Ian's Must-have Measuring Tools

By Ian Kirby

The range and variety of measuring tools has exploded since the days of wooden, shop-made versions. The author simplifies your choices by dividing them into four categories and assessing their pros and cons.

The walls of one shop in which I worked were covered in sayings. One of them declared, "If it looks right — it is right." Another goes back to my early days in an English chairmaking shop where they measured things by "a skeg of the eee." Especially on Chippendale style chairs, if you measured carefully, the left and right sides are not exactly alike — same as your face. But if it looked (skeg) right to the eye (eee), then it was complete. Nevertheless, we make things with the aid of measuring tools, but then again, they all rely on the "eee" to determine right or wrong!

As woodworkers we need to be able to measure four things:

- alignment — straightness
- planar accuracy — twist
- angular accuracy — angles
- linear dimension — length

Of the tools we use for our measurements, only the dimension measures are calibrated so that we can say the measurement is too small or too large and by how much. The rest tell us right or wrong but not by how much. In other words, we rely on our eyes to gauge a given measurement. For instance, if you want to check that an edge is square to a face, you plant a try square on the face of the board and look to see if light is showing through between the edge and the tool. In real terms, that's a lot of leaps of faith:

- is the try square actually square?
- is the face on which you put the stock of the square flat?
- are you holding the square in contact with the face of the board?
- could you actually detect an inaccuracy of a degree or so?

Valid questions all, but how much does it matter? The answer lies in what you are making.

What Are You Making?

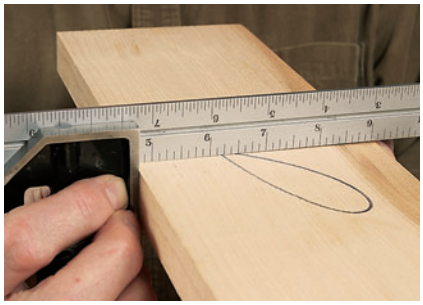
If it's an Adirondack chair nailed together from scrap softwood, as the originals were, you are likely applying a different set of standards than if your goal is a chest of drawers in quartersawn oak. The absence of square edges on the boards of the chair will make little difference to the final outcome. Unsquare edges on the parts of a chest of drawers could be of consequence since unsquare edges are a prelude to inaccurate joints. In any case, it's your decision in the end, and it's your assessment of what is square.

To gauge the planar accuracy of a piece of stock … to see if it is twisted, the author uses winding strips. Winding strips are simple, elegant and dead accurate.

Here's a little game you can play to take another look at a "square edge." Plane a square edge on a piece of flat wood about 5" wide and check it as normal by putting the stock on the 5"-wide face. Once you are satisfied it's right, check it again, but this time put the square on the edge so the blade is going across the face. Chances are, what you were satisfied with as square in the first case is less than square in the second case.

The Family of Measuring Tools

The first measuring tools, like the objects being made, were fashioned by the woodworker for his own use. Now they come from a variety of measuring tool manufacturers. What we need to measure hasn't changed much, but what we use to measure with has changed considerably — in some cases radically. The most important and most used are straightedge, winding strips, and try square.



Any inaccuracy in the squared edge is augmented when the blade is placed across the side instead of the edge.

Straight to the Point – Alignment

To measure straightness you need a straightedge. Given a long plane, you can plane a piece of wood straight that is about three times longer than the plane. To check that the edge is straight, you would make three pieces as you would a butt joint and test them one on the other. The preferred wood for this and most measuring tools was straight-grained Cuban mahogany. It's very stable, dense and easily worked.

