Water Activity Knots

Handbook

Version 1.4

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Ropework

Ropework describes the various skills required in working with rope. Ropework is the processes and skills used to make, repair, and use rope including the tying of knots, splicing, making lashings, and proper use and storage of rope. In the past the skill of a sailor was often judged by how well he knew knots and ropework.

In Sea Scouting and Water activities ropework is broken between the water based Adventure Skills and the Nautical Scheme. The table below outlines each of the essential knots, hitches and lashing plus on which scheme and where on the scheme it appears.

	Scouting Ireland - Adventure Skills			Nautical Scheme		
	Paddling	Sailing	Rowing	Boatman	Helmsman	Navigator
Round turn & two half hitches	Stage 3	Stage 2	Stage 2	Bronze		
Bowline	Stage 3	Stage 2	Stage 2		Bronze	
Figure of eight knot	Stage 3	Stage 2	Stage 2	Bronze		
Clove hitch	Stage 3			Silver		
Reef knot	Stage 3			Bronze		
Short splice		Stage 8				1
Double sheet-bend		Stage 8			Silver	
Jury-rig knot		Stage 8				2
Bowline-on-the bight		Stage 9				
Sheep shank		Stage 9				
Sheet bend				Silver		
Fisherman's bend				Silver	Silver	
Rolling hitch					Silver	
Cleat hitch					Gold	
Square lashing	Stage 3			Gold		
Sheer lashing					Bronze	
Tripod lashing				Gold		
Diagonal lashing						1
Back splice					Gold	
Eye splice						2
Long splice						2
Whip the end of a rope					Gold	

Ropes

Rope may be constructed of any long, stringy, fibrous material, but generally is constructed of certain natural or synthetic fibres. Synthetic fibre ropes are significantly stronger than their natural fibre counterparts, but also possess certain disadvantages, including slipperiness.

Common natural fibres for rope are Manila hemp, hemp, linen, cotton, coir, jute, straw, and sisal. Synthetic fibres in use for rope-making include polypropylene, nylon, polyesters, polyethylene, aramids and acrylics. Some ropes are constructed of mixtures of several fibres or use co-polymer fibres. Rope can also be made from metals like steel.

Nylon

The introduction of Nylon ropes represented a huge advance for sailors. Nylon dock lines and lashings do not wear out, splices only required one or two additional tucks; and melting a rope's end provides a quick, temporary "whipping".

Terylene

Terylene ropes stretch much less than other ropes and are not weakened by water. Like Nylon terylene has a relatively high density. It also melts and the end of a rope can be fused using heat. It exhibits negligible creep under load and has excellent resistance to ultra violet light.

Polypropylene

Polypropylene was first produced in the 1950s. As a rope material it has a low melting point and is degraded by ultra-violet light. However, it floats, absorbs no water, does not shrink when wet, and is inexpensive. It is widely used as a light-duty pulling rope. It is usually made of large diameter fibres that are easily damaged by abrasion. Melting the ends is easy but provides limited protection from fraying because damage readily separates the fibres from the melted end.

Round-turn-and two-half-hitches

The Round-turn-and two-half-hitches is used to hitch a boat to a pole or bollard.

Pass the end around the post twice. This takes the strain while you tie the knot. Go around the standing end to make the first Half Hitch. Pull this tight. Continue around in the same direction to make the second Half Hitch. Pull tight to complete the knot.

Bowline

The bowline is used to create a loop at the end of a rope, generally around an object.

Lay the rope across your left hand with the free end hanging down. Form a small loop in the line in your hand. Bring the free end up to and pass through the eye from the underside (the rabbit comes out of the hole). Wrap the line around the standing line and back down through the loop (around the tree and back down the hole). Tighten the knot by pulling on free end while holding standing line

Figure of eight

The figure of eight knot is used as a stopper knot at the end of a rope to prevent the end passing through an eye or a pulley.

Stretch a length of the rope in front of you parallel to the ground and twist to form a loop, as though you are going to make an overhand knot. Twist the loop an additional time, bring the end around an poke it through the loop. Pull to tighten and the finished knot should look like a figure eight.

