



Learn How to Weave With

WEAVING TODAY™

Weaving Terms, Warping a Loom, and More



Steps for Warping: Front to Back

1 Make a guide string

Measure a guide string the desired length of the warp plus about 6" for tying the ends of the string to pegs. Tie one end to the starting peg and make a path on the warping board that accommodates the full length of the string with the other end tied to a second peg.

2 Wind the warp

Wind the warp following the guide string with a threading cross at the starting end; see Figure 1.

Choices

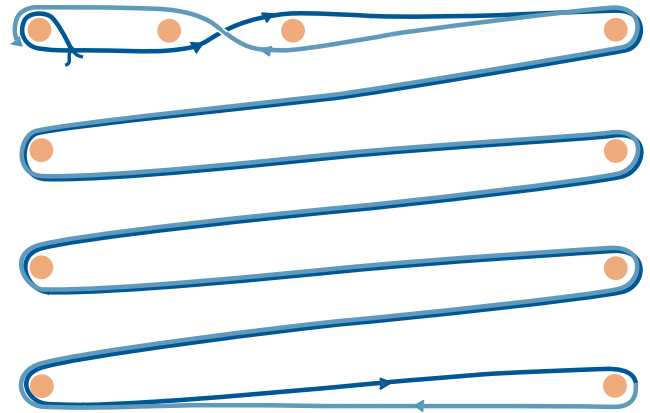
- Wind one end at a time for warps with lots of colors. At color changes, tie the new end to the old end at the first or last peg.
- Wind two ends together for solid-color warps, warps with few color changes, or warps with two alternating colors. Keep a finger between the two threads as you wind to prevent them from twisting around each other.
- Wind a separate warp chain for each color if there are not too many colors (five or six) and if the denting order allows sleaying as in Step 6b.

Tips

- Wind with even but loose tension—the threads should be just tight enough to prevent them from drooping.
- Do not overlap threads on the pegs.
- If the total number of threads or their thickness makes them too crowded on the pegs (covering more than half of each peg when pushed toward the board), wind the warp in two or more equal chains.

3 Count the threads

Count the threads at the cross or at the last peg. If you count on top of one of the cross pegs,



1. Each trip from the first peg to the last peg and then back to the first peg produces two warp threads.

there will be twice as many warp threads as the number you count. This is also true if you count at the last peg, since each loop around that peg is two warp threads. You can keep track of the count by finger-crocheting a cord to enclose a designated number of threads in each loop (ten, say); see Photo 8, page 5. Or you can count only after winding a great many ends, finger-crochet around all of these, write down the number, and repeat.

4 Secure the warp chain

Tie the four arms of the cross as in Figure 2, page 3. (You can instead pass a single thread through the two openings of the cross and tie the ends in a loop. It's harder to find the cross later with this tie than it is with four ties, but it is easier to untie.)

Measure the distance from the breast beam of your loom to about 10" beyond the shafts and tie the first half of a surgeon's knot in the warp at this distance from the starting peg for the choke tie; see Photo 6, page 5.

Make other choke ties (with complete square knots) in the warp only if the threads are very slippery or springy.



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5 Chain the warp

Cut the warp loops at the last peg and chain the warp from the board: Make a loop of the threads and pull another loop through the first loop with one hand. Pull a loop through the new loop with the other hand (see Photo 3, page 4). Continue, pulling loops hand over hand until you reach the peg nearest the half-knotted choke tie. Hang the newest loop on an empty peg. Make the first half of the surgeon's knot in the choke tie extremely tight and then tie the second half. Cut the loop of threads at the starting peg and carry the chain to the reed.

6 Sley the reed

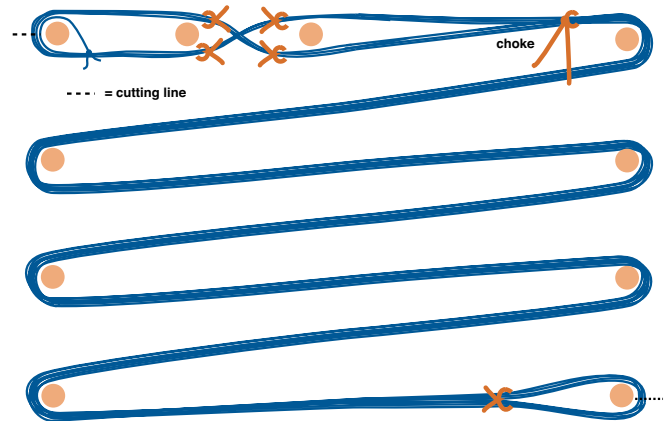
You can sley the reed at the loom (tie the choke tie to the breast beam) or propped in an upright position on a table. To help you center the warp in the reed, mark the center of the reed and measure from the center to each side a distance half the warp width. Then:

a. For warps wound as in Step 2a or 2b, place lease sticks in the cross and remove the cross ties (if you are sleying the reed at the loom, you will have to secure the lease sticks to the sides of the loom between the reed and the breast beam). Sley the reed as required by your draft and remove the lease sticks. If you sleayed the reed at a table, now place the reed in the beater and tie the choke tie to the breast beam.

b. For multiple chains wound as in Step 2c, place lease sticks in the first warp chain and sley these ends following the draft, skipping dents for the other chains. Remove the lease sticks, place them in the second chain, and sley, again leaving spaces for the remaining chains. Repeat until all chains are sleayed. (Tie the choke ties for each chain to the breast beam.)

7 Thread the loom

Remove the lease sticks if they are still in place. Make sure you have enough heddles on each shaft. Divide any extra heddles on each shaft so there will be an equal number on each side of the threaded warp. Sitting behind the shafts, thread



2. Tie the cross, the end, and the first half of the surgeon's knot that will become the choke tie.

the heddles working from right to left if you are right-handed, from left to right if you are left-handed, or from the center to each side. Break the threading into sections of about $\frac{1}{2}$ " of warp width. After threading each section, check the threading and then tie the ends in an overhand knot (see Photo 7, page 5).

Most important! Do not pull any threads out of the choke tie at the breast beam. This knot's purpose is to keep the threads in perfect alignment.

8 Beam the warp

When all the ends are threaded and hang in knotted groups from the heddles, carefully cut the choke tie(s) on the breast beam. Behind the shafts, tie each pair of knotted threads to the apron rod of the warp beam without untying the overhand knots (see Figure 4, page 4). Don't worry about even tension; just make all tails about the same length.

At the front of the loom, divide the warp into halves (from the center of the reed, run your finger between the two halves of the warp all the way down to the chain resting on the floor; do this even if you wound the warp in multiple chains). Then similarly divide the halves into halves until the whole warp is divided into sections of about 2" each from the reed to the



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floor. Pull firmly on each section. Never handle or comb individual threads even if a few look slightly out of place.

*Move the beater to the breast beam. Begin winding the warp on the warp beam, allowing the beater to reach the shafts. When threads become tangled at the reed, go to the front and pull firmly on each section.** Repeat from * to ** until the warp encircles the warp beam and then begin inserting heavy paper at least 2" wider or warping sticks 2" longer than warp width (about 2 per turn) to separate the layers. Keeping the warp divided in sections from the reed to the floor, continue to repeat from * to **, until the warp is wound onto the beam.

