



Knots for Cavers

Knots, Hitches, Bends, and Splices

Step By Step Instructions
For tying knots for Caving

Knot Requirements – by Slide Edge Color

Required Knots

Additional Knots

Credits

The photography and illustrations in this presentation are the creation and property of Grog LLC:

<http://www.animatedknots.com>

Version 7.0 - May 21, 2017



The text slides were created from the *Basic Vertical Class* materials of the Vertical Section of the NSS.

Nomenclature

Rope Terms:

- **Working end** (where the knot is)
- **Standing line** (middle part, hanging free)
- **Running end** (free end of the rope)

Nomenclature

Knot types:

- **Knot** - Tied configuration that doesn't move or slip.
- **Hitches** - Tied configuration that ties around an object or a rope. When the object or rope is removed, the tie falls apart.
- **Bends** - Tied configuration between two ends of a rope(s).
- **Splices** - Interwoven strands (decorative macramé is also here).
- **Stopper** - A knot that is affixed to a rope that causes no slippage.

Nomenclature

Knot Terms:

- **Body** (main part of the knot)
- **Loop** (turn of rope that crosses itself)
- **Bight** (doubled loop, doesn't cross itself)
- **Tail** (free end of the rope after the knot)
(minimum 4 X the rope diameter)

What Makes a Good Knot?

- **Friction** - Makes the knot hold.
- **Dressing** - Aligning the rope through the knot (increases friction).
- **Alignment** - Keeping the knot in the direction of forces.
- **Procedure** - Tie it, Dress it, Stress it.

Strength of Knots

- **Sharp bends** weaken the rope
(A bend of 4 times the rope diameter causes minimal loss of strength).
- **Constriction or girthing** (like a barrel knot) holds the rope.
- **"Backing up" a knot** (keeps free end from loosening the tie).
- **Efficiency Table** (approximate retention of rope's strength).

Ties to Learn (Efficiency)

Figure Eight	75-80%
Figure Nine	80-85%
Overhand Bend	50%
Double Overhand Bend	65-70%
Triple Overhand Bend	80+%
Ring Bend (Water Knot)	55%
Bowline	70-75%
Butterfly knot	60-65%
Prusik Knot	80%

Extra Ties to Learn (Efficiency)

Munter Hitch	75-80%
Chain Braid	100%
Clove Hitch	90+%

Overhand

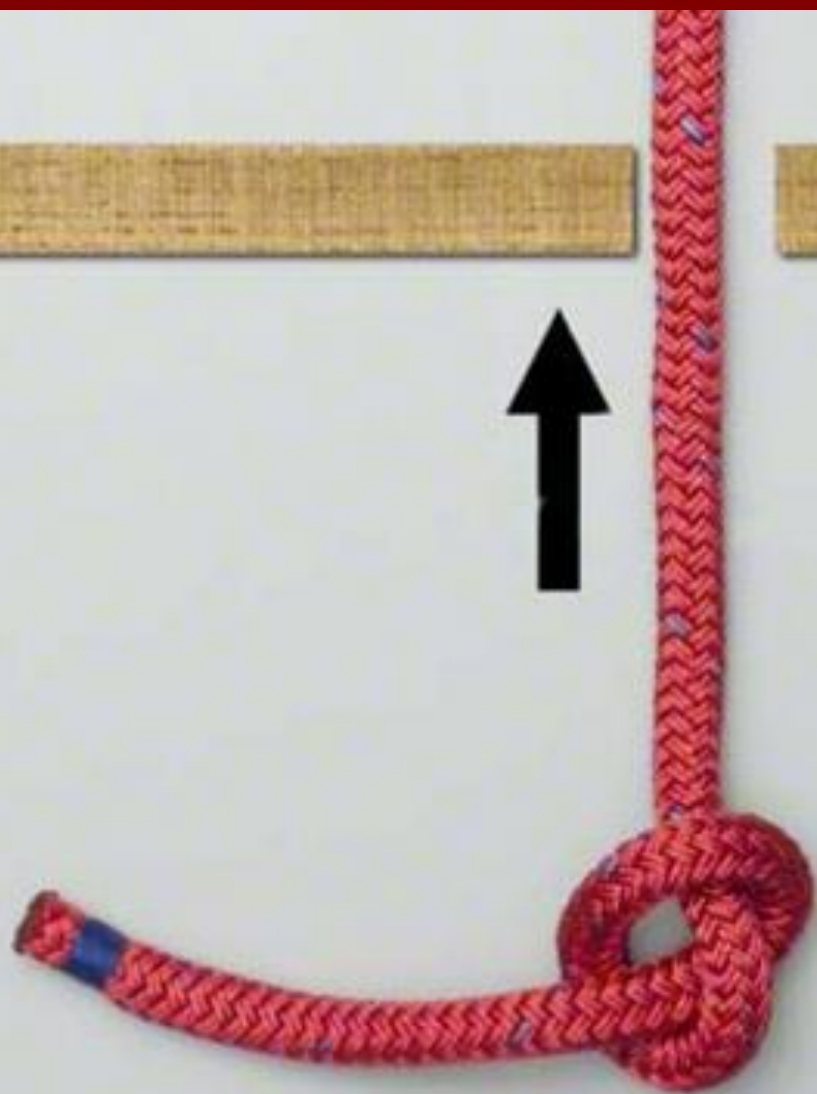
For Securing Ends of the tie.













Bowline

For Securing Equipment to the rope.

















Structure

Figure Eight

A Strong Knot with Minimal Weakening of Rope.

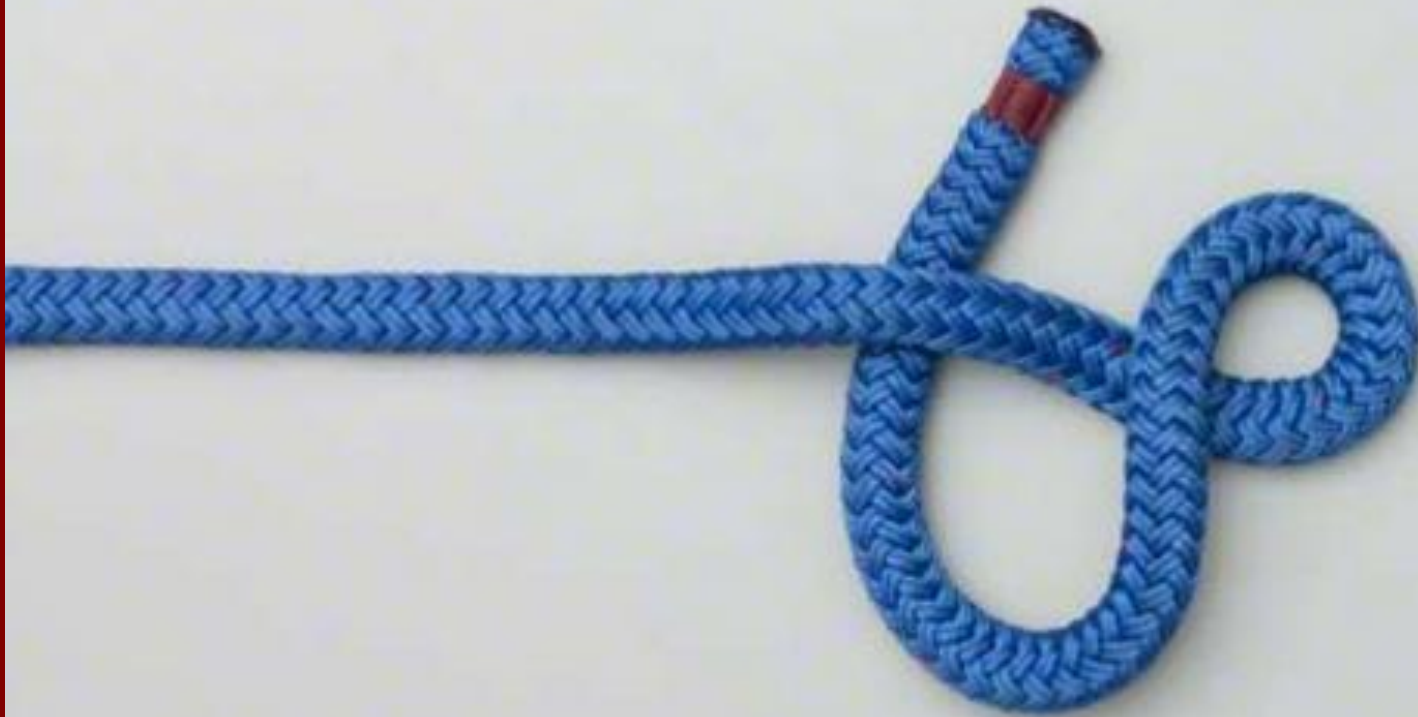
(Use doubled line to make a **Figure Eight Loop** to use at the end of the climbing rope.)







