



Proper Knot Tying

Program: Electrician Technician

Course: EL110 Basic Safety

Objectives: Under the supervision of your instructor, you should be able to tie various rope knots.

Lab Equipment: N/A

Required Tools:

- 2-foot piece of rope

Materials: N/A

Safety (PPE): N/A

Resources:

- Ugly's Electrical References 2017 Edition
- [101 Knots](#)

Required Time: 180 Minutes

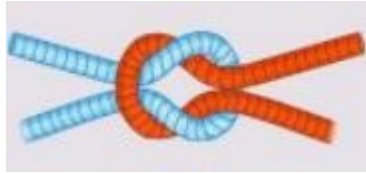
Shop Maintenance:

- All work will cease 20 minutes prior to the end of class.
- All work areas must be cleaned.
- Tools and equipment must be cleaned and returned to the designated areas (cage, tool room, cabinets etc.)
- Any broken or missing tools must be reported immediately.
- Tools and equipment are student's responsibility.

Procedures:

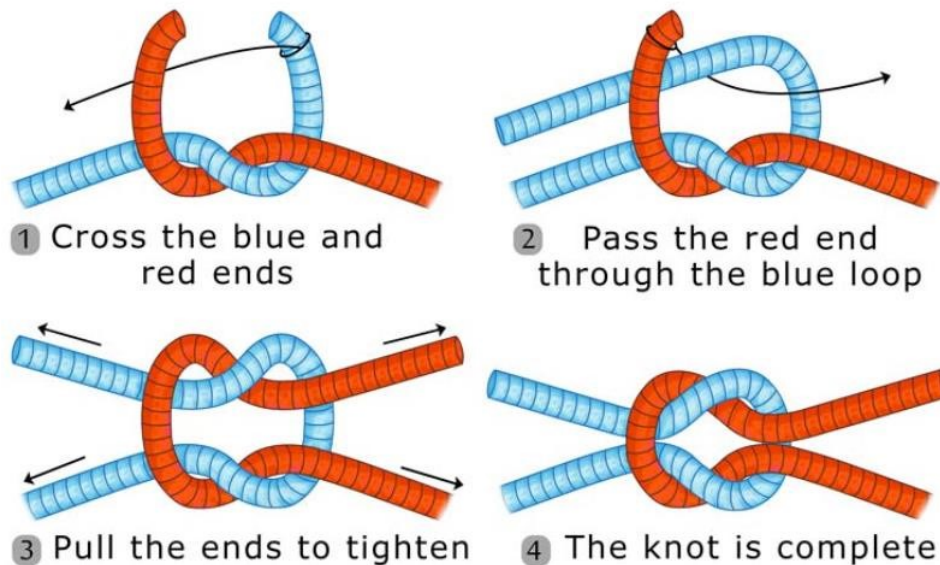
1. Square Knot

The square knot can join 2 ropes of the same size. It is the first knot we learn to make with our shoelaces. It looks like a bow and is hugely unreliable. Its breaking strength is only 45% of the line strength. This leads surgeons to add an extra turn to the first half knot. The simple and ancient binding knot is also known by the names Hercules, Herakles, flat, and reef knots. It helps to secure a line or rope around an object.





How to tie a Square (Reef) Knot



Tips:

1. After the knot is made, the tag ends should lie on the same side of the knot. If they don't, you might just have made the thief knot, a highly inferior version.
2. A half hitch can be added at each end of the knot to dress and secure it.
3. Since the friction of the 2 rope ends holds it together, it is not suited for nylon ropes.

Advantages

- Easy and quick to tie
- Elegant

Disadvantages

- It slips and comes undone. Hence it should not be used as a bend.
- Only suited for light duty. Unsafe for tying or binding heavy loads and lifesaving.

Uses

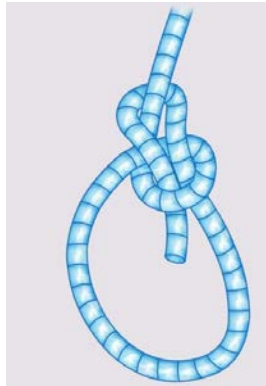
- Making friendship or other bracelets and necklaces of hemp, paracord, elastic or any other cord, embroidery floss, even leather. It can be used for adjustable closures and clasps in bracelets.
- In macramé patterns (some use an alternating square knot and square knot button pattern) for necklaces, chains, bracelets, sinnets, plant hangers.
- Tying neckerchiefs and neckerchief slides in navy uniforms, karate belts, baseball gloves, triangular bandages, webbing, handkerchiefs, and bandanas.
- As a substitute for cargo straps.
- Making bows (ribbons are good for these) on dresses, etc.
- In surgical sutures, beadwork, electrical wire splice, logos and hair braids.
- Camping.
- Pioneering.