Tips

- The warp should go onto the beam at exactly its width in the reed. It will tend to spread out at the edges, causing less density there. Tie two very heavy cords or place two C-clamps around the back beam on each side of the warp. Push them against the warp to make it about $\frac{1}{4}$ " narrower on each side than its width in the reed. The warp will then go onto the warp beam at the correct width and even density.
- The warp must be wound very tightly so that the threads cannot change their tension in relation to each other throughout the weaving. After each full turn of the beam, pull on each of the 2" sections very firmly (wrap the section a

couple of times around a smooth stick and pull on the stick to save the skin on your hands).

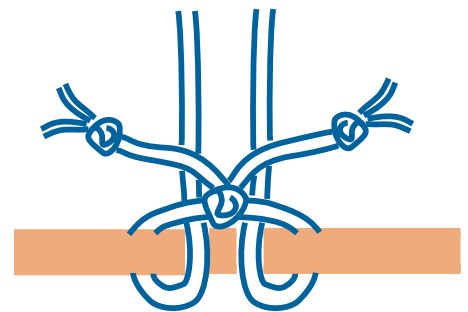
- Maintain the divisions between the warp sections from reed to floor and vary the order in which you pull: from the center out, from right to left, from left to right.
- To clear any tangles, pick up a section of warp near the floor in one hand, pull to apply tension, and then strum the threads with the other hand without allowing them to move in the hand that is holding them.

9 Tie onto the front apron rod

Starting in the center, take two $\frac{1}{4}$ " groups of warp threads, pass them over and around the front apron rod (as with the back apron rod), and tie the first half of a square knot on top. Continue tying groups, working from the center out, alternating sides. When you've tied half knots for all of the groups, tie the second half of each square knot. Very important: Do not make the knots tight. If you do, each succeeding knot, aided by the tension of the others, will be tighter than the previous one. Instead, holding the tails from the first half of the knot, one in each hand, take the two tails toward the reed to eliminate slack, bring them down to snug the knot against the rod (think "snug," not "tight"), and tie the second half of the knot. Notice how this feels and make each knot feel the same way. This will make the tension even on all threads.



3. To chain a warp, make a loop and pull another loop through it. Pull the next loop through with the other hand and continue.



4. To tie the warp onto the back apron rod, pass two warp groups over the rod and tie a square knot on top of the two groups. Leave the original overhand knots in place.



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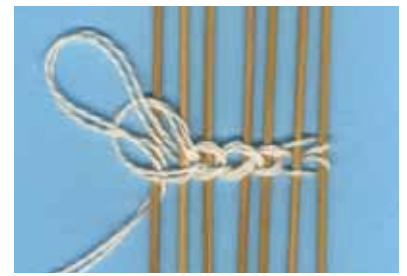
5. To tie a square knot, wrap the right yarn around the left yarn; then wrap the left yarn around the right yarn.



6. To tie a surgeon's knot, wrap the right yarn around the left yarn two times; then wrap the left yarn around the right yarn.

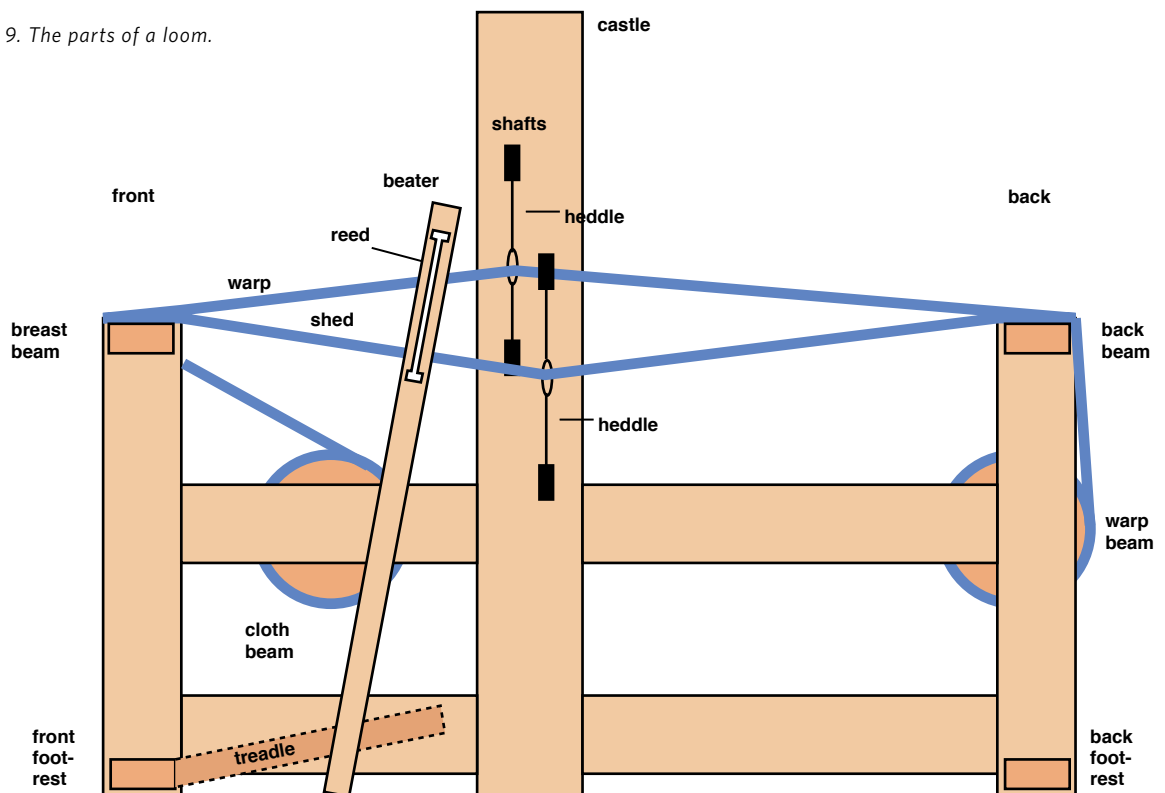


7. To tie an overhand knot, make a loop and put the tail of the yarn through the loop.



8. To finger crochet a counting thread, make a lark's head knot around the first group of threads. Pull a loop of the two-thread tail through the first loop around the second group of threads. With the tail behind each group of threads, pull up successive loops to enclose each group. When the chain is not needed, pulling on the tail will release the chain.

9. The parts of a loom.





Steps for Warping: Back to Front

1 Make a guide string

Measure a guide string the desired length of the warp plus about 6" for tying the ends of the string to pegs. Tie one end to the top left peg and make a path on the warping board that accommodates the full length of the string with the other end tied to a second peg.

2 Wind the warp

Wind the warp following the guide string starting at the bottom peg with the threading cross near the top left peg; see Figure 1. (This makes all warp loops at the top peg continuous for attaching to the warp beam apron rod.)

