



The Art of Woodworking – Beginners Guide

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Introduction To Woodworking

Woodworking encompasses a great number of diverse activities, including turning, woodcarving, marquetry, cabinetmaking and joinery, however, every specialist craftsman or craftswoman has at some time mastered the fundamentals of measuring and marking, dimensioning, assembling and finishing – considered the basics of woodworking skills that are the core of any woodworking calling.

The ability to think in three dimensions is needed to mark out the wood for a project and to imagine how one component fits with another and in what order is required of a woodworker. You will also need to know which tools will give the best results, depending on the level of accuracy required and the properties of the wood you are using.

Dimensioning is the process of reducing raw materials accurately to size. This almost invariably entails planning components square and true – a procedure that is simple in principle but takes a lot of practice to become perfect.

Cutting and assembling a variety of joints are part of all but the simplest of woodworking projects. Long been regarded as a measure of a woodworker's skills, joinery needs a steady hand-eye coordination, but experience will tell you the best way to fasten one piece of wood to another attractively and discreetly without sacrificing strength.

One necessary addition to these pivotal skills is an appreciation of how wood behaves. It is a unique, living material that continues to swell and contract with changes in humidity, a factor that a woodworker must deal with in the design and construction of every project. Some woods are easier to work with than others, and each piece, regardless of the species, is exclusive in the way the grain turns and twists.

There is no one right way to do anything in woodworking. The right way is the way that works best for you and what works best is a balance between the time something takes, the tools available, the pleasure you take in the process and the quality of results you are looking for.

There are arguments for both the use of hand tools and the use of machines for woodworking. Some say that using hand tools allow you to develop the 'knack' of cutting and shaping wood without tearing the grain. While other woodworking experts proclaim that you can often complete a project in less time with hand tools because of the set up required for the mechanical tools. Others believe just the opposite. We will discuss both options, hand tools and machine tools in this book.

With a little patience, the right tool and techniques and a good set of plans, you don't have to be Bob Villa to build something you'll treasure for years to come.

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Safety First

Any discussion of woodworking machinery should begin with shop safety; hand tools require safety precautions as well. Woodworking machines are made to cut, chop, abrade, slice, drill and shave materials that are considerably harder than human skin. When used carelessly, machines are dangerous and when used properly, machines can be a wonderful help.

Wherever woodworkers gather, stories of accidents and near-misses come up sooner or later. Perhaps the term 'accident' is misleading here because 'accident' implies the injured person is a 'victim' of circumstances beyond their control; in most cases, it may be more appropriate to say that the 'perpetrator' suffers the consequences of his or her own carelessness.

Consciousness of safety is the first requirement of good craftsmanship. Here are several things you can do to protect yourself while working with wood, either with machines or hand tools.

- Wear hearing and eye protection when using saws, routers, sanders and other equipment. To keep splinters and dust out of your eyes, use large plastic safety goggles, a face shield or safety glasses.
 1. Goggles – the rigid lenses of safety goggles are surrounded by a soft plastic frame that fits and seals against the contours of your face. The sides are ventilated to prevent condensation and they can be worn over prescription eye glasses.
 2. Hearing protectors – earplugs and padded ear muffs protect your hearing from overexposure to noise. Always wear protectors when using noisy power tools that could cause long-term damage to your hearing.
- Keep your workshop area clean and neat so you won't trip over a scrap of wood or an extension cord at an inconvenient moment.
- Tie up long hair; don't wear loose-fitting clothing or any jewelry. All of these items can get caught in the machines and drag you towards the blades or other sharp parts.
- Don't use machinery when you are tired or have consumed alcohol – any amount of alcohol, even a little bit is too much for operating machinery. This type of machinery is dangerous enough when you are fully alert, so why increase the odds of an accident?
- Focus on what you are doing at all times and take a break if you mind starts to wander. You are most likely to have an accident when performing the same operation over and over again. Walk away for a few minutes between cuts.

- If you are not comfortable making a cut or aren't sure if a particular cut is safe, get advice or help before you try it. Find a friendly woodworker to ask, perhaps at the local high school or college.
- Keep saw blades sharp. The harder you have to push, the less control you have over the wood. This can cause slips and loss of fingers or worse
- Be prepared for accidents. Consider these questions:
 1. Where is your telephone?
 2. Where is your first aid kit? – You should always have an extensive first aid kit available at all times.
 3. Where is the nearest person who can help you? – You should never be alone while woodworking.
 4. Can you give clear directions to your shop over the telephone?
 5. Are you familiar with basic tourniquet and first-aid techniques?
- If a serious accident does occur, call 911, not your friend. Your friend will not be able to help you if you suddenly go into shock on the way to the hospital.
- If you should be unfortunate as to sever any fingers, take them with you to the hospital in case they can be reattached. Severed fingers should be wrapped in gauze and soaked in a cup of salty water that is kept cold in ice; the fingers should never touch the ice.