Clove Hitch

The clove hitch consists of two identical half hitches made around an object. It can be used as a binding knot, however as it is not very secure in that role it is not recommended.

Reef Knot

A reef knot joins two ropes of equal thickness and is formed by tying a left-handed overhand knot and then a right-handed overhand knot, or vice versa. It should not be used where life, limb or property may depend on it. A common mnemonic for this procedure is "right over left and under, left over right and under".

Short Splice

The short splice is used to join two identical ropes or repair a defective rope. A short splice will increase the ropes diameter by about 1.5 times its original size which may create problems when the rope needs to pass through a pulley or like structure. The short splice will, however, retain almost 100% of the original line strength.

Tape the rope. Unravel enough for about 5 tucks (3 shown here). Push the ends into each other and tape the middle. Make the first complete set of tucks, and then another. Repeat this using the other end. Remove the tapes, tighten, and complete the remaining tucks.

Sheet-bend

The sheet bend is a knot that joins two ropes of unequal thickness together. It is a knot that is related to the bowline. This knot is much more secure than the reef knot though still prone to slippage in some modern fibres.

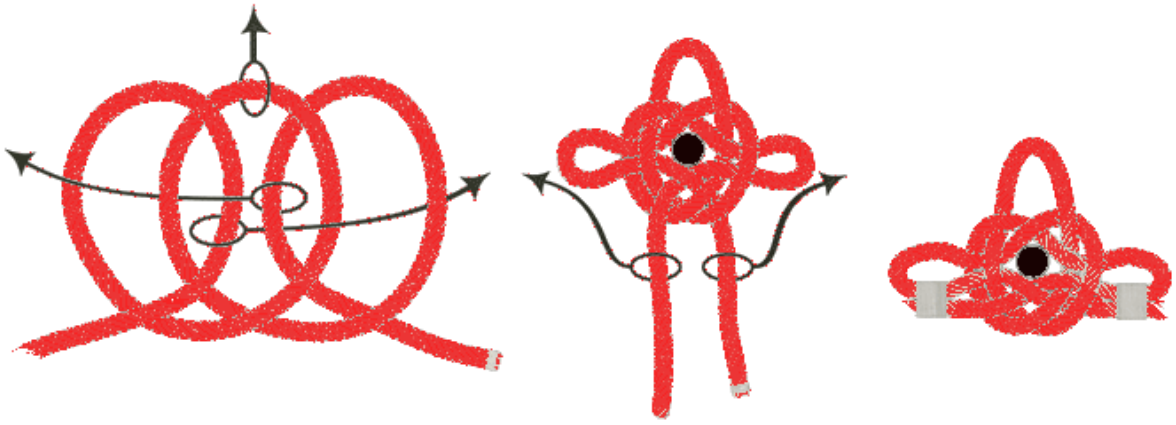
To tie the sheet bend, make a bight in the thicker rope, and then hold both ends of the bight in one hand. Now take the smaller rope and thread it up the bight, wrap it around the bight of the larger one and tuck it underneath where the smaller rope comes up through the larger rope's bight.

Double sheet-bend

When ropes are considered unequal i.e. ropes of different materials and/or diameter) or where the rope is particularly smooth (the modern very high strength fibres like spectra, kevlar, dyneema especially), markedly different in size, the tail of the smaller rope can be taken twice round the bight in the larger rope to create the double sheet bend.

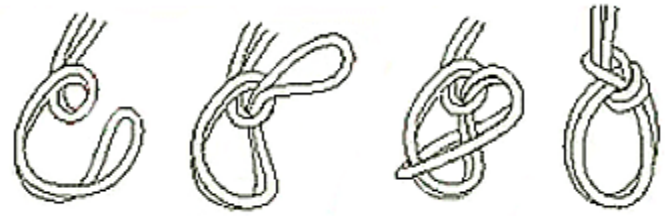
Jury mast knot

The Jury mast knot is traditionally used for jury rigging a temporary mast on a sailboat or ship after the original one has been lost. The knot is placed at the top of a new mast with the mast projecting through the centre of the knot. The loops of the knot are then used as anchor points for makeshift stays and shrouds. Usually small blocks of wood are affixed to, or a groove cut in, the new mast to prevent the knot from sliding downwards.