Choices

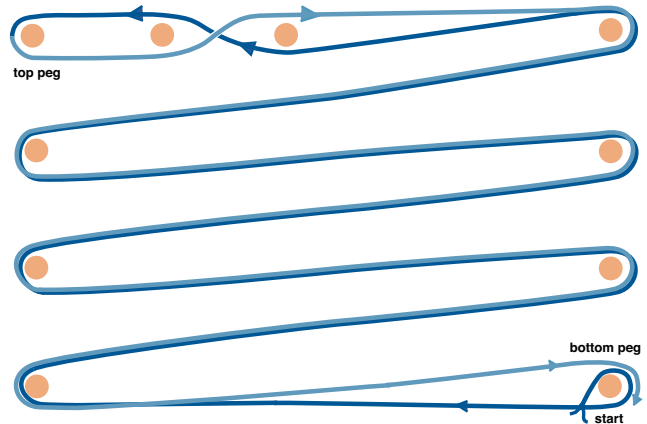
- Wind one end at a time for warps with lots of colors. At color changes, tie the new end to the old end at the first or last peg.
- Wind two ends together for solid-color warps, warps with few color changes, or warps with two alternating colors. Keep a finger between the two threads as you wind to prevent them from twisting around each other.

Tips

- Wind with even but loose tension—the threads should be just tight enough to prevent them from drooping.
- Do not overlap threads on the pegs.
- If the total number of threads or their thickness makes them too crowded on the pegs (covering more than half of each peg when pushed toward the board), wind the warp in two or more equal chains.

3 Count the threads

Count the warp threads at the cross by finger-crocheting a cord around each group of threads that will be placed in one space of the raddle (see Photo 5, page 9).



1. Each trip from the bottom peg to the top peg and then back to the bottom peg produces two warp threads.

4 Secure the warp chain

Tie the four arms of the cross as in Figure 2, page 7. Tie one choke tie (a cord wrapped around the warp and secured with a square knot; see Photo 4, page 9) near the end peg. If the warp threads are very slippery or springy, tie other choke ties along the length of the warp as necessary.

5 Chain the warp

Cut the warp loops at the last peg and chain the warp from the board: Make a loop of the threads and pull another loop through the first loop with one hand. Pull a loop through the new loop with the other hand (see Photo 3, page 8). Continue, pulling loops hand over hand until you reach the cross, and remove the chain from the warping board.

6 Spread the warp in the raddle

Attach the raddle to the back beam. Place lease sticks in the threading cross. Secure the lease sticks to the sides of the loom between the back beam and the shafts (the structure of your loom will determine the best way to do this; the lease sticks should be side by side with a distance



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between them of about 1"). Place a sturdy rod in the uncut end loops near the cross. Attach the rod to the apron rod of the warp beam, sliding the warp to one side (it will rest on one end of the raddle with the counting thread and cross ties still in place). With the heddles pushed to the sides and the reed removed, drape the rest of the warp chain through the castle, over the breast beam, and down to the floor in front of the loom. Tie the warp to the breast beam with a piece of cord to keep the warp in place while you spread it in the raddle. Remove the ties that secured the cross.

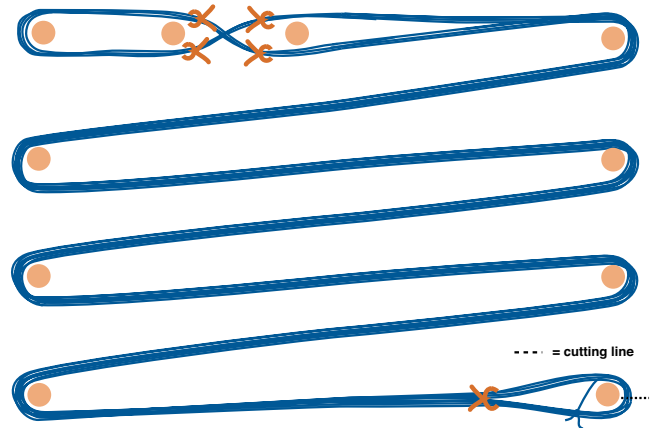
Undoing a stitch at a time in the finger-crocheted counting cord, place the group of threads encircled by each stitch in one space of the raddle, centered for the weaving width required by your project. Secure the warp in the raddle by stretching rubber bands across the pegs. When the warp is completely spread and secured with rubber bands, untie the cord holding the warp at the breast beam.

Tip

If the breast beam and back beam of your loom are about the same height and the length of your lease sticks is close to the width of your loom, here is one way to secure them: Tie two cords on each side of the warp from breast beam to back beam. With the lease sticks parallel to the back beam and resting on the cords, on one side lower one cord and raise the other to make an opening in which to place the end of one lease stick, then reverse the positions of the cords to make an opening for the end of the other lease stick. Repeat with the cords on the other side, securing the other ends of both lease sticks in the same way. The cords will hold the lease sticks conveniently in place for beaming and threading.

Variation

You can sley the raddle at a table instead of at the loom (place lease sticks in the cross, a sturdy rod in the end loops of the warp, and a heavy book on the warp chain to provide tension). When the warp is spaced in the raddle and secured with rubber bands, take the warp, lease sticks, and raddle to the loom, secure the lease sticks behind



2. Tie the four arms of the cross and chain the warp from the warping board beginning at the bottom peg.

the castle, and tie the rod with the end loops to the warp beam apron rod as above.

7 Beam the warp

Divide the warp chain into sections: Run your finger between the two halves of the warp from the breast beam to the the floor. Then divide the halves into halves until the whole warp is divided into sections of about 2" each. Pull firmly on each section to straighten and align the warp threads. (Never handle or comb individual threads.)

Keeping the lease sticks tied in place behind the castle, begin winding the warp onto the warp beam. If threads tangle at the lease sticks, go to the front and pull firmly on each section. When the warp encircles the warp beam, begin inserting heavy paper at least 2" wider or warping sticks 2" longer than warp width to separate the layers. Continue, winding a complete turn and then tightening each section at the front of the loom. Maintain the divisions between the sections and vary the order in which you pull to tighten: from the center out, from right to left, from left to right. Wind and tighten until the cut ends of the warp hang below the lease sticks in a convenient position for threading (long enough to come through the heddles plus about 10").



Steps for Warping: Back to Front

Tips

- As it is beamed, the warp will tend to spread out at the edges. The edge threads will therefore wind on with less density, causing an eventual difference in tension during weaving. To avoid this, tie two very heavy cords or place two C-clamps around the back beam on each side of the warp. Push them against the warp to make it about $\frac{1}{4}$ " narrower on each side than its width in the raddle. The warp will then go onto the warp beam at an even density.
- The warp must be wound very tightly on the warp beam so that the threads cannot change their tension in relation to each other throughout the weaving. To pull firmly on each 2" section and save the skin on your hands, wrap the section a couple of times around a smooth stick and pull on the stick.
- To clear any tangles, pick up a section of warp near the floor in one hand, pull to apply tension, and then strum the threads with the other hand without allowing them to move in the hand that is holding them.

8 Thread the loom

Count the number of heddles required on each shaft for your draft and make sure you have enough. Divide any extra heddles on each shaft so an equal number is placed on each side of the threaded warp. Sitting at the front of the loom,



3. To chain a warp, make a loop and pull another loop through it. Pull the next loop through with the other hand and continue.

thread the heddles following your draft from right to left if you are right-handed, from left to right if you are left-handed, or from the center to each side.