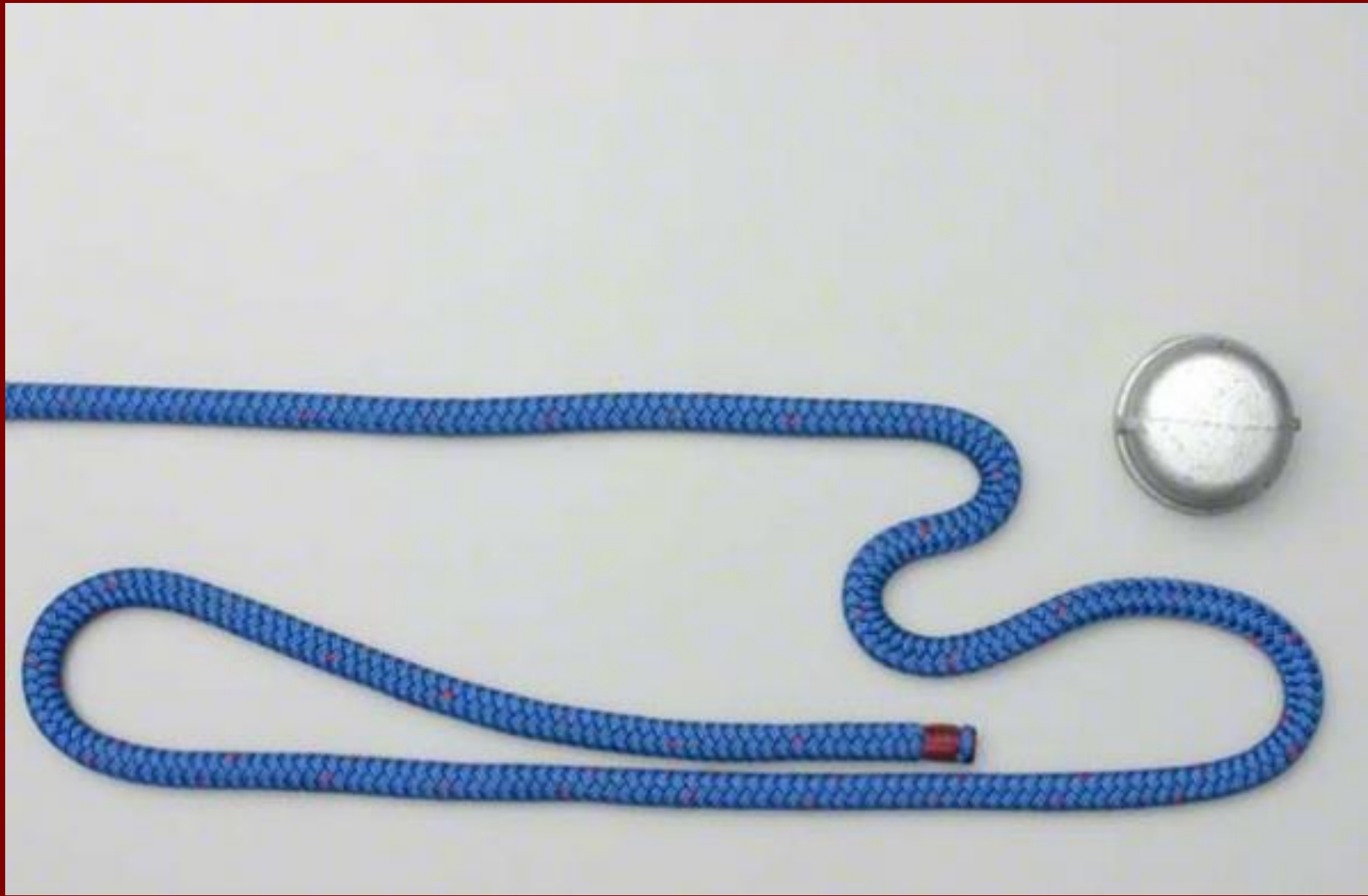




Structure

Figure Eight Follow-Through

A Workhorse Knot
(makes a strong loop; used to tie
the Rope around a fixed anchor).









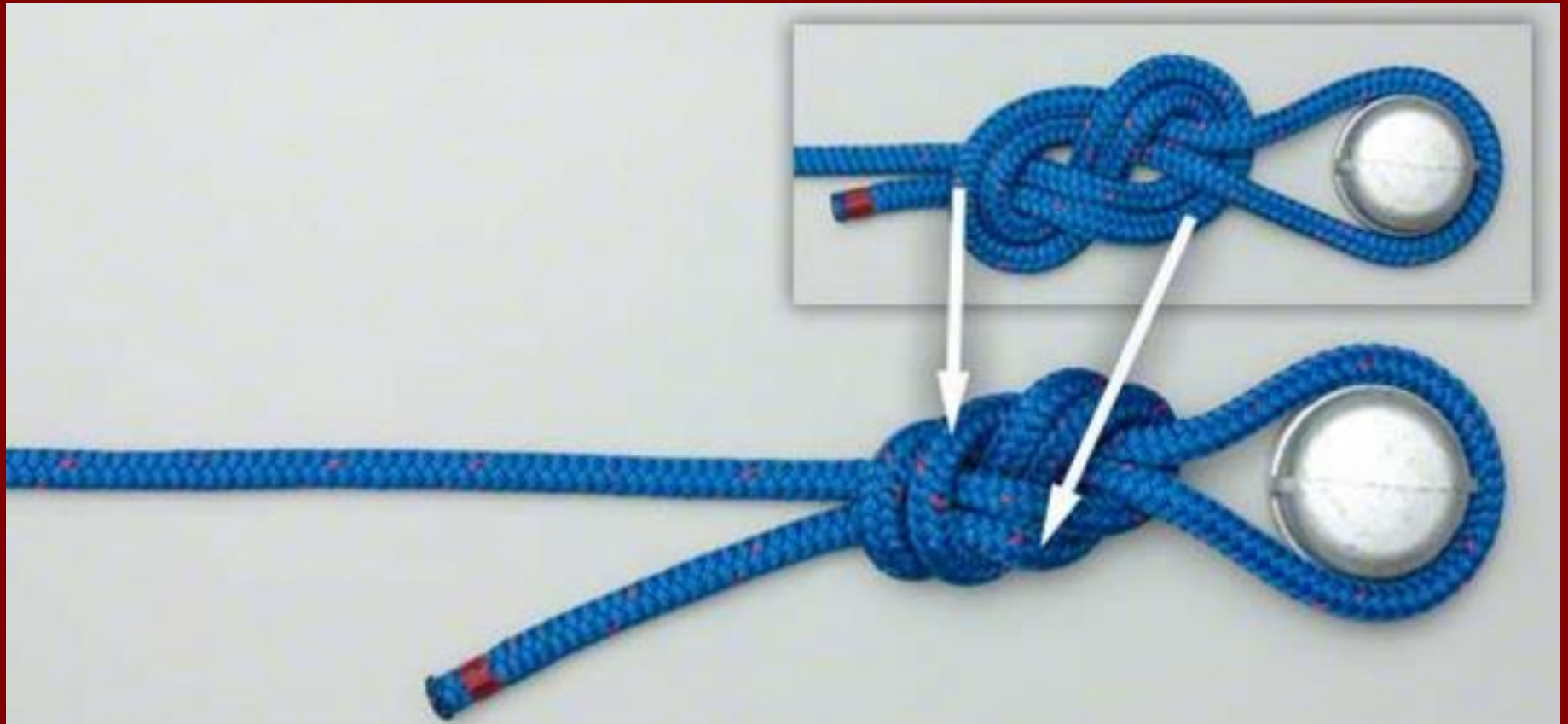












Dressed

Water Knot (Ring Bend)

A Workhorse Knot

(Used for tying rope and webbing together;
Especially good for tying rope or
webbing of dissimilar sizes).

