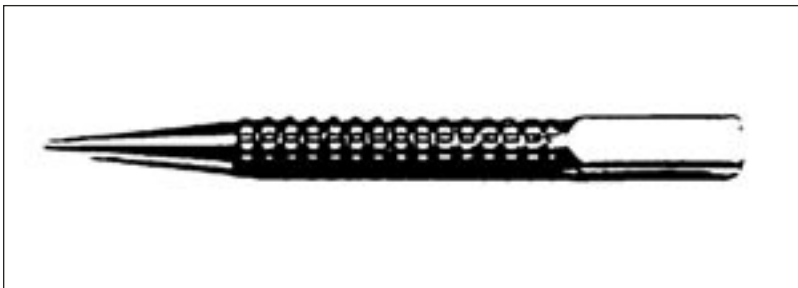
### Sizing of Nails

The sizes of nails are referred to as penny size. The short form for penny is d. A 1 ½ inch nail is written as a 1 ½ d nail.

Nails that are shorter than two inches in length (5 cm) are sized in fraction of an inch and the wire-gauge size. Wire gauge sizes include # 17, 18, 19 and 20. These numbers are written on the bins or boxes in which you find nails at the hardware store. Most plans tell you what size and number of nails to use. If confused, explain what you are building and the store employee should be able to recommend the size of nail.

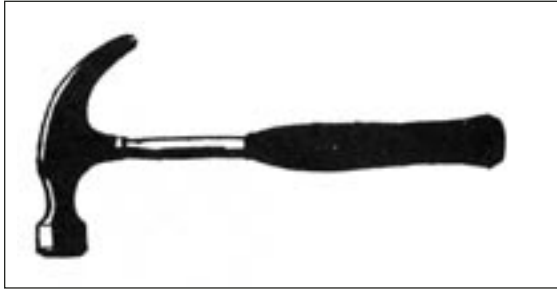
## Nail Set

A nail set is used to push the head of a finishing nail or brads into the wood a bit further, so that the hole can be covered up with putty. A nail set looks like a fat spike with a flat ends. Nail sets come in different sizes, to fit the different sizes of finishing nails.



## Hammer

Use your claw hammer to drive and remove nails. Don't let anyone use it for anything else! Hammers come in a range of sizes and shapes. Choose the weight that feels right for you. Hammers come with wooden, metal or fiberglass handles. The best hammer heads are forged steel. Mark your name and phone number on your hammer somewhere.



### Safety Tips for Hammering

- Make sure the hammer head is secure.
- Wear eye protection.
- Secure long hair so it does not get caught in the passing hammer.
- Make sure the hammer head is clean.
- Use your woodworking hammer only for woodworking.
- Hold your hammer at the low end of the handle when using it.
- Watch out for other people when using your hammer.
- Keep the head at right angles to the surface you are driving the nail into. This will keep the nail from bending.
- If you have to pull out a long nail, put a block of wood under the hammer head. This gives you better leverage and will also prevent breaking off the handle.
- When you set your hammer down, make sure the entire hammer is out of the way, so people will not accidentally knock it off the surface.
- Start your nail with a couple of taps, then move your fingers away from the nail.

*Tip: To hold a nail in a tiny spot, thread a doubled string through a drinking straw. Poke the nail through the loop, then tighten the string to hold the nail.*

*Tip: Nails go into dry wood more easily if they have been dipped in a bit of wax. You can drill a small hole in the end of your hammer and fill it with melted paraffin, so the wax is always handy for you!*

## Driving Nails (how to hammer)

- Choose the right hammer for the job. Use a smaller hammer for small nails and a heavy hammer for larger nails.
- Hold the nail in the right spot with one hand.
- Swing the hammer from your wrist. Tap the nail lightly so that it will stick in the wood by itself. Once it sticks into the wood by itself, take that holding hand away. This is important. (As the makers of bandaids will tell you.) Use that hand to steady the board as you hammer.
- Hold your hammer at the lower end of the handle (away from the metal head). This will give you a better swing and make better use of your energy.
- Use your whole arm for the most power. This will come with experience.
- Keep the handle of the hammer at a 90 degree angle to the nail while driving. This will help the nail go into the wood in a straight line and not bend.
- Keep your eyes on the nail. Hit the nail squarely on the head. Your skill at this will increase with practice.
- Try to avoid hitting the wood itself, so you do not dent the wood.
- Once the nail is completely into the wood, stop!



## To Start a Nail

Sometimes wood is so hard, that it is difficult to start a nail into it. This can be frustrating. Here's a way around the problem.

- Clamp the two pieces of wood together securely.
- Mark the spot for the nails with a scratch awl or a pencil.
- Drill a pilot hole with a drill bit slightly smaller than the nails you are using.
- Tadah! Nail away!

## Using a Nail Set

- Choose a nail set that matches the size of the head of the nail you want to work on.
- Hold the nail set on the head of the nail.
- Gently but firmly tap the nail until it is just under the surface of the wood.
- Now you will be able to fill the hole with putty, so that the nail will not show. After the putty dries completely, you will sand it smooth.

## Bent Nails

Bent nails are very common. Try to straighten them to prevent waste. Hold a block of wood against the nail and then tap the nail repeatedly against the block. Don't try to straighten it all in one swing, unless it only has a very small bend. Sometimes you can straighten a short nail without the block.

## Pulling Nails Out

You will remove nails from projects or from old structures many times in your life. Here's how to do it.

- If you have enough room, place a flat block of wood between the hammer head and the good piece of wood. This protects the wood and will also give you better leverage.
- Make sure the head of the nail is snug in the V of the claw of the hammer. Otherwise, you can pull off or mangle the head of the nail.
- Pull smoothly; do not jerk the nail. Put the discard nails in the bin.



## Removing Dents

Occasionally you will dent wood. Some small dents will come out with steam. Use a moist cloth and an iron over the dent for a few seconds.

# USING A PATTERN

You can find patterns in woodworking books, magazines or web sites. For simple projects, you can outline a picture.



## Supplies

Small piece of wood (30cm by 30cm); pattern or drawing that will fit on the wood; carbon paper; dulled pencil; masking tape.

