

PIONEERING - A Quick Guide



***A guide to introducing Scouting Ireland
Pioneering Skills Levels 1-4***



What is Pioneering?

Pioneering is the knowledge and skill of using simple materials to build structures that are used in a wide range of Scouting activities. These skills can also sometimes be referred to as one element of “**Backwoods engineering.**”

Historically the term 'Pioneering' is taken from the military pioneers who went ahead of armies to build bridges and clear paths. It is very much an activity that has been at the fore of all Scouting activities since the beginning.

To become competent and able in developing pioneering skills requires **time, patience** and lots of **practice**. Learning how to use knots and lashes, poles and ropes to create **structures** and '**gadgets**', is something that will not happen overnight. It does however, give Scouters opportunities to be as imaginative as possible in developing activities that showcase Pioneering skills and builds.

This guide will provide some **useful hints** and **tips** and outline some of the basic ideas and approaches you may wish to use to develop a programme up to **Level 4** of the **Pioneering Adventure Skills**.

Something to remember

Don't rush...it may be tempting to just get on and do, however, take a moment to plan before you get stuck in, and take care along the way.

Scale your projects... starting out small allows you to practise designing structures, learning knots and recognise the important lashings to use before starting bigger projects.

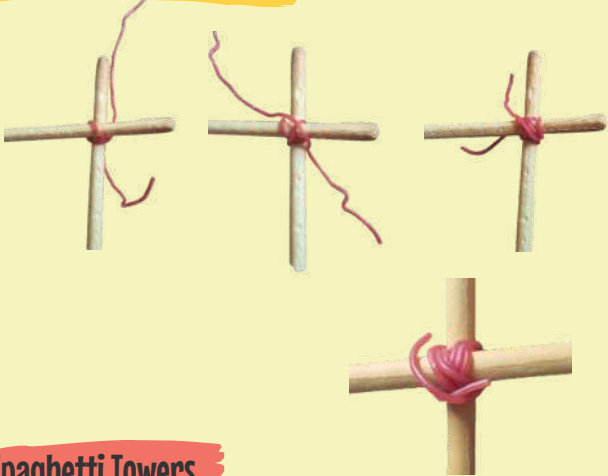
Make it interesting... big pioneering builds aren't going to happen quickly, find ways to make the simple projects fun, like edible pioneering or making catapults or rafts that you can play with.

Finally...Wear sturdy shoes...when starting bigger pioneering projects you'll need to take care to avoid squished fingers and toes. Closed-toe, sturdy shoes are a must and you may want to look into gloves too.

Introducing Pioneering Skills

A good way to introduce what '**pioneering skills**' are all about is to demonstrate to the group how they can go about tying some basic lashings/ knots and making some simple structures.

Edible lashings & knots



You will need

Edible poles (breadsticks or chocolate fingers etc)
Edible ropes (strawberry laces or cheese strings etc)

1. Start by winding the string around both poles.
2. Next, wind the string back in on itself so that it twists.
3. Now, wrap the string diagonally across the poles in one direction with two or three turns.
4. Then wrap diagonally with two or three turns the other way.
5. Tie off the lashing practicing with a clove hitch.
6. Voila...check everyone's knot or lashing.. if it has been tied correctly, it can be eaten.

Spaghetti Towers

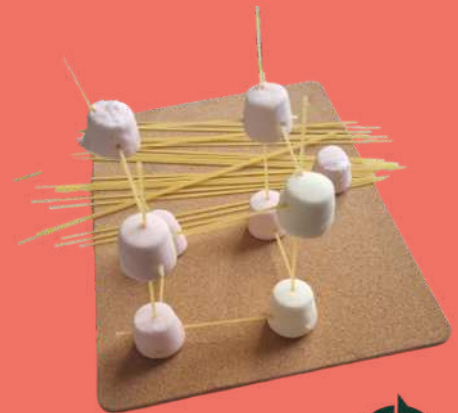
Spaghetti towers are a great way of introducing basic shapes and structures to the group.

Ask the group to make a freestanding tower using only uncooked spaghetti and marshmallows.

This activity can be done as a patrol, sixes etc or individually, but agree how their towers are being judged beforehand.

Ensure that towers are freestanding, winning towers might be based on who's is the highest or strongest or who's is the best design.

To keep it interesting you may want to limit the pieces of spaghetti and marshmallows groups can use and/ or put a time limit on the task.





Introducing Pioneering Skills

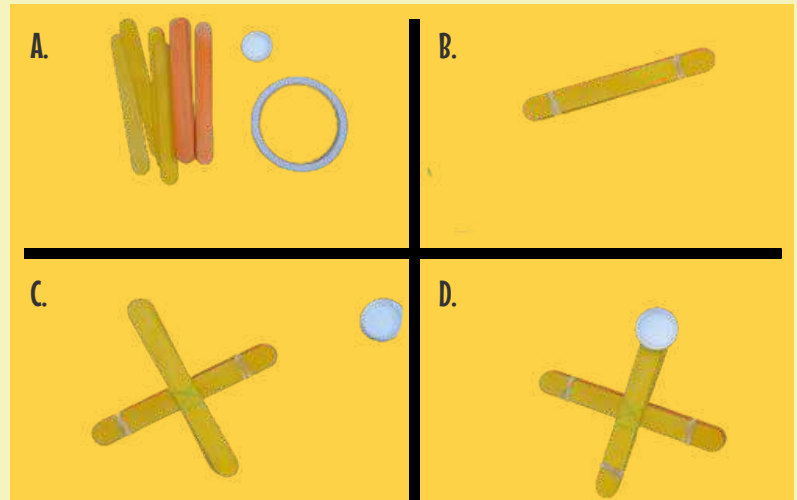
Lollipop Catapult

Introducing builds that are a little more complex will help demonstrate further what pioneering skills and learning involves.