Tip

It is easier to see the warp threads as you thread if the lease sticks are positioned at a slight angle, with the lease stick closest to you below the lease stick beyond it. If you used cords as described in Step 6, place cones of yarn or other objects on the back beam under the cords to raise them at the back.

9 Sley the reed

To help you center the warp in the reed, mark the center of the reed and measure from the center to each side a distance that is half the warp width. Then sley the reed as required by your draft.

10 Tie onto the front apron rod

Starting in the center of the warp, take two $\frac{1}{4}$ " groups of warp threads, pass them over and around the front apron rod (see Figure 6), and tie only the first half of a square knot on top. Continue tying groups, working from the center out, alternating sides. When you've tied half knots for all of the groups, tie the second half of each square knot for each one.

Tips

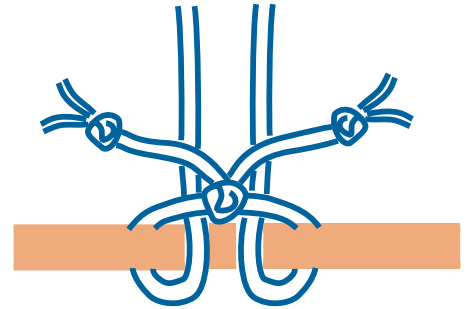
- Very important: Do not make the knots tight. If you do, each succeeding knot, aided by the tension of the others, will be tighter than the previous one. Instead, holding the tails from the first half of the square knot, one tail in each hand, take the two tails toward the reed to eliminate slack, bring them down to snug the knot against the rod (think "snug," not "tight"), and tie the second half of the knot. Notice how this feels, and make each knot feel the same way. This will make the tension even on all threads.
- Tying on in small groups makes it possible to start weaving without needing heavy scrap yarn to spread the warp and aids in providing even warp tension from the start.



Steps for Warping: Back to Front



4. To tie a square knot, wrap the right yarn around the left yarn; then wrap the left yarn around the right yarn.

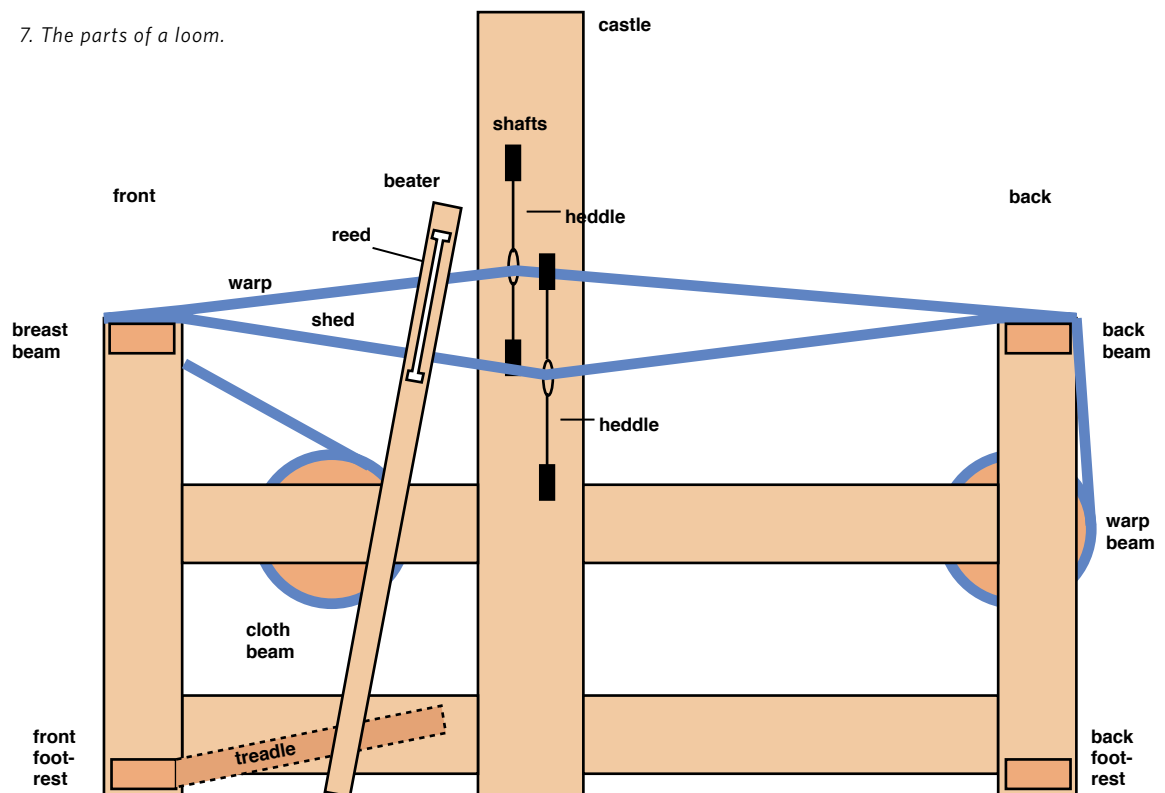


6. To tie the warp onto the front apron rod, pass two warp groups over the rod and tie the first half of a square knot. After all groups are tied, tie the second half of each square knot snug, not tight.



5. Make a lark's head knot around the first group of threads. Pull a loop of the two-thread tail through the first loop around the second group of threads. With the tail behind each group, pull up successive loops to enclose each one. Pull on the tail to release the chain.

7. The parts of a loom.





What Equipment Do I Really Need?

Excerpted from November/December 2004, Page 14

The projects in this issue recommend all sorts of equipment. It's always hard for new weavers to know how to set priorities for what to buy—especially since weaving equipment is expensive. (I don't mean that it costs more than it should, but if you compare the cost of a **loom** with the cost of knitting needles. . . .)

So, what do you really need? Everyone knows you need a loom, but there are many other accessories to consider. You'll want to have at least 100 heddles on each shaft—the wider the warp and the finer the threads, the more **heddles** you'll need.

Your loom probably came with a **reed**. Different projects require different reed sizes, but you can often achieve the suggested setts with other reeds. (*The Weaver's Companion*, Interweave, 2001, pages 14-15, explains how to do this.) To start, it's good to have a 10-dent and a 12-dent reed (and an 8-dent reed if you plan to use thicker yarns).

You won't be able to weave long without a **warping board** (or reel)—doorknobs are not a satisfactory substitute. Choose a warping board with sturdy, thick pegs that are solidly fixed in the frame.

To warp from back to front, you'll need a **raddle**. That's a board with pegs or nails that separate the warp into groups as it's wound on the beam.

A ½" dent raddle is more useful than one with bigger spaces, (See warping Back to Front, pages 6-9). **Lease sticks** are also necessary if you warp from back to front—smooth flat sticks with slightly rounded edges or smooth dowels work well.

You should have at least two **boat shuttles** with a minimum of a dozen **bobbins** and at least two **stick shuttles** (start with a length of about 12"). For faster and more joyful weaving, use a boat shuttle for all yarns thin enough to wind efficiently on a bobbin.

A **bobbin winder** is a must. Electric ones are very nice but not essential. (Put one on your holiday gift list.)