## Procedure

- Tape one side of the pattern to the wood, so that it will lift like a flap. Line the pattern up so it is right where you want it.
- Put the carbon paper under the pattern, with the carbon side against the wood.
- Using the dulled pencil trace along the lines of the pattern, pressing firmly. (A sharp pencil would cut the pattern.)
- Lift the carbon paper up to make sure the pattern is marking properly.
- Lay the paper and pattern back down, tape in a few more places, and continue tracing.
- When you are done, you can cut this out, paint or carve or wood burn it!

*This is a great technique to use for making various crafts you admire!*



# SANDING & FINISHING

## Sanding

We sand wood to smooth the rough edges and scratches left by cutting it. Sanding also makes a project look and feel to be better quality.

Sandpaper is gritty material glued onto paper. It comes in a range of coarseness. Use coarse sandpaper when starting to sand a project. Use finer sandpaper when you are getting to the final stages of sanding.

Sandpaper coarseness is expressed as grit. The lower the number of grit, the coarser the paper. The higher the number, the finer the grit. For example, 80 grit sandpaper is much coarser than 120 grit sandpaper. The grit number is printed on the back of the sandpaper. Many project plans will suggest what grit of sandpaper to use.

Sandpaper comes in standard sheet sizes of 22cm by 28cm. We divide these sheets into four pieces to use in a sanding block. Don't ever use your scissors to cut sandpaper it will dull the blades and the scissors owner will never let you forget it! Who needs that?

Fold the sandpaper in half, with the grit side out. Crease it on the fold. Slice it on the paper side with a knife. Fold the two halves. Cut them again. You will have four pieces of sandpaper to use in your hand-sanding block.

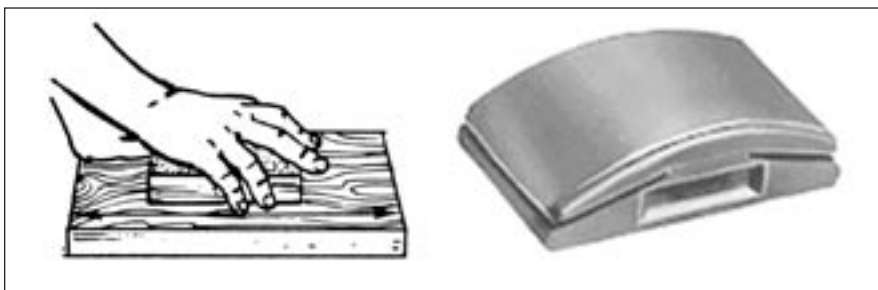
Before you use your sandpaper, roll the paper, grit side out, to break up the glue on the paper a bit.

Tap sandpaper on the back to clear dust.

Wipe your work off with a lint-free cloth.

## Hand Sanding Block

Use a hand-sanding block to make the best use of your sandpaper. A sanding block helps you put even pressure on the wood you are sanding. This prevents you making grooves in your project with the sandpaper.



You can either make or buy a hand-sanding block. A hand-sanding block is a piece of wood about 2 cm by 11 cm by 12 with a bit of carpet or rubber glued to the bottom. The sandpaper is held against the carpet or rubber so there is a bit of give when sanding.

Wrap the sandpaper around the bottom of the block of wood (paper side against the carpet or rubber) and hold it on with your fingers. Start sanding with your coarser grit sandpaper and finish with your finer sandpaper.

Always sand with the grain. If you don't, you will scratch the wood. And that does not look good. On the edges of the wood, sand along the edge.

## Sanding Tiny Pieces of Wood

Glue some sandpaper onto a piece of plywood. Hold your small piece of wood and rub it against the sandpaper, rather than rubbing the sandpaper against the object.

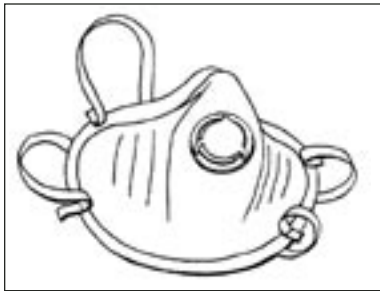
## Dust Management

Sanding produces very fine dust particles. It is the smallest dust particles ( the ones that are too small to even see) that can cause the most damage to the lungs of woodworkers. Dust particles less than 10 microns are the most dangerous because they can get into the alveoli of the lungs. To give you an idea of size, a human hair is approximately 100 microns in diameter.

## Dust Protection

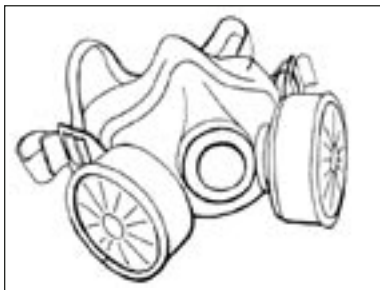
### *Nuisance Filters*

Nuisance filters (disposable paper filter masks) do not filter out particles smaller than 10 microns, the dangerous size. It is almost impossible to get a good seal with these masks.



### *Reusable Respirators*

Reusable respirators provide a good seal against the face and the filters can be replaced when dirty. They filter out the smaller particles. A good fit is crucial for a respirator to work properly.





## Finishing

When finishing a project, it is very important to work in a dust free area. Otherwise, your project will have dust and hair etc. stuck all over it!

We finish a wood project to protect it and to improve its appearance. Finishes either penetrate the wood or sit on the surface.

- Choose a finish according to the appearance of the wood and how the project will be used.
- Use rubber or latex gloves to protect your skin.
- Provide adequate ventilation.
- Rags or steel wool damp with oil can combust so put in a bucket of water or a metal container with a tight lid (outside).
- Dispose of any leftover products according to local laws and with respect of the environment.

### Penetrating Finishes

Stains and preservatives soak into the wood fibres so that you can still see the grain and also feel the wood. To remove stain or preservative, you have to actually remove the wood fibres they have penetrated.

Penetrating oils include linseed, tung, teak, Danish and polyurethane oils. Oil alone will darken wood. Penetrating oils are easy to maintain but are not as tough a finish as others.