Bowline on a bight

The bowline on a bight is used to create two loops in a rope where access to either end is unnecessary.



Fold your rope in half, make a loop in one side of the rope and feed the other end through the loop. Pull the “pulled through” loop over the top and behind the large loop. Pull tight to complete.

Sheep Shank

A sheep shank is used to shorten a rope.

Make a long bight in a rope which it is desirable to shorten, and taking a half hitch near each bend.

Fisherman's Bend

The Fishermans Bend is used for attaching a rope in a similar fashion to a round turn and two half hitches to a ring or similar termination.

Like the round turn and two half hitches start with a full turn around the pole but keep the second turn slack. Pass the end around the standing end and through the second turn. Now continue by finishing with a half hitch on the standing end.

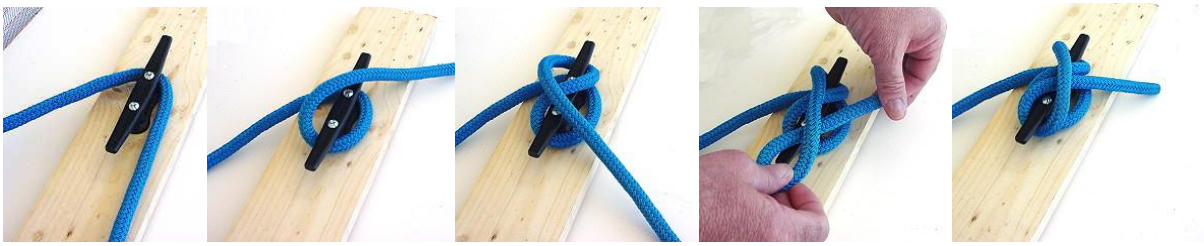
Rolling Hitch

The Rolling hitch is used to attach a rope to a pole or another rope. It is friction hitch operating like a simple Prusik knot from climbing. The pull is along the length of the object and not at right angles.

Start by making a half hitch around the main rope with the smaller rope.

A common usage while sailing is for rigging a stopper to relax the tension on a sheet so that a jammed winch or block can be cleared. Follow the first half hitch around and cross the standing end. Now finish with a half hitch.

Cleat Hitch



A cleat hitch is used to secure a boat to a cleat on a mooring.

When securing a rope to a cleat, first take turn-around the two sides of the cleat before bringing over the top and making two or three crisscross turns over the horns of the cleat. If you are securing a rope which is going to be in position for some time, and which does not have to be let go in a hurry, you can finish with a half-hitch. If not, simply take another complete turn round the cleat.

Square lashing

Start with a Clove Hitch around one pole. Twist short end around long and wrap the rope around both poles, alternately going over and under each pole about three or four turns. Tighten the lashing by surrounding it with three or four frapping turns. Finish with a final Clove Hitch.