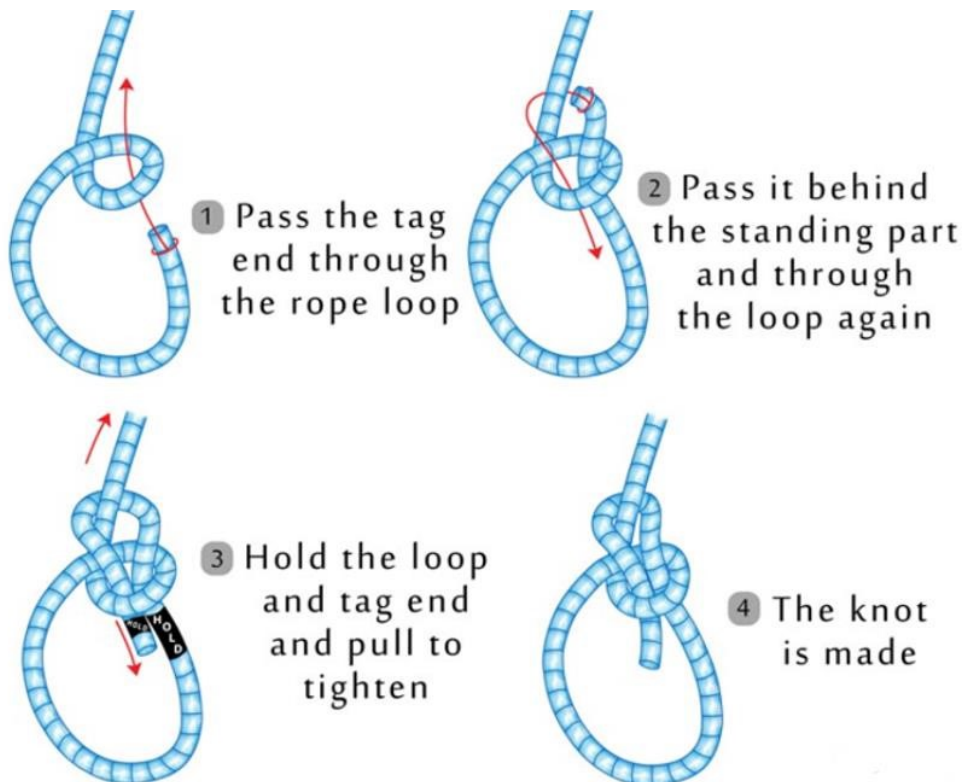
- Knitting.
- Joining crochet yarn.
- In magic tricks.

2. **Bowline Knot**

The bowline (pronunciation “boh-lin”) is a knot that can itself be tied at the middle of a rope making a fixed, secure loop at the end of the line. It retains about 60% of the line strength and has a knot efficiency of 77%.



How to tie a Bowline Knot:



Tips:



1. The tying procedure can be remembered by the bunny mnemonic where the loop made in step 1 is imagined as a rabbit hole, the standing part as a tree trunk and the tag end, a rabbit. While tying, the bunny comes up the hole, goes round the tree and back down the hole.
2. It can be tied with one hand; in case you are injured or have other issues.
3. It is dangerous to load the knot sideways as it may lead to slippage while rappelling, etc.
4. In step 1, the end is passed through the loop in a way resembling the making of an overhand knot.
5. You can interlock the loops of two bowlines to join two ropes. The sheet bend can also do the same, but temporarily.
6. It can be tied in the slip knot method where the standing part is passed through the loop of step 1, instead of the tag end, forming a bight through which the end is passed and pulled tight. This quicker version is known as the snap bowline.