A good place to start is in the building of simple lollipop catapults. This will demonstrate design & planning, introduce simple lashings and enable groups to see pioneering in action.

You will need:

Lolly sticks, Elastic bands, Double sided tape, Milk bottle top, pom-poms or table tennis balls



Method

Step 1. Start with about 7 popsicle sticks and place them on top of each other. Twist an elastic band around each end to hold them in place.

Step 2. Place another stick above and one below the stack of 7 so they make a cross shape. Position the end you want to place the milk top on (the catapult cradle) so that there is more of the lollipop length on one side of the cross.

Step 3. Tie an elastic band around the middle of the cross, twist another elastic band around the bottom of two sticks as you can see in the picture C.

Step 4. Attach a milk bottle top using double sided tape or strong glue. The catapult is complete and you can now experiment with pom-poms or your ping-pong balls to see which flies further.

Pioneering - The Basics

The next step in developing pioneering skills is to begin to explore and discuss the 'terminology' of pioneering building and introduction of the basic shapes and frameworks that will be used time and again in projects.

Some basic terms

Lashing: A rope or cord by which two or more objects (eg. spars) are bound tightly together.

Spar: A pole or length of round timber more than 3 inches in diameter.

Brace: A spar connecting two others to give support or strength.

Tripod: A triangular structure of spars.

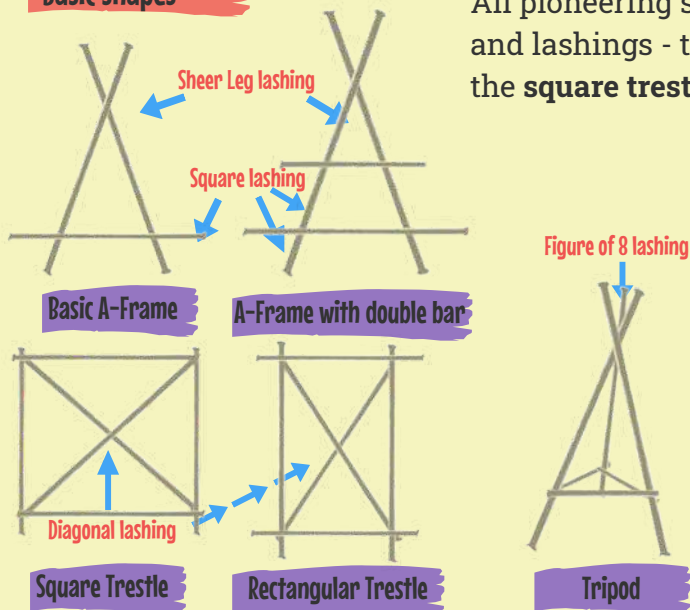
Hitch: A knot used in making fast or securing a rope to another rope or object. Will not hold position by itself.

Tip: The lighter end of a spar, opposite to the butt (the heavy end).

Make Fast: To secure a rope so that it will hold when the strain comes onto it.

Frap: To bind something tightly.

Basic shapes



All pioneering structures are created using a number of basic forms and lashings - the **A frame**, the **A frame with double bar**, the **sheer legs**, the **square trestle** and the **rectangular trestle**.

If constructed properly, these structures will be stable and will not move out of their shape.

Once the basic shapes are constructed, they are combined with spars and hitches to create larger structures. **REMEMBER** building smaller/ lighter structures are always going to be easier to lift and position than one big, heavy frame/ structure.

Pioneering - Skewers, dowel & bamboo too

Wooden skewers, dowel rod and bamboo are light weight and cheap materials that can be used to make the basic shapes and frames that are used in pioneering.

Using these materials in conjunction with elastic bands allow for easy construction of both simple and elaborate structures, without the need for learning and practicing knots. This should help to secure 'buy in' and understanding of future pioneering activities for the group.

The Pile Hitch- elastic bands allow you to use pile hitch as a fast connector or a way to finish a connection between your rods.



Begin by constructing small pyramid shapes which are strong and stable. These pyramids can then be locked together to make more complex structures. Maintaining the pyramid shape in your design is important as it add stability to the final project.

Experiment with designs and shapes, making **mini bridges** or **catapults**, you may wish to introduce the **basic shapes** and practice building **A-Frames**. The idea is to fire the imagination for the group and encourage them so that they are prepared and ready to learn the more complex skills such as knot tying and building with spars.



Pioneering- Rope

Ropes and Scouting are synonymous with one another, ropes and pioneering skills even more so. Pioneering uses ropes and wooden spars joined by lashings and knots to create the structures of pioneered engineering, with the aim of teaching practical, teamwork and problem solving skills.