Water Knot (Ring Bend) Tying:

- Tie a loose overhand knot in the end of the strap.
- Thread the other strap in the reverse direction following the exact path of the first overhand knot.
- Pull the knot tight.

Use Arrow Keys





Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys

A blue and red woven strap is shown against a white background. The blue part of the strap is knotted, while the red part is a straight section extending from the knot. The text "Use Arrow Keys" is overlaid in the bottom left corner.

Use Arrow Keys

A close-up photograph of a woven fabric strap, likely made of nylon or polyester. The strap is primarily blue, but has a section of red woven fabric at the bottom left. A knot is tied in the blue section, and a loop of the red section is visible at the top right. The background is a plain, light-colored surface.

Use Arrow Keys

A blue and red woven strap is shown against a white background. The strap is made of a ribbed fabric. It features a knot in the center where the blue and red sections meet. The red section extends from the bottom left towards the top right, while the blue section extends from the top left towards the bottom right. The knot is formed by the blue section looping over the red section.

Use Arrow Keys

A close-up photograph of a red and blue woven strap tied in a knot. The knot is a reef knot (square knot), with the red strap forming the left and right sides and the blue strap forming the top and bottom. The straps are made of a woven fabric with a distinct ribbed texture. The background is a plain, light-colored surface.

Use Arrow Keys



Use Arrow Keys



Use Arrow Keys

A close-up photograph of a reef knot (square knot) made from a red and blue braided rope. The knot is centered in the lower half of the frame, with the two ends of the rope extending downwards and outwards. The background is a plain, light-colored surface. The text "Use Arrow Keys" is overlaid in the bottom left corner.

Use Arrow Keys

Double Overhand Bend (Grapevine Bend)

The Double Fisherman's (Grapevine Bend) is the way to join two ends of a line to form a Prusik Loop and is also an excellent and reliable way of joining two climbing ropes.

Double Fisherman's, or Grapevine Bend, Knot Tying:

Overlap the two ends. Wrap one end around both ropes two full turns. Then pass this end back through these turns and pull tight. Next pass the other end two full turns around both ropes. Pass this end back through and pull tight. Pull on both ropes to tighten the two knots against each other.



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



The Back View of the Double Fisherman's is extremely neat and symmetrical. When ropes of the same color are used, it appears that four identical loops encircle the junction.

Butterfly (Loop) (Lineman's Loop)

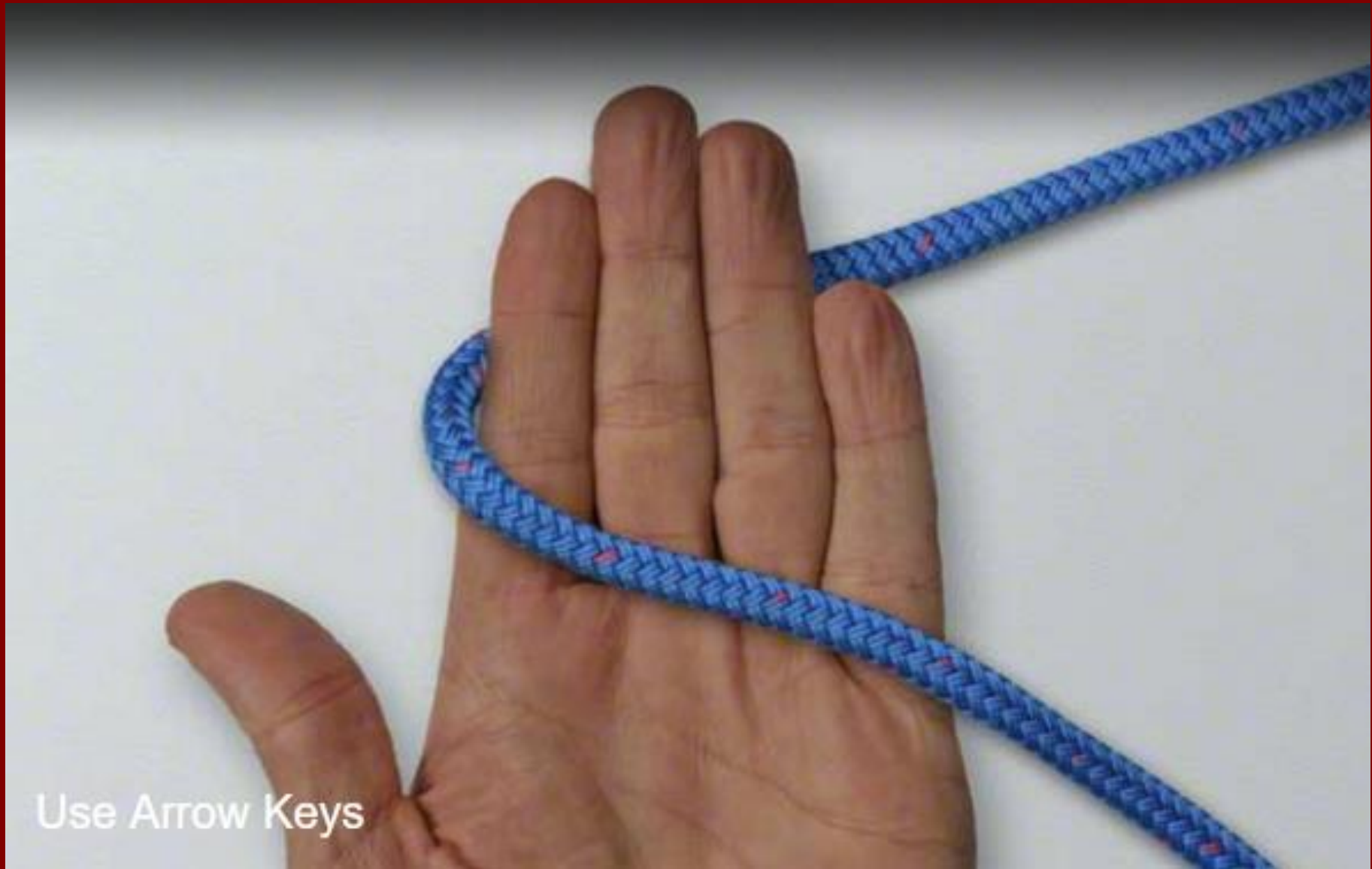
What is now known as the Alpine Butterfly provides a secure loop in the middle of a piece of rope. Load can be safely applied: from the loop to either end of the rope; between the two ends with the loop hanging free; or to the loop with the load spread between the two ends.

Alpine Butterfly Loop (Lineman's Loop) Tying:

Wrap the rope around your hand twice. At the end of turn one, position the rope close to your fingertips. Continue around and complete turn two back near your thumb. Pick up the turn near your fingertips. Wrap it around the other two turns. Slide the knot off your hand and tighten by pulling on the loop and the ends.



Use Arrow Keys




Use Arrow Keys

A close-up photograph of a person's right hand, palm facing up, holding a thick blue braided rope. The rope is looped around the fingers and thumb in a specific way, likely demonstrating a step in a knot-tying process. The background is a plain, light-colored surface. The text "Use Arrow Keys" is overlaid in the bottom left corner.

Use Arrow Keys



Use Arrow Keys

A close-up photograph of a person's open palm holding a blue braided rope. The rope is looped around the fingers and thumb in a specific way, likely a step in a knot-tying tutorial. The rope has a distinct herringbone or twill weave pattern. The background is a plain, light-colored surface.

Use Arrow Keys



Use Arrow Keys

A close-up photograph of a person's hand holding a blue braided rope. The rope is looped around the fingers and palm in a specific way, likely to demonstrate a step in tying a knot. The background is a plain, light-colored surface. The text "Use Arrow Keys" is overlaid in the bottom left corner.

