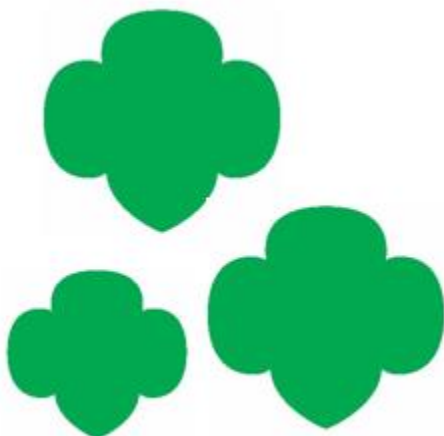




LASHING MANUAL

2016



INTRODUCTION TO LASHING

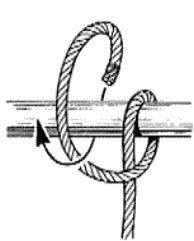
DEFINITION OF LASHING: Lashing is a method used to join together poles (or 'spars' as they are often called) with rope to build camp projects like wash stands, tables, and even a camp shower!

Knowing how to attach two pieces of wood together securely and at the proper angle gives you a real advantage in the outdoors. Lashing is a wonderful skill because it is creative, builds teamwork, and provides great satisfaction after the completion of a sturdy and useful lashing project.

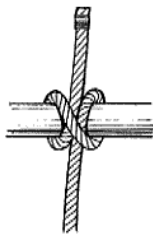
HISTORY OF LASHING: Lashing has been around for a long time. Early lashing probably involved *wrapping* a few strips of bark around branches to make a shelter, or using vines to attach a stone to a branch to make an ax. In modern times, the same methods are used, but strips of bark and vines have been replaced with natural and synthetic fiber ropes. We no longer cut or collect branches from the wild.

'Pioneering' is the art of making structures by using lashing. If you are searching the internet for project ideas try using "pioneering projects" as a search term.

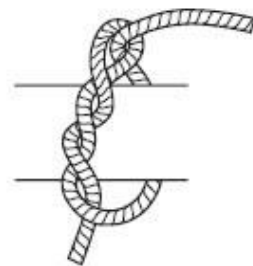
KNOTS NEEDED TO LASH: Basic knot skills are essential in order to build a sturdy structure. The *clove hitch*, the *square knot* (aka: reef knot) are the two knots you must know and be consistent at tying well. Practice these knots until you know them upside down and backwards. Some styles of lashing can use the timber hitch as an alternative to starting a lashing.



Clove Hitch



Square Knot



Timber Hitch

Try it! You'll like it!



INTRODUCTION TO LASHING (cont.)

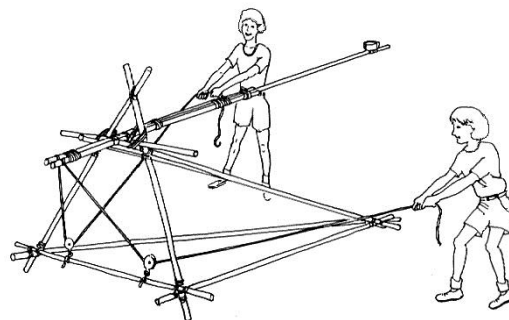
LASHING TYPES:

There are several methods of lashing poles together; each method has a specific application to build the strongest project. Most projects will utilize several of these methods. The types include:

- **SQUARE LASHING:** This is the most commonly used lashing method. It is used to attach two poles to one another at a 90° angle or very close to that. This form of lashing will keep the two poles from sliding over each other.
- **TRIPOD LASHING:** This type is used to bring together three poles to form a tripod. This same kind of lashing can be used for four poles to make a quadpod which is more stable.
- **DIAGONAL LASHING:** This type of lashing is used where the poles are at an angle other than 90° and where the poles have to be pulled together or when they tend to spring apart from each other. An example is the cross-brace of a framework.
- **SHEER LASHING:** This method is used to join two poles together to form a scissor shape often used for table legs (sheer legs).
- **ROUND LASHING:** This method is used to join two poles to make a longer length, for example when making a flagpole.
- **CONTINUOUS LASHING:** This method is used to join flat planks (*lath*) or small poles onto a horizontal surface. This is the last step in building a table top or chair seat.

STRONG versus WRONG: Since lashing has been around for so long and is practiced in every country on the planet, there are many different ways to lash. Keep in mind that NO one way is the ONLY way – rather judge your technique based on how strong or secure it is and how neat the lashing looks. Keep trying different standard ways until you find a method that works best for you and your project.

This trebuchet shows 5 types of lashing: Sheer, Round, Square, Tripod, and Diagonal.



The Possibilities are Endless!

GETTING STARTED

MATERIAL NEEDED FOR LASHING:

Poles: As mentioned earlier, harvesting wood from the wilderness does not align with the Girl Scout principles of protecting our natural environment. Therefore, wood used in lashing projects will need to be obtained from lumber or gardening stores.

- *Pine* poles are easy to find milled at lumber yards. They are available in a variety of thicknesses (diameter) and lengths.
- *Tree or gardening stakes* can be obtained from gardening centers. They come in a variety of lengths and diameters. Make sure they are sturdy enough.
- *Bamboo* is light weight and inexpensive. It can handle vertical stress. However, it has a tendency to splinter, has a slick surface and does not have great horizontal strength. Ending with square knots is highly recommended due to the slick surface.
- *PVC pipe* is lightweight but is NOT recommended because it is too slick.