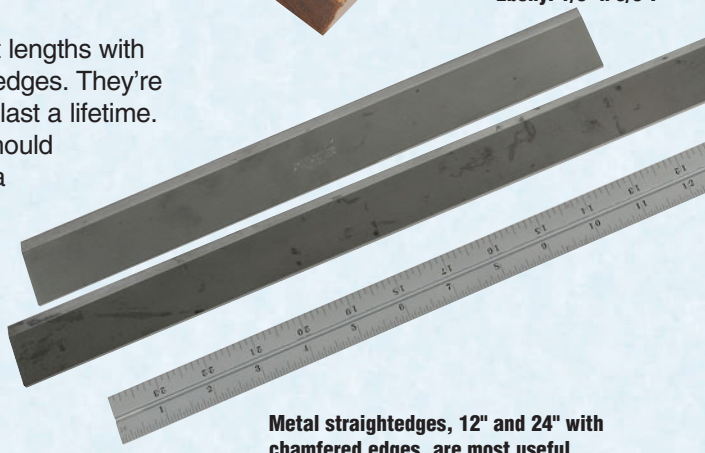
Most woodworkers would make at least two straightedges, one short and one long, to deal with different situations. They were made to the highest standards of design finesse and finish. Elegantly thin in section to keep down the weight — and damage to both tool and workpiece if dropped — they were often made even more workmanlike by the inlay of an ebony edge which would extend the life of the tool and better resist knocks.

Commercial straightedges were slow to arrive in workshops. The woodworking tool manufacturers probably knew they would be in competition with shop-made products, so we don't find Marples or Stanley marketing a wooden straightedge. Instead, we take a leap into the world of metalwork and begin to use steel straightedges that are made by companies making measuring tools for the machinist.

Shop-made straightedge. Mahogany: 3/8" x 2" x 21". Ebony: 1/8" x 5/8".

Types of Straightedges

They come in different lengths with square or chamfered edges. They're not cheap — but they last a lifetime. It's the one tool you should "hand on" in as good a shape as the day you bought it. Don't use it as an edge to cut against because it's too easy to remove a sliver of metal from the straightedge with a misdirected marking knife.



Metal straightedges, 12" and 24" with chamfered edges, are most useful. A 24" rule from your combination square will also do the job.

Checking straightness of the face *side* of a board with a wooden straightedge.

Checking straightness on the face *edge* of a board with a wooden straightedge.

Planar Accuracy – The Long and Short of Winding

Mahogany winding strips: the overall dimensions are 3/8" x 2¼" x 14¼". The maple strip tapers from 7/16" down to 3/16" at the top edge.

Twist is referred to by the woodworker as winding. A board or assembly in winding has its ends twisted in opposite directions. To check for twist, you need a set of winding strips. Winding strips come as a pair of parallel-sided straight pieces of wood of the same dimension. They are not commercially available, so you make your own.

The preferred wood for measuring tools, Cuban mahogany, is long gone, but you could source some by dismantling an old piece of furniture. However, new Honduras mahogany will do fine. The prime stuff is referred to as "pattern maker's grade." If unavailable, any clear, straight-grained, quartersawn and dry material will do the job. Make as many pairs to any dimension that suits your type of working and fuss with inlay to your heart's content. Provided they are made accurately, plain or fancy works equally well. The important thing to realize is that winding strips are the basis of measuring planar accuracy — there is no alternative.

The center marks are essential because, to get a correct reading, you align them as you sight the work.

Check for twist by putting winding strips at each end (at right angles to the board) and align your eyes with the center marks. Half the board may be flat, the other half in twist. Complete the survey by moving the winding strips.

Angular Accuracy — Measuring on the Bias

The measuring tools we use to determine angles fall into three subgroups:

- try squares which measure 90°
- miter squares which measure 45°
- sliding bevels which measure variable angles.

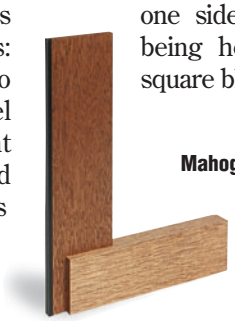
There is more design variety in this group in general and try squares in particular than any of the other measuring tools. Indeed, try square changes reflect a loose history of the changing nature of woodworking. To "try" means to apply a test to determine whether a standard is met, and the standard tested by a try square is 90°.

The tool measures (and assists marking) a right angle in three ways:

In the simplest of terms, it's two pieces of wood with straight parallel edges fastened together at right angles. The part you hold is called the "stock"; the part at right angles to it is called the "blade" — though of course it doesn't cut anything.