Knowing your ropes, their parts and commonly used knots will stand you and your group in good stead when embarking on many a pioneered challenge:



Sisal

Low cost rope that ties well and holds knots



Manila

Low cost, ties & knots well, stretch resistant, cuts easily



Polypropylene

Lightweight & floats on water, high visibility



Nylon

Strong, elastic stretch & resistant to UV, Oil & water



Polyester

Rot & mildew resistant, low stretch & abrasion resistant

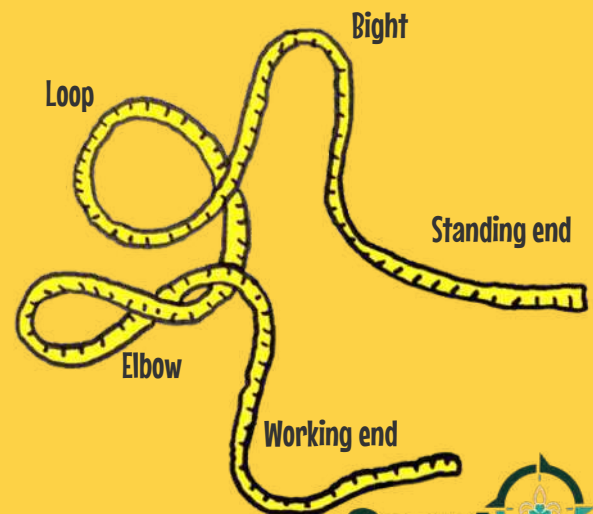
The parts of the rope

Bight - A fold in the rope or U-shaped section of rope being used in making a knot. The two parts lie alongside each other, they **do not cross** each other.

The **standing end** (or standing part) of a rope is the part that is **not active** in knot tying. It is the opposite part in the working end.

The **working end** (or working part) of a rope is the part active in knot tying

Elbow - refers to any two nearby crossings of a rope. It is created when an additional twist is made in a loop



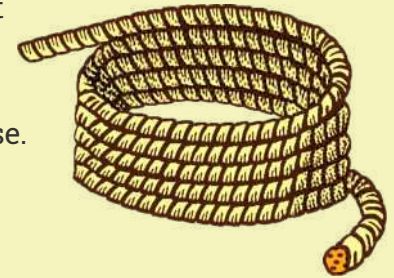


Pioneering- Rope

Like all the equipment used in our Scouting adventures, the care we give will determine how long equipment lasts and how much use we will get from it.

Rope is no different and requires a good amount of care. Ropes should be **stored in well ventilated and dry areas**, never put away wet and kept off the floor.

Ideally ropes should be hung up and coiled so that they are ready for use. Two techniques for coiling include the '**unattached coiled**' rope and the '**figure of 8**' coil.



Ropes can be washed if necessary using cold water and soap and hung to dry. **However**, for ropes that have been trailed through mud or along a damp forest floor, it is suggested that you let the rope **dry naturally** and shake out the loose debris before entertaining washing the rope.

Whipping a rope

If a rope is becoming frayed and split at an end, placing a **whipping knot** will help to protect and maintain the life of the rope.

1. Take some twine, create a **bight** and lay it along the rope.
2. Wrap the **working end** around the bight & rope 3 times.
3. Continue wrapping for a further 10 turns or until the whipping knot is equal in length to **1 and half** times the diameter of the rope.
4. Finish by tucking the working end **through the loop** of the bight and pull both ends to secure the whipping knot.



Pioneering- Knots

Knowing how to tie knots is a very useful skill. Understanding the purpose of a particular type of knot and when it should be used is equally as important.

Knowing the correct knot to use for a task and how to tie it properly can help avoid creating dangerous situations.

The easiest way to learn how to tie knots is to find clear diagrams and guides, copy them and practice as much as possible.

The next number of pages offer a **visual guide** for a range of common knots with some information on what they are used for, and should be used to help you practice tying knots.

Figure of 8



Half Hitch



Knot Types

Stopper knots: stopper knots are as the name suggests designed to tie at the end of a line. An example of this would be a **figure of 8** knot.

Loops and nooses: these knots are used to tie a secure loop or a moving loop. A **bowline** is an example of this knot type.

Bends: these knots are used to tie one rope to another, a **sheet bend** is a good example of this type.

Hitches: These knots are used to fasten a rope to something. Hitches work when the rope is put under tension. An example of this knot type would be a **clove hitch**.

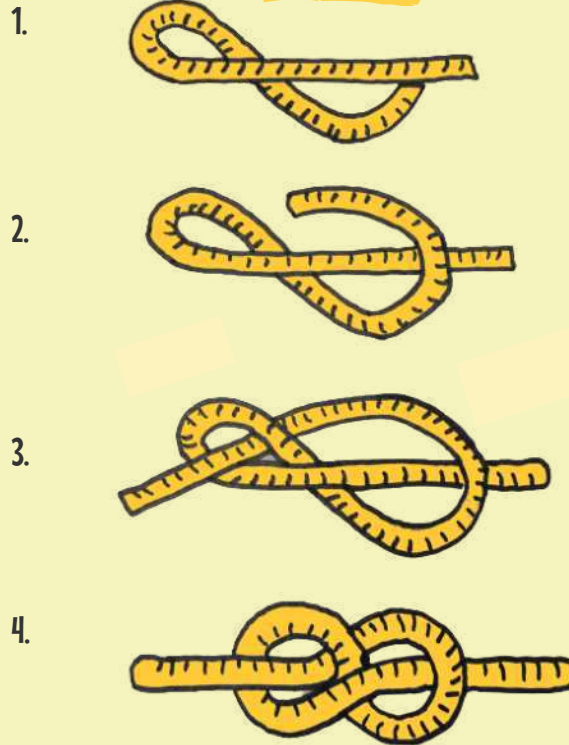
Pioneering- Knots

Bow Line



Used to make a reasonably secure loop in the end of a piece of rope. For example it can be used to fasten a mooring line to a ring.