Keep in mind that materials may be found from recycled sources – like an old broom handle or closet pole. For a typical camp project poles usually vary in length from 2-10 feet. Depending on the strength needed, the diameter of the poles generally ranges from $\frac{3}{4}$ " to 3 inches.

Rope: The size and length of the rope you need are among the first questions you have to answer. Braided rope from $\frac{1}{8}$ to $\frac{3}{16}$ inches in diameter is recommended and can be purchased inexpensively. To determine the length of rope needed for each lashing, add the diameters (in inches) of the two poles at the point the lashing is being made. For example, if one pole is $\frac{3}{4}$ inches in diameter and the other is 2 inches in diameter, the total equals 2.75 inches. Multiply this total by 3 to calculate the length of the rope (in feet) needed ($2.75 \times 3 = 8.25$ feet or 8 feet plus 3 inches). The thicker the rope you use, the longer it needs to be.

It is better to err on the long side when making lengths of rope. Excess rope can usually be used for additional *wraps* and *fraps* or it can be wound around the pole. However, if your rope is too short, you may connect two lengths of rope using a square knot. For safety, don't leave the lashing short; always have a minimum of 3 *wraps* and 3 *fraps*.

Note: Many Service Units have lashing supplies in their equipment stores. Check to see if you can borrow materials as opposed to purchasing them.

HOW TO BEGIN TEACHING:

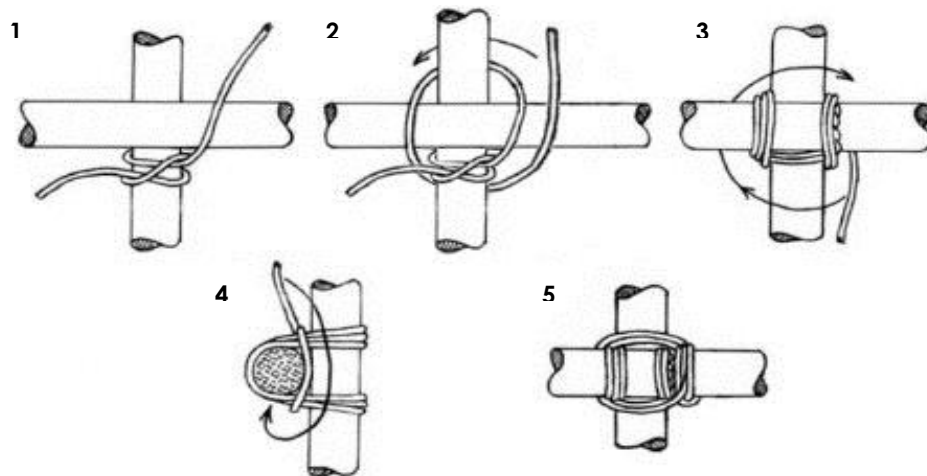
Being competent in tying square and clove hitch knots is the first step. As an introduction to lashing, miniature scaled projects can be taught/built using short (~1.5 ft.) dowels and smaller diameter rope. Begin by teaching the square and tripod lashing methods; these are the two most functional types. Focus on neatness of the *wraps* and *fraps*, not speed. Girls can work on a table or the floor in pairs. Teach one type of lashing at a time, allowing them to feel confident before moving to the next type.

METHOD - SQUARE LASHING

SQUARE LASHING: This is the most commonly used lashing method. It is used where the poles will try to slide over each other and are at 90° or very close to that.

Learn how to square lash:

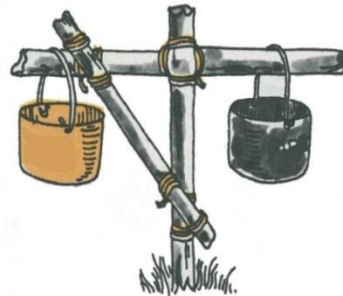
1. Begin with a clove hitch underneath the pole to be supported (figure 1). Leave enough of a tail (*standing end*) to tie a square knot when lashing is complete. Alternatively, end with a clove hitch as shown in Figure 5.
2. Position the horizontal pole above the clove hitch.
3. *Wrap* the rope up over the horizontal pole, then across behind the vertical pole, pulling tight all the time (figure 2).
4. Next bring the rope down over the horizontal pole then across behind the vertical pole. This finishes one complete *wrap* (figure 2). Continue *wrapping* in the same way making sure your rope sits on the outside of the previous *wrap*. The *wraps* should not overlap so the rope won't slip and loosen the lashing. All *wraps* should be neat, even, and tight.
5. After 3-4 *wraps*, next *frap* ~3 times. *Frapping* is when you wind the rope between the poles, pulling tightly each time you go around. This tightens the rope *turns* already made even tighter, preventing the poles from moving (figure 3 & 4).
6. Finish off with a square knot using the *standing end* or with a clove hitch (figure 5).