Shop-made Try Square

Few of the original shop-made versions of the try square exist, but contemporary drawings and early photographs show them quite clearly. Once the basic design had been settled on — the design that was handed down to us — the shop-made tool had few drawbacks to it. At best it was made as a very elegant slim-bladed tool using boxwood, a dense, stable, yellow wood, now almost logged out. You might imagine that a major difficulty when using an all-wood try square would be the tendency to slice up the blade when knifing a line round a shoulder. The answer was a striking knife, beveled on one side only, the flat side being held against the try square blade.



Mahogany stock and blade fitted with durable ebony edge to mark against. Stock: 5/8 " x 1⅝" x 5⅜". Blade: 3/16" x 2" x 6¼".

Try Squares made by Woodworking Tool Manufacturers: These were a mixture of wood and metal. The wooden stock, which defined it as a woodworker's tool, was fortified on the inside edge with a brass strip — a clear nod to superior aesthetics and quality. The hard blue steel blade, held in place by three studs, clearly stated this was a sound, workmanlike tool built to last. These companies created a family of tools by making miter squares and sliding bevels of the same materials.

The three brass studs in the Marples try square became a symbol of distinction. The diamond-shaped cutouts in the wooden stock were made with the most primitive hand-cranked drill

Try squares (left to right) by Stanley, Marples, and E.C. Emmerich.

To "try" means to apply a test to determine whether a standard is met, and the standard tested by a try square is 90°.

which had a split Dremel-like bit. It revolved in a heavy steel template that had the three diamond-shaped openings in it. I well remember the day I was in the Marples factory in Sheffield and tried my hand with this tool, which I was convinced had descended from an ancient culture. The mess I made with that "simple" tool left Marples short one try square stock for the day's production.

Try Squares by Specialty Tool Makers: The gradual downmarket quality of the big hand tool manufacturers' products has been countered by the emergence of small companies making hand tools, such as Lie-Nielsen and Clifton.

Each tool they make is superior to the versions made by their bigger predecessors. While the tools don't bring increased performance, they are invariably heavier, more precious, more handsome — and more expensive. You might say their market axiom is, "We care more, we give more, we charge more."

A good example is Bridge City Tools, which has been making try squares for more than 20 years. They are an exquisite combination of rosewood, brass and stainless steel. You must decide for yourself whether to preserve their pristine looks or put them to use in the rough and tumble of bench use.

Try square and combination square by Bridge City Tools.

All-Metal Try Square (Engineering Machinist's Square): An all-steel square, shaped the same as wooden ones, is made by an industry that makes tools for metalworkers. Its standard of accuracy is higher than we will ever need as woodworkers.

I always think the economical price makes it a very worthwhile purchase.

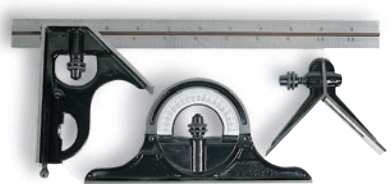
4" and 6" all-metal try squares ... quality at an affordable price.

Combination Square Made By Specialist Measuring Toolmakers For Machinists: This is the traditional standard of machinist's squares. It's been in use for as long as any of us remember. Long ago it spawned cheap knockoffs. It's the first example of woodworkers dipping into the machinist's toolbox.

The design has two features not associated with a try square. First, the blade is graduated so that it works also as a rule. Second, the blade slides.

With these differences come new capabilities, but the difference extends beyond these because the usual 12" blade can be replaced by a 24" or 36" blade. Then again, any of these blades can have a revolving head or a 45° head attached to it instead of the usual 90°. It's these features that make it a "combination square."

I use this as my standard square, not because of the additional useful but minor capabilities it brings and not because of add-ons that make it a combination square, but because of the assurance of knowing that it locks at 90°. That faith derives from the reputation of the maker: in this case, Starrett.



Starrett combination set, available in black crackle finish or black glass finish with hardened parts.