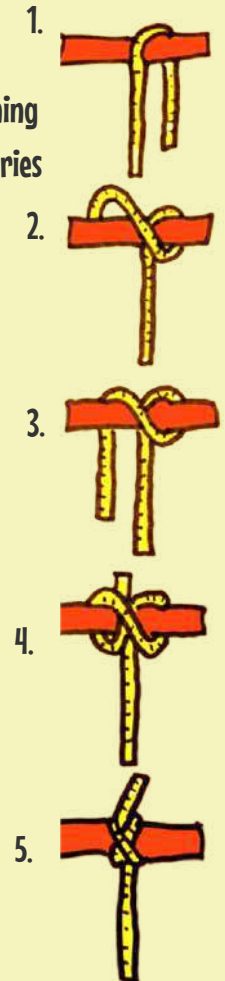
Figure of 8



Used as a stopper knot. It prevents the rope from sliding through an opening such as a carabiner or belay device.

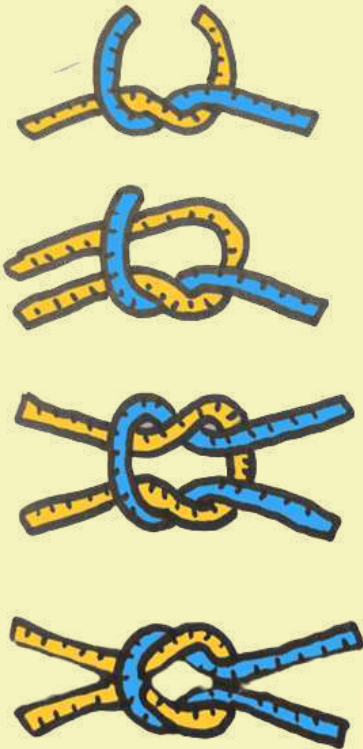
Clove Hitch

Used for securing lines running along a series of posts, belaying, starting lashings, or weak binding.



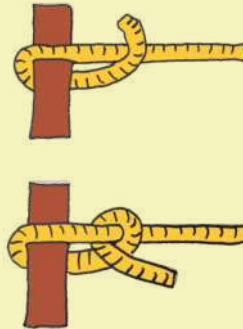
Pioneering- Knots

Reef Knot



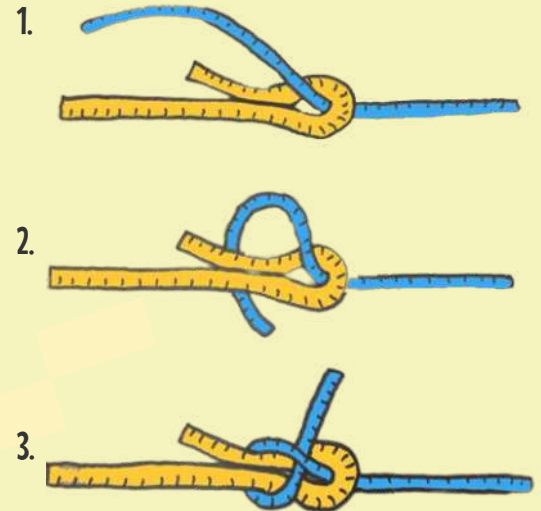
Used to tie the two ends of a single rope together such that they will secure something, for example a bundle of objects, that is unlikely to move much.

Half Hitch



Used to tie rope around an object and back to itself.

Sheet Bend



Used for joining two ropes of different diameters.



Pioneering- Knot Boards

At Level 2 of pioneering skills, you must be able to make a '**Knot Board**' that showcases your ability to tie a range of different knot.

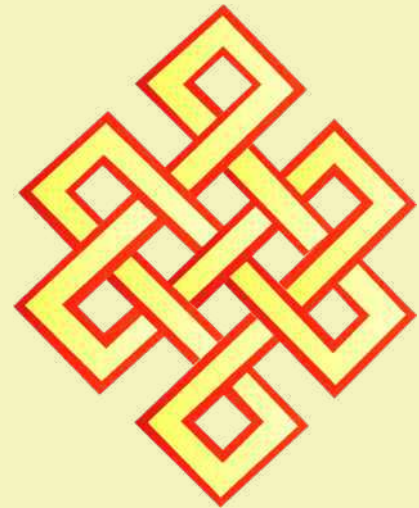
A knot board can be as varied and unique as you want it to be. Cardboard, wood, plastic, cork, even old clipboards can be repurposed and cut into any shape or design to make your board.