Health concerns –

Breathing sawdust is not healthy; it can be allergenic, toxic and carcinogenic. The sawdust from some imported woods, including teak, is particularly harmful and is known to cause skin rashes and respiratory problems. Several studies have shown that woodworkers have a high rate of nasal cancers.

Because even a little sawdust can clog sinuses and aggravate allergies, try to wear a mask whenever you make dust, whether it's from machinery or sandpaper or sweeping the floor. Masks range from thin paper with an elastic strap to the thick rubber with a replaceable toxic-fume-proof filter. Heavy-duty masks are generally unpleasant to wear so some compromise will need to be made between efficiency and comfort.

Some of the solvents and finishes used in furniture finishing are also allergenic, toxic and carcinogenic. Petroleum distillates in commercial oil finishes, naphtha and benzene are all suspicious of contamination. Because many of these solvents are toxic to the human body by breathing or through skin contact, it's a good idea to wear rubber gloves and a toxic-vapor mask when working with them.

Wood shop accidents happen in an instant, especially with power tools. The results can be irreversible and even life-threatening. Your first line of defense against mishaps is really simple; Think Before Acting. Respect the capabilities and dangers of your tools and know how to use them safely.

Plan your work so you can get help lifting or moving heavy objects. Set high standards for tool maintenance and operations. Never use dull blades or bits. Remove guards and other safety devices only when absolutely necessary. And keep your work area clear of debris and clutter.

Hardwoods Vs Softwoods

Lumber can be grouped into two broad categories – softwoods and hardwoods – based on a botanical distinction. Hardwoods are those species that come from leaf-bearing trees that produce flowers, fruits or nuts. Common North American hardwood lumber includes maple, oak, ash, walnut, cherry, beech, birch and poplar.

There are many less common Western hardwoods as well, like butternut, mesquite, holly, pear and sycamore. Other countries log innumerable hardwood species as well. Some of these exotics include teak, mahogany, ebony, rosewood, bubinga, purpleheart and pear. These exotic woods can be purchased through the Internet or specialty catalogs; however, they are pricey and may only come in a limited size.

Softwoods come from the large family of cone-bearing trees that bear needles rather than leaves. Firs and pines of all sorts, redwood, cedar and cypress are typical North American softwoods made into board lumber. Because these species are well suited for construction purposes, all lumber used for framing and roughing construction comes from softwood trees.

They are sufficiently strong for structural applications, yet are easy to work with common hand or power tools. Another advantage is that cone-bearing trees grow rapidly and develop straighter trunks and branches than the hardwoods. And finally, more softwood trees can be planted per acre than hardwood trees so they produce a higher lumber yield in less time.

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Common misconceptions –

It is a common misconception that hardwoods are called hardwood because the wood is hard, while softwood is so named because they are soft. It is true that many hardwoods are more difficult to machine than softwoods, however the distinction actually has nothing to do with the hardness or workability.

Southern yellow pine, for example, is heavy dense softwood used for stair treads and large framing lumber. It machines and accepts fasteners in a manner like that of hardwoods. Walnut and poplar are common hardwoods, but they can be routed and sawn as easily as cedar or redwood.

Even pricing is not a good indicator of hardwoods or softwoods. More softwood is manufactured into building materials than furniture-grade lumber, but what does become lumber can be quite expensive. Take for instance, clear sugar pine lumber, it is just as costly as premium cherry or white oak.

Actually, the basic economics of supply and demand have more to do with lumber pricing than the particular species of wood or even its grade designation.

Choosing what to use –

Woodworking projects can use both softwoods and hardwoods. Generally, hardwoods end up as indoor projects such as furniture, trim-work, cabinetry and turnings because the wood grain and figures are highly desirable. Softwoods tend to become outdoor furniture, children's projects such as tree houses and other sorts of utility or painted projects. These are merely general guidelines. If money is no object, you can build children's furniture from practically any furniture-grade lumber you have.

The answer to – what species should I choose for a particular project? – is not cut and dried.