Example Project: Fire Bucket Holder

Here are the suggested materials:

- one 4-foot x 2-inches *stake*
- two 2-foot x 1-inches straight poles
- Three 9-foot x ~5/32" diameter lashing ropes

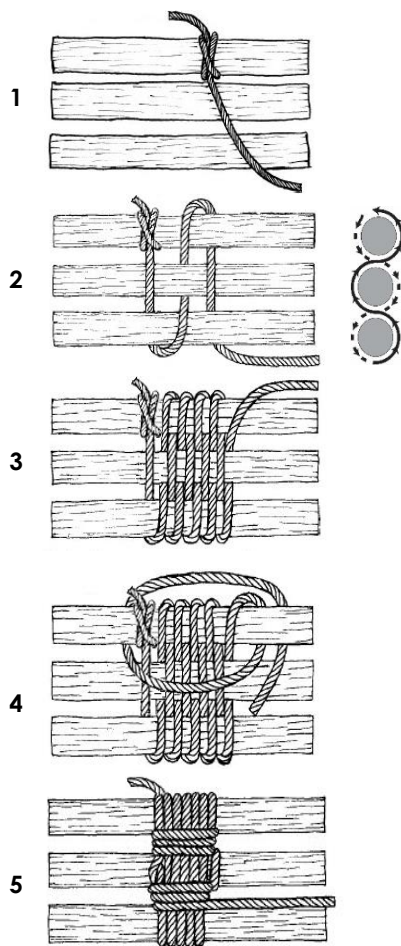


METHOD - TRIPOD LASHING

TRIPOD LASHING (AKA: *Figure of Eight lashing*): This method is used to bring together three poles to form a tripod. There are several ways to lash a tripod. Below is the most common and effective method.

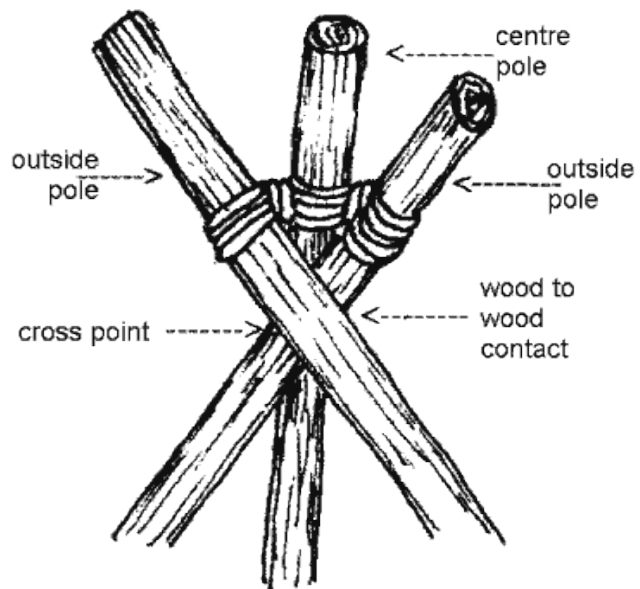
Learn how to tripod lash:

1. Lay 3 poles side-by-side. If poles vary in length be sure to have the *butt ends* aligned.
2. Start with a clove hitch on one of the outside poles. (figure 1)
3. Continue with 4-6 *turns* over and under the poles not too tightly; in a figure of eight pattern. (figure 2 & 3)
4. Make ~3 *frapping turns* between each pole. (figure 4 & 5)
5. Finish with a square knot using the *standing end* of the original clove hitch.
6. Alternatively, some end the lashing with a clove hitch instead of a square knot.



Setting up a tripod:

Cross the outside poles so that the cross point is under the center pole. This evenly distributes the load via the wood-to-wood contact.



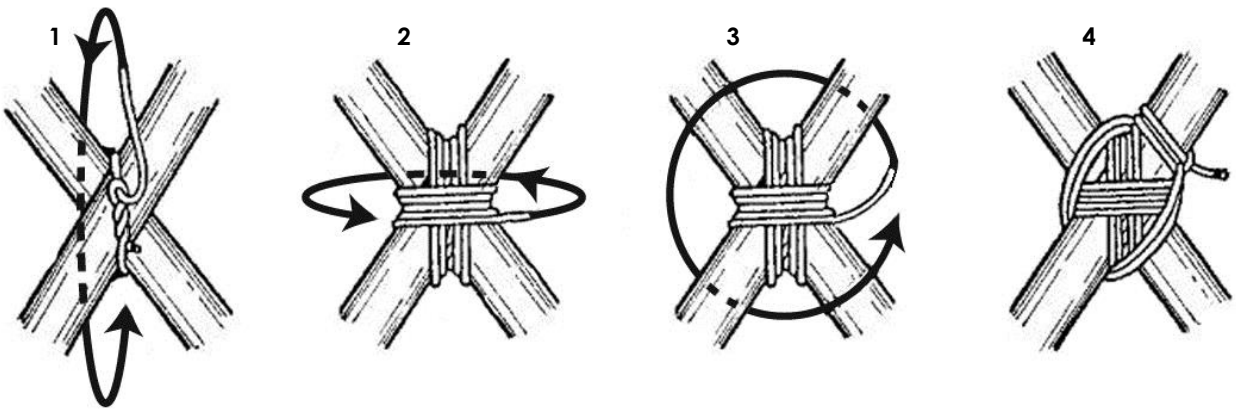
NOTE: Tripod lashing that is too tight or has too many wraps may either prevent the tripod from being formed or may overload the rope. In this respect tripod lashing differs from other lashings: it is possible to make it too tight! On occasion, trial and error may be required to obtain the correct tension.