Materials

- Mount for knots (cardboard, wood, etc)
- Choose knots to showcase such as the bowline, reef, highwayman's hitch, figure of eight, etc.
- Select the rope or cord to tie your knot with.
Paracord is best and two colours make it easier to see your knots.
- Something to cut the rope and secure the ends like a lighter.
- Marker or pens
- Tacks, glue or similar to secure the knots to the board.

Method

- Begin by choosing the knots you want to include followed by what materials are best to display your knots.
- Cut the board into the desired shape and make holes in the board for you to feed the rope/ cord through for the knots.
- Tie your chosen knots, mount and secure and seal the end of the rope/ cord appropriately.
- Label the knots and display.



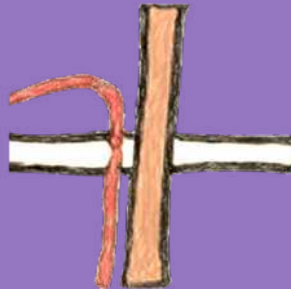


Pioneering Shapes- Square Lashing

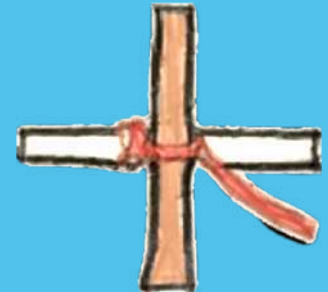
Square lashing is used to **bind spars** together. There are different types, but all consist of a **series of wraps** around the spars, and **fraps** around the wraps **between the spars**.

Used to lash two spars together at, or near, right angles to each other, this lashing is designed to be **load bearing** and can be used to create **scaffolding** or to make a **rectangular frame**.

1. Start by tying a clove hitch around one of the poles.



2. Twist the loose end from the clove hitch around the rope and then wrap the rope around the two poles.



3. The rope goes on the outside of the previous turns around the cross piece and on the inside of the existing wraps on the other piece.



4. Continue wrapping the rope around the poles following the "inside - outside" sequence.



5. Once you have enough wraps to give you the strength you need, guide the rope horizontally between the two poles.



6. Wrap the rope around the knot between the poles (frapping). Pull the frapping as tight as possible and add another turn. Finish the lashing with a clove hitch around the end of a cross piece.



Pioneering Shapes- Diagonal Lashing

Diagonal lashing is a type of lashing used to **bind spars or poles together**, to prevent **racking**. It is usually applied to cross-bracing where the poles do not initially touch, but may be used on any poles that cross each other at a 45° to 90° angle. Square lashing is used for load bearing and **diagonal lashing** is used for cross bracing.

1. Start by tying a timber hitch diagonally around both poles.



2. Wrap the rope around the both poles three or four times in the same direction.



3. Start the second set of wrapping turns by going past and around the pole.



4. Once you have enough wraps to give you the strength you need, guide the rope between the two poles.



5. Wrap the rope around the knot between the poles. This is called frapping. Pull the frapping as tight as possible.



6. Finish the lashing with a clove hitch around the end of a cross piece.

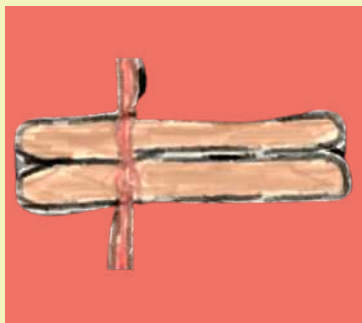


Pioneering Shapes- Round & Shear Lashing's

The **round lashing** (also known as vertical lashing) is used to **join two poles together** to extend their length.

Shear lashing's are most often used when spar legs are to be spread apart to form an **A-frame**. The clove hitch is tied around one leg only and frapping turns are taken between the poles.

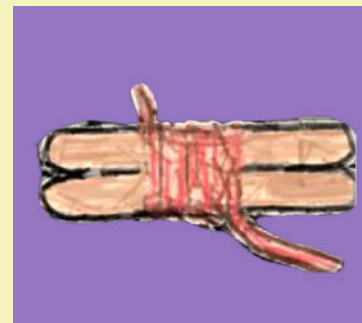
Round Lashing



1. Start by tying a clove hitch round the poles.



2. Wrap the rope neatly around both poles several times.

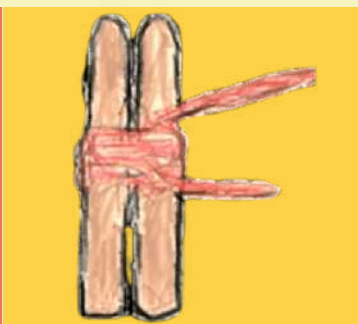


3. Finish the lashing with a clove hitch.

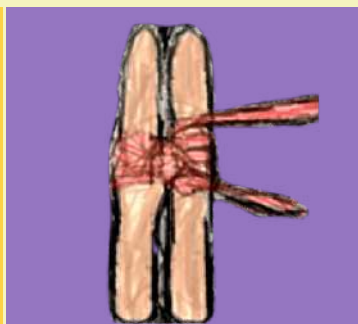
Shear Lashing



1. Start by tying a clove hitch around one of the poles.



2. Wrap the rope neatly around both spars several times.



3. Pass the rope between the poles to make two frapping turns.



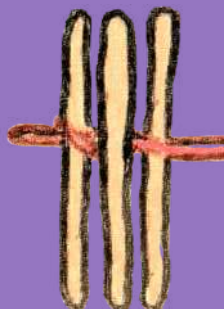
4. Finish the lashing with a clove hitch.