### Surface Finishes

Paint, varnish, shellac and lacquer are surface finishes. Varnish, shellac, lacquer are clear and allow you to see the grain of the wood. Paint has colour and hides the wood.

### Using Penetrating Finish (for inside use only)

#### *Supplies*

Safety glasses, lint free cloths, good quality small paint brush, finish, 340 grit silicon-carbide paper or 0000 grade steel wool, rubber or latex gloves.

#### *Procedure*

- Brush a coat on the surface. Make sure the grain is evenly wet.
- Rub in the oil. First use a circular motion, and then change it to follow the grain.
- Let it dry. (Check the container for proper length of time.)
- Lightly sand with the paper or steel wool.
- Apply more coats (1 to 3 more is average), lightly sanding in between, until you are satisfied with the finish.
- After the final coat, use a small piece of steel wool to give the surface a fine sheen.
- Rub briskly with a soft, clean cloth.

### How To Stain

- Read the instructions for applying oil. Stains apply in a very similar fashion.
- Use a cloth for small items, and a brush for larger projects.
- Read the container for drying times.
- Does your stain require a protective coat? Read the container for suggestions about compatible protective coats.

## How to Varnish

- Prepare the wood finish. It must be clean and smooth. If necessary, fill any holes and cracks. To clean, wipe with mineral spirits.
- Brush varnish against the grain. Then, brush diagonally. Then, brush with the grain.
- When completely dry, use fine silicone-carbide paper to smooth the finish.
- Repeat with another layer or two of varnish, until you are satisfied with the result.

## How to Paint

### *Supplies*

Newspaper, paint, clean paintbrush, old clothes to wear, something to paint, cleaning solvent.

### *Procedure*

- Protect your work surface with newspaper.
- Mix your can of paint. (If you just bought it, they will offer to shake it for you. Shaking can cause bubbles in your topcoat.) Make sure it is well mixed, right to the bottom of the can.
- Make sure the object you are painting is clean and free of dirt and grease, or the paint will not stick well. If necessary, clean the surface with mineral spirits.
- Dip only the tip of the brush into the paint (no more than 1/3 of the brush.)
- Start painting in the corners and work out from there. Paint the flat, easy bits last.
- Brush the paint with the grain in easy strokes. Keep going until the paint starts to get too thin.
- Redip your brush and continue.
- Do not put too much on at once. Sometimes you have to let the first coat dry and apply a second coat.
- If painting two colours next to each other, let the first colour dry completely before starting the second coat. Be patient!

## Clean up after Painting

- Clean up immediately after finishing your painting. The longer you leave it, the harder the job will be.
- Rub the brush against the side of the can to squeeze out excess paint.
- There will probably be paint in the groove on the top of the can. Scoop this out and scrape it back into the can. The lid will fit on better this way and your paint will not dry out.
- Check on the can about cleaning procedures. Follow those instructions.
- Most paints you will use for these projects require a solvent for clean up. Paint thinner works as a solvent. Pour a bit of solvent into a clean can and swish the brush in it. You may have to change the solvent a few times until the brush appears to be clean.
- Tap the brush to get rid of the excess solvent. Brush it on dry newspaper until it appears dry.
- Dispose of the solvent soaked papers in metal container with lid, outside any building. Solvent soaked rags can burst into flames by spontaneous combustion.

## Cleaning your Hands

Put a bit of paint thinner on a cloth or paper towel and rub on paint spots until they are gone. Do not pour paint thinner on your skin. Apply liquid soap (without water) and rub and scrub. When the paint thinner appears to be gone, then use warm water on your hands. Put on some skin cream to protect your skin from chapping.

Dispose of the papers or cloths in a metal container with a lid outside the building.

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# GLUING

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The strongest joints use both nails and glue. The two most common glues used in woodworking are white glue and yellow glue (also called carpenter's glue).

White glue is an all-purpose glue that works for most woodworking projects. If you require an extra strong joint, choose yellow glue. Yellow glue is more expensive but provides a better bond.

Wood that has glue on it will not accept stain and finish the same way that clean wood will. Handle glue carefully.

## To Use Glue

- Wood must be clean, dry and smooth or it will not glue successfully.
- Apply a wiggly line of glue to both pieces to be glued. Smear the glue around until all the surfaces are covered. If you use too much glue, it will squeeze out, make a mess and go to waste.
- Put the two glued pieces together and squeeze them. A small amount of glue should squeeze out on the edges. Line them up the way you want them. Clamp them, using wood scraps to prevent dents in the project. Clean up any excess glue.
- Lightly tighten the clamps at first. Check for positioning.
- Tighten the clamps further.
- Leave the clamps on for at least an hour.
- When you take the clamps off, leave the project overnight before you do any other work on it.
- Clean up.

## How long for glue drying?

Check the label on your glue container. Most glue dries within 24 hours.



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# MULTIPLE CHOICE TEST

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## Annual Rings

- The mark left in the tub after you take your spring bath
- A gift you give your spouse on your anniversary
- Lines that indicate the age of a tree
- A nice name for wrinkles.

## Kerf

- A light slap on the side of the head
- A concrete edge on the side of the road
- A type of yogurt drink favored by Bedouins
- The gap or slot made by the cut of a saw or blade

## Defect

- A type of filter for a camera. Put defect on the lens in bright weather.
- Small insect that bores into old wood.
- A type of varnish used in Europe.
- Flaw or weakness in something.



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# THINGS TO MAKE

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## **Level One Projects.**

1. Bench hook
2. Square Cut Box
3. Stilts
4. Name sign #1
5. Name sign #2
6. Folk Art Critter
7. Computer Shelf
8. Wooden Birds

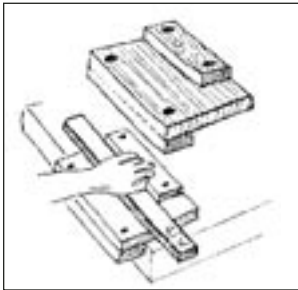




## Bench Hook

A bench hook steadies wood while you saw it. You hold the wood you are sawing firmly against the back of the bench hook. The front of the bench hook is hooked over the front edge of the work bench, so that nothing slides. Viewed from the end, a bench hook looks like a capital S.