A **loom bench** that can be adjusted to the right height is better than trying to weave from a chair or stool. It's also handy to have the bench space beside you for placing shuttles and scissors.

You'll need an **umbrella swift** if you use yarn that comes in skeins. You can wind a warp on the warping board directly from the swift or you can wind yarn from the swift into a ball. **Ball** and **cone winders** are available, but they do not need to be at the top of your priority list.

Madelyn



Weaving Terms

One of the biggest obstacles to learning about weaving is its terminology. Not only are most weaving words ordinary words that mean something else in regular life (so that you don't know you don't know what a word means), but different sources use the same words for different things—or different words for the same things. To make matters worse, each weaving word can usually only be understood in relation to other weaving words, so that to know one, you really have to know them all. To help clarify this muddle, here are the definitions of some basic words about weaving and weaving equipment.

A **loom** is the frame that holds the warp threads aligned and under tension so that weaving can take place.

The **warp** is all of the threads that are aligned vertically on a loom before weaving begins. A warp end is a single warp thread.

The **weft** is all of the horizontal threads that interlace with the vertically aligned warp. A pick is a single pass of the weft through a shed; a pick is also called a **shot**.

Winding a warp is the process by which all the threads in the warp are measured and aligned in order. Usually this is done by placing each end in a premeasured path on a warping board or warping reel. The order of the ends is maintained by the threading cross.

The threading cross is the "x" formed by alternate warp ends because they each take a different path over and under a pair of pegs on the warping board: over/under for one end and under/over for the alternate end. If the openings created by the pegs are maintained when the warp is removed from the warping board, the crossing of the threads is also maintained and keeps them from shifting their order.

A **warping board** is a square frame with evenly spaced sturdy pegs along the sides of the frame and pegs that can accommodate a cross along the top and the bottom. Warp threads are wound on the board in order and measured by a designated path around the side pegs. Warping boards can accommodate up to 18 yards of warp length.

A **warping reel** can also be used to wind the warp. Some reels are vertical; the reel spins on a vertical axis and the warp is wound around it through a path that goes from the top to the bottom of the reel and back again. Some reels are horizontal; the reel spins on a horizontal axis and the warp is wound around it from one end to the other and back again. Reels can accommodate longer warps than boards and can be faster to use (the longer the warp, the greater the savings in time).

A **swift** is an expandable cage that turns on a center rod to hold a skein of yarn so that it can be wound into a ball or directly onto the warping board. A warping paddle is a device that allows the winding of multiple warp ends in the same pass around a warping board while keeping them separate and aligned and providing a cross of individual ends. One type of paddle is



equipped with two rows of holes that keep the threads separate; the cross is picked by hand at the cross pegs on the warping board. Another type had alternate slots and holes that keep the threads separate and also form a cross of individual ends when the paddle is raised and then lowered at the cross pegs.

A **spool rack** is a frame with thin horizontal metal rods that can support many spools of thread. Multiple ends can be unwound at the same time from the rotating spools to fill a section of a sectional warp beam or to pass through the slots and holes of a warping paddle.

A **cone holder** allows ends from multiple cones to be wound at the same time. A screw eye, hook, or other device directs each thread so it unwinds above its cone without upsetting the cone or becoming tangled with threads from other cones.

A **choke**, or **choke tie**, is a very tight tie made around all of the threads in the warp—usually this is done on the warping board or reel.

Lease sticks are two rods or flat stick longer than the width of the warp. They are placed in the openings of the cross. The cross is maintained in the space between the lease sticks, keeping the threads in order for threading or slewing.

A **raddle** is a board at least as long as the width of the warp with evenly spaced pegs or nails ($\frac{1}{4}$ "–1" apart). Groups of warp ends are placed in each raddle space, and the warp is wound on the warp beam with the raddle secured on the back beam. The width of the warp in the raddle and the number of ends in each space determine the density and width of the warp on the warp beam. (Raddles are used for warping methods in which the warp is wound on the warp beam before being threaded through the heddles.)

A **raddle cross** is formed by groups of warp ends on the opposite end of the warping board or reel from the threading cross (which is formed of individual ends). The number of ends in each group is equal to the number of ends to be placed in each dent of the raddle.

The **heddles** are wires, nylon braid, string, or flat steel rods attached to the shafts. Each heddle has an eye in the center through which a warp end is threaded. (Because of this eye, heddles have sometimes been called needles.)

The **shafts** are the frames that hold the heddles. When a shaft is raised or lowered, all of the warp ends threaded through the heddles on that shaft are raised or lowered. (**Harness** is sometimes used as a synonym for shaft, although originally it was the name for the mounting that holds all of the shafts.)

Each weft pick passes through a **shed**. The shed is the opening made by raised and lowered warp threads.

The **breast beam** is the horizontal crosspiece on the loom directly in front of the weaver. The woven cloth passes over the breast beam on its way to the cloth beam.

The **cloth beam** is the (usually) cylindrical rotating crosspiece of wood (sometimes of metal) at the front of the loom on which the woven cloth is wound.

The **back beam** is the horizontal crosspiece on the back of the loom around which the warp passes on its way to the warp beam.

The **warp beam** is the (usually) cylindrical rotating crosspiece of wood (sometimes of metal) at the back of the loom on which the warp is wound.

Beaming the warp is the process of winding the warp on the warp beam. The layers are usually separated with sturdy paper or warping sticks.



Warping sticks are thin slats of smooth wood about $\frac{1}{8}$ " thick, $\frac{3}{4}$ " wide, and longer than the width of the warp.

Sectional warp beams are warp beams with protruding pegs that separate the beam into sections, usually 1-2" wide each. The warp is wound into each section separately.

When a warp is wound sectionally, it is first threaded in a **tension box** that tensions each thread evenly and spreads the threads to the width of the section.

Apron rods are sturdy wood or metal rods, one of which is attached to the warp beam, the other to the cloth beam, sometimes by cloth aprons, more often by cords. The warp is tied to the apron rod of the warp beam before beaming and to the apron rod of the cloth beam after beaming, threading, and slewing.

Tying on the warp usually refers to the tying of small groups of warp threads to the front apron rod.

The **threading** is the order in which each warp end passes through a heddle on a specific shaft.

The warp threads also go through a **reed**, a steel comb with teeth that space the warp at an even density for the desired width. Reeds are sized by length and by the number of spaces—called **dents**—per inch (i.e., 4, 5, 6, 8, 10, 12, 15, 18, etc.). The reed is placed in the beater and acts to press the weft into the cloth as well as space the warp.

The **beater** is a frame that holds the reed. It is attached to the loom by an upright on each side that pivots to pull the reed through the warp and “beat” the weft in place at the fell of the cloth. The fell is the woven edge of the cloth on the loom where the most recent pick has been inserted.

Slewing the reed is the placing of the warp threads through the dents of the reed. The

number of dents in the reed and the number of warp threads in each dent determine the density—or sett—of the warp.

The warp **sett** is the number of warp ends per inch—usually abbreviated as **epi**. The weft sett is the number of weft picks per inch—usually abbreviated as **ppi**.

A **reed hook** or **sley hook** is a flat piece of metal, wood, or plastic with smooth curves at both ends for pulling threads through the dents of the reed.