METHOD - DIAGONAL LASHING

DIAGONAL LASHING: This method is used where the poles have to be pulled together or when they tend to spring apart from each other for example in the cross-brace of a framework. Often the two poles form an “X” and prevent a project from *racking*. Diagonal lashing should also be used when the angle which the poles are placed is other than 90°.

Learn how to diagonal lash:

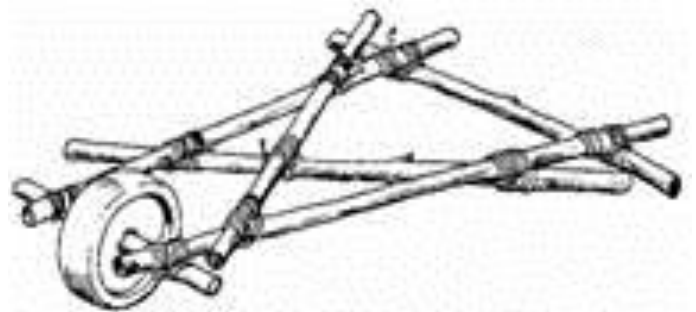
- Begin with a timber (figure 1) or clove hitch around both poles to draw the poles together.
- Wrap 3-4 *turns* around the two poles in one axis (figure 1).
- Next make 3-4 *turns*, this time over the center hitch (figure 2).
- Tighten the *turns* by applying ~3 *frapping turns* between the poles, pulling each *turn* tightly (figure 3).
- Finish with a clove hitch (figure 4).
- Alternatively, you may start with a clove hitch around both poles and end with a square knot.



Example Project: Wheel Barrow

Here are the suggested materials:

- Four 4-foot x 2-inch poles
- One 3-foot x 2-inches poles (handle)
- One 2-foot x 2-inch poles (axle)
- One wheel
- Nine 12-foot x ~5/32-inch diameter lashing ropes



METHOD-SHEER LASHING

SHEER LASHING: (sometimes spelled 'shear') This method is used to join two poles together to form a scissor shape often used for table legs (sheer legs). With this application the poles might either lift or support weights.

Learn how to shear lash:

1. Line up the two ends of the poles. If poles are of uneven length, align *butt ends*.
2. Start with a timber (figure 1) or clove hitch around one pole.
3. Continue with 6-8 *turns* which are made firmly, but not too tight (figure 2).
4. Next, make ~3 *frapping turns* between the two poles to tighten the lashings (figure 3).
5. Finish with a square knot or clove hitch and spay legs open (figure 4).

Note: Sheer legs need to have diagonal support to prevent *racking*.

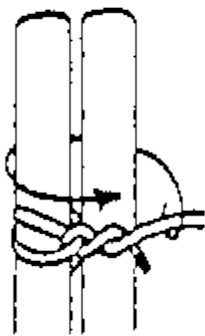


Figure 1

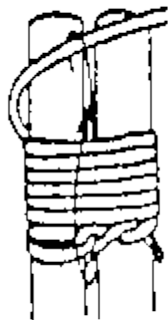


Figure 2

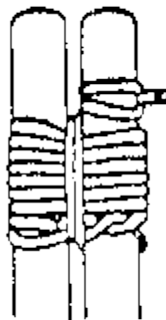


Figure 3

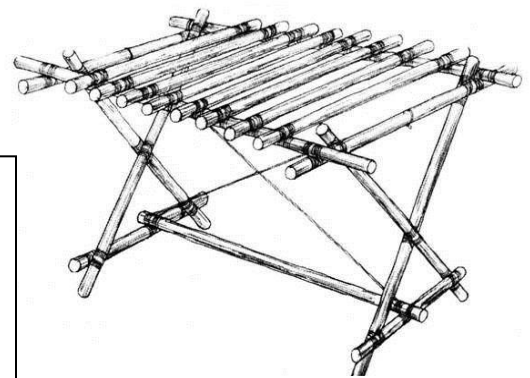


Figure 4

Example Project: Simple 4' Table

Here are the suggested materials:

- Seven 6-foot x 2-inch poles (legs & *stringers*)
- Four 3-foot x 2-inch poles (leg supports)
- Sixteen 12-foot x ~5/32-inch diameter lashing ropes
- Two 24-foot x ~5/32-inch diameter lashing ropes (for continuous lashing – see pg. 9)
- *Lath* material for table top (4-foot X 3-foot)



Notice the diagonal rope under the table tied from side-to-side to prevent *racking*.

METHOD – ROUND LASHING

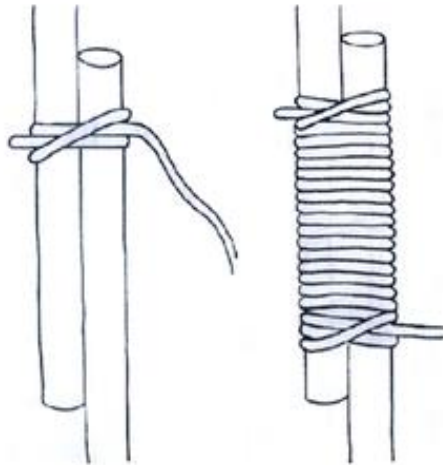
ROUND LASHING: This method is the most commonly used lashing for extending the length of a pole.

Learn how to round lash:

1. Begin with a good overlap of poles; at least a quarter of the total length, better still is an overlap of one third.
2. Start with a clove hitch around both poles near the end of the overlap.
3. Continue with 8-10 tight *turns* round both poles.
4. Finish with a clove hitch.
5. To tighten, insert small *wedges* inside the *turns*; from both above and below.