Attach the lips so that the side edges are flush with the centre piece. If they aren't, any wood you hold with your bench hook won't be straight.



### Materials

- 1 1x8", at least 12" (30 cm) long
- 1 1x2", at least 24" (60 cm) long

### Tools

- 6d finishing nails
- wood screws
- wood glue
- sandpaper, 100 grit
- tape measure, try square, pencil, C-clamp, handsaw, hammer, screwdriver, protective eye wear

### Cut List

- 1 1x8" base
- 2 1x2x8" strips (lips)

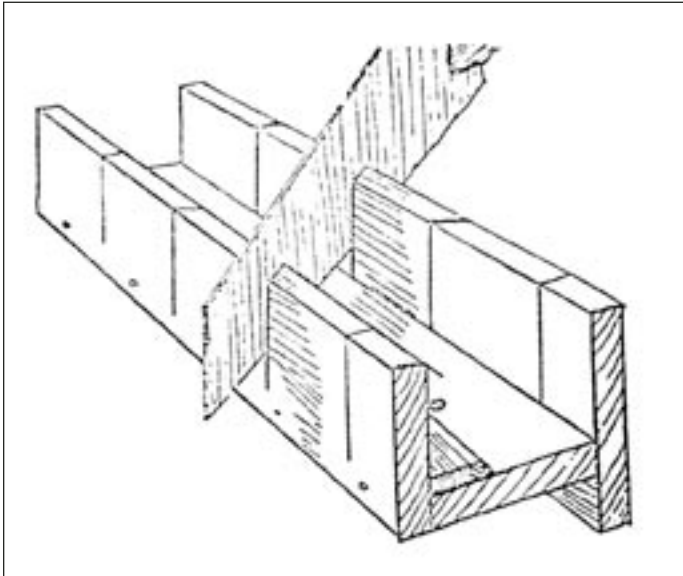
### Instructions

1. Use the try square to see if your 1x8 is square. If it is not, mark a square line, then cut it. (Secure the board with the C-clamp because you don't have a bench hook yet!)
2. Use your tape measure to measure a point 8" from the new end of the board.
3. Use the try square and pencil to draw a line through that point, across the board. This is your other cut line.
4. Secure the board with the C-clamp. Cut on the cut line. This piece of wood is the base for your bench hook.
5. Square one end of the 1x2 using your marking tools, c-clamp and handsaw.
6. Cut two 8" pieces from the 1X2. These are called lips.
7. Glue and clamp the pieces together as shown in the diagram. Countersink the screws so they will not scratch any project.
8. Wipe off any extra glue that squeezed out.
9. Sand your bench hook with your sandpaper so it will not scratch your projects.
10. Take a picture of it! Initial and date your work. Note in your record book. Congratulations!



## Square Cut Box

This box looks and works like a mitre box but is designed for square cuts only. It helps when cutting dowels or small bits of wood for projects. It would be nice to have one of your own, or to make one for a friend.



### Materials

- 1 1x4, at least 40" (1 m) long
- 8 No. 10 x 1 2" flathead wood screws
- 4d finishing nails
- wood glue
- sandpaper, 100 grit
- duct tape

### Tools

- marking tools
- c-clamp
- handsaw
- hammer
- protective eye wear
- twist drill and 5/32" bit
- screwdriver

### Cut List

- 3 1x4x12"

### Instructions

1. Check the end of the 1x4 to see if it is square. If not, use your marking tools to square it.
2. Clamp the board to the work surface. Use your marking tools to measure a square line across the board at 12" from the square end. This is your first cut line.
3. Use your handsaw to cut on this line. This piece will become the bottom of your mitre box.
4. Repeat steps two and three, to make the sides of your mitre box. Lay the unglued pieces against each other, as they will appear in the finished mitre box.

5. Have a helper hold the square cut box bottom on its long edge. Run a line of glue along the top edge.
6. Set one of the side pieces flat on the glued surface so that they look like a capital L from the end. The edges should meet evenly. Have the helper keep on holding them together.
7. Put on your protective eye wear.
8. Choose a spot about one inch from the end of the square cut box. Hammer a nail down through the side, into the edge of the bottom. Make sure the nail is straight up and down or it will break out of the wood.
9. Hammer a nail at the other end of the square cut box. These nails hold things together so you can later screw the pieces together more securely.
10. Turn the project over, so that the bottom pieces other edge faces up. Run glue along that upper edge.
11. Set the remaining side piece on the edge of the bottom piece (on that glued surface). Nail it as you did the other side. It should look like a C from the end.
12. Clamp the nailed square cut box to the work surface, so that the open side faces you. Mark the places for four screws on the side piece facing up. Space them evenly between the two nails.
13. Dimple the Xs by tapping a large nail with a hammer. Do not drive the nail in. This dimple helps the drill work more easily, without slipping.
14. Insert the drill bit into the hand drill.
15. Wrap a bit of duct tape around the bit at 1/2 from the sharp end. This marks how deeply you will drill.
16. Hold your hand drill straight up and down, so the holes will not come out of the boards. Drill a hole at each X. Stop drilling when you reach the duct tape.
17. Repeat steps 12 to 16 for the opposite side of your square cut box.
18. Drive the screws into the pilot holes you drilled. Keep pressing down on the screwdriver as you turn it. Keep working until the head is just even with the wood surface.
19. Set the square cut box on the work surface, on its bottom. The open side should be facing up.
20. Use your marking tools to mark six inches from either end on a top edge.
21. With a try square and pencil, draw a square line across both top edges. Turn your try square so you can mark a line on the face nearest you. Use the line you just drew to guide you.
22. This next cut is very important. Clamp the square cut box, open side up, to the work bench. Use a handsaw to carefully cut through both sides of the square cut box at the line drawn on the side. Cut until the teeth just meet the bottom. Do not cut into the bottom. This cut must be straight.
23. Sand. Take a picture! Initial and date your project. Note in your record book. Congratulations!

## Stilts

These stilts have several settings so they can be adjusted for different sizes of users! Before you drill any holes, lay the pieces of wood together so you will understand the assembly. Measure twice, cut or drill once!