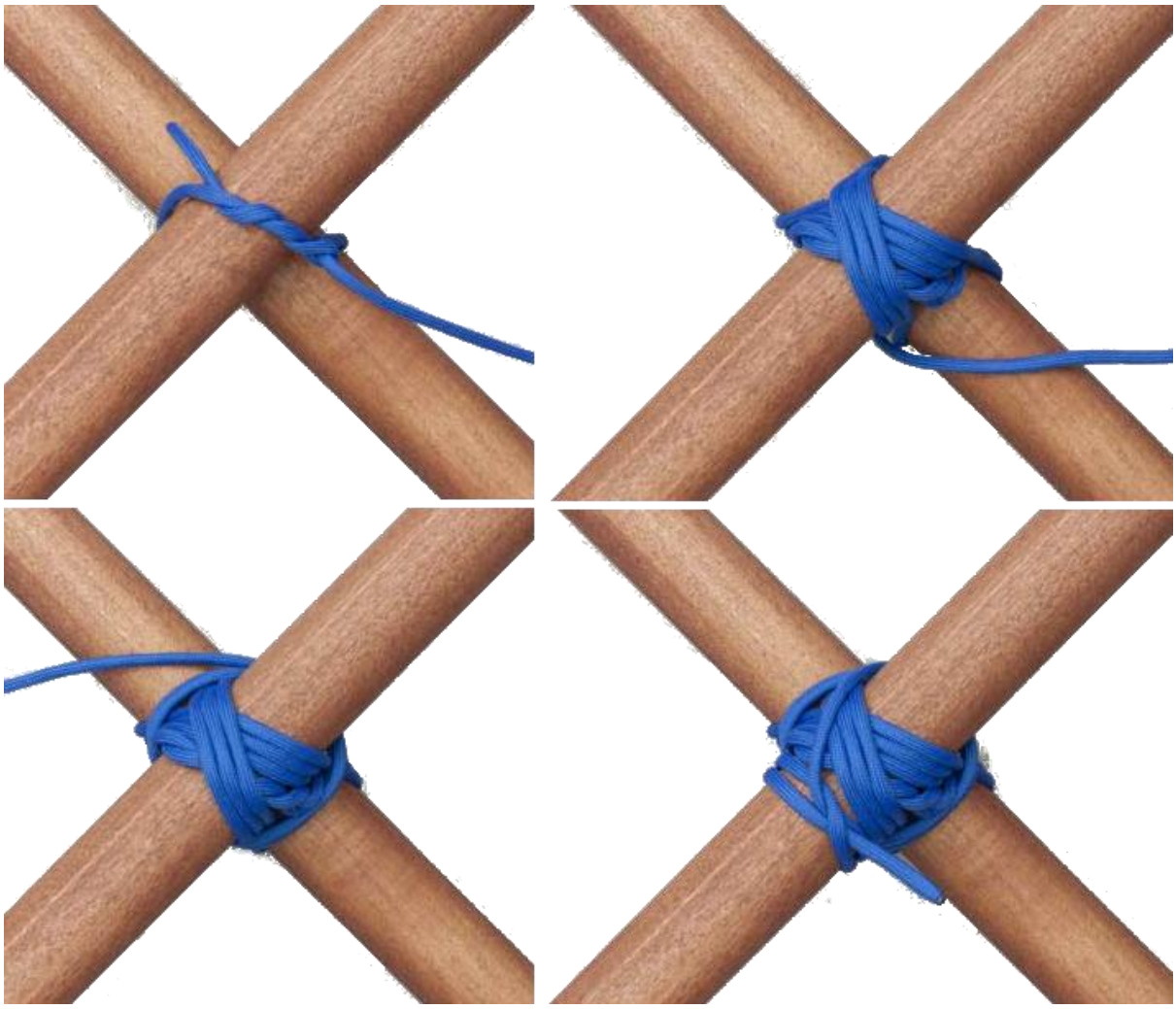
Sheer lashing

Start with a Clove Hitch around one pole. Twist short end around long and wrap the rope around both poles, alternately going over and under each pole about three or four turns. Tighten the lashing by surrounding it with three or four frapping turns. Finish with a final Clove Hitch.