Note: Poles longer than about 2' should add a second lashing to strengthen the overlap so no movement is possible in any direction. (see flagpole below for illustration)

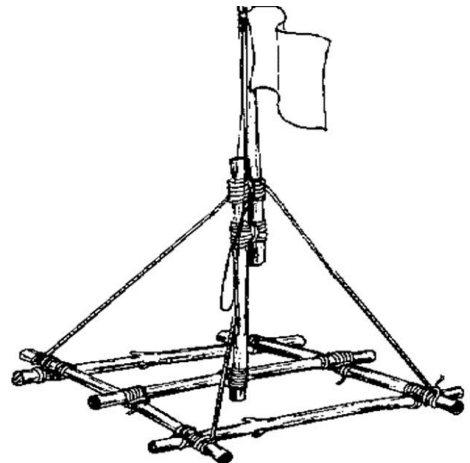
Special Note: Unlike all other lashing methods, round lashing has NO frapping turns. The manner in which these lashings are applied results in the poles being in a position where they are already tightly touching. Taking frapping turns between the parallel poles would only weaken the connection.



Example Project: Flag Pole

Here are the suggested materials:

- Seven 6-foot x 2-inch poles
- Nine 12-foot x $\sim 5/32$ -inch diameter lashing ropes
- Two 15-foot x $\sim 5/32$ -inch diameter lashing ropes (guy ropes)
- One flag, one eye-bolt, and two spring-loaded clamps

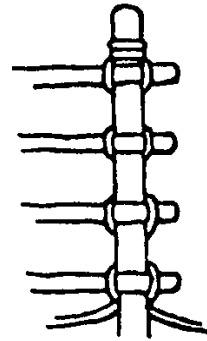


METHOD - CONTINUOUS LASHING

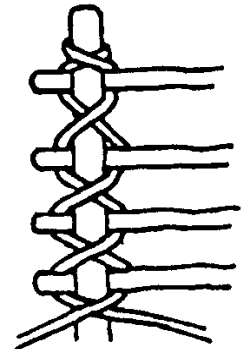
CONTINUOUS LASHING: This method takes 3 people and is used to attach flat planks (*lath*) or small poles onto a horizontal surface. This is the last step in building a table or deck.

Learn how to do continuous lashing:

1. Before starting, ensure that the support poles (*stringers*) are parallel, flat, and that the distance between them is appropriate for the length of the planks.
2. Begin with 2 long lengths of rope; each 6 times the distance that will be lashed.
3. Find the center of each rope and mark with tape or marker.
4. Bundle each half so it can easily be held in the hand. You can wind the rope on a paddle or secure with a loose rubber band (bundle in a way ensuring that the *working end* slides freely when being pulled/used).
5. Start with a clove hitch in the center of the rope on each *stringer* pole.
 - a. Note: two girls will work together, each lashing a *stringer*. The third girl will slide the next *lath/pole* in place and keep things even.
6. Hold both paddles/bundles of rope, one in each hand like horse reins.
7. Place the first plank and bring both ropes over it.
8. Next, bring ropes under *stringer* pole and crisscross.
9. Bring ropes back to top and slide in next plank.
10. Continue going over, under, crisscross and up, then sliding in a new plank until continuous lashing is complete.
11. Finish with a square knot using the two ends.



Top View

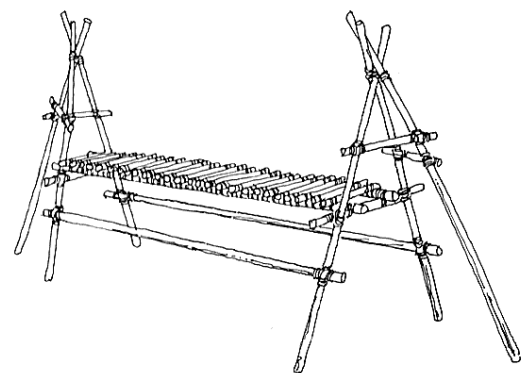


underneath View

Example Project: Chippewa Kitchen

Here are the suggested materials:

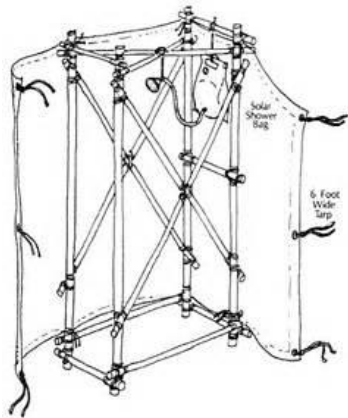
- Six 6-foot x 1-inch poles for tripods
- Four 8-foot x 1-inch poles for stringers and braces
- Six 3-foot x 1-inch poles for braces
- Eighteen 5-foot x 1/8-inch rope
- Two 40-foot x 1/8-inch rope for continuous lashing
- Planks for table top (2-foot x 7-foot area)



MORE PROJECTS TO BUILD

So, now that you have all of the knowledge and have practiced each lashing skill, you can begin building more camp gadgets and even larger campsite improvements. Below are some additional lashing project ideas.