Ask yourself a few questions –

- *Is this an indoor or outdoor project?* Most wood will degrade over time in the presence of water or ultra violet sunlight. Moisture is another 'deadly' threat to wood; it invites mold and wood-boring insects. Some of the most durable outdoor woods include western red cedar, cypress, white oak and redwood. These lumbers contain natural oils or profiling compounds that resist rot and help repel insects. Boatbuilding woods such as mahogany and teak are excellent choices, although they are much more expensive than the common weather-resistant species.

Consider using a pressure-treated wood if you are not using it for food or contact with skin (such as a chair or bench). It takes paint well once the

infused chemicals dry and the wood tends to be warranted for decades against rotting. Be careful and wear a dust respirator when machining pressure-treated lumber to keep from inhaling the sawdust, which contains the treating chemicals.

- *Will the project be painted or receive a clear finish?* For painted projects, choose wood that has a smooth texture without a heavy grain pattern. Ideally, the lumber should sand and finish so smoothly that the grain entirely disappears. Good paint-grade hardwoods include birch, aspen and birch. These also tend to be less expensive than hardwoods with more attractive wood grain patterns. Softwoods generally produce a blotchy, uneven tone when they are finished with a stain, but they make excellent economical painted woods. Pines, firs and other 'white woods' are good candidates for paint finishes.
- *What thickness and proportions of lumber does your project require?* Nearly all the board lumber you will find in a home center or lumberyard will be milled to ¾-inch thickness. There could be a small amount of 'craft' woods in ¼-inch thickness made of oak or poplar as well as laminated blanks in a few sizes up to 3 inches thick. Lengths of 'craft' woods will be limited to about 3 feet. Some projects require large panels such as tables and entertainment centers and if you don't own a jointer and clamps to glue your own wide panels from narrower boards, your local home store probably stocks pre-glued sanded panels as wide as 3 feet and up to 8 feet long.
- *Which project parts will show?* Commonly practiced in furniture building is to use a secondary or cheaper lumber on the insides and backs of pieces and the more expensive, nicer wood on the outer areas of the furniture. Places that secondary wood might be used are drawers, shelves inside a cabinet, the backs of cabinets and desks, under the tabletop, legs, etc. Poplar and pine are often integrated into projects as secondary wood pieces.
- *What does your budget allow?* Lumber is expensive, particularly if you buy it completely surfaced. Sometimes sticker shock will push you over the edge and make your choice of lumber obvious. When tallying up the amount of lumber you will need, factor in another 20 to 30 percent additional wood. The overage invariably gets used in the end. If the price is out of reach, consider using a more economical wood and staining it to match the color of a more expensive wood.

Various Styles Of Saws

There are many things to consider when choosing a saw blade – making safe, smooth cuts with your radial arm saw, table saw; compound slider miter saw or chop saw depends on having the correct blade for the tool and, for the kind of cut you would like to make. Performance varies from blade to blade and presently, not a lack of them in the stores today, so choose wisely.

Choosing the correct saw blade –

It's not all that complicated, really. In order to put together a top rate saw blade assortment of your own, you're required to identify a small amount about what diverse blades do and what distinguishes the top-quality from the cheaper ones. Once you figure this out, you'll be able to decide the blade that is best for the type of woodworking you will be doing and your budget can afford.

There are blades that are intended to do a number of things. Some blades are for crosscutting wood, ripping wood, cutting veneered panels and plywood, cutting melamine, cutting non-ferrous metals and cutting plastics and laminates. Combination blades and general purpose, these blades are for using two or additional kinds of cuts. The amount of teeth, the gullet, the hook angles (the tooth angle) and the tooth configuration all determine how good the saw blade is.

Amount of teeth –

Saw blades with less teeth move the wood faster furthermore blades with more teeth offer a smoother cut. For example, a 10' blade considered for ripping wood usually has fewer than 25 teeth plus are intended to move the material quickly through the machine along the extent of the grain. With the least little bit of effort and leaving a fresh cut and a least amount of scoring, the higher quality rip blade will outperform a lower quality rip blade which is not designed to make mirror-like smooth cuts. (mirror meaning both edges are the same).

Alternatively, a crosscut blade is well thought-out to give you an even cut crossways against the grain of the wood without any tearing or splintering. Between 60 and 80 teeth are found on the crosscut blade. Remember, moving less material, each tooth comes in contact with the wood less and this means a crosscut sharp edge makes numerous additional single and smoother cuts than the ripping blades. A polished finish will appear on the wood if using a good quality crosscut cutting edge.