Use Arrow Keys



Use Arrow Keys



Use Arrow Keys

Use Arrow Keys





Use Arrow Keys



Use Arrow Keys

Prusik Knot (Hitch)

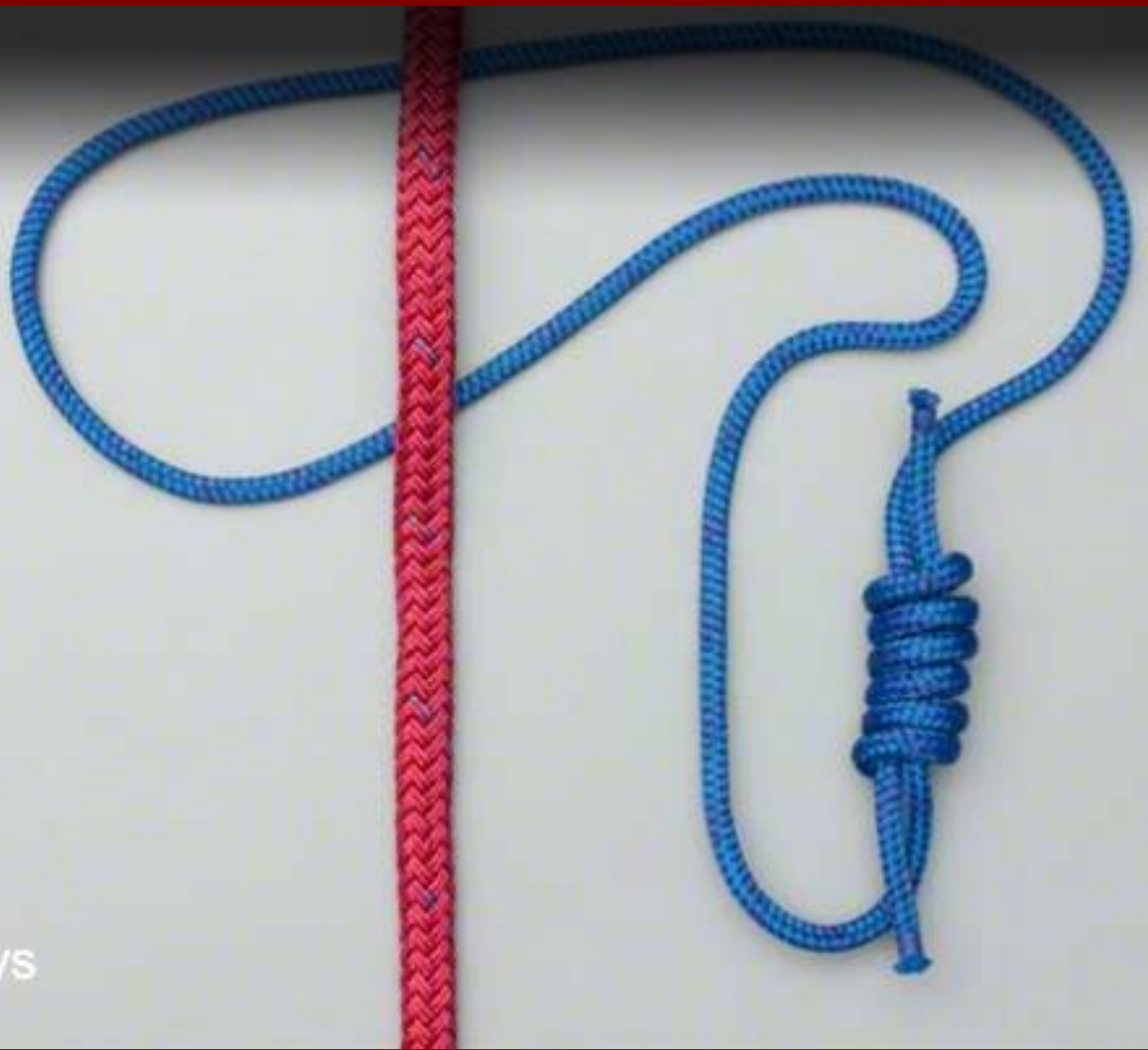
The knot requires a "Prusik Loop". Its principal use is allowing a rope to be climbed - ascending or "*Prusiking*". Two Prusik loops are alternately slid up the static rope: a long Prusik loop reaches the climber's foot – to allow leg power for ascending, and a second short Prusik loop is attached to the harness – to allow sitting.

Prusik Knot (Triple Sliding Hitch) Tying:

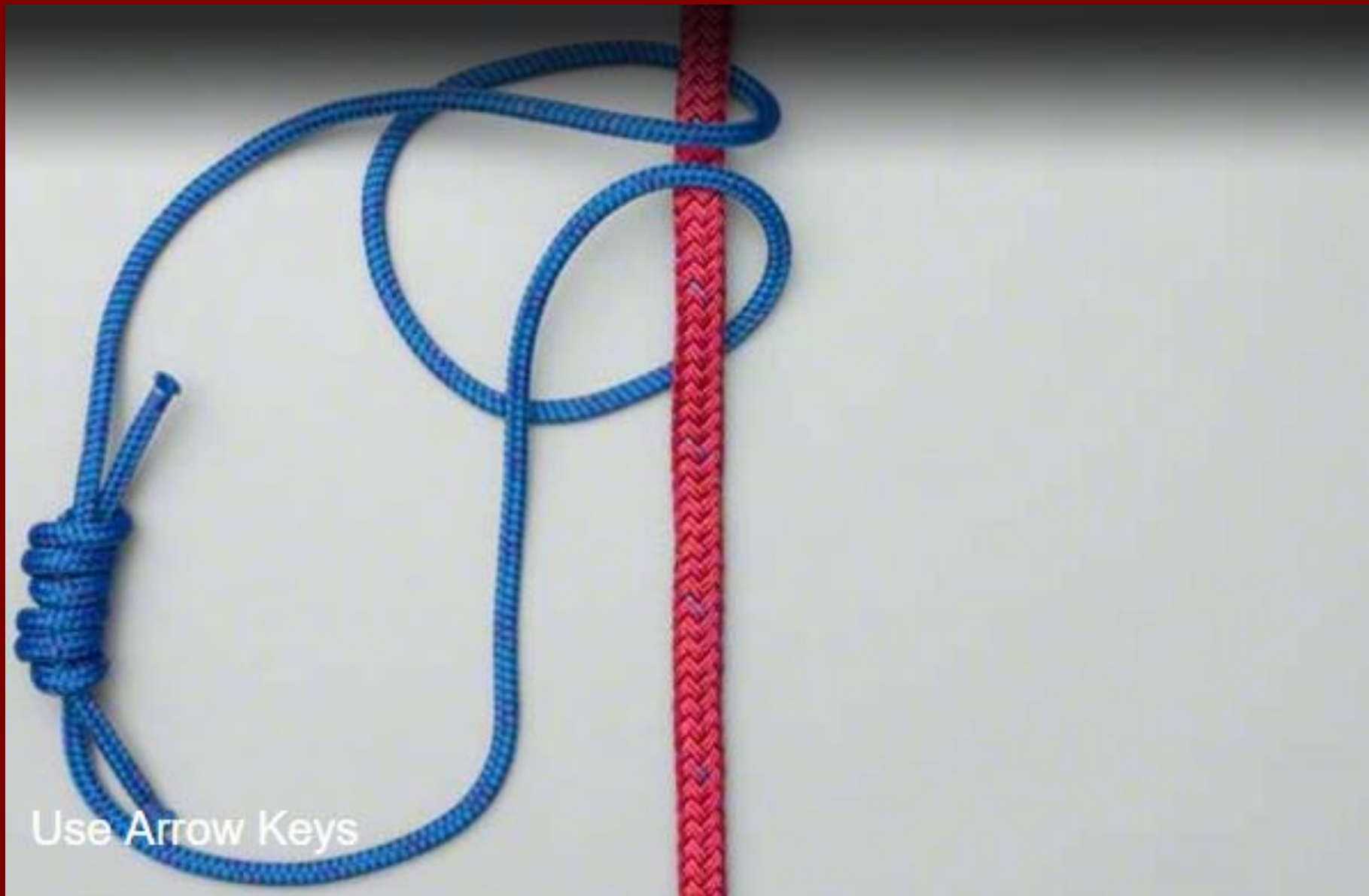
Use a piece of cord formed into a loop. Pass the knot around the rope three times inside the loop. Make sure the turns lie neatly beside each other and pull the knot tight.