Reed holders are wooden supports that keep the reed at a vertical position so it can be sleyed at a table rather than on the loom.

A **threading hook** (or **heddle hook**) is a long slender piece of flat metal with a handle at one end and a tight curve at the other to catch and pull warp threads through the heddles.

The **treadles** are pedals attached to shafts to make them go up and/or down in all of the combinations required by the weave structure.

The **tie-up** shows the shafts that must be raised and/or lowered by each treadle to make each shed required by the weave structure.

The **treadling** (treadling order, treadling sequence) is the order in which the treadles are depressed, i.e., the order in which each shed is made.

The **weave structure** is the order in which warp and weft threads go over and under each other, i.e., the **interlacement**. If they interlace alternately, the weave structure is plain weave.

“Tromp” is an old way of saying “step” on a treadle. **Tromp as writ** means to step on the treadles in the same order as the shafts are threaded (also called “treadle **as drawn in**”). If the shafts are threaded 1-2-3-4; to tromp as writ or treadle as drawn in, you step on the treadles in that same order, 1-2-3-4.



Boat shuttles (which look a bit like boats) are equipped with a central hinged rod on which a **bobbin** (a slender spool) wound with the weft thread is placed. The bobbin rotates as the shuttle is thrown, and the weft is pulled snug at the selvedge by the drag of the unwinding thread against the rotating bobbin.

Stick shuttles are flat pieces of wood that are usually notched at each end so that the weft can be wrapped from end to end around the shuttle. The shuttle must be turned over a time or two as it is brought out of the shed to free weft yarn for the next pick. The turn of the thread at the selvedge must be adjusted manually.

An **end-feed shuttle** has a shaft secured at one end that supports a pirn (like a bobbin but with narrower end). The weft is pulled off the narrow end of the nonrotating pirn and tensioned with an adjustable tensioning device at the nose of the shuttle.

Tabby is used to name a weft that weaves plain weave when there is also another weft, usually heavier, that weaves pattern (as in overshot or summer and winter). Tabby is sometimes used as a synonym for plain weave.



Tie One On: Basics You Need to Know

Actually: Tie more than one on! The two scarves on page 18 are woven on the same threading but on different warps. The second warp was “tied on” to the first, thread by thread.

This might seem like a time-consuming process, but it takes less time than threading from scratch. Moreover, you don’t have to worry about whether or not the threading is correct—you’ve tested that with the previous warp.

There are several reasons to tie on. One is that you ran out of warp before you ran out of ideas. Another is: You want to weave the same thing but in different colors. Especially with a narrow

warp as for these scarves, tying on for many different-colored pieces is fun and rewarding.

Here are easy steps for tying a new warp to an old one.

Wind the new warp

Wind the new warp with the same number of ends as the old one. It’s a good idea to check these numbers carefully. If you are missing ends or have extra ones after you’ve tied on, you’ll know something is wrong somewhere, and you can correct it. Tie a choke tie about 20” from the cross end of the warp (Photo a).



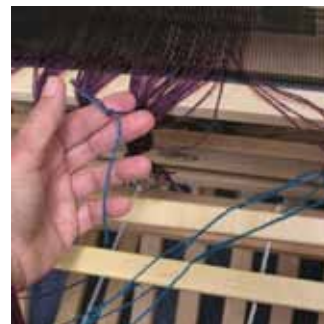
a. Tie a choke tie



b. Place lease sticks in the cross



c. Bring ends together



d. Tie an overhand knot



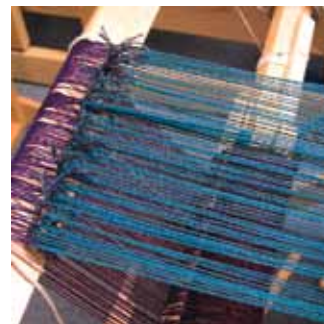
e. Repeat with all warp threads



f. Shake the knots through the reed



g. Move the knots to the heddles



h. Beam the warp



Take the new warp to the loom

Cut the loops of warp at both end pegs and take the warp to the loom. Place lease sticks in the cross and secure them to the loom so that you have easy access to the ends of both warps (Photo b).

Tie the ends together

Starting at the right if you are right-handed or the left if you are left-handed, take the first end from each warp and bring the two ends together (Photo c). I usually pick up the old end in my left hand and bring the new end to it with my right hand. Then tie the two ends together in an overhand knot (Photo d). Determine a length of knot tails that you intend to keep relatively consistent, mine are usually about 1" long. Continue, tying each knot so tails are about the same length (but not worrying compulsively). Listen to music or a book on tape and enjoy the process; no thought is necessary.

Take knots through reed and heddles

When all the knots are tied (Photo e), remove the lease sticks. Pick up the warp chain at the choke tie and pull firmly; all the knots will straighten up like good soldiers. Remove the choke tie and turn the beam so that the knots are about 1" from the reed. Then pick the warp threads up in groups (about 1" worth) and move them up and down to jiggle the knots through the reed. Do this in the middle of the reed where the teeth are most flexible (Photo f). When the knots are all through the reed (Photo g), turn the beam so that the knots move to about 1" in front of the heddles. Then jiggle them through the heddles the same way as through the reed.

Beam the warp

When the knots are all through the heddles, continue winding (Photo h). The old warp will wind around the warp beam until the knots arrive and the new warp begins winding on. Pack the layers as the warp winds around the beam just as you always do. If you use heavy smooth paper or sticks, the knots should not cause any irregularities. When the ends of the new warp reach the reed, tie on the warp as usual to the front apron rod, and you're ready to go!

Some tips

An overhand knot is probably the easiest and most secure knot to use for tying on. It is also bulky. Be sure that the dents of your reed can accommodate the knot before you start tying. A 15-dent reed, for example, will not accept knots made by tying together two ends of Harrisville Shetland.

A weaver's knot is just as secure but less bulky. This knot is well worth learning to use, but it is much easier to learn if someone shows it to you than by trying to follow a diagram.

If you finishing tying the knots and you have an end from the new warp left over, go back and look carefully for any ends of the old warp that you might not have tied. You don't want to add a thread after the warp is beamed and look at it dangling off the back beam for the length of the new warp!



Fulled Wool Scarves

Multiple Projects on the same Threading

Madelyn van der Hoogt

Choose from a fabulous array of colors and make lots of scarves for quick and easy holiday gifts. Change weft colors for different looks on the same warp—or change the colors of the warp, too! Simply tie a new warp onto the one you’ve just finished. The setts of both the warp and the weft in this project are very open to allow maximum fulling to take place during wet finishing. The result is a wonderfully soft, thick, cuddly, warm, winter scarf.