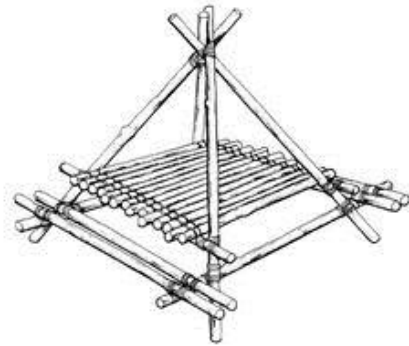
The fun, adventure, involvement, and challenges are built right in — and also the success...



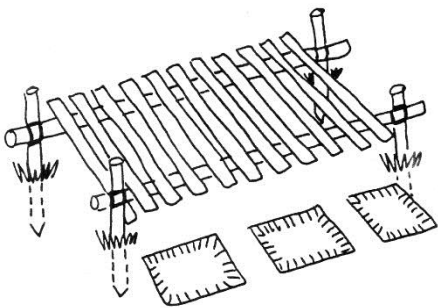
Camp Shower



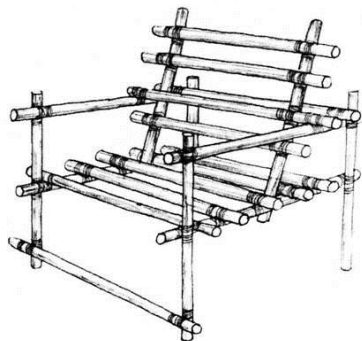
Firewood Shed



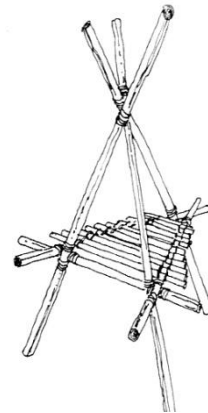
Picnic Table



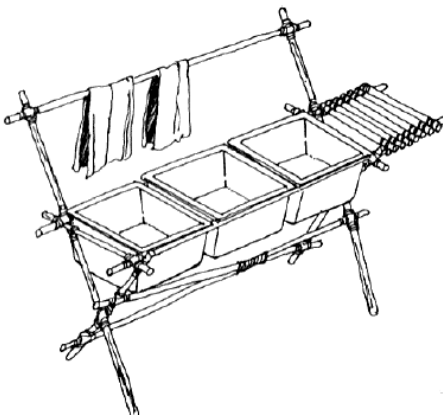
Low picnic table



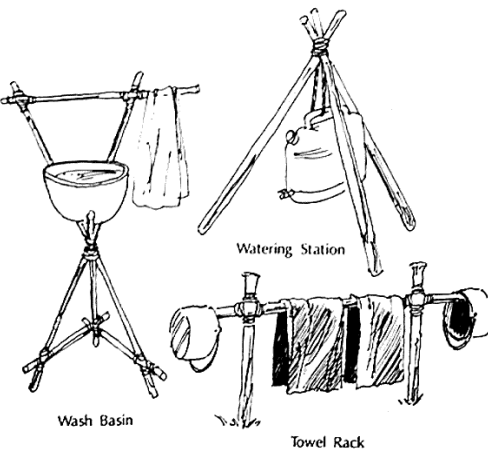
Chair



Tripod Table



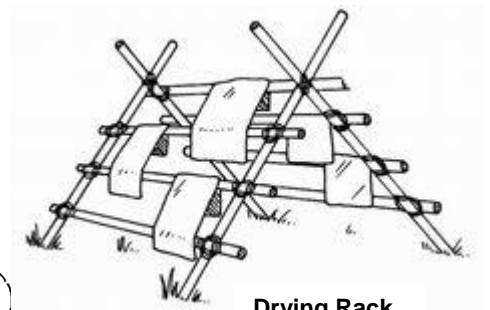