### Materials

- 1 scrap 2 x 4, at least 16" long
- 2 scrap 2 x 2s, at least 60" long
- 1 scrap 1 x 2, at least 16" long
- 4 hex bolts, 3/8" x 7"
- 4 3/8" washers
- 4 3/8" wing nuts
- wood glue
- sandpaper, 100 grit

### Tools

- square and pencil
- handsaw
- hammer
- protective eye wear
- brace with 3/8" bit

### Cut List

- 2 2x4x6" (steps)
- 2 2x2x60" (legs)
- 2 1x2x6 3/4" (braces to keep feet slipping off steps)

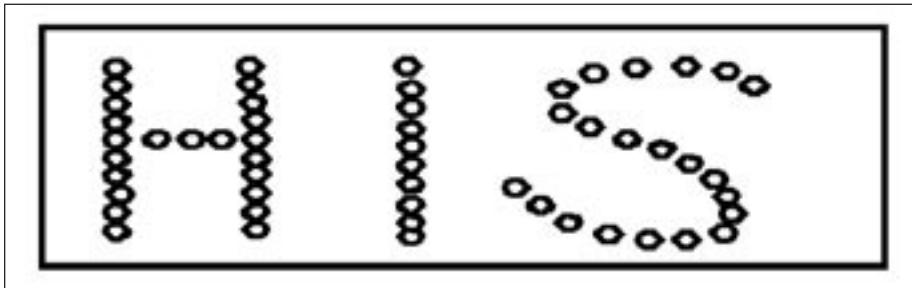
### Instructions

1. Measure and mark a square line at 60" on the 2x2 using your marking tools.
2. Clamp this piece to the work bench. Cut on the line. This will be one leg of your stilts.
3. Cut a matching stilt leg, the same length.

4. Clamp a stilt leg to the work bench with a piece of scrap wood under it. Using your tape measure, mark an X at every four inches, starting from one end, until you have marked four Xs. Mark the Xs in the centre of the leg.
5. Use the brace and bit to bore a hole at each X. The scrap wood under the leg protects the work surface when the bit cuts through the leg.
6. Repeat the marking and drilling steps for the other leg.
7. Clamp the 2x4 to the work bench with a C-clamp, with at least 8 inches hanging over the edge.
8. Measure, mark and square the 2x4 at six inches from the end. Clamp and cut it at the six inch line. This will be one step.
9. Repeat steps seven and eight to make a matching step.
10. Measure, mark and square a 1x2 piece so it is 6-3/4" long. Clamp and cut it. This piece will keep your foot from sliding off the step.
11. Repeat step 10 to make another brace. You will glue a brace to the outside edge of each step.
12. Put a step on the work bench on its edge. Put glue on the edge that is facing up.
13. Lay the flat face of a brace on top of the glued step edge, so that 3/4" of the brace hangs over one end. Put on your protective eye gear.
14. Hammer a finishing nail through the brace and into the step, at either end. Place the nails near the ends so that there will be room to bore holes for the bolts that hold everything together.
15. Repeat steps 13 and 14 for the other step and brace.
16. Mark where the bolts will go through this way. Place the step/brace piece on the workbench with the brace on the bottom. One edge of the step will face up. Measuring from the end of the step that is even with the brace, mark two marks on the steps edge, at 1" and at 5".
17. Square across the step's edge at each mark. Pencil an X at the centre of each line.
18. Clamp one step/brace piece to the work surface, with a piece of scrap wood underneath. Use a brace and 3/8" bit, drill a hole all the way through both X marks. Hold the brace and bit straight up and down so the hole does not come out the side.
19. Repeat step 18 for the other step/brace.
20. Sand all the pieces well, especially the legs where you will be holding on.
21. Assemble your stilts, making sure that the step/brace piece is right side up! Decide what set of holes to use. Push the bolts through the step/brace until they come out the other side of the leg. Put a washer and wing nut on each bolt and tighten.
22. Ask people to stand back while you practice or they might get bonked by a stilt! Take a picture!

## Name or Message Sign # 1

Make this sign to hang on your door or sit on a shelf or mantel!



### Materials

- Paper
- Scrap of 1 x 4, approximately 12" long
- paint or stain (optional)
- drill and bit

### Instructions

1. Sketch the word or name for the sign on a piece of paper the same size as the finished sign will be. Practice two or three times until you are satisfied with how it looks.
2. Square off the ends of the 1x4 at a length that your word will fit on, plus one inch at each end. Sand it carefully.
3. Sketch your word/name onto the wood with a pencil.
4. Put a piece of duct tape at 1/4" on the bit of the drill. This will show you at what depth to stop drilling.
5. Drill holes on the pencil lines of the letters for the name/word.
6. Dust the sign. It might be necessary to vacuum the holes to get all the dust out!
7. You can leave your sign plain, or you can paint the surface with a roller, so that the holes show up against a painted surface.
8. Take a picture for your record book. Congratulations!





## Name or Message Sign #2



### Materials

- scrap of pine

### Tools

- pencil
- ruler
- coping saw
- rasp
- sandpaper
- finish

### Instructions

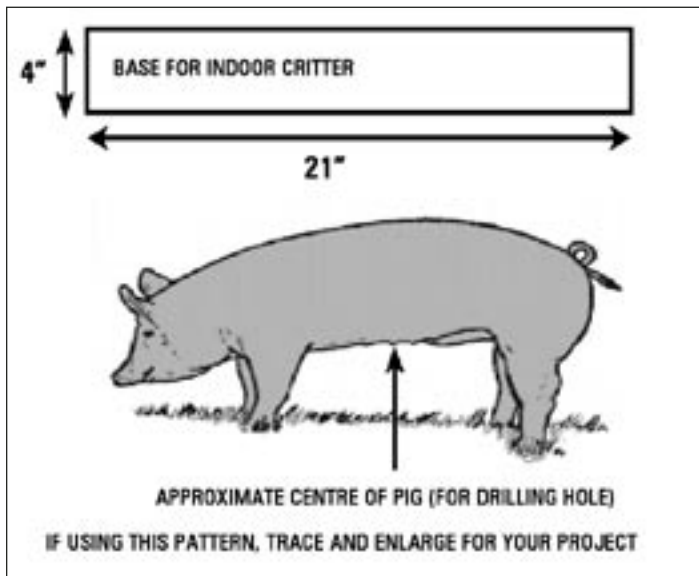
1. Write your name or message in rounded letters so that letters touch.
2. Cut out the name or message, being careful not to separate them.
3. Smooth with a rasp, if necessary.
4. Sand, then finish.