Tripod lashing

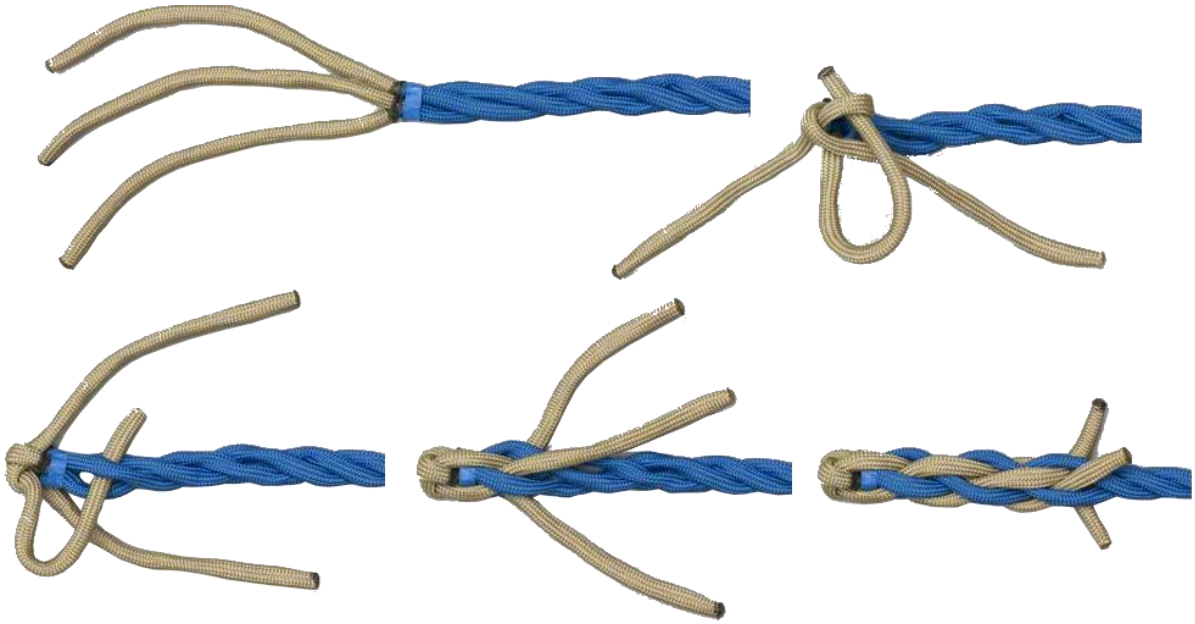
The tripod lashing is a shear lashing that binds three poles together at the same point. Start with a Clove Hitch around one pole. Wrap six racking turns around the three poles weaving in and out between them. Make two or three tight frapping turns in the two gaps. Finish with a Clove Hitch.

Diagonal lashing



The diagonal lashing is binds two poles in a cross diagonally at 90° or 45°. Start with a timber hitch around the poles to secure the rope onto the pole. Make three turns in each direction - tightening steadily throughout the turns. Make two frapping turns, tightening the joint as much as is possible. To complete make two half hitches clinched into a clove hitch.