Advantages

- It does not slip or bind under load
- Fast and easy to tie and untie
- Does not jam

Disadvantages

- If there is a load in the standing end, it cannot be tied or untied. Hence, it should be avoided in that case.
- Its ease of untying makes it unsuitable for mountain and rock climbing. It should be tied with a stopper knot (double overhand) when used for such purposes.

Uses

- To tie a mooring line around a tree, post, pole, anchor, ring, ladder, or any other object.
- Boating, sailing (for example, tying a jib sheet to the clew of a jib), fishing.
- It is thrown and tied around the waist for rescue operations, firefighting.
- By boy scouts, linemen.
- For attaching soft strings to a banjo, tree climbing, hanging hammocks using guy lines, tying a horse safely, connecting a handle line to a kite.

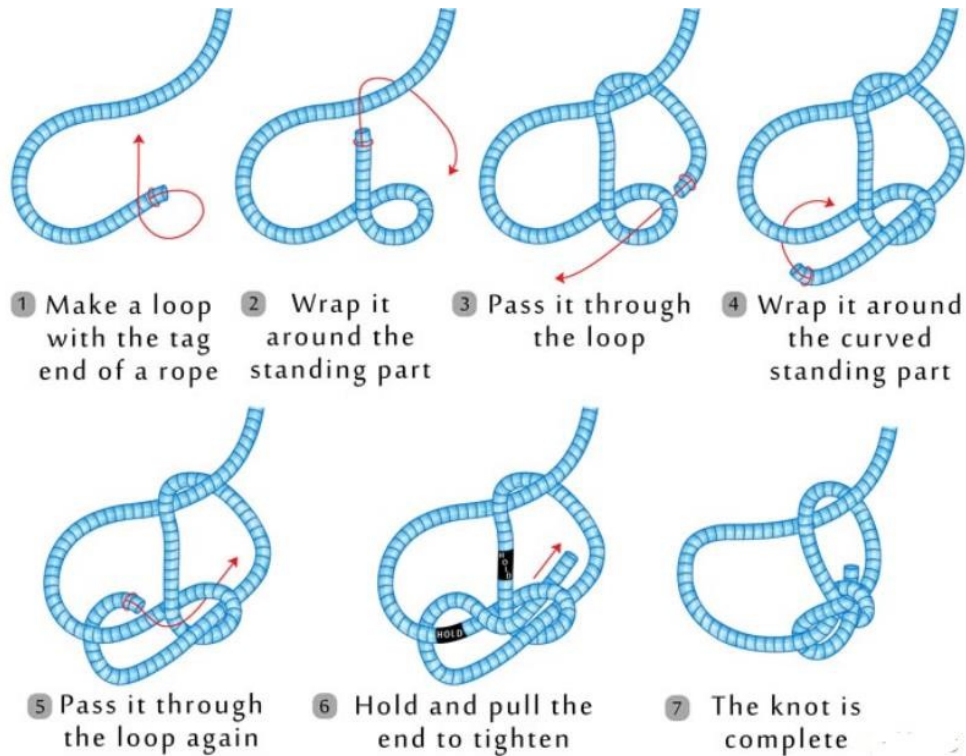
3. Running Bowline Knot

The running bowline is a noose. It creates an adjustable loop that can be drawn up tight. The nice sliding knot can be tied around trees or posts. Based on the classic bowline knot, this one is very secure. It works well in rigging situations. It serves the purpose of retrieving objects by throwing a large loop of the knot around them and cinching it down by pulling the standing line.





How to Tie a Running Bowline Knot



Tips: Some people precede it with a half hitch that can share the load. However, many feel that the running bowline is strong by itself.

Advantages

- It can be untied easily
- Doesn't close on the standing end and bind it.
- Non-jamming release
- It retains a major portion of the line strength

Disadvantages

- If the tree branch or support is too high, it might be a challenge to throw the loop around it. Even if you manage to do it, retrieving the line might be a problem

Uses

- To bind parcels.
- By arborists for tree climbing.
- It allows lowering or raising heavy objects.
- Hanging tree swings.
- Boating.