*Suggestions for messages: Office, CEO, Joy, Peace, Hi!, Exit.*



## Folk Art Critter

Make this item to liven up a lawn or flower bed, or to adorn a shelf or mantel inside! Select your favourite critter or image as the subject. (E.g. a running horse or dog, a happy pig, a lightning bolt, a simple scene)



### Materials

- 1 1 x 8 pine, 21" long (Body)
- 4 x 4, 21" long base (for indoor item)
- 2 to 3 feet of 1/4" dowel (for indoor item) or
- metal stair-runner rod (for outdoor item) for stand
- 14" square scrap of scrap sheet metal or thin wood for small detail pieces (e.g. legs, ears, tails etc.)
- Coping saw
- tin snips
- rasp
- sandpaper
- exterior grade paint (for outdoor projects) or
- acrylic paint (for indoor projects)
- artist's paintbrushes

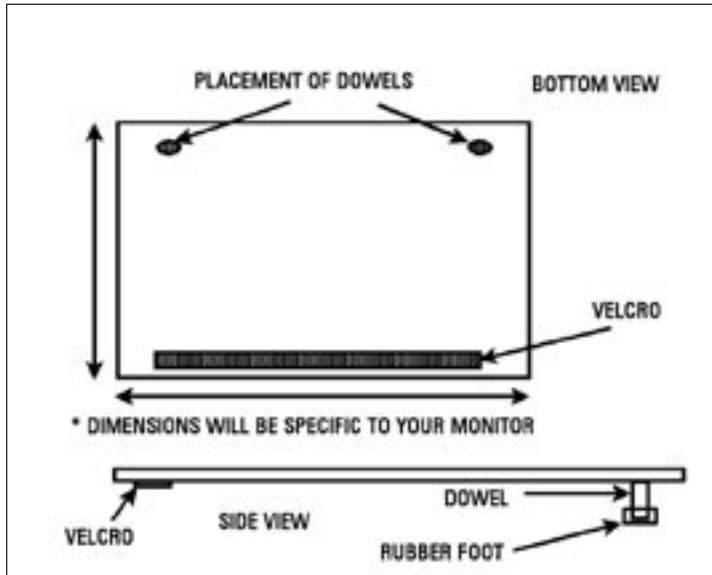
### Instructions

1. Trace or sketch your pattern for the main body part onto the 1 x 8.
2. Cut out using a coping saw. Use the rasp and sandpaper to smooth.
3. Trace or sketch the small detail parts (such as ears, tails, wings etc.) on the thin wood or metal. Cut using either coping saw or tin snips.
4. Assemble the critter without glue, as a trial. With adult help, determine where the centre of the critter is. Mark that spot on the bottom edge of the body with an X.
5. Paint all the pieces carefully. Let dry. Glue the detail pieces onto the main body with epoxy glue. Let dry.
6. For an indoor project, carefully drill a hole 2" deep at the X in the critter's body. Cut the dowel the length you want. Put a dab of glue on the end of the dowel and gently, but firmly push it into the hole.

7. For the indoor critter, drill a 1/2" hole in the centre of the base. Dab epoxy onto the bottom of the dowel and insert into the hole in the base.
8. For an outdoor critter, put a dab of epoxy on the end of the stair runner rod and push into the hole at the X.
9. Take a picture for your record book. Congratulations!

## Computer Shelf

This is a small shelf that sits on top of your monitor so you can use that otherwise tilted space for something! Do you know anyone who might like one for a gift?



### Materials

- wood the dimensions of the top of your monitor (3/8" to 2" plywood will do fine)
- dowel (1/2" to 5/8" ) the length will be determined by the angle of the top of your monitor
- two rubber or plastic feet to go on the end of the dowel
- glue

### Tools

- saw
- measuring tools
- sandpaper
- drill
- adhesive-backed Velcro
- paint or stain

### Instructions

1. Measure the width and depth of the top surface of your monitor to decide how big to make the shelf.
2. Cut the wood to these dimensions.
3. Set the wood on top of the monitor, so that the surface is flat. There will be a gap at the back of the board, between it and the top of the monitor. This is where you will put dowels as feet to hold up the shelf. Measure this gap.
4. With the wood still in place, mark the best place to install the dowels.
5. Cut the dowels to the length of the gap, plus the depth to which you will sink the dowels into the shelf. (Make the depth of the holes about 2 to 2/3 of the thickness of the wood.)
6. Drill two holes in the spots you marked.
7. Insert the dowels, with the rubber feet on, as a test. Place it on top of the monitor.

8. If you are satisfied with the dowel location and their length, glue in the dowels.
9. Sand lightly.
10. Finish with your preferred materials.
11. Clean and dry the top of the monitor where you will attach one side of the Velcro.
12. Attach a generous strip of Velcro to the top of the monitor. Attach the matching piece of Velcro to the appropriate spot on the computer shelf.
13. Take a picture for your record book! Congratulations!

## Wooden Birds

This project will give you good practice in using a coping saw and sanding. You can paint the birds to make them look realistic or you can just stain or varnish the wood. You can hang these around the house or yard or even on the Christmas tree. Wooden birds sell well at craft fairs and make enjoyable gifts. You can also sketch other birds that you like and make them.

You could also make them in a bigger size and use them as lawn ornaments!