Gullet –

The space missing from the blade plate in front of each tooth, which allows for chip removal, is called the gullet. In the crosscutting blade, the chips are fewer and smaller per tooth so the gullet is much smaller. In the ripping blades the rate is much faster than the crosscutting action and the chips are bigger so therefore the gullet needs to be bigger to accommodate the larger amount of material coming through it.

The hook angle –

Rather than be perfectly in line with the blade, the teeth are tipped either inward or outward, depending on the configuration of the blade. Hook angle is the slant shaped connecting a tooth face and a line drawn down the middle of the blade across the tip of the tooth. A downbeat hook angle signifies the teeth tip away from the path of rotary motion and the reverse is said for the positive hook angle. A zero hook slant demonstrates the teeth are in line with the midpoint of the blade.

A very aggressive hook angle (degrees of 20 or more) will also have a very fast cutting rate. A negative or low hook position will have a slower supply rate and will stop the blade from 'climbing' the material as often happens.

Tooth configurations –

The way the blade cuts is often affected by the way the tooth is shaped and the way they are grouped together. The configuration has to do with the way a blade will cut, if it's a crosscutting, ripper or laminates cutter.

Hand saws –

No one can deny the aggressive speed of a table saw or a sliding chopsaw, however, for joinery; it's hard to beat the backsaw's precision for slicing just what you need. Hand saws are much cheaper and easier to control than machine saws. The backsaw can hold the sharpest, thinnest of blades and they can slice wood with minimum waste and maximum control.

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Measure Twice, Cut Once

Most woodworkers don't give much thought to most basic tools in their shop, they are too busy picking out the best chisels, scrapers, clamps, special jigs, tool, woodworking machinery, hand planes and all manner of accessories to make their work go smoothly and more accurate. What they are missing is the measuring and marking tools.

Look at what you own in the way of measuring and marking tools. Many of the frequent troubles in woodworking are out of a four-sided figure frames, casework, joints that fit poorly, etc. can be traced back to the measuring and marking mistakes. The culprit is usually only a matter of using the incorrect measuring and marking too for the job. A tape measure was not calculated for the extremely accurate measurements that most woodworking projects require.

Making for some exacting work, in most woodworking projects, the first thing you do is marking and measuring linear dimensions. Miscalculations as small as 100th of an inch when marking and measuring in such complicated joinery or small, tight parts will later show up as gaps in joints or uneven parts or a host of other less-than-perfect results.

Depending on how correctly you are able to interpret a measurement into an objective mark on a piece of wood is the outcome of measuring from point 1 to point 2. Holding down a tape measure while trying to accurately mark off a measurement is a difficult task, mainly because tape measures are not meant to lay flat. An accurately calibrated and readable marking and measuring tool is needed for all woodworking projects.

Rules and tape measures –

Since even the best measuring tools are relatively inexpensive, most woodworkers acquire a variety of rules and tape measure to meet different need. However, it is advisable to use the same rule or measuring tool throughout the project, just in case there is any variation between one tool and another. Purchase both rules and tape measures with standard and metric graduations – but take care not to confuse one system with the other once you have begun to mark out a work piece. You can measure one piece of wood accurately and then use it as a template for the other pieces if more than one of the same size is needed, this will save you time in the marking and measuring department.

1. Tape measure – retractable steel tapes, measuring from 6 to 16 ft (2 to 5m) long, are usually graduated along both edges. A lock button prevents the tape from retracting automatically. Some tape measures incorporate a liquid-crystal display that tells you how far the tape had been pulled from its case; a built-in memory retains the measurements when the tape is

retracted. Self-adhesive steel tapes are sold without cases for sticking along the front edge of a workbench.

2. Four-fold rule – The folding carpenter's rule made from boxwood with brass hinges and end capes is still popular among traditional artists. Most folding rules are 3ft (1m) in length fully extended. Because it is relatively thick, you have to stand a wooden rule on edge in order to transfer measurements accurately to the work. Similar rules made from plastic are sometimes made with beveled edges to overcome this problem.
3. Straightedge – every workshop needs at least one sturdy metal straightedge, measuring between 1ft 8in (500mm) and 6ft 6in (2m) long. A beveled straightedge is ideal for making accurate cuts with a marking knife and for checking that a planed surface is perfectly flat. Some straightedges are etched with standard metric and/or graduations.

Squares and T-Bevels –

Squares are used to make sure things are at a right angle to one another. In a woodshop, these things might be the edge of a board, the shoulder of a tenon, the fence on a jointer and so on. However, square is an abstract term. Looked at closely enough, nothing is truly square; some things just approach the idea of being square more than others. There are three types of square generally used in woodworking.