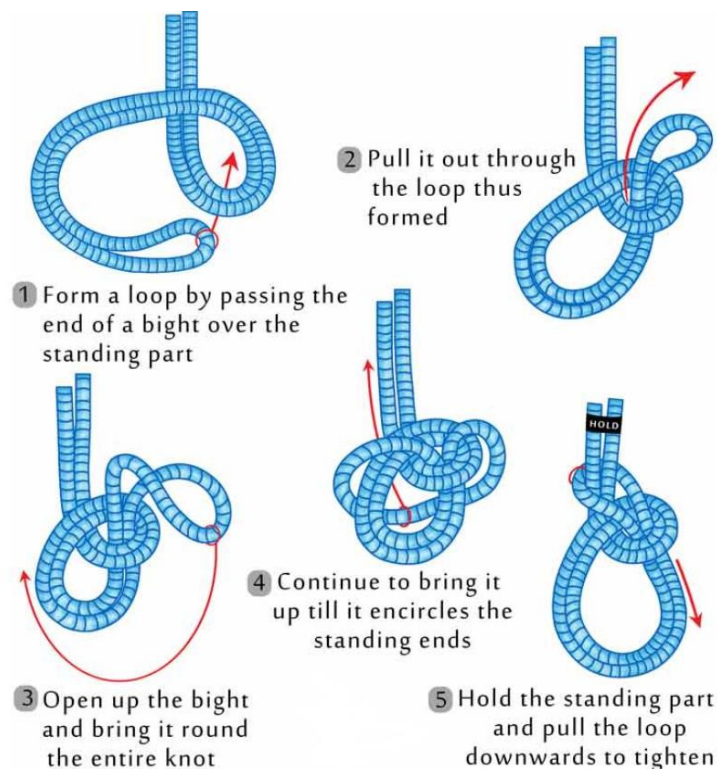
4. Bowline on a Bight Knot

Bowline on a bight creates a secure loop in the middle of a length of rope. It is a variation of the bowline knot that looks similar but is made with a single strand of rope. If you want to make a dependable loop when neither end of the line is available, this is one knot you can vouch for.

When tied to a climbing harness its ability to easily untie after a severe fall makes it score above the figure eight knot. However, it should be protected further with powerful backup knots with long tail ends when used such.



How to tie a Bowline on a Bight Knot



Advantages

Disadvantages



- • Easy to tie
- Does not slip or bind
- Non-jamming
- Might slip when only one of the ropes of the loop is loaded

Uses

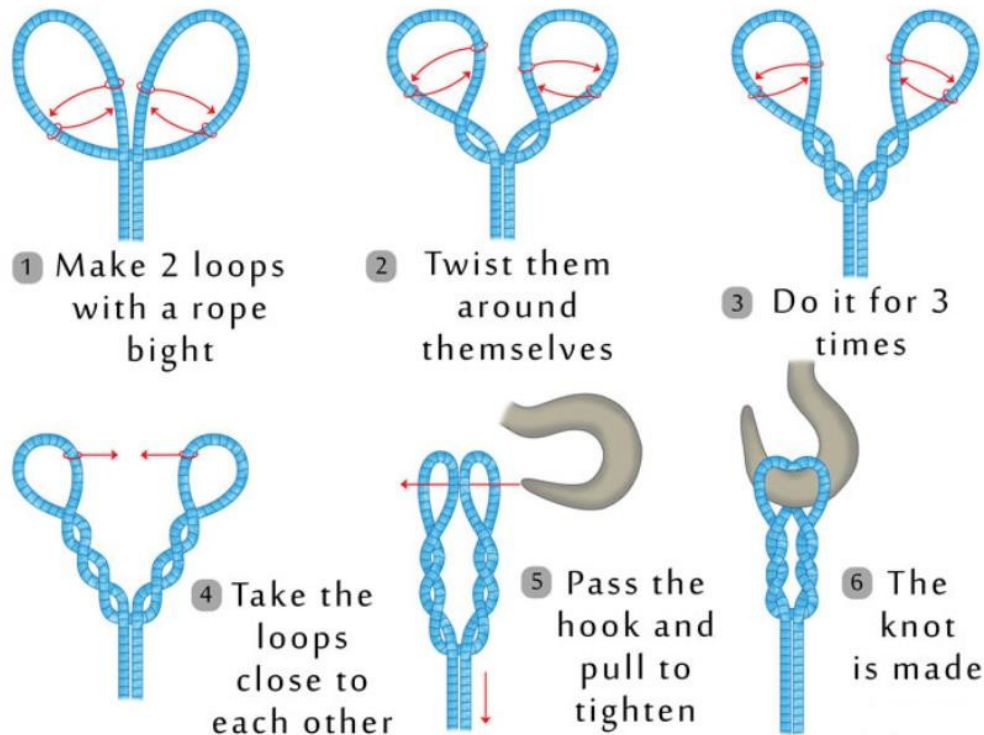
1. Forms a secure toe-hold at the middle of a rope while climbing.
2. To make an emergency Bosun's chair.
3. Commonly used as a seat for hoisting purposes.
4. The double loop distributes the load making it popular among cavers.
5. Allows a free-hang descent. Can be easily adjusted to avoid rub points and waterfalls.