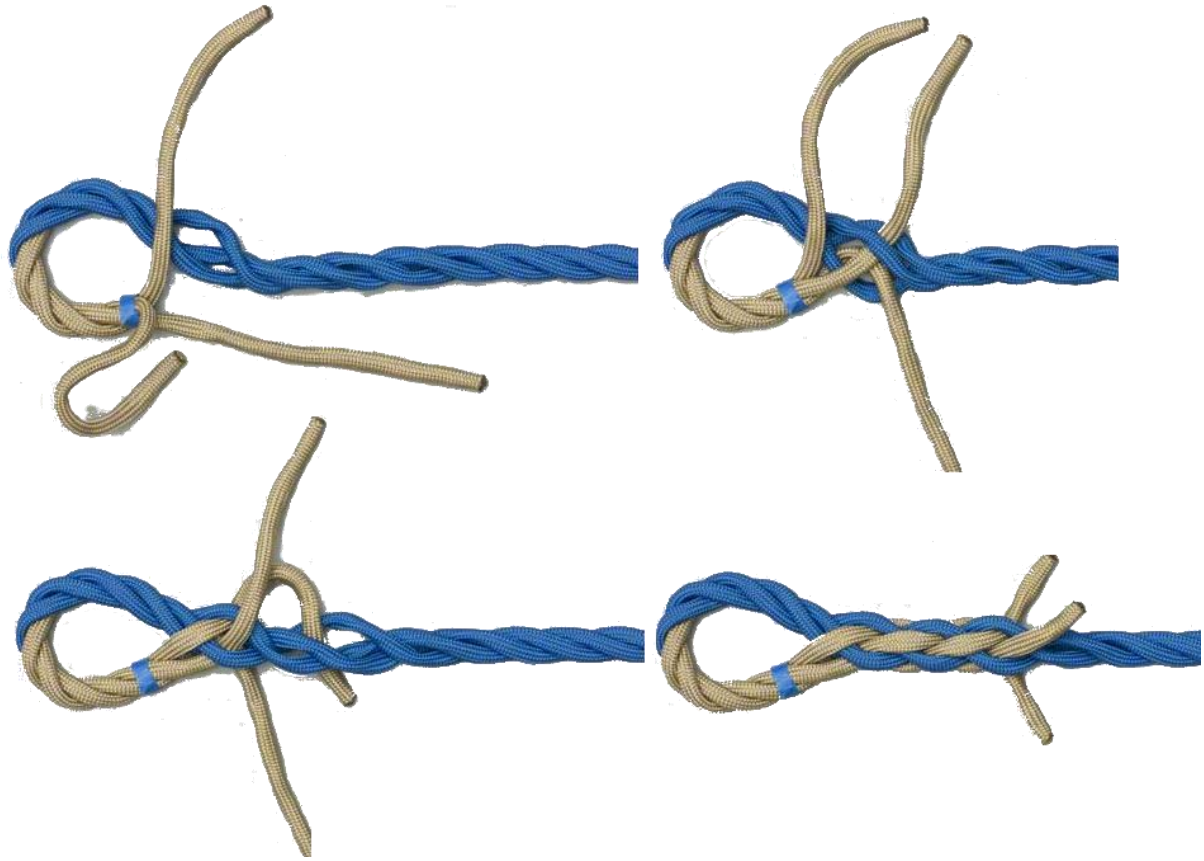
Back splice



A back splice is used where the strands of the end of the rope are spliced directly back into the end without forming a loop. It is used to finish off the end of the rope to keep it from fraying. The end of the rope with the splice is about twice the thickness of the rest of the rope. With nylon and other plastic materials, the back splice is often no longer used; the rope strands are simply fused together with heat to prevent fraying.

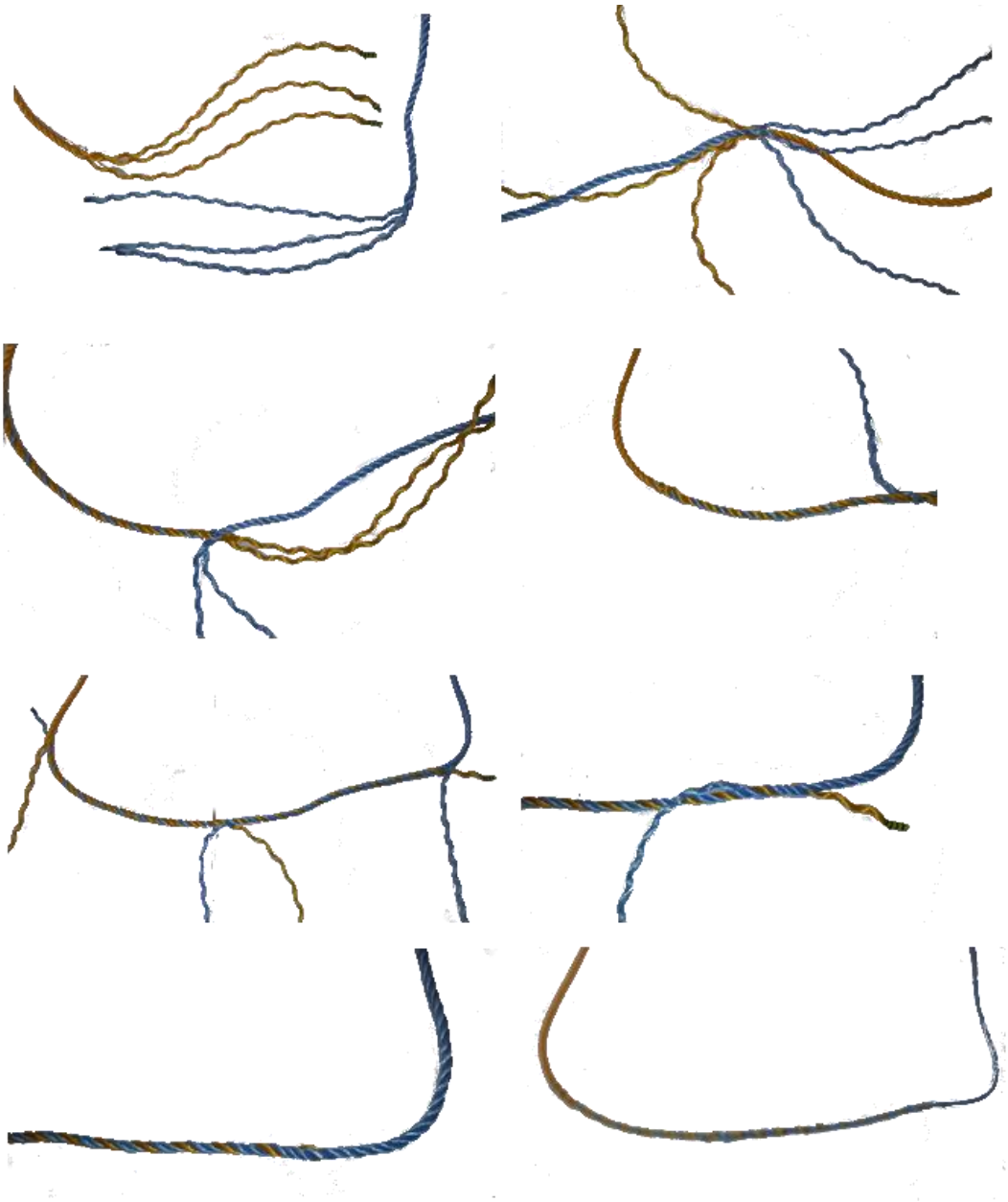
Form a Crown Knot by passing each strand over its neighbour and then tighten the knot. Splice each strand into the rope by passing it over and under alternate strands in the standing end. Complete a second and a third set of tucks to complete the back splice. Trim the excess to tidy.