These two scarves were woven on different warps, both of Harrisville Shetland, one in Garnet, the other in Peacock. Both yarns are somewhat “heathered” (flecks of other colors are spun into the yarn), a quality that makes them work well with a variety of weft colors. You can choose to weave many scarves on one very long warp or even tie on new warps to change scarf

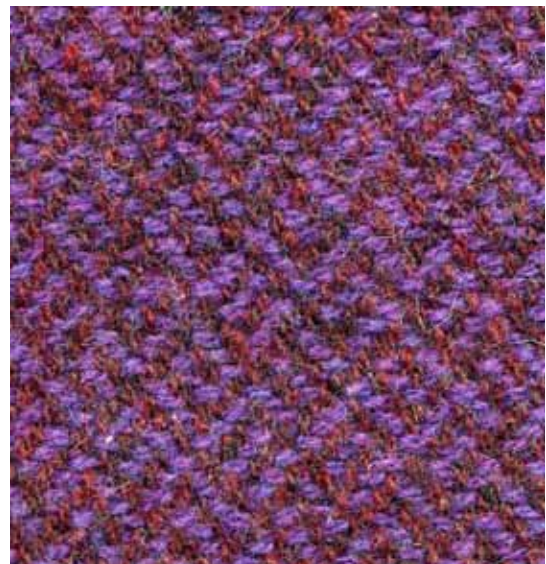
colors completely. Whatever you choose, you’ll find the weaving easy and fun.

Tying on warps

You might think it would be a time-consuming process to tie a new warp to an old one, thread by thread. There are only eighty-two threads in this warp, however, so it takes very little time—much less than



a. A Garnet warp works well with many different weft colors, each producing a unique overall color effect.



b. A weft color close in hue to the warp color makes the design more subtle but gives a rich blend of the two colors.



it would take to sley and thread anew. For complete steps and photos of the process of tying on a new warp, see Beginner's Corner, *Handwoven*, November/December 2007, pages 14-15.

The basic process is first to wind the new warp with the same number of ends as the one you will tie it to. Check the number carefully. If at the end of tying on you have any ends left over, you will know you've missed some and can correct your error. Cut the loops at the ends of the new warp and remove it from the warping board. Place lease sticks in the cross and secure them in front of the reed.

Then, taking the first end of the old warp and the first end of the new warp on one side (right side if you are right handed, left side if you are left-handed), tie them together in an overhand knot. Repeat with the next end from each warp and continue until all ends are tied. The knots do not have to be exactly at the same point for every tie. Especially with wool, small tension differences between the threads are not a problem.

When the knots are all tied, remove the lease sticks and grab the new warp at a distance from the knots where the chain is undisturbed and pull tightly to straighten all the ends. Begin turning the warp beam until the knots reach the reed. Grab the warp in small groups behind the reed and jiggle the knots through the reed. Turn the crank again until the knots reach the heddles, and jiggle them in groups through the heddles. After this point, you can wind the warp on as usual.

Fulling Shetland yarns

Shetland yarns feel a bit stiff on the cone. The spinning oils that cause this stiffness make the yarns easy to use for weaving, adding strength and preventing stickiness. Washing the finished pieces removes the oils so that the yarns bloom beautifully, becoming soft, fuzzy, and very lofty.



WEAVING TODAY™

1 Wind a warp of 84 ends Garnet (or other color) 5 yd long. Use your preferred method to warp the loom following Figure 1 and the directions in the Project at-a-Glance.

2 Allowing 6" for fringe including the amount used to tie on, weave the first scarf for 65" following Figure 1 in a selected weft color. I found it easiest to remember the treadling if I divided it into two parts: 5-1-4-3-2-1; and then 5-3-6-1-2-3. I stopped only at the end of one of these sets and could keep track of which one by checking to see if the last pick was a 1 or a 3. Because the fabric is very open (in order for fulling to be sufficiently effective), it is hard to recognize mistakes in the woven cloth. Take care to unweave if you suspect an error; it will show up when the fabric is full. Weave the second

scarf using a different weft color and allow 12" between scarves for fringe.

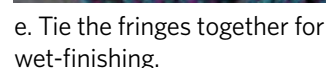
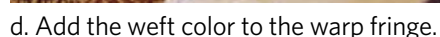
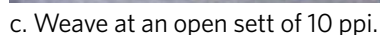
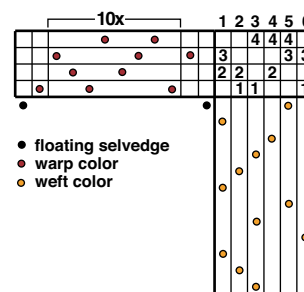
3

Remove the fabric from the loom and cut scarves apart allowing 6" for fringe at each end of each scarf. Prepare a twisted fringe: For the same mix of colors as in the scarf, to each group of 6 warp ends, add 4 strands of the weft yarn (thread 1 strand in a needle with a needle-threader and take the doubled strand through the cloth at the edge). Twist the warp group first to secure the weft at the edge, twist the added group in the same direction, and then twist the two together in the opposite direction and secure with an overhand knot.

4 Tie a new warp to the old one following the directions in Tie One On, pages 15-16, to weave more scarves.

5 To wash scarves: To ensure regular fulling along the length of the scarf, tie the fringes of each scarf together at the ends (I used a strand of the the yarn and tied it around overhand knots to join). Machine wash, cold water, with a small amount of Orvus Paste. After 4-minute agitation, check degree of fulling every minute. When scarf width is about 6", remove and rinse by hand. Roll in towels to squeeze out excess water. Lay flat to dry. Trim fringe to 3-4".

1. Draft for scarves





Project at a Glance

Weave structure for scarves

Plaited twill.

Equipment

4-shaft loom, 9" weaving width; 10-dent reed; 1 shuttle; tapestry needle; threader.

Yarns

Warp: 2-ply wool (1,800 yd/lb), 420 yd (3¾ oz), Garnet for scarf at right on page 18, Peacock for scarf at left.

Weft: 2-ply wool (1,800 yd/lb), 167 yd (1½ oz) each scarf, Gold for scarf at right on page 20, Plum for scarf at left.

Yarn sources

Harrisville Shetland by Harrisville Designs is available from most weaving retailers. (See colors at www.harrisville.com.)

Warp order and length

84 ends (includes 2 floating selvages) 5 yd long (allows 6" for take-up, 42" for loom waste; loom waste includes fringe). Allow 80" for each additional scarf.

Warp and weft spacing

Warp: 10 epi (1/dent in a 10-dent reed).

Width in the reed: 8⅔".

Weft: 10 ppi. Woven length (measured under tension on the loom): 65" per scarf; allow 12" for fringe between scarves.

Finished dimensions

Amounts produce two scarves 6" x 58" each with 3½" fringe on both ends.

A Weaver's Guide to Yarn

Wool

20/2 wool
5,600 yd/lb; 20, 24, 30

18/2 wool
5,040 yd/lb; 20, 24, 30

12/2 wool
2,980 yd/lb; 12, 15, 20

2-ply Shetland wool
1,800 yd/lb; 12, 15, 20

3-ply fingering-weight wool
2,800 yd/lb; 15, 18, 20

100% 2-ply spelsau wool
1,245 yd/lb; 10, 12, 15

8/3 wool
1,490 yd/lb; 10, 12, 15

Build your stash! Take this guide to your local yarn store to help you choose new yarns to love plus identify weavers' all-time favorites.

Yarn samples shown here are **Handwoven Editors' choice**—the yarns we love to use!