5. Cat's Paw Knot

The cat's paw or offshore swivel knot is used to connect a rope or line to a ring, swivel or hook. The versatile knot is simple to tie and doesn't jam. It can be used as a sling for lifting heavy loads at any angle. The twisted loops give it good strength and even if one side breaks, the other side will hold temporarily so that the load can be lowered.



How to tie a Cat's Paw Knot



Tips:

1. Certain modifications of the knot have additional twists on both the sides of the bight. In fishing monofilament lines, it can have as many as 5 turns.
2. You can use a closed strop or a paracord double line instead of the rope bight.

Advantages

- Doesn't come undone easily

Disadvantages

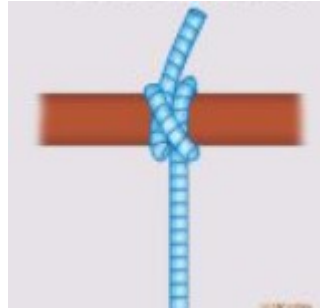
- If both sides of the double line are not kept of equal length, the knot may deform

Uses

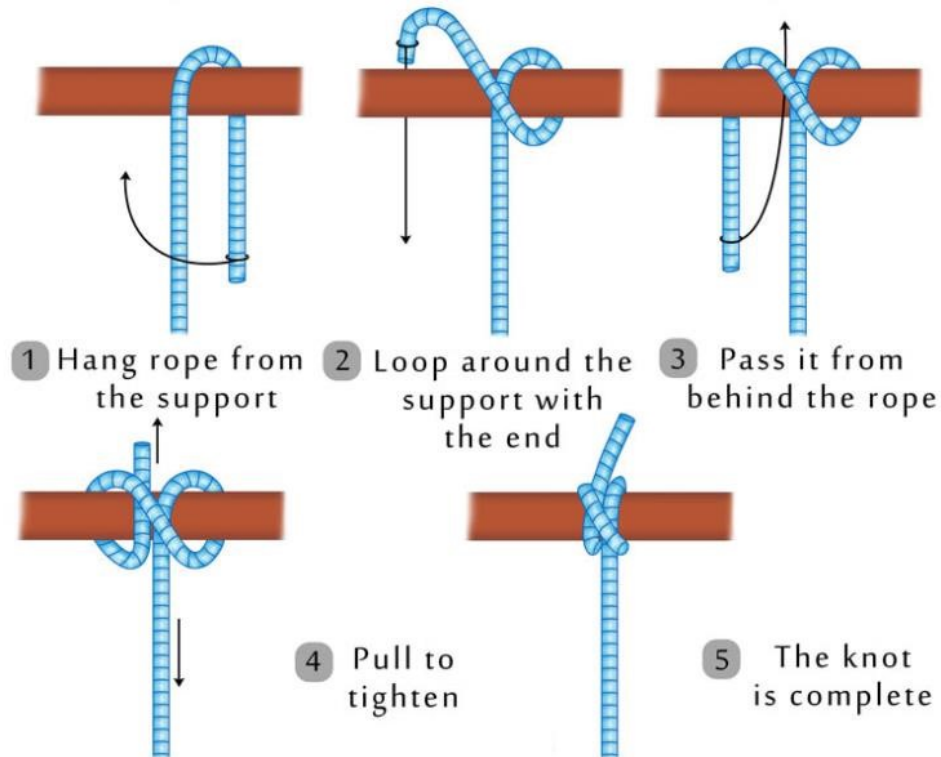
- To lift heavy loads from ships. It is commonly used in docks and wharves.
- For loop-to-loop connections in fishing. It can join a braid to a mono leader and braid to braid. It can be used to directly connect to a Bimini twist.