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys



Use Arrow Keys

Munter Hitch

(Italian Hitch)

The Munter Hitch - (the Italian Hitch) allows controlled belaying of a climber or equipment.

Munter Hitch Tying:

The climbing rope passes through a locking carabiner, round the rope, and back through the carabiner. For controlled descent, the brake hand need only apply relatively little force on the free end. Use a carabiner large enough to allow the hitch to be inverted through the carabiner when pulled. The load end should pass first round the spine side (not the opening side) of the carabiner to prevent chafing against the lock.











Load





Invert



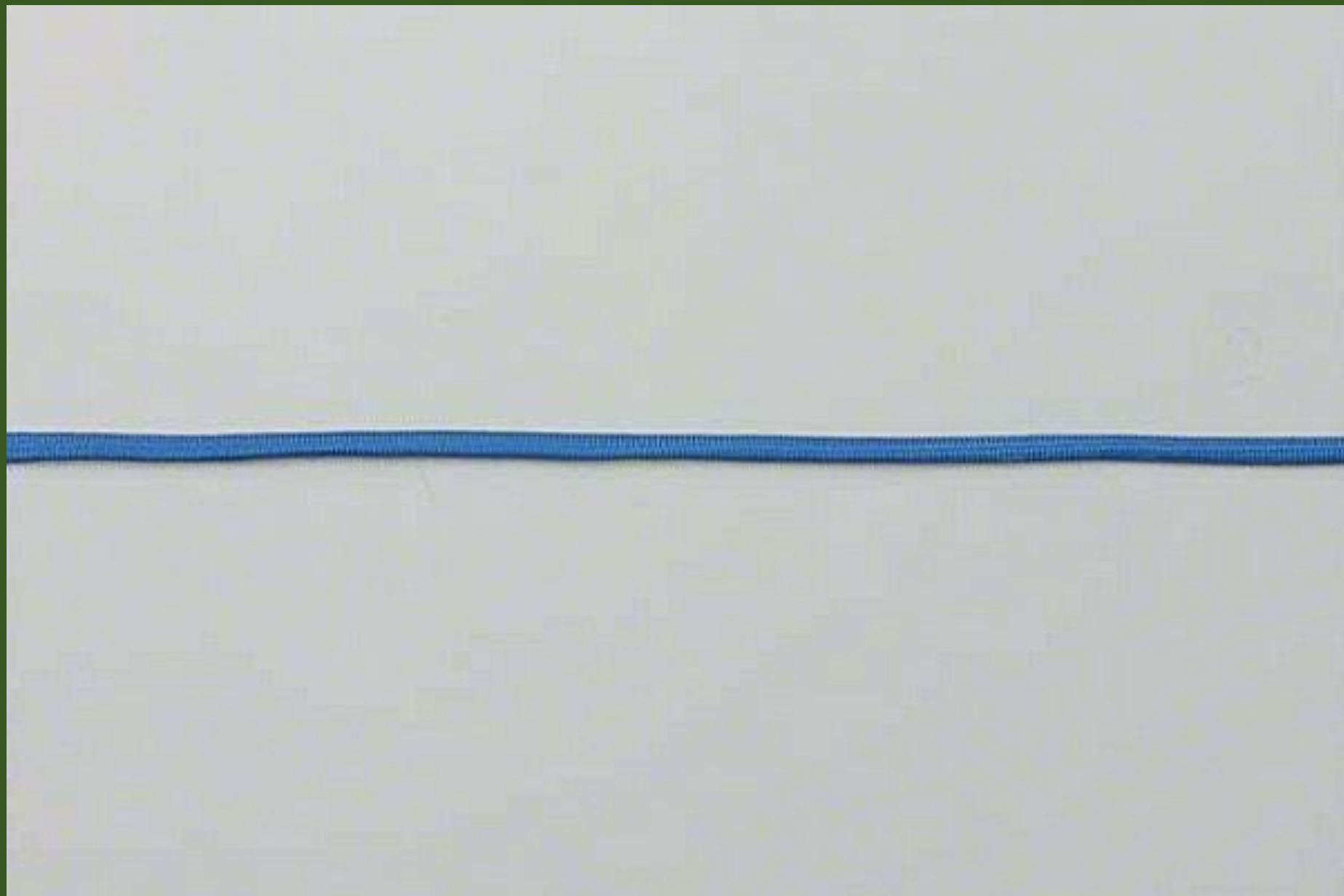
Take Up Slack

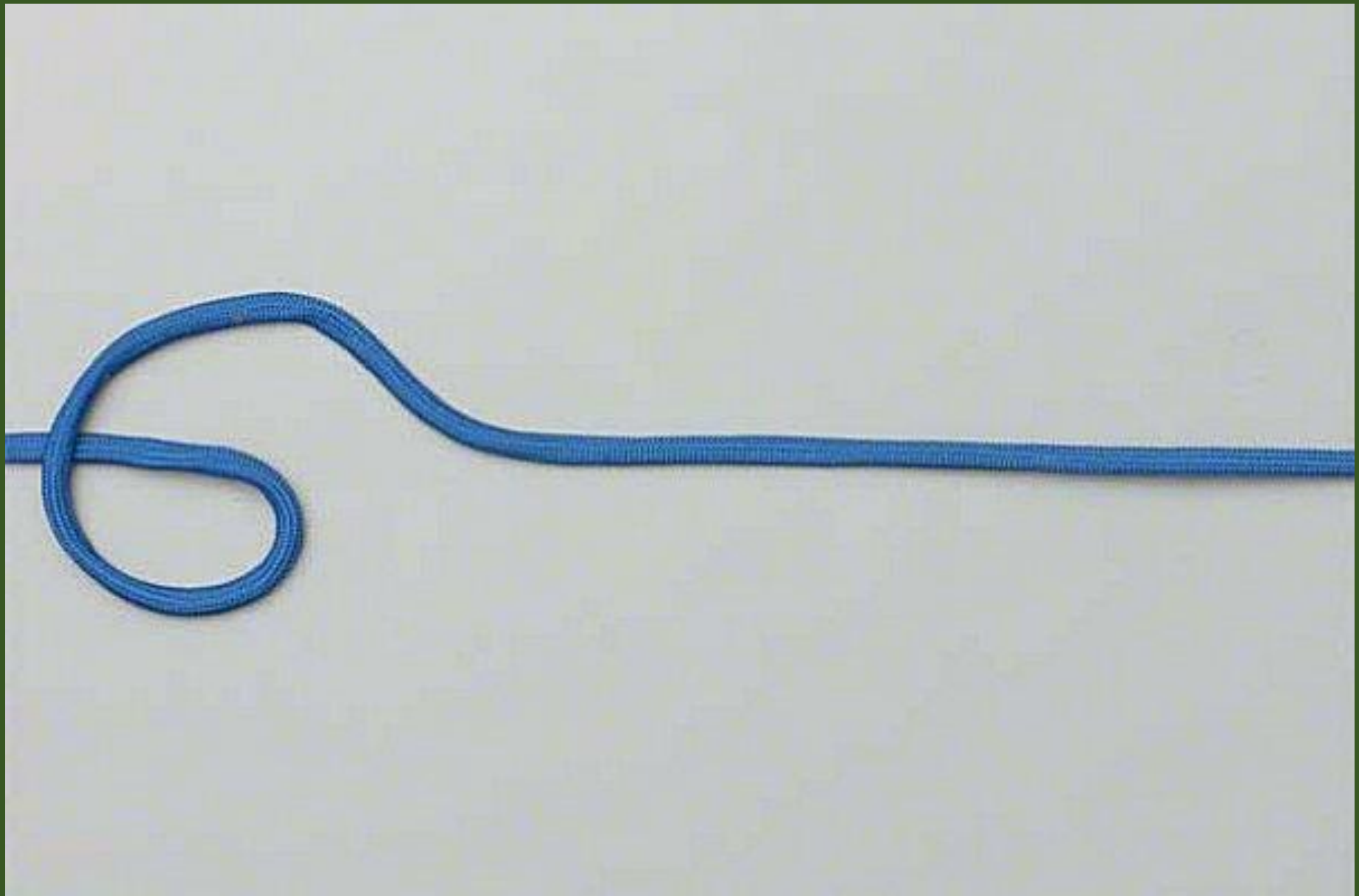
Chain Sinnet (Monkey Braid)