Combination Square from Mass Marketing Companies: These look-alike squares are made to sell at different price points, so their quality of detail varies and their accuracy is suspect. Although they look like the more expensive combination square, the heft and feel tell a different story.

Less expensive versions of combination squares have the features of the more expensive models, but not the quality.

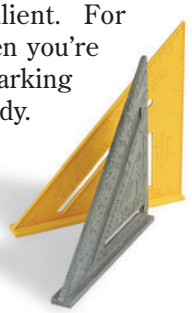
Made by the Specialist Measuring Tool Manufacturers for the Consumer Market: This tool is made by Starrett, so it carries with it all of the confidence we place in that company's product. The popular blade lengths are 4" and 6". The square stock makes it useable from either side, which is an advantage over the "combination" shape stock.

Another square in the woodworker's toolbox.

For me it's like an extension to the wooden try square with clear advantages and no drawbacks. I use both sizes ongoing and greatly enjoy them.

New Polypropylene Square: This is not altogether a try square — you can check an edge with it — but it warrants inclusion.

It's cheap, it's lightweight, it's durable, and it's resilient. For marking out boards when you're harvesting parts or marking out any crosscut, it's handy.



The author is fond of these inexpensive polypropylene squares for marking out boards while harvesting stock.

Try Square Cubed!

As demonstrated by the series of photos below, there are three 90˚ angles that are found on a try square. The inside edges of the stock and blade, the outside edges of those same parts and the inside edge of the stock with the outside edge of the blade.

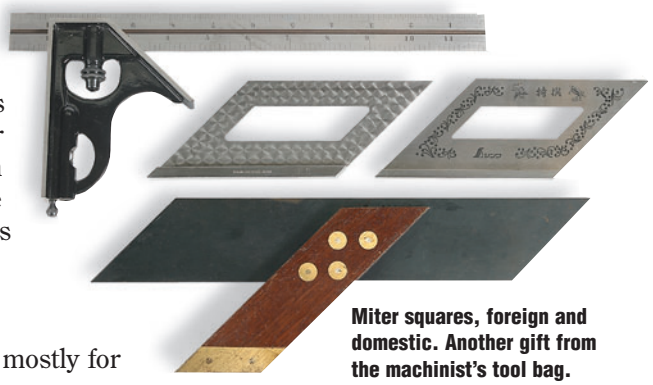
Inside edge of stock and inside edge of blade.

Outside edge of stock and outside edge of blade.

Inside edge of stock and outside edge of blade.

45° Miter Squares

Here we dipped into not only the machinist's toolbox with the miter face on the combination square, but also the Japanese woodworker's tools.



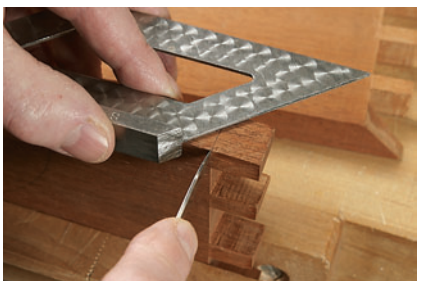
Miter squares, foreign and domestic. Another gift from the machinist's tool bag.

Using a Miter Square

A miter square is used mostly for measuring and marking corner miter joints, which means that it's often only operating over a distance of 3/4" or so. The machinist's square and the wood-and-metal type are good for checking miters because you can offer them to the work like a try square. They are less good for marking out because you have to position the marking knife by deciding where you think the miter will fall by positioning your knife on the top edge — there is no assist.

Although the Japanese miter square is poor for checking miters, it's very good for marking out because of the lip that hooks onto the workpiece. Put the point of your marking knife in the knifeline on the face of the workpiece and hold it at right angles. Slide the miter square up to it and it's accurately positioned to knife the miter line.

You have to position the knife where you think the miter will fall, then slide the square to it. "Sometimes the magic works; sometimes it doesn't." — *Little Big Man*.



Position your marking knife in the line on the face of the workpiece, then slide the miter square to the knife.