Pioneering Shapes- Tripod Lashing

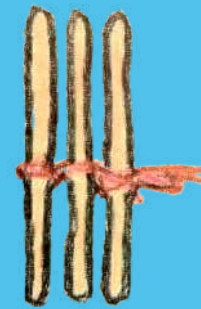
The **tripod lashing** is a shear lashing that binds three poles together at the same point. The most common use of this lashing is to **join three spars** together to form a **tripod**.

The tripod lashing can be used just about anywhere in a structure that three poles cross each other at the same point and the same time in the sequence of construction.

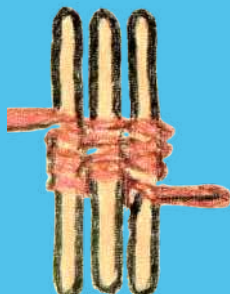
1. Start by tying a clove hitch around one of the poles.



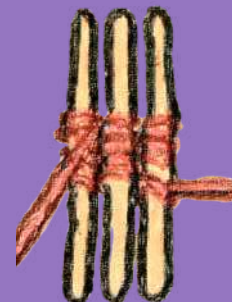
2. Weave the rope between the poles.



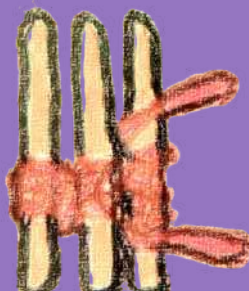
3. Continue weaving until there are about five or six turns around the poles.



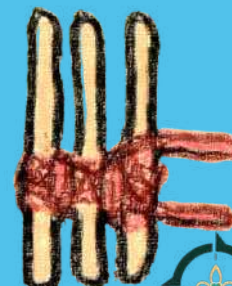
4. Pass the rope between the poles.



5. Make two frapping turns between the poles.



6. Make two frapping turns between the other two poles. Finish the lashing with a clove hitch and ease the spars into the shape of a tripod.



Pioneering Structures- Towers

Once you and your group have mastered the basic structures and the knots/ lashings that are used in their construction, the next step is to begin to put these shapes together to create more intricate structures.

Towers are used readily as bases for structures such as bridges and/ or can be used as stand alone objects for flying flags or providing watch areas. To make this tower, **tourniquet** lashings will be used as they are quick ways to tie spars together to make the basic shapes required to make the tower.

You will need: 8 x 3 metre spars/ 8 x 2.5 metre spars/ Planks for platform base Lashing ropes/ Small poles for tourniquet lashings

1. Place a tripod lashing on 4 sets of spars as shown in diagram. the centre pole being 2.5 metres in length. the two outside spars being 3 metres in length.
2. Stand up tripod 'sets' and spread out legs so that the 3 metre spars act as braces, and the centre spar acts as the corner support of the tower.
3. Move the sets together using tourniquet lashings at the bottom and tie diagonal lashings as the braces cross.
4. Place 2.5 metre spars on top to brace the top section together.
5. Place planks on top to provide platforms if it is to be used as a single tower.

The **tourniquet lashing** is made using a loop of rope and a small pole. The loop is passed around the spars to be lashed and a small pole inserted in the loop. This is twisted until the binding is tight. The small pole is then secured to the nearest spar with sisal to prevent it unravelling.



Pioneering- Anchorage

As builds become more complex it will be necessary to use 'guy' ropes and 'anchors' to fix taller and more unstable structures.

When possible you should anchor ropes to fixed objects such as a large, mature tree or large rock. However, if these are not available (as is usually the case) it will be necessary to create our own anchors.

The two most common anchors to use are the **3-2-1 picket** and the **picket and log** anchor.

Pickets

Using a single 3 in. (7.5cm) diameter picket driven 3ft. (91cm) into the ground, will hold a considerable amount of weight, but a **3-2-1 holdfast** anchorage will hold approx. 2 tons of weight.

Pickets should be at least 5ft. (160cms) long and put in position using a sledge hammer or large mallet, if the ground is soft they need to be longer. Pickets should be set at a 60 degree angle and the bindings between pickets should always run from the top of one picket to the bottom of the other. Always ensure that the picket and anchorages are exactly aligned to the line of strain.

When using the **Log & Picket** anchorage, you will need to source a good heavy log and place it directly at right angles to the line of strain against the pickets that you have set in place. Fasten a strop round the log and fix the straining rope to the strop.

Handy tip: Pickets should be positioned in the ground approx. 3 times the height from which the main rope leaves the structure.

For example: if the main rope passes over the sheer legs at 3 metres above the ground then the pickets should be set 9 meters from the base of the sheer legs.

Pioneering-Additional Learning for Scouts

Safety

As with all Scouting activities, safety will always be a key priority, and those who are working to complete their Pioneering Adventure Skills will be required to **discuss** and **demonstrate** their own understanding of safety and how to be responsible and respond to issues that may arise.

Across all levels of pioneering Scouts **must** be able to **create a plan** for their activity or build, **identify potential danger**, and **understand** the roles and tasks required to complete a project. They must also at **all times** understand **why** it is important to **follow instruction** and guidance from their Scouter.