6. Clove Hitch Knot

It is considered to be one of the most important knots alongside the sheet bend and bowline. Also known as a double hitch, it is simply 2 back-to-back half hitches around a cylindrical object such as a tree, ax or a post. It causes an efficiency loss of approximately 40%. The quick release knot can also be tied with webbing. It can be an interesting forest school activity.



How to Tie a Clove Hitch



Tips

1. The direction of pull in the 4th step should be opposite to each other.
2. On repeatedly weighting and non-weighting the knot, it may loosen and may creep up the open gate of a non-locking carabiner. Hence it should never be kept unattended and is to be used with a locking carabiner.
3. Instead of the linear support you can have a ring.
4. You can finish it with a half hitch stopper back around the standing part to prevent slipping.

Advantages

- • Easy
- The rope on either side of the hitch can be adjusted without untying the knot Can be tied with one hand effectively shortening belay transitions
- Unties easily in Dyneema slings unlike the overhand knot
- Holds tight when 1 strand is weighted

Disadvantages

- • Slipping
- Binding
- Unreliable when tied to a rectangular or square post
- Thinner ropes, when heavily loaded may be difficult to untie

Uses

- Functions as a crossing knot.
- To start and finish a lashing such as the conventional square lashing in pioneering.



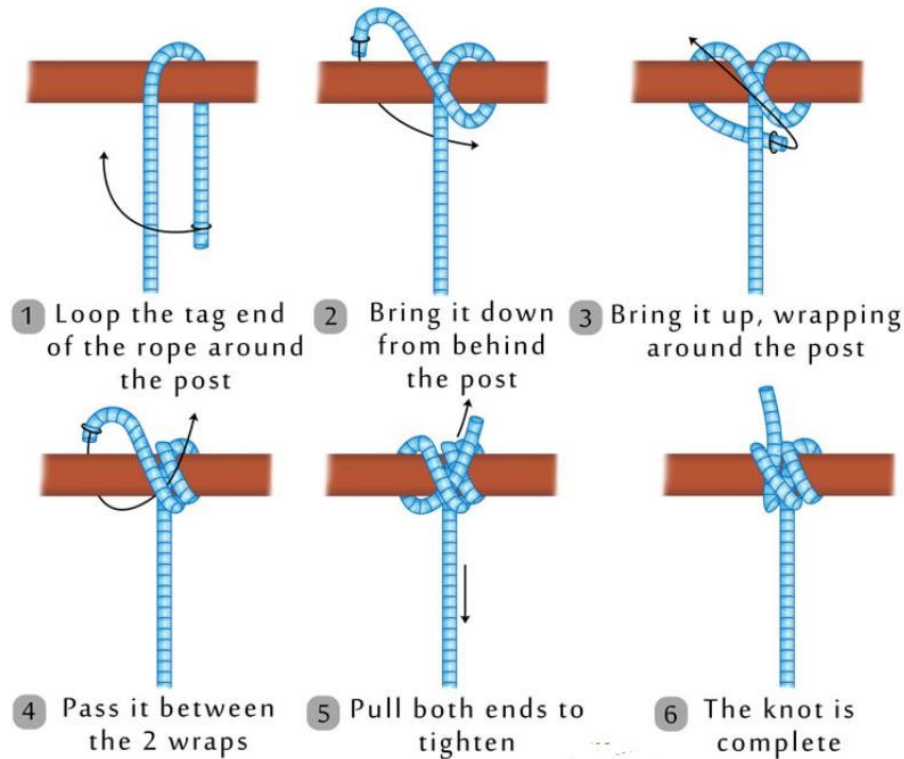
- For the master point in a fixed rock-climbing anchor. Can also connect a personal anchor.
- By placing the knot on the spine of a carabiner you create a biner block that securely blocks against a rapid.
- In solo climbing (as it is safe for self-belaying on a biner) and for rappel transitions.
- Hoisting.
- For tying bandages (arm slings) in case of injuries and for first aid.
- To tie a fender to a rail on a moving boat.
- In hammock hanging systems.
- Aircraft wiring.

7. Rolling Hitch

The rolling hitch is a friction knot that can attach a thinner rope to a thicker one or a single rope to a post or spar. It holds firmly in the direction of the standing part. It belongs to the group of slide and grip knots and facilitates lengthwise pulls on it. Until 1841 it was known as Magnus or Magner's hitch. At that time the name rolling hitch was applied to round turn and two half hitches.