Linen

8/1 linen
2,400 yd/lb; 15, 20, 24

tow linen singles
4,300 yd/lb; 20, 24, 28

16/2 linen
2,400 yd/lb; 15, 20, 24

20/1 linen
6,000 yd/lb; 24, 30, 36

14/2 linen
2,100 yd/lb; 12, 16, 20

10/2 linen
1,600 yd/lb; 10, 15, 18

8/3 linen
800 yd/lb; 8, 10, 12

8/4 linen
600 yd/lb; 8, 10, 12

8/5 linen
480 yd/lb; 6, 8, 10

Silk

30/2 silk, 7,850 yd/lb; 24, 32, 40

20/2 silk, 5,000 yd/lb; 20, 25, 30

2-ply silk, 1,725 yd/lb; 12, 15, 18

Cotton

20/2 cotton, 8,400 yd/lb
30, 36, 48

16/2 cotton, 6,720 yd/lb; 24, 30, 36

10/2 pearl cotton, 4,200 yd/lb; 20, 24, 28

10/4 cotton, 2,100 yd/lb; 12, 15, 18

5/2 pearl cotton, 2,100 yd/lb; 12, 16, 18

3/2 pearl cotton, 1,260 yd/lb; 10, 12, 15

Blends

14/2 alpaca/silk
80% alpaca, 20% silk
3,472 yd/lb; 18, 20, 24

22/2 nialin
60% cotton, 40% linen
2,740 yd/lb; 15, 20, 24

22/2 cottolin
60% cotton, 40% linen
3,000 yd/lb; 15, 20, 24

18/2 wool/ silk
50% wool, 50% silk
5,040 yd/lb; 20, 24, 30

10/2 merino/Tencel
50% merino, 50% Tencel
2,800 yd/lb; 12, 15, 18

75% yak, 25% bamboo
1,440 yd/lb; 8, 10, 12

Numbers after yd/lb indicate ends per inch (open for lace, medium for plain weave, close for twill). These will vary according to desired fabric hand.

Rayon

Tencel

Bamboo

10/2 rayon, 4,200 yd/lb; 20, 24, 28

10/2 bamboo, 4,200 yd/lb; 20, 24, 30

5/2 Tencel, 2,100 yd/lb; 12, 16, 18

5/2 bamboo, 2,100 yd/lb; 12, 15, 18

rayon chenille, 1,450 yd/lb; 12, 15, 18

A Weaver's Guide to Yarn

Using wraps to determine sett

Wind the yarn around a ruler for one inch. Wind firmly and evenly without stretching; don't overlap and don't leave spaces. Count the number of wraps.



Balanced plain weave wraps per inch $\div 2 =$ epi

Warp-faced plain weave wraps per inch $\times 2 =$ epi

Weft-faced plain weave wraps per inch $\div 3 =$ epi

Balanced 2/2 twill wraps per inch $\times \frac{2}{3} =$ epi



To mix yarns, wrap the ruler with each yarn in the proportion it will appear in the cloth. Wind more than one inch and divide by the number of inches you wind for an average of all the yarns.

Reed chart

Order of sley in the reed	6	8	10	12	15	20
0-0-1	2	3	3	4	5	7
0-1	3	4	5	6	7½	10
0-1-1	4	5	7	8	10	13
0-1-1-1	4½	6	7½	9	11½	15
1	6	8	10	12	15	20
1-1-1-2	7½	10	12½	15	19	25
1-1-2	8	11	13	16	20	27
1-2	9	12	15	18	22½	30
1-2-2	10	13	17	20	25	33
1-2-2-2	10½	14	17½	21	26	35
2	21	16	20	24	30	40
2-2-2-3	13½	18	22½	27	34	45
2-2-3	14	19	23	28	35	47
2-3	15	20	25	30	37½	50
2-3-3	16	21	27	32	40	53
2-3-3-3	16½	22	27½	33	41	55
3	18	24	30	36	45	60
3-3-3-4	19½	26	32½	39	49	65
3-3-4	20	27	33	40	50	67
3-4	21	28	35	42	52½	70
3-4-4	22	29	37	44	55	73
4	24	32	40	48	60	80
4-4-5	26	35	43	52	65	87
4-5-5	28	37	47	56	70	93
5	30	40	50	60	75	100

Sett (ends per inch)

Conversions

Measurements (rounded off)

Linear

1 in	= 2.54 cm
1 ft	= 30.5 cm
1 yd	= .91 m
10 cm	= 4 in
1 m	= 39 in, 1.09 yd
100 cm	= 1 m

Weight

1 oz	= 28.4 gm
1 lb	= 454 gm
1 g	= .035 oz
50 g	= 1.75 oz, .11 lb
100 g	= 3.5 oz, .22 lb
500 g	= 17.6 oz, 1.1 lb
1,000 g	= 2.2 lb, 1 kilo

To convert knitting-yarn skeins to yd/lb

m/50 g
multiply by 8.3 to get m/lb
multiply by 9.14 to get yd/lb

m/100 g
multiply by 4.15 to get m/lb
multiply by 4.57 to get yd/lb

m/250 g
multiply by 1.66 to get m/lb
multiply by 1.83 to get yd/lb

Knitting-yarn directory

Superfine (laceweight)

	wpi	yd/lb	plain-weave sett
wool	30-40	5,000-6,000	18-28
cotton	25-68	2,000-8,000	15-40
linen	28-54	2,100-4,200	14-30
silk	30-100	2,800-17,000	15-65
bamboo, Tencel, etc.	30-84	3,360-12,600	15-48

fine (fingering or sportweight)

	wpi	yd/lb	plain-weave sett
wool	14-22	1,500-2,800	8-14
cotton	15-24	1,000-2,000	8-12
sock	18-20	about 2,000	8-15
silk	14-22	1,100-2,000	8-12

DK (double knitting)

	wpi	yd/lb	plain-weave sett
wool	11-16	900-1,500	6-8
blends	15-16	1,000-1,250	8-10
silk	14	1,500	8-10
bamboo, Tencel, etc.	12-22	1,000	10-12

medium (worsted)

	wpi	yd/lb	plain-weave sett
wool	10-12	640-1,000	6-8
wl/blends	10-13	800-1,200	4-8
cotton	10-13	630-900	5-8
cot blends	12-16	840-1,000	7-9
alpaca, angora blends, etc.	12-18	1,200-2,200	6-8

bulky

	wpi	yd/lb	plain-weave sett
wool	6-10	250	4-6
wl/blends	6-10	280-800	4-6
alpaca	7-8	490-600	4-6

super bulky

	wpi	yd/lb	plain-weave sett
wool and wl/blends	4-7	260-420	4

Determining yardage

Count system There are several methods for designating yarn size from which yardage per standard weight can be derived. The system most used for spun yarns is the *count* system. It is based on the number of yards in a pound of a single standard strand. Size 1 is the lowest count. Here are the yardages for size 1 of some common fibers:

Cotton, spun silk	840
Linen, hemp, jute, ramie	300
Woolen	256
Worsted	560

To find the yardage of a yarn of a higher count than size 1 (finer), multiply the count times the yardage of size 1. For a size 20 (20/1) cotton: $840 \times 20 = 16,800$ yd/lb

To find the yardage of a plied yarn, multiply the count times the yardage of size 1 and divide by the number of plies. For example, for 20/2 cotton: 840×20 divided by 2 = 8,400 yd/lb.