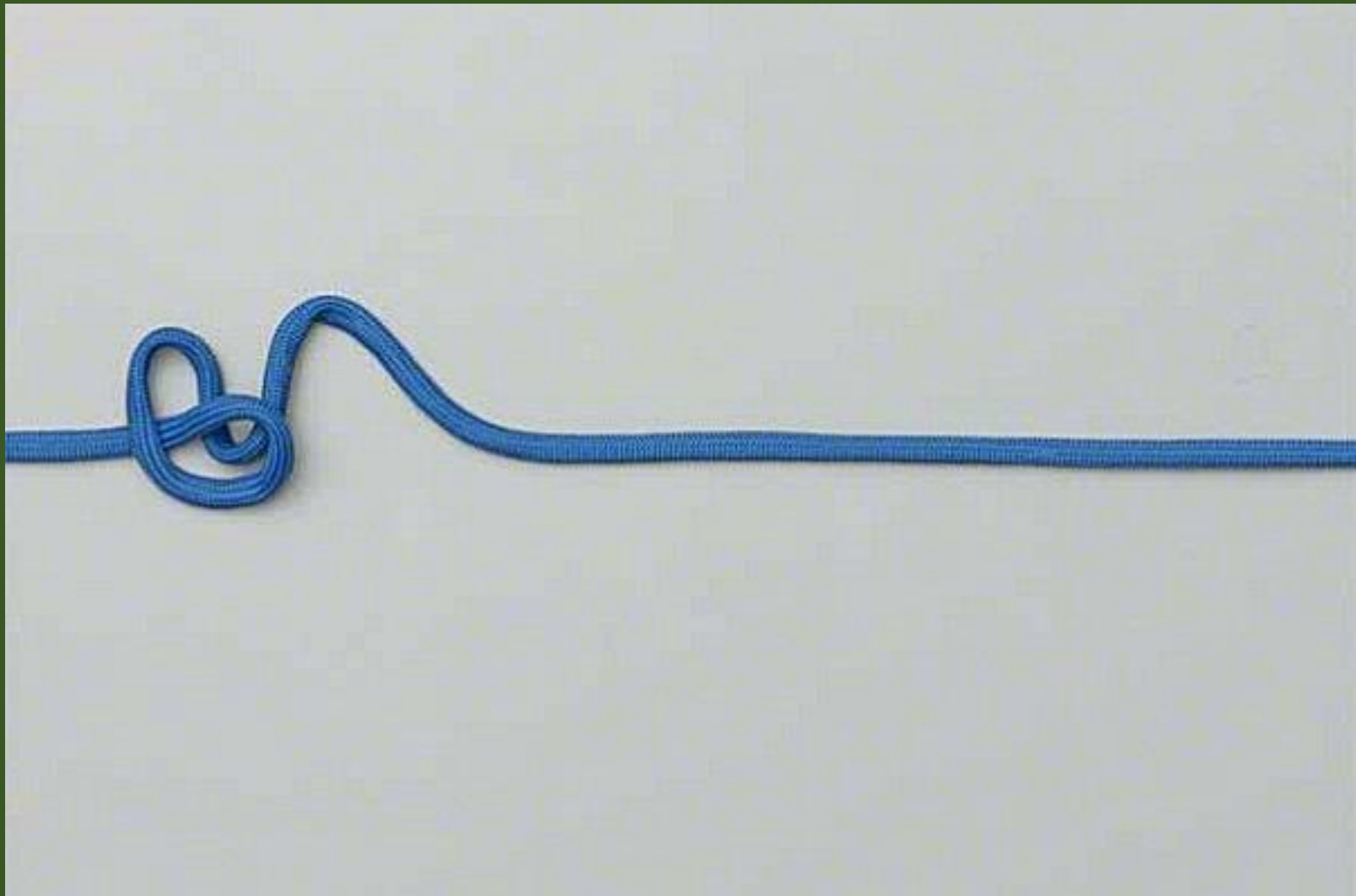
The Chain Braid is used by climbers as a means of preventing a rope getting tangled, e.g., when being washed or stored. When used for storing rope, it is much quicker to make much larger loops.

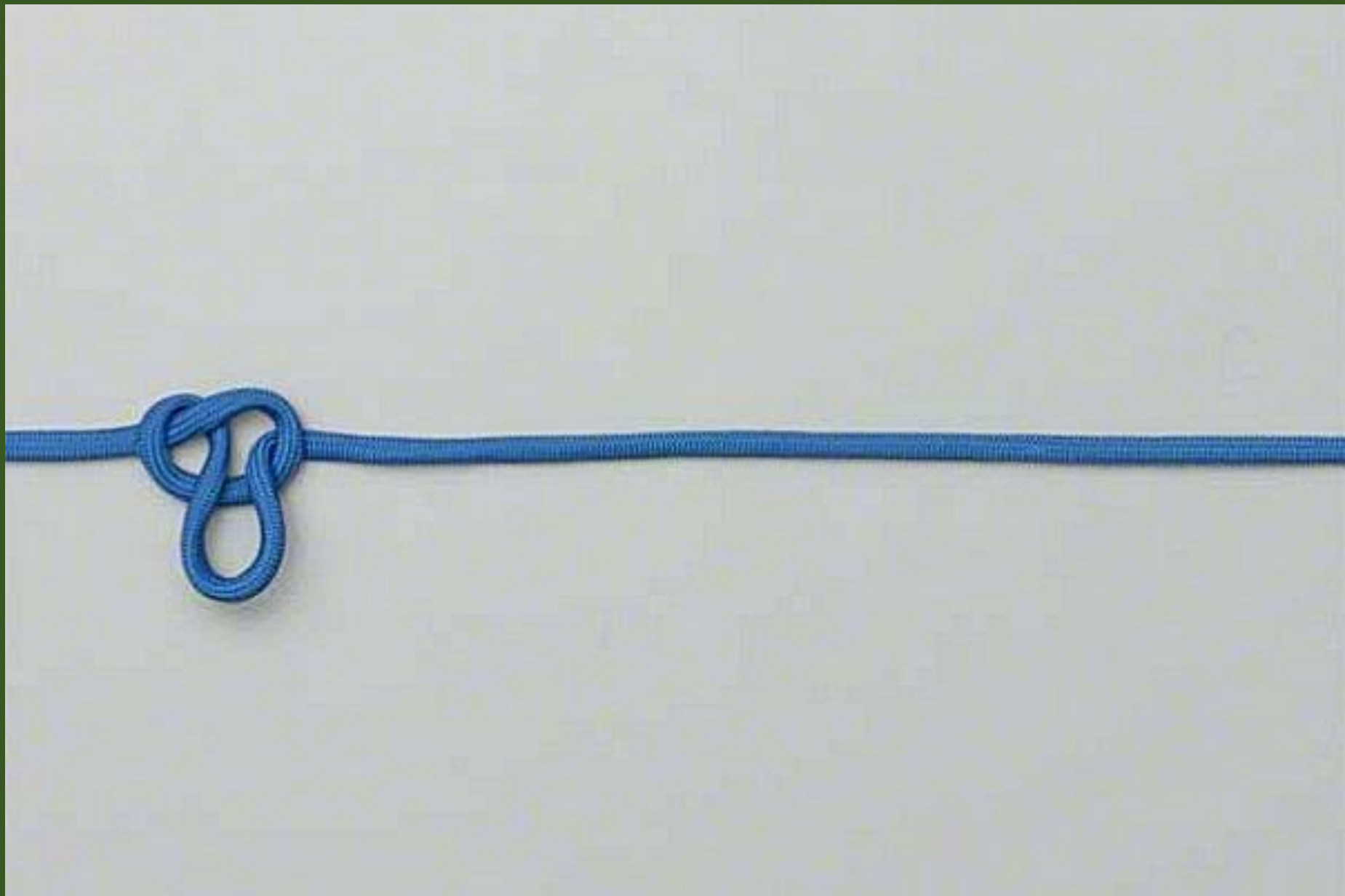
Chain Braid Tying:

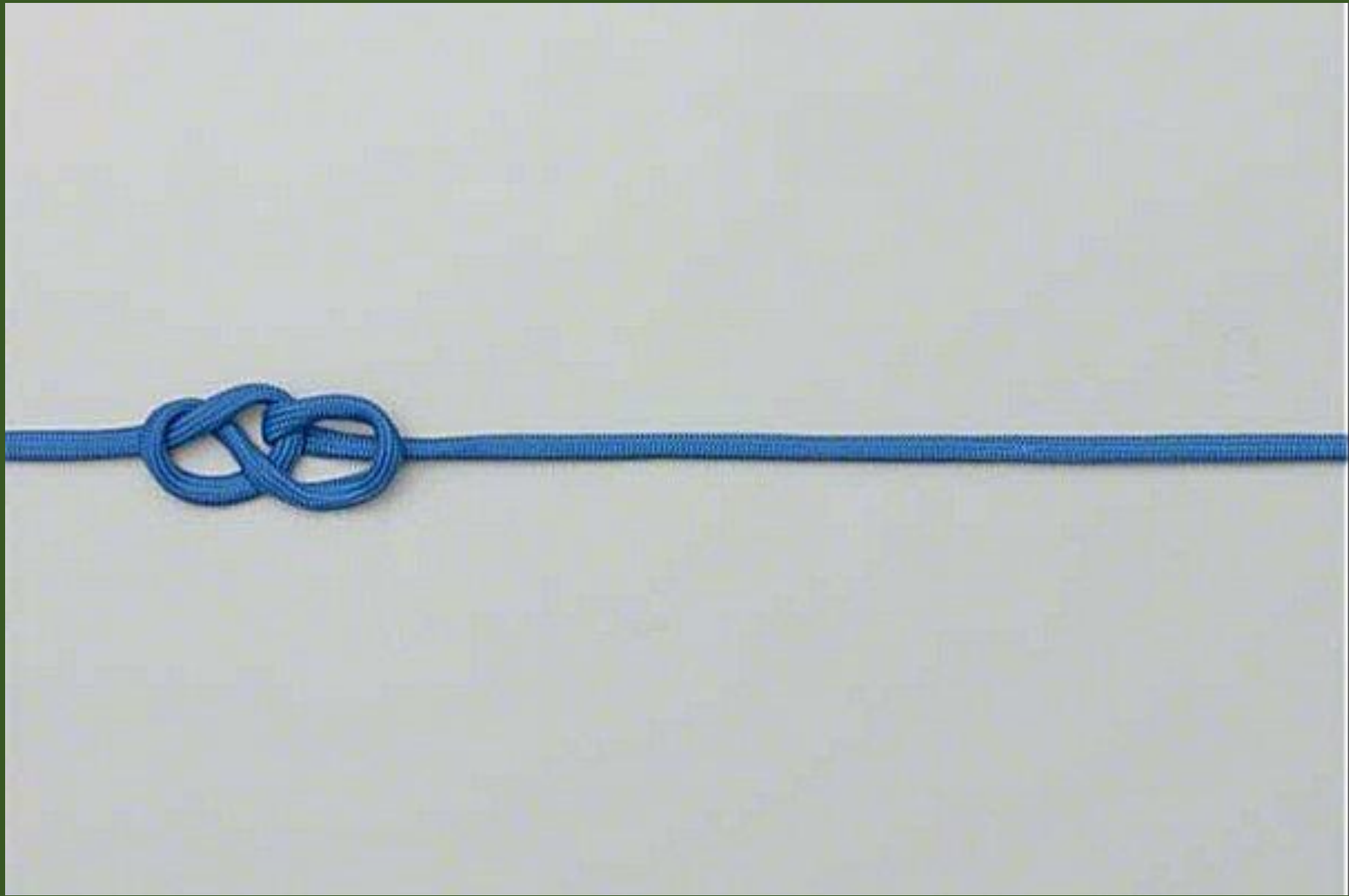
Make a noose in the rope. Form a loop and tuck it into the noose. Make another loop and tuck it into the previous loop. Keep repeating. When the chain is long enough, lock it by passing the end through the final loop.