### Materials

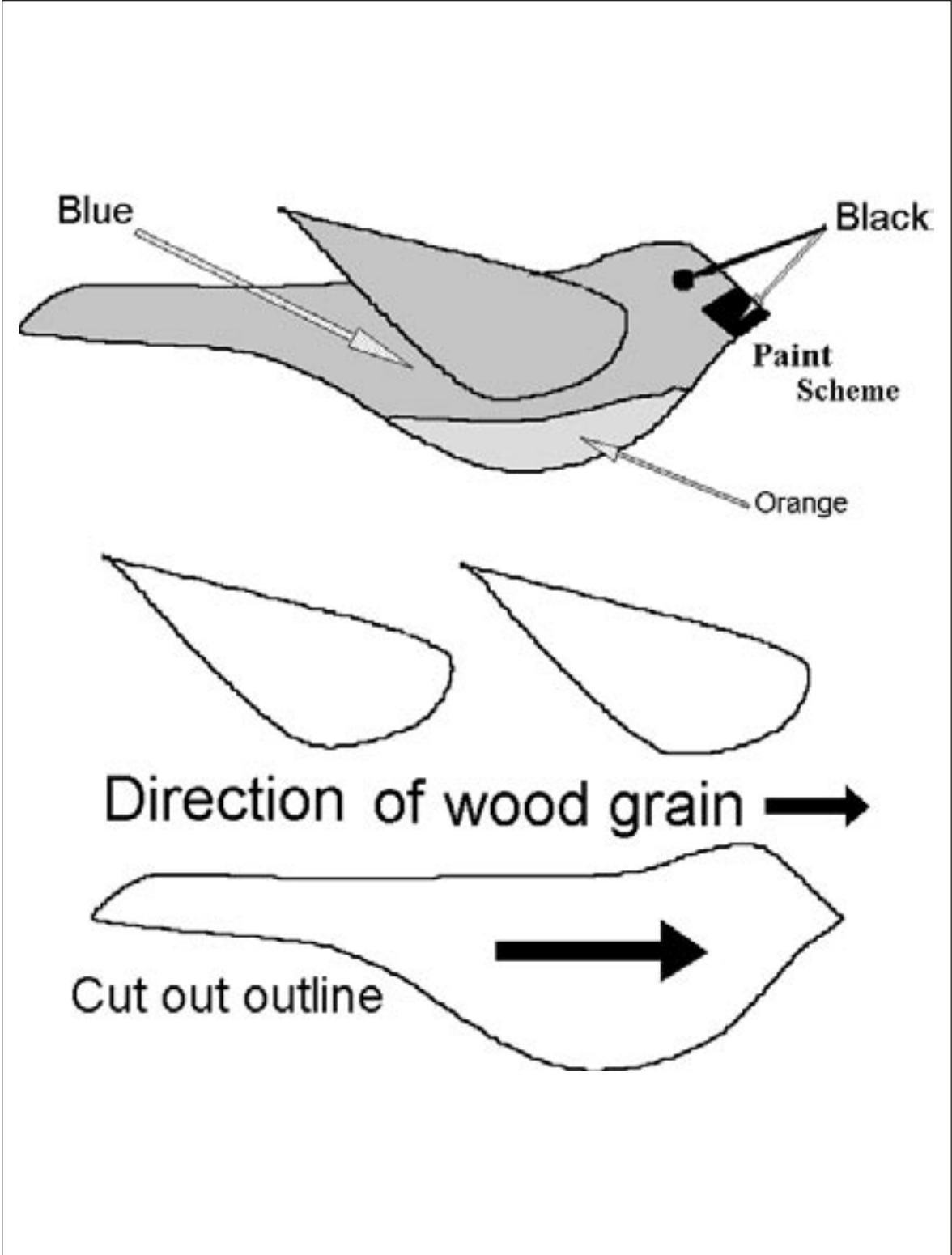
- Scrap pieces of pine or other soft wood (3/4" for the body and 1/2" or thinner for the wings)
- Sandpaper
- Finishing materials of your choice (paint, stain, varnish etc.)
- Cleaning supplies
- Small hook

### Tools

- Pencil
- Tracing paper
- Coping saw
- Paint brush
- Hand drill and small bit

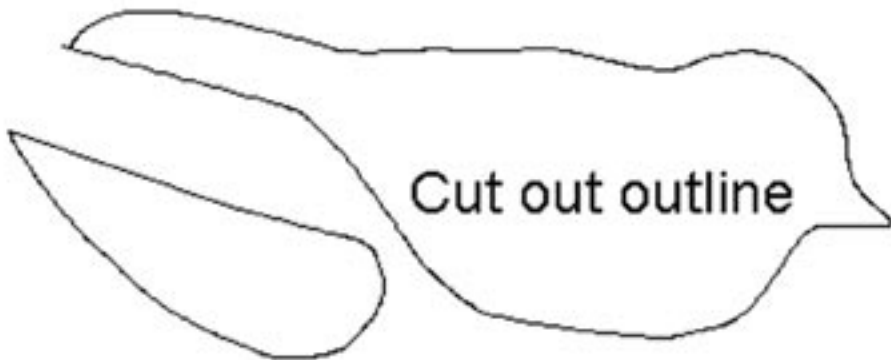
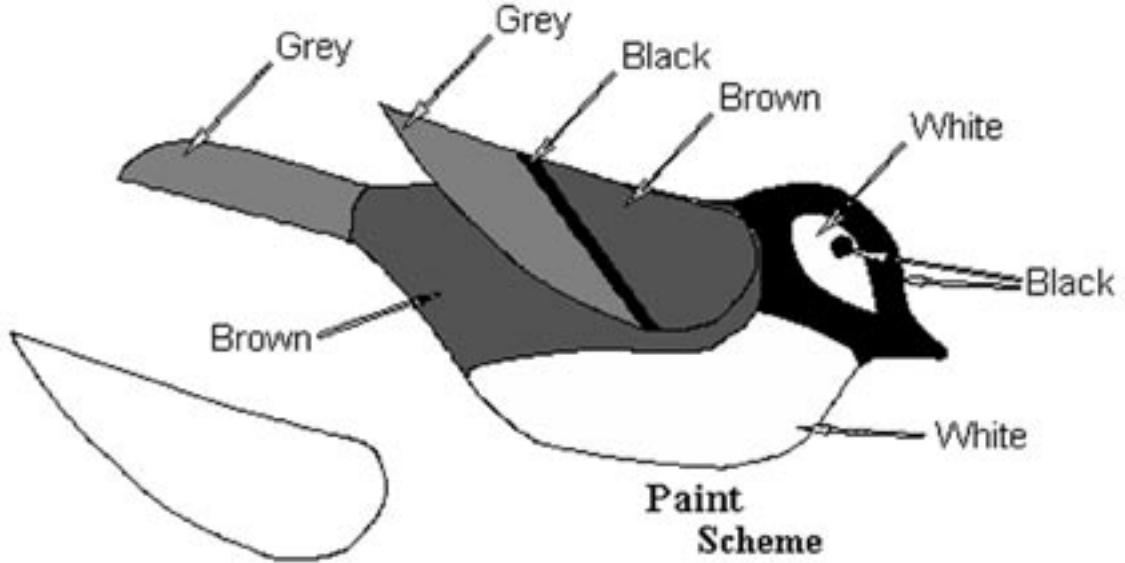
### Instructions