As a Scouter **you will be responsible** in demonstrating a range of techniques to use to ensure safety, including the **safe use of tools**, the correct **procedures** used **for lifting** bulky or heavy objects and in **communicating** how individually we **look after ourselves** and as a team we work in safety together.

Emergencies & First Aid

At **Levels 2 & 3**, Scouts will need to be aware of **when** and **how** to **contact emergency services** in relation to where the pioneering activity is being run. Often these activities may be run as part of a camp, so this should be covered in preparing for camp etc.

The ability to **treat small cuts** and **wounds** is also a required skill. Discussing and preparing personal First Aid kits as well as practicing how to treat injuries is another useful activity to run as part of any pioneering programme.

Leave no trace

Also at **Level 3**, Scouts will be expected to discuss and explore the **basic principles** related to 'Leave no trace'. These may have been explored if the Scout has completed **Hiking** or **Backwoods activities**, but it never does any harm to **revisit** them when planning to complete a pioneering activity away from the Den.

Pioneering- Additional Learning- Tools

Pioneering or Backwoods engineering and living requires the use of a range of different tool to help in the construction of a range of gadgets and frames etc. and in completing the general duties associated with camp set up and living.

Scouts will need to know about and demonstrate how to safely use and look after their tools and equipment if they wish to progress across the pioneering skills levels.

The next number of pages will provide you with a **brief overview** of some of these tools, and include some hints and tips for how they should be used.

These pages ARE NOT a replacement for training that you as a Scouter should undertake and be signed off on to the correct level, before delivering skills training in tools to others.

As with backwoods skills learning, when introducing the use of tools **you must remember** a number of things before commencing activities that involve the use of tools; this includes asking yourself:



- **Am I trained** and signed off to the appropriate level to deliver training in using tools used in Scouting?
- **Have I completed a Risk Assessment** and do I **understand** all Scouting Ireland policy for using these tools?
- **Do I have enough support** and supervision for delivering 'tool based' activities?
- Is the planned activity **age appropriate** and do I have **enough resources** for everyone?
- **Am I confident** in my ability to lead a 'tools based' activity?



Pioneering Tools - Pen/ Pocket knife

Pen knives are a great way of introducing 'knife skills' to older Cubs and Scouts.

A Swiss Army knife or similar may look innocuous enough, but it is a bladed object and as such should be treated with respect, and safety placed front and centre of all that it is used for.

1. The very first thing that you should do when you are given or purchase a pocket knife is to read the instructions. This will provide information on how to care for and maintain the knife correctly.

2. Before using the knife, take note if the blade(s) on the knife are lock blades or not. If not, think what might happen if you do not use the knife properly and the blade closes.

3. Never use the knife with all the 'tools' open, instead only open the tools one at a time, having more than one open can make it difficult and dangerous to use.

4. Practice holding your knife with the different tool settings open, familiarise yourself with their use and be comfortable and confident in using them.

5. Think about what the tool is realistically able to achieve, don't push it to hard and cause injury.

6. Become familiar with the different 'holds' to use when handling the knife and **remember to always cut away from yourself.**

7. Be sure to maintain your knife correctly, if it is not oiled and if it gets clogged with mud you are more likely to get injured as it will become stiff and dangerous.

Remember you are only as sharp as your knife. You must keep your knife sharp ready for use, a blunt knife is a dangerous instrument and an inefficient tool



Pioneering Tools - Bow Saw

A bow saw is often used along with an axe for preparing firewood and is essential for all camps where an open fire is being used. They can also be used for felling dead trees or chopping and cutting limbs for resources used in constructing pioneering apparatus.

Bow saws are used to cut wood that is too large for a hand-axe. They need to be greased to prevent the blade from rusting and, as blades are relatively cheap, they should never be sharpened but replaced regularly.

Using a bow saw

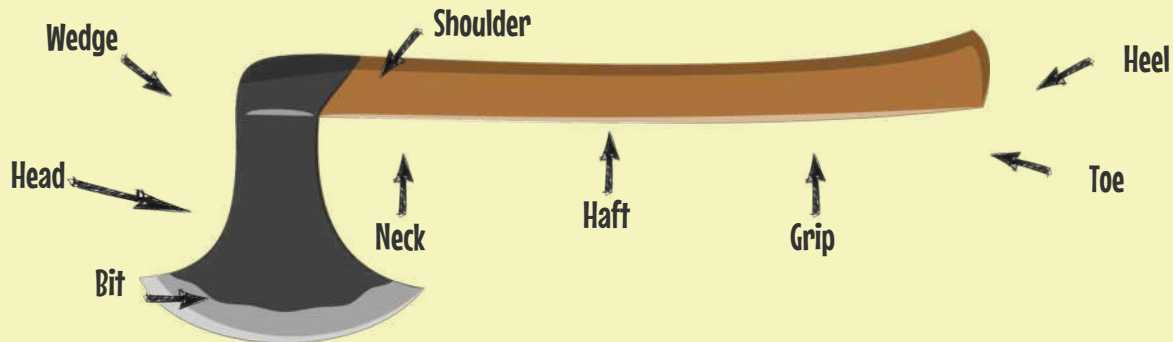
1. Make sure that the wood you are cutting is held firmly. If you need to use your hand for this make sure it is kept well away from the blade.
2. Start slowly by pulling the blade backward towards you until the blade is well into the wood. The push and pull in a steady rhythm using the whole length of the blade. Do not apply downward pressure; let the saw do the cutting. Trying to force it will often result in the blade getting stuck.
3. Always mask the saw when not being used. Either with a plastic 'clip-on' mask or tie a length of sacking around the blade.