Sliding Bevels

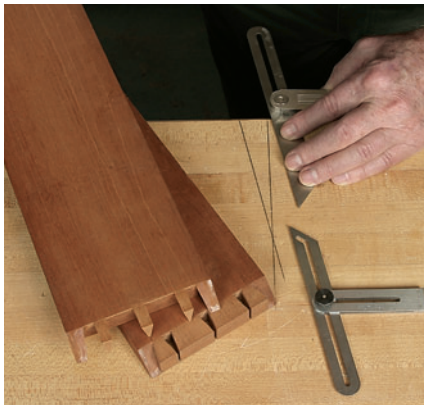
Three types are available. The all-metal model in the middle has a useful feature. The curved end is separated from the straight edge by a small step. This allows you to position the bevel accurately on the odd occasion that you have to work with only a small area to land on with the end of the bevel. I find the locking mechanism mediocre. The tab is uncomfortable to tighten and it doesn't take much pressure to change the setting. The bottom level is the one I use. The knurled lock nut is positive and the tool is beautifully made and finished by Starrett.

Three types of sliding bevels.

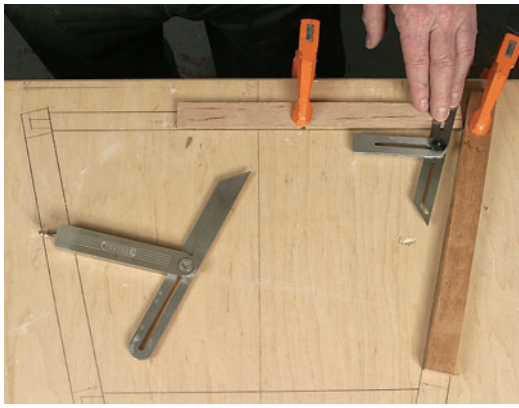
Using a Sliding Bevel

A sliding bevel is set to the required angle from a drawing. We don't know what the angle measures in degrees, and it wouldn't help because the tool isn't graduated. The angle of pins and tails on a dovetail joint is expressed as the slope: the ratio of width to length. In this case, the slope is 1:4⅞.

To set a sliding bevel to mark out a beveled shoulder line on a tenon, you need a full-size working drawing. Clamp a piece of wood in place on top of the drawing and set the bevel to them.



Draw the required slope on the bench and set the sliding bevel to it.



An angled shoulder line on a tenon is made by first setting the bevel to pieces of wood clamped in place on the drawing.

Linear Dimension — The Long and Short of Graduated Scales

The linear dimension family: tapes, rules and calipers.

This is a unique family of measuring tools because they are graduated. Different situations call for the use of different tools. The most common tool is the metal tape. When checking diagonals for square with a tape, take care to fit the tab end exactly the same way in each corner, and don't let the tape bend or kink.

For most bench work in furniture making the 12" and 24" rule are the most useful. It's easy to set gauges to and take positive measurements.

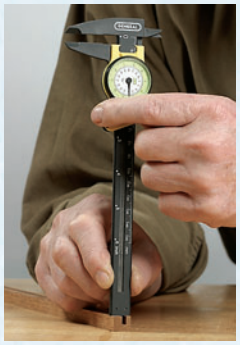
The Vernier caliper, also borrowed from the machinist's toolbox, is offered in metal and plastic. The black plastic model is graduated in 1/64" and is very popular. At about the same price, the metal version is graduated in 1/1000ths of an inch and often used by machinists for some rigorous comparative measurements. The digital model atop its red case, graduated in imperial and metric to three decimal places, is hardly necessary for woodworkers, but it's offered in many catalogs. Go figure.

Checking squareness of an assembly with a tape measure.

Pinch rods are sharpened so they will fit into the corners. Sight and touch make the measurement.

Using Vernier Calipers

The vernier is an excellent gauge for measuring the depth of grooves, stopped holes or stopped mortises. The knife edges on the other side of the main jaws are used to measure the inside dimensions of grooves or tenons. The key to accuracy is to first make firm contact on the workpiece with the fixed jaw.



The author gauging depth with a dial caliper. Linear dimension requires measuring tools with graduated scales.

Use your thumb to firmly press the fixed jaw into full contact with the workpiece.