Eye splice



An eye splice is used where the working end is spliced to form a loop. Tape rope to prevent further unravelling at the point where the eye should complete. Unravel enough for 4 or 5 tucks. Arrange strands. Pass the centre one under a standing strand. Pass lower one under lower adjacent standing strand. Pass the upper strand under the upper adjacent standing strand. Repeat the process for the remaining sets of tucks. Remove the tape.

Long splice



An long splice is similar to the short splice except the long splice more or less maintains the same thickness as the two ropes in question. Start by unravelling 15 turns or so in both ropes and then interlink them as was done for the short splice. Take a pair of strands one from each side and unravel one further while replacing it by rolling the strand from the opposite rope in the vacant groove. Repeat this process for another pair of strands but this time remove the strand from the other rope and lay the strand from the first rope in its groove. The remaining ends should be weaved into the completed rope about two turns each. If thickness of the rope is critical then each of these ends should be thinned by cutting the remaining strands at an angle to thin out the piece to be weaved.

Whip the end of a rope

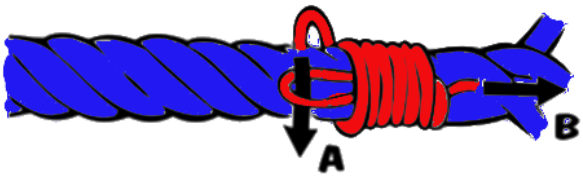
The common whipping is a simple whipping knot to stop a rope from unravelling. It is a variation of the 'Hangman's' knot. Normally a natural fibre rope is whipped with tarred two strand hemp or marline.

The rope should be whipped a short distance (One and a half times the diameter) from its end.

Lay the head of the twine along the rope, make a bight back along the rope

Begin wrapping the twine around the rope and bight of twine securely.

Wrap until the whipping is one and a half times wider than the rope is thick



Slip the working end of the twine through the bight. Carefully pull on the standing end of the twine until the bight and working end are pulled under the whipping.

Cut the twine flush with the edges of the whipping and the rope end not less than half its width from the whipping to give the rope end a finished look.