1. Try squares – are the most commonly used squares among furniture makers. They have blades of brass or steel (generally from 6in to 12in long) set in a thicker wood or metal stock. If the stock is wood, it should be faced with metal to ensure long-term accuracy. The reliability of try squares can vary sharply, even among those made by the same manufacturer.
2. Engineer's square – these are similar in design to the try squares, but made entirely of steel. Blade lengths start at approximately 2 in. These squares are more reliable than try squares, probably because engineers are a more demanding bunch than woodworkers. Engineer's squares can be used interchangeably with try squares in a woodshop.
3. Framing squares – these are made for house building. They have two large blades that form a right angle. One blade is 2in wide by 24in long; the other is 1 ½ in by 18in long. Framing squares are not expected to be precise as try squares or engineer's squares.

Marking tools –

1. Pencils – every shop needs pencils for marking out your designs and marking wood in order to keep track of jointed surfaces and which piece fits together where.
2. Knives – these are indispensable in a woodshop for tasks such as marking tenon shoulders and cutting cardboard templates. Knives are a preference, pocket knives, box cutters; utility knives with a retractable blade are all useful in a woodworking shop.
3. Awls – these are sharp, pointed instruments with a variety of uses. They differ in the fineness of their points and the thickness of their shafts. A fine-pointed awl is useful for marking out joinery and scribing lines and a thick-shanked, broad-pointed awl is good for making pilot holes in wood prior to drilling. The dimple it leaves when tapped with a mallet forms an exact starting point for a drill bit.

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Chisel Basics

There are only a few truly indispensable hand tools for woodworking today. Near the top of the list would be the basic chisel. This is a tool that does it all, from carefully paring away thin shavings in intricate detailed work to quickly scooping out large chunks of waste wood. You will find chisels in every basic aspect of woodworking from furniture making to trim carpentry to woodcarving.

There are several different types and sizes of chisels one should carry in their woodworking shop and each is designed for a specific job. You could consider purchasing a 4 piece set which includes $\frac{1}{4}$ -, $\frac{1}{2}$ -, $\frac{3}{4}$ - and a 1 inch beveled bench chisel with blade lengths from 4 to 6 inches. Plastic handles are best because they can stand up to being hit by a mallet and are comfortable to hold for long periods of time. If you only have the budget for one, purchase a $\frac{3}{4}$ inch chisel and be sure to purchase a reputable brand because quality counts, it will hold up to repeated sharpening longer.

Using your chisel –

To chisel a shallow mortise or notch at the border of a piece of wood, begin by placing the indentation edge with a blade groove. And then, place the beveled edge in front of the throw away area, position the chisel edge in the subsequent line, holding the chisel perpendicularly and tap with your mallet which makes the cuts around the border. Place the bevel downward; make one-sided cuts from the stock facade to the boarder cuts to make the indentation walls. Following the angled boundary cuts to the preferred deepness, rotate the chisel bevel side up and cut diagonally against the grain and taking away the majority of the unusable portion. When the indentation has come to its estimated dimension, use tiny cuts to help reach its final size and deepness.

Use a wide bevel chisel, with the bevel up in a semi-circular sweeping motion with the stragglng end of the blade doing the slicing if you need engrain paring done.

The easiest and quickest way to slice a cavernous mortis is to first drill a sequence of holes with a drill bit that is to some extent tinier than the depth of the hole. Then use the chisel to shear away the throw away pieces amid the holes.

Concave curves can be trimmed by using a chisel so as to be somewhat wider than the width of the reserve. Press down on the blade while rotating downwards on the handle and pushing straight ahead all while holding the bevel down.

Sharpening –

For fast cutting and clean, a sharpened edge is necessary as well as for individual safety. An unsharp tool make a rough cut – you want everything to be smooth – but the additional strength necessary to drive the tool could cause you to have less control over the situation which could lead to accidents.

By honing a chisel regularly on a water or oil stone, you will keep it sharp and in top shape for cutting and scraping. The cutting edge bevel is typically around 20 to 35 degrees, however you don't have to hone the complete bevel, in its place, hone a small, minor bevel at the top to a little more of an angle than the most important bevel.

Set the bevel steadfastly on the stone and then rise the chisel about five degrees. Shift the blade back and forth until a wire edge builds on the back of the blade. Flip the blade over and lay it entirely level on the stone, glide it back and forth a few times to eliminate the edge of wire. Pare across an endgrain as a check for unevenness.

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