3-Sink Dishwashing Station w/ rack



Wash Basin

Watering Station

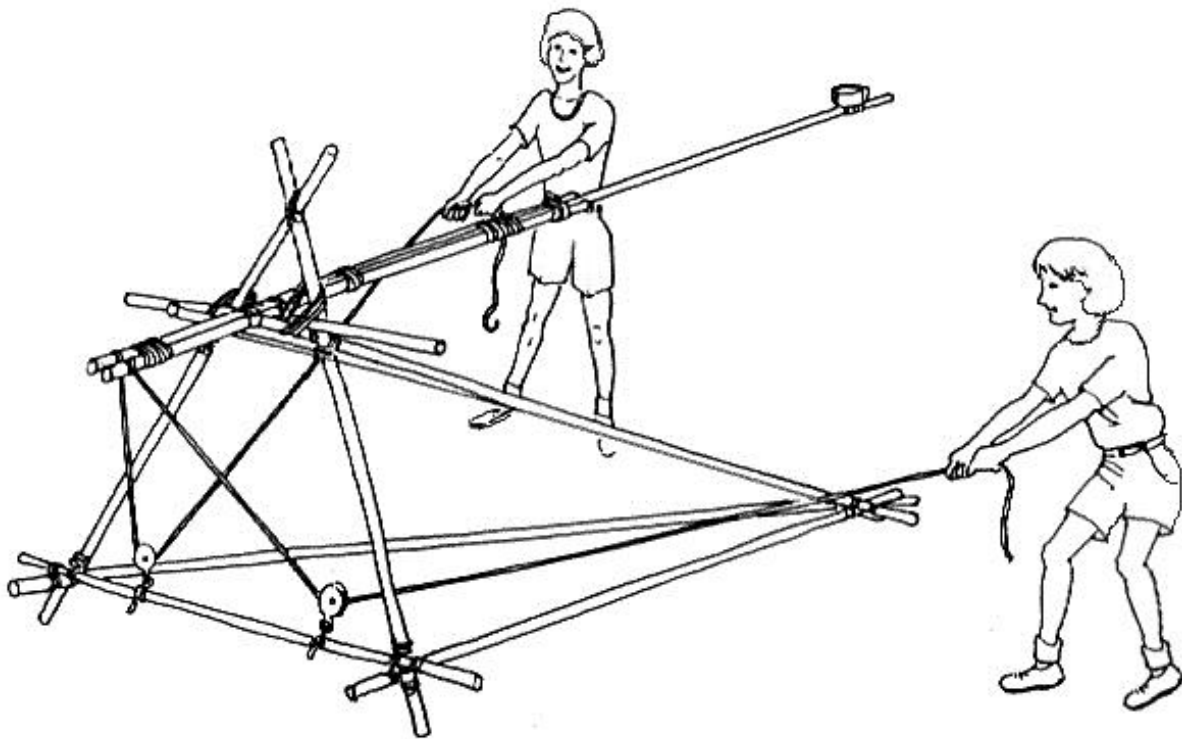
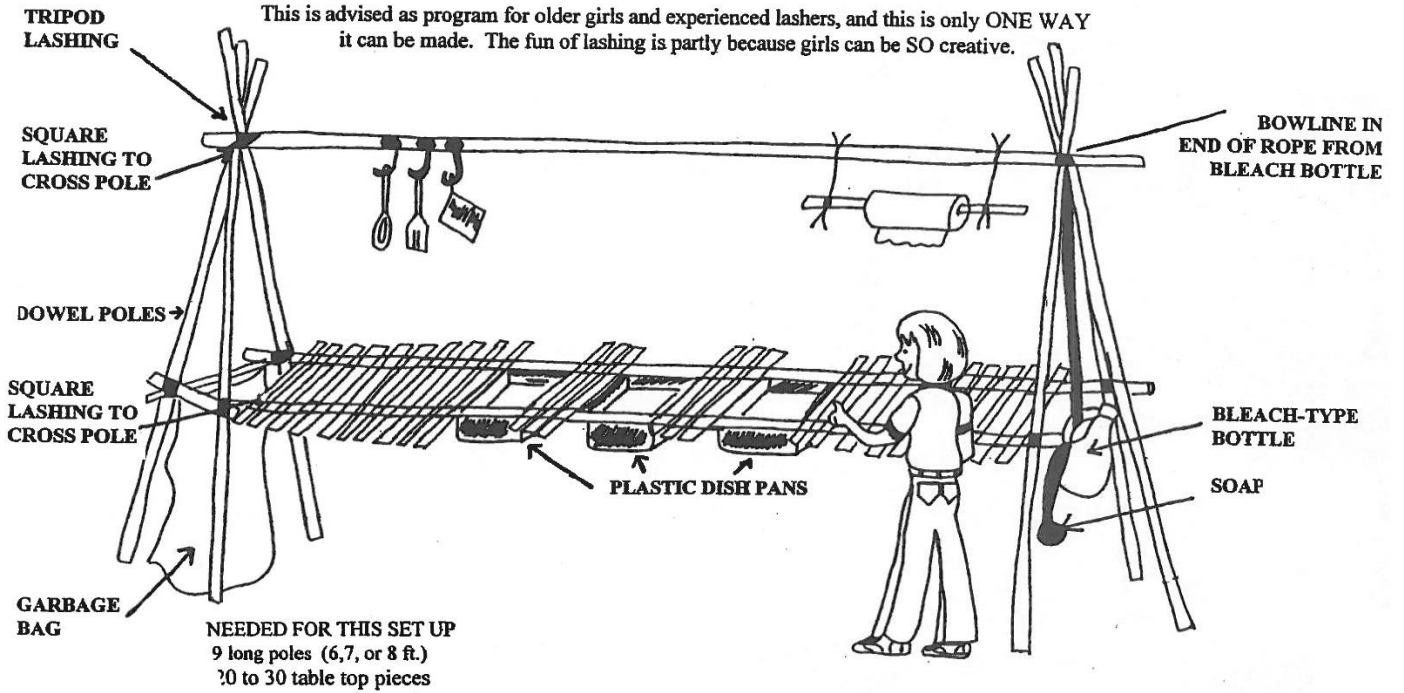
Towel Rack



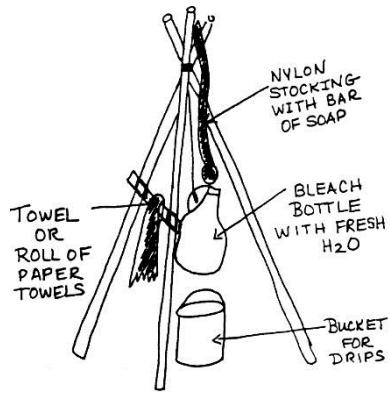
Drying Rack

Chippewa Kitchen with Dishwashing Set-up

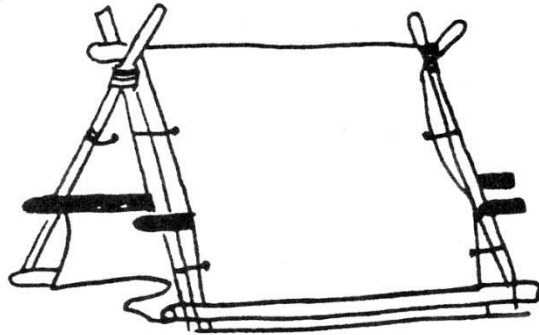
This is advised as program for older girls and experienced lashers, and this is only ONE WAY it can be made. The fun of lashing is partly because girls can be SO creative.