How to tie a Rolling Hitch



Tips

1. As some of the modern ropes are very slippery, a rolling hitch would not hold to them.
2. If you want, you can back it up by two half hitches.
3. Note the formation of a half hitch in step 4.

Advantages

Secure and easy

Disadvantages

Not secure enough for climbing purposes

Uses

- To clear a jammed block or winch by releasing the pressure off the line.
- Sailing and scouting.
- To pull up hoses in fire service.
- For hauling tools aloft in construction work and arboriculture.
- To secure a snubber to an anchor chain.

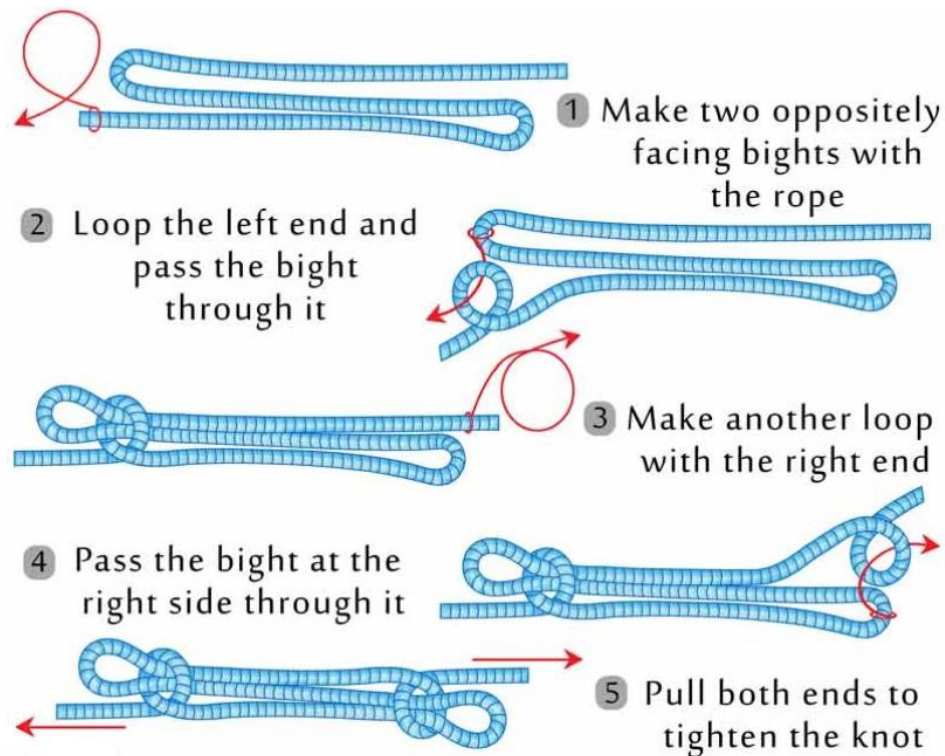
8. Sheepshank Knot

The sheepshank knot is mostly used to shorten a length of rope temporarily. Not being a stable knot, it falls apart under too heavy or too little load. Hence, it should be avoided. Knot experts caution against using it and advises to seize or secure the ends to make it safe unless the need is purely temporary.





How to tie a Sheepshank Knot



Advantages

- Remains secure under tension, especially for the coarser ropes.
- Protects a damaged, weakened or frayed rope.

Disadvantages

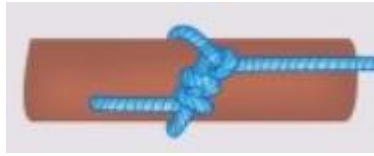
- Can be easily undone on removing tension. So, tension needs to be maintained at both ends to keep it in place.
- Fails under load when tied with slippery synthetic ropes even when it is under tension.
- Almost impossible to tie under load.
- Cannot pass through sheaves or blocks.