When teaching beginners to use a bow saw, ensure **they pass** their hand through the bow to hold the wood.

This means that if the saw jumps out of the **kerf** (groove) only the **back** (blunt side) of the blade can make contact.

Once the blade is fully in the timber, pass the hand back through and cover the **kerf** with the thumb, this will prevent the blade jumping out of the kerf and causing injury.

Pioneering Tools - Axe



An axe is an essential camp tool especially if you plan on having a fire. It is a potentially dangerous tool and should only be used by trained Scouts who know the safety guidelines.

Safety

- **Use an axe of a size and weight that is suited to the job and your level of ability.**
- Wear appropriate clothing and footwear (preferably boots), avoiding scarves, lanyards or any loose items that could be snared and tie long hair back.
- **Inspect tools before use. Check for damage and ensure that the parts are aligned and held together securely.**
- Never use a blunt axe or saw, which is likely to slip or bounce on impact.

How to chop wood safely

1. Crouch or stand with your feet apart behind the chopping block.
2. Hold the wood to be chopped with one hand.
3. With the other, grip the axe on the lower haft, on the 'grip'.
4. Chop the wood by keeping the axe and the lower part of the arm straight and bending your arm at the elbow rather than the wrist. Chop at opposite 45 degree angles, in a 'V'.
5. Clear chipping away regularly and use them as kindling.



Advanced Pioneering- Block & Tackle and Leverage

As Scouts and indeed Scouters knowledge, experience and skills in Pioneering progress beyond Level 4, more complex and ambitious engineering projects can begin to be realised.

More advanced mechanisms and skills will be required to complete these complex builds. It is important that you

source the correct training materials and guidance

that will **assist your development** and learning in understanding how these skills and mechanisms work and are applied.

Block and tackle is the term used for a system of pulley's and ropes working together. A **block** is a set of pulleys or sheaves mounted on a single frame. An assembly of blocks with a rope threaded through the pulleys is called **tackle**. The process of threading ropes or cables through blocks is called "**reeving**". Using a block and tackle system amplifies the tension force in the rope to lift heavy loads or to create tension in guy lines or any other rope that needs tensioned.

Using **leverage** as a **mechanism** is an effective method of shifting heavy loads and a great way of encouraging groups to work together as a team, conserve energy and prevent injury when moving a heavy load. When using a lever **you must** make sure that it is **strong enough** to withstand the strain that is being placed on it. When using a lever to lift and object, **lift it only a small distance** at a time and use a roller or solid block under the object as you lift it to reposition the lever after each lift.

Closing & Acknowledgements

The information in this guide is intended to help support Scouters in developing pioneering activities and programmes for the young people from Level 1 to Level 4.

This guide should be used for reference only, it is not a replacement for the training and resources that are available through Scouting Ireland, Provincial and County Training teams and/ or through the peer to peer support that should be made available within your Scouting Ireland Group.

When undertaking facilitation and delivery of any training and skills activities linked to pioneering, please ensure that you are trained up to the appropriate level, make sure that all Scouting Ireland Guidance and Policy is followed, and make certain that you have the adequate resources and support necessary to deliver the activity.

The content of this guide has been informed and adapted from a range of resources available through Scouting Ireland websites and other external sources.

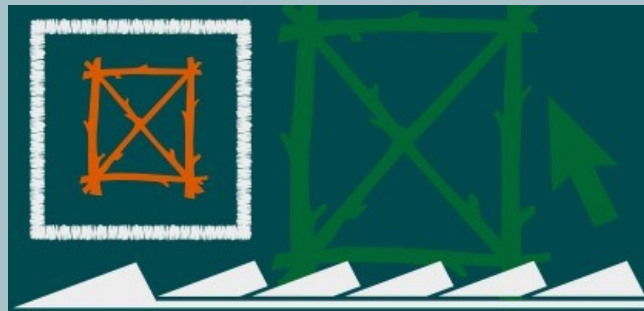
A particular acknowledgement should be made to the Scouting Ireland Western Province and their Scouts Stepping Up - Adventure Skills - Pioneering programme resources.

Useful Links/ Resources

- **Scout Pioneering** , John Sweet
- found via: <https://ppcbsa.org/wp-content/uploads/Scout-Pioneering-Sweet-1974.pdf>
- **Pioneering Projects**• , John Thurman
- found via: https://drive.google.com/file/d/1hlVO_hHDOXNw99IIXPTReUfOfCn6xlue/view
- **Pioneering Principles** , John Thurman
- found via: <https://drive.google.com/file/d/12GnSCL2XgH0weVlXNZ6aAliQrWGaaybn/view>
- **Scout Engineering - The Scouting Trail** , C Kavanagh
- found via: <https://issuu.com/scoutingireland/docs/engineering>
- **Bamboo & Cane/ mini - pioneering** , No Limits magazine
- found via: <https://issuu.com/scoutingireland/docs/cubs/9>



PIONEERING



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