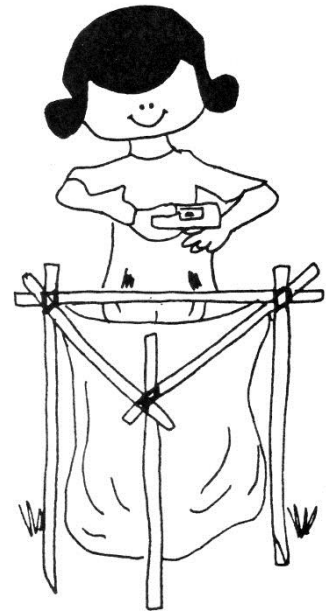
Trebuchet—what in the world would you do with something like this?



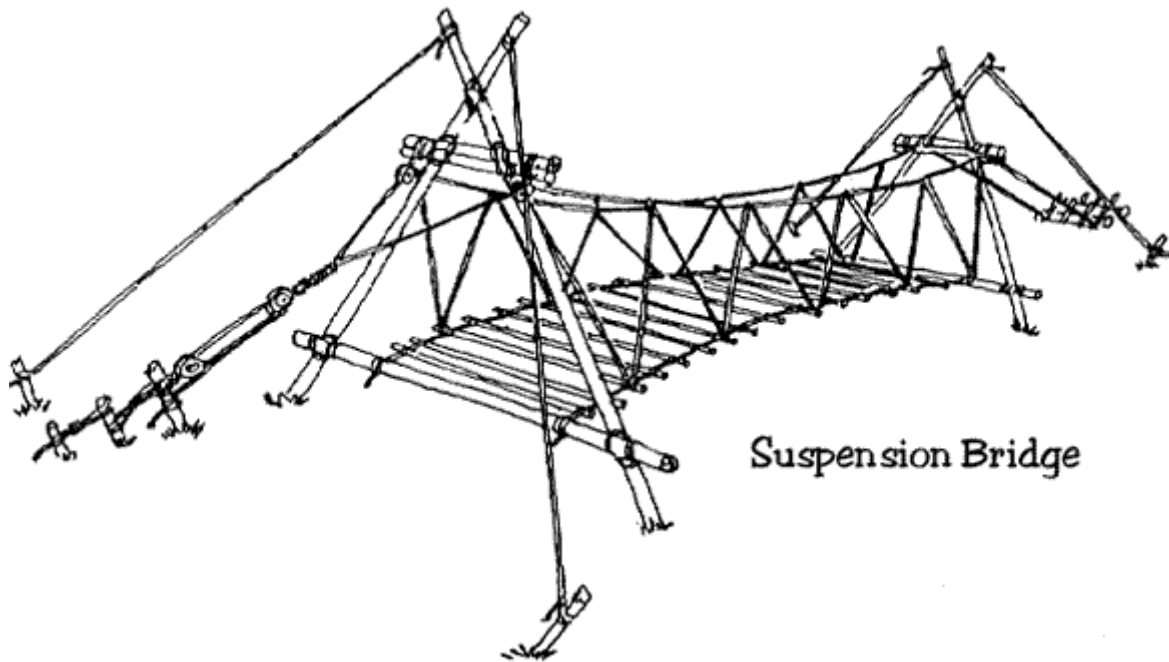
Tripod Hand wash Station
Even staying clean can be FUN!



Tent



Three-legged trash bag holder



Suspension Bridge

GLOSSARY

- **Butt end.** The term *butt end* refers to the end of a pole that will be on the ground. If the pole has a tapered diameter the *butt end* would be the end with the largest circumference.
- **Frap.** A *frap* is a *turn* made between the poles. It goes around the *wraps* to pull the *wraps* tighter.
- **Lath.** *Lath* is a flat plank of wood often used in continuous lashing to form a table top.
- **Racking.** *Racking* is the undesirable movement of the project from side to side due to insufficient structural support.
- **Spar.** A *spar* is a strong pole used in lashing projects. Sometimes also called a *stave* (smallest in size).
- **Stake.** A *stake* is a pole with one sharpen end. Used to drive into the ground.
- **Standing end.** The *standing end* (or standing part) of a rope is the part not active in knot tying. It is the part opposite of the *working end*.
- **Stringer.** *Stringer* refers to two parallel poles that are used as the foundation to attach planks using continuous lashing.
- **Turn.** The term *turn* is often used to describe going around a pole (a *wrap*).
- **Working end.** The *working end* (or working part) of a rope is the part active in knot tying. It is the part opposite of the *standing end*.
- **Wedge.** A *wedge* is a small tapered stick that is used to tighten a round lashing.
- **Wrap.** A *wrap* is a *turn* made around the two poles to hold the poles tightly together.

We made it! That's all that matters!