Uses

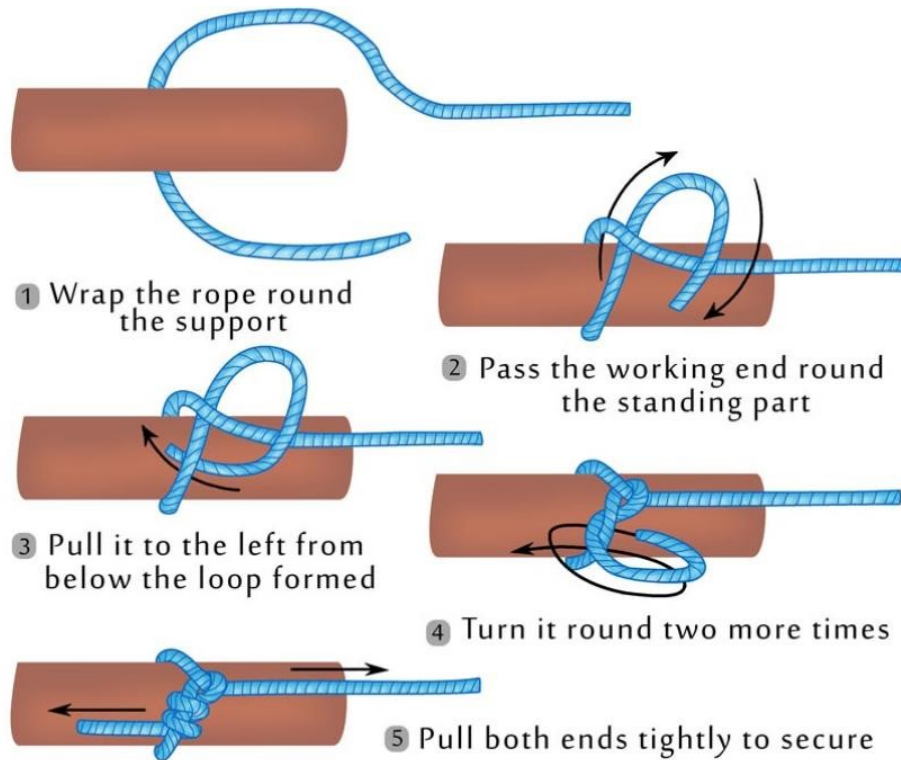
- For securing loads to trailers or trucks.
- In sailing.

9. Timber Hitch

The timber hitch is used to secure a rope round a post or any cylindrical object. It is also known as Bowyer's Knot owing to its use in attaching the end of the bowstring to a longbow.



How to tie a Timber Hitch



Advantages

- Easy to tie and untie even under a heavy load.
- Free from jamming or slipping.

Disadvantages

- Secure only as long as tension is maintained.

Uses

1. Its main use lies in handling cargo.
2. Helpful for towing a log or a spar in water or on land.
3. Used by arborists and lumbermen to attach ropes to branches, tree trunks and logs.
4. To connect the strings of the guitar and ukulele to their bridges.

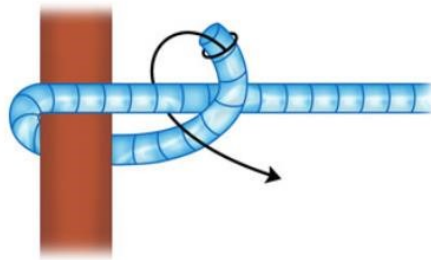


10. Half Hitch Knot

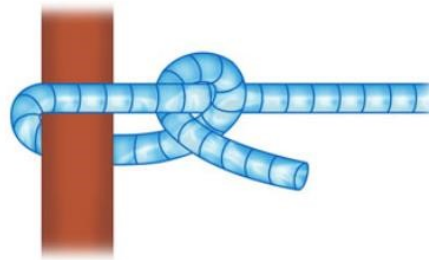
It is basically an overhand knot with the working end brought over and under the standing part. Though it is insecure by itself, it forms the basis of many other reliable knots. It may be used for decorative purposes as in French whipping. The overhand and single half hitch knots have different appearances and the latter necessarily requires a support for the initial loop to be made.



How to tie a Half Hitch



1 Wrap the rope around the support



2 Pass the end through the loop and tighten

Uses

- Fishing with bait (can be used on pilchards, squid, prawns, etc.).
- Fly tying in fly fishing.
- Making paracord survival bracelets, can koozies (sometimes in a slightly modified form).
- **Pulling of wire by electricians.**
- Forms parts of the cleat, clove, cow, timber, rolling hitches among others.
- An easier alternative to the square knot for tying sutures in surgery.