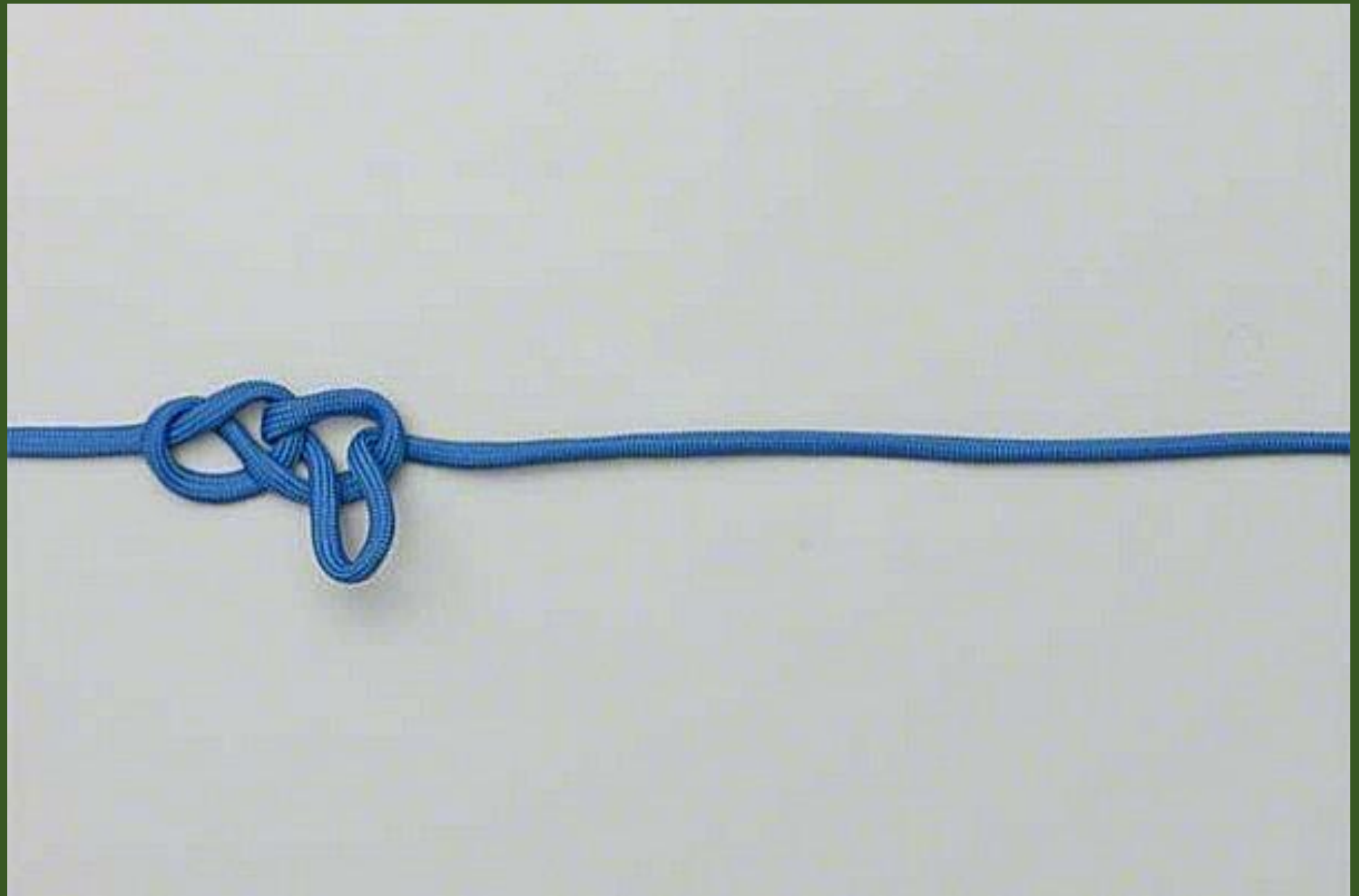


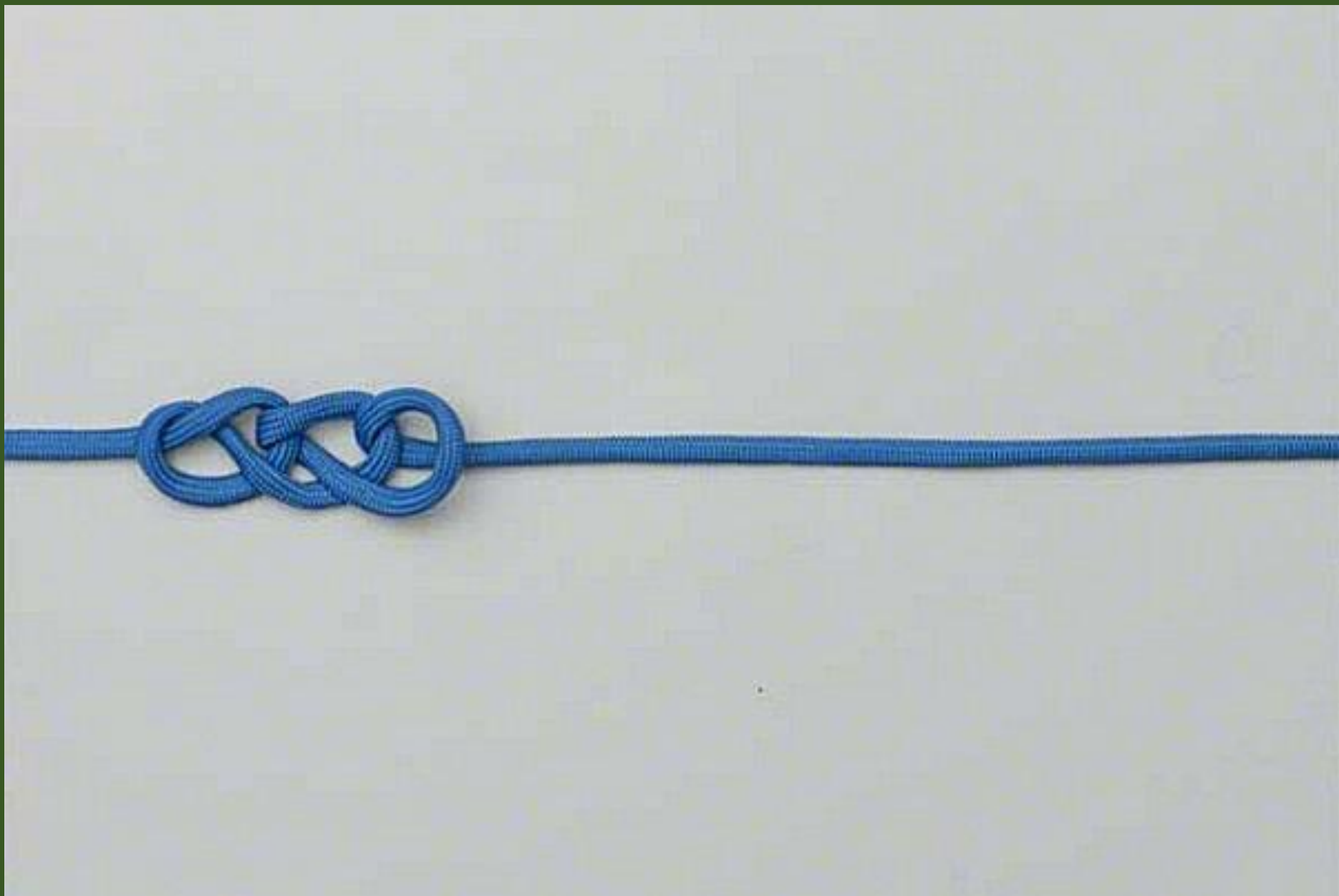
























Clove Hitch

The Clove Hitch is an easily-adjustable tie for securing cylindrical objects (pipes, logs, etc.).

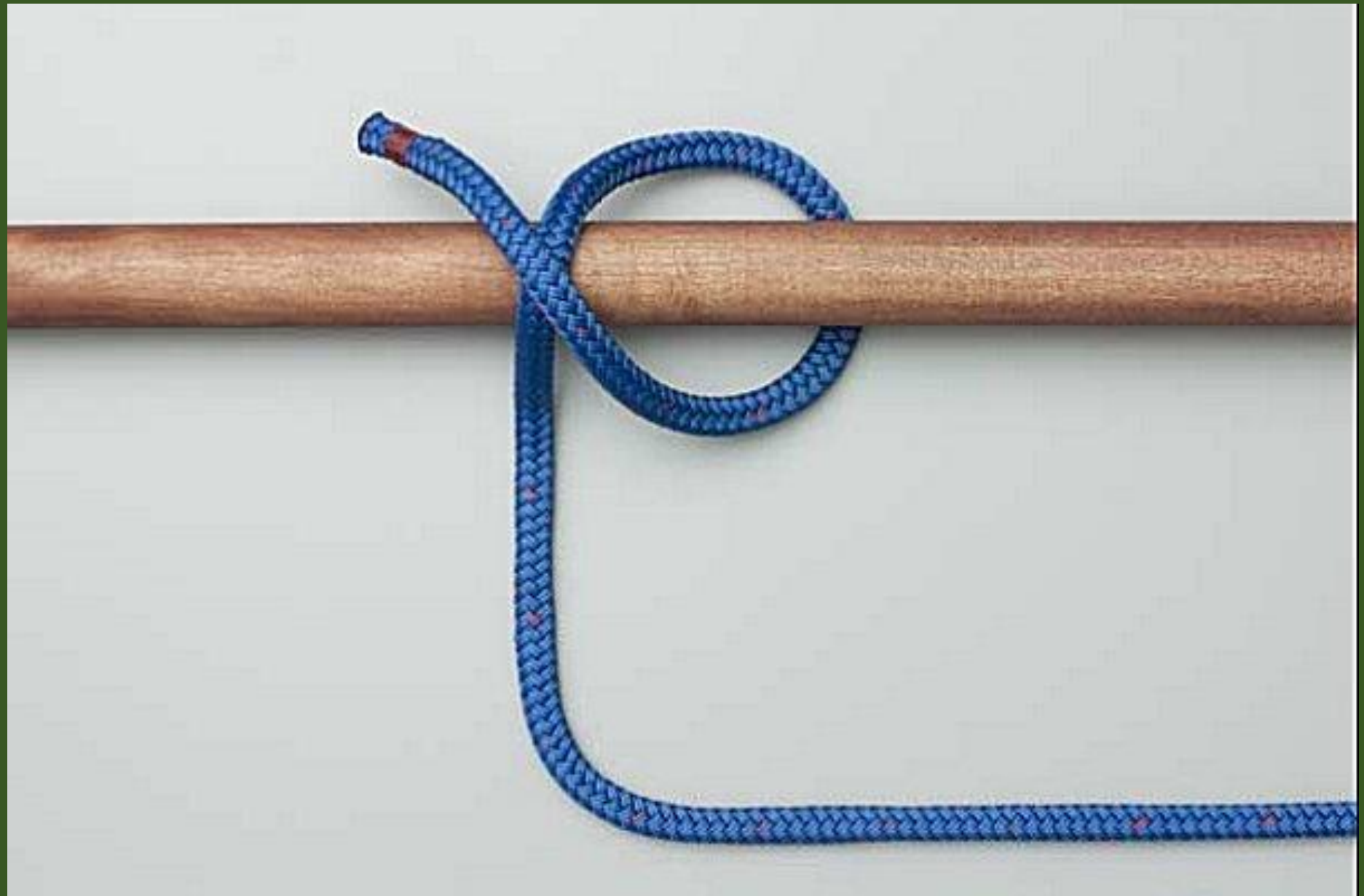
Clove Hitch Tying:

Pass the end of the rope around the pole. Continue over the standing end and around the pole a second time. Thread the end under itself and pull tight to form the clove hitch.

NOTE: For use with equipment only. This tie can slip or jam tight under heavy load.













Structure

Practice your knots until you can tie them in the dark (blindfolded) ... you may have to.

Climb Safely !!!