1. Place your pattern pieces on the wood, with the arrow running in the same way as the wood grain.
2. Trace your pattern onto the wood.
3. Cut out the wood pieces.
4. Sand carefully.
5. Glue the wings to the bird. Remove an excess glue so it will not interfere with your painting. Let dry.
6. Paint or finish as you prefer.
7. Carefully insert the small hook into the top of the bird, so it will hang straight.









Direction of wood grain →

# MEMBERS: I CAN CHECKLIST

*Leader Signature*

## **Safety**

- Name common hazards in work area \_\_\_\_\_
- Explain how a person should dress when working with wood and tools \_\_\_\_\_
- Identify hazards in work area and respond appropriately \_\_\_\_\_
- Tell others about hazards \_\_\_\_\_
- Tell others about safe habits \_\_\_\_\_
- Inform adults about hazards \_\_\_\_\_
- Determine and take accident precaution steps \_\_\_\_\_
- Ask another member to stop if I see unsafe practices or hazards \_\_\_\_\_

## **Wood**

- Name main parts of a tree \_\_\_\_\_
- Explain, in simple terms, how a tree grows \_\_\_\_\_
- Determine the age of a tree by counting rings \_\_\_\_\_
- Recognize at least two types of wood (e.g. Pine, oak) \_\_\_\_\_
- List characteristics of wood that make it a good building material \_\_\_\_\_
- List two characteristics of wood that make it a challenging building material \_\_\_\_\_
- Give a simple explanation of the role of the lumber industry in Canada's history \_\_\_\_\_
- Explain the difference between hardwood and softwood \_\_\_\_\_
- Explain steps to take to reduce warping in a project \_\_\_\_\_

## Measurement

- Explain in simple terms, why measurement is important \_\_\_\_\_
- Explain difference between imperial and metric measurement \_\_\_\_\_
- Give examples of best use of: ruler, tape measure, square \_\_\_\_\_
- Accurately measure and cut wood \_\_\_\_\_
- Acknowledge the importance of using only one system of \_\_\_\_\_
- Measurement in a project \_\_\_\_\_

## Tools and supplies

- Identify common woodworking tools and their proper use \_\_\_\_\_
- Identify common woodworking supplies and their proper use \_\_\_\_\_
- Recommend handling and storage to protect tools \_\_\_\_\_
- Safely use tools to build projects \_\_\_\_\_
- Use appropriate safety equipment \_\_\_\_\_

## Gluing

- Explain why and when it is appropriate to use glue \_\_\_\_\_
- Name types of glues and their characteristics \_\_\_\_\_
- Explain and demonstrate application of glue \_\_\_\_\_
- Explain and demonstrate how to use glue and nails together in a project \_\_\_\_\_
- Explain clean up and storage of glue and applicators \_\_\_\_\_
- Give practical tips to avoid clamp scars on wood \_\_\_\_\_
- Explain the effect of glue on paint and varnish \_\_\_\_\_

## Sanding

- Explain the purpose and value of sanding \_\_\_\_\_
- List the steps in sanding \_\_\_\_\_
- Identify the direction of grain in wood \_\_\_\_\_
- Explain the importance of sanding with the grain \_\_\_\_\_
- List steps to avoid problems with dust \_\_\_\_\_
- Demonstrate how to clean sandpaper \_\_\_\_\_
- Demonstrate how to sand tiny pieces of wood \_\_\_\_\_
- Identify the various grades of sandpaper and their use \_\_\_\_\_

## Finishing

- Explain what is meant by finishing \_\_\_\_\_
- Explain the purpose and value of finishing \_\_\_\_\_
- List the steps in finishing \_\_\_\_\_
- Select an appropriate finish based on intended use, type of wood, personal taste \_\_\_\_\_
- Use finishing products safely \_\_\_\_\_
- Apply finishing techniques to selected projects \_\_\_\_\_
- Demonstrate proper cleaning and storage of materials and equipment \_\_\_\_\_

## Patterns

- Explain the benefits of using a pattern \_\_\_\_\_
- Select pattern appropriate to skill level, resources available, personal interest \_\_\_\_\_
- Redraw a pattern \_\_\_\_\_
- Demonstrate how to read a pattern \_\_\_\_\_
- Trace a simple outline onto wood \_\_\_\_\_
- List sources for project patterns \_\_\_\_\_

## My work as a gift

- Take pride in my developing skill in woodworking! \_\_\_\_\_
- Identify items I could make as gifts for individuals or the community \_\_\_\_\_
- Encourage other members to apply their skills for others enjoyment and benefit \_\_\_\_\_
- Look for opportunities to learn more about woodworking \_\_\_\_\_

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# EVALUATION

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Your input is a valuable asset to the 4-H program!

As you go through the project year, write your comments and suggestions about the project on this form. When you complete your project, mail this form to us. We want to hear from you!

## Woodworking Project Evaluation

4-H and Agriculture Education Branch  
Alberta Agriculture and Rural Development  
7000 113 ST NW RM 200  
EDMONTON, Alberta T6H 5T6

**Evaluation Date:** \_\_\_\_\_

## Please Tell Us

*Which techniques and skills did you learn and use for this project?*

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*What did you like best about completing this project?*

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*Are you pleased with your project? Is there anything you would change if you were to do the project again?*

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*What are you going to do with your project?*

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*How long did it take you to finish your project?*

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*Additional Comments?*

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