

ACTION HEROES

The mind is the ultimate weapon



STEM resources

STEM – Science, Technology, Engineering and Maths – this subject matter form the basis of a wide array of knowledge that is inter-connected to work based careers. Many schools cover these areas through the school curriculum in an academic way but STEM based subjects don't have to be boring.

In Scouting we offer young people a unique learning space where everything can be explored. Learning by doing, working in teams, sharing ideas and being creative, solving problems – these are some of the ways that Scouting uses to gain and impart knowledge.

Throughout our programme we already introduce many STEM type activities to young people – of course we do not 'tag' them in this fashion and they are presented to young people as challenges, games and explorations in the fun learning spaces of our meetings and activities.

This collection of resources highlights the many activities and ideas that can be incorporated into our programmes, so that young people can see STEM as fun and awaken their interest in these subject areas.

In today's world, many employers seek a wide knowledge of the STEM related areas. With the increased focus on science, technology and information transfer and interaction those new to a work environment are expected to have a solid base of knowledge of these areas. Another requirement of the work place and an increasing request from employers are young people who have addition life skills. These skills include what are called 21st century skills – ability to work in teams, take leadership and responsibility, be creative and innovative, be able to solve problems all key skills provided by Scouting.

By combining STEM related areas with what we do best in Scouting – develop young people - we have a package of activities and ideas that can provide young people with a solid base from which to develop their life long career path.

This resource has been funded by the Science Foundation of Ireland because they recognise the value of the Scout programme and how it provides learning spaces for young people that are unique and based on play and fun. Science can be perceived as 'boring' by many young people but we



hope in this resource to provide a series of novel activities that will show science in a new fun way.

The resources have been created around a series of themes. By using themes it allows us to explore the wide area of STEM through many different scenarios. The resource only provides the ideas, it does not present a programme structure or how it might be developed as a programme cycle. This we will leave to the young people in your Section as they develop programme cycles and adventures in your programme. So, many possibilities are possible from simple insertions in meetings, to themed camps and activities, wide games or incident trails.

The ideas presented are only a sample of the millions of possibilities that can be used. The internet is widely distributed with many ideas related to STEM. This resource presents and links to the best ones that can be undertaken by Scouts in all Sections.

Using the resource

The resource is driven by the poster (cover of this handbook) – a full size series of posters will be provided to each Group for display. On the poster is a series of QR codes that when scanned by a QR code app on a mobile phone that will bring the user to an online

interface. That interface will lead to this PDF resource, Video links, Pinterest pins and other websites. Each of the links is related to the theme that is been presented. There are a number of different resources and they can be found collectively via the resource area www.scouting360.ie

The mobile phone – in a young person's pocket- is a powerful interaction tool and computer and can quickly present the ideas to young people to explore. Ideas are presented in an easy to understand way and then it is time for some hands-on experience and learning by doing as each idea is tried out at meetings and activities.

It is suggested that Scouts (in all Sections) are exposed to the resources so that they can discover the ideas and then create programme cycles and adventures at which they can be included. The themes can be used as presented or mixed and matched to create new themes/adventures/trails etc.

Included in the resources is an innovation and creativity exercise. The idea of this exercise is to allow young people to create and invent. All inventions are created by a process of knowledge (science), inventing the new item or process (engineering), refining and developing (maths can be used) and finally producing a new invention (a tool – a piece of technology). The creation process is STEM applied and how it is done is in teams (small team system in sections), gathering knowledge, working creatively as a team, engineering their idea and solving problems and creating new solutions. We do this every time we challenge young people at meetings and on activities and incident trails. So again, Scouting is good at this.

It is therefore suggested that each programme cycle will include one 'invention' session where Scouts can take the knowledge they have explored in the themed meeting or programme cycle and use this knowledge to invent something new and exciting. Ideally this session would be undertaken in week three or four of a programme cycle when some knowledge has been gained in a themed area.

Plan, do, review, is of course a cornerstone of our programme method and the review process should include a reflection on what has been learned or changing attitudes to STEM type activities.

Storylining

As Baden Powell once said – 'Scouting is a game for young people and a job for adults' and within this context story- lining is extremely important in holding together the programmes and activities we run. A series of incidents can be held together with an inventive storyline, for example, related to escaping from a prison camp or tasks to be completed in a treasure hunt. Likewise at our meetings we will run games and challenges and these should also be story-lined (or within a symbolic framework – Lands of Adventure in the Cub Scout Section).



In the context of the STEM resources they have been related to themes which in themselves suggest possible storylines and scenarios. Action hero's for example focuses on action hero films and situations, James Bond, Bourne, Indiana Jones, MacGyver and many such films and TV series provide the backdrop and the situations that an action hero must escape from, find clues, improvise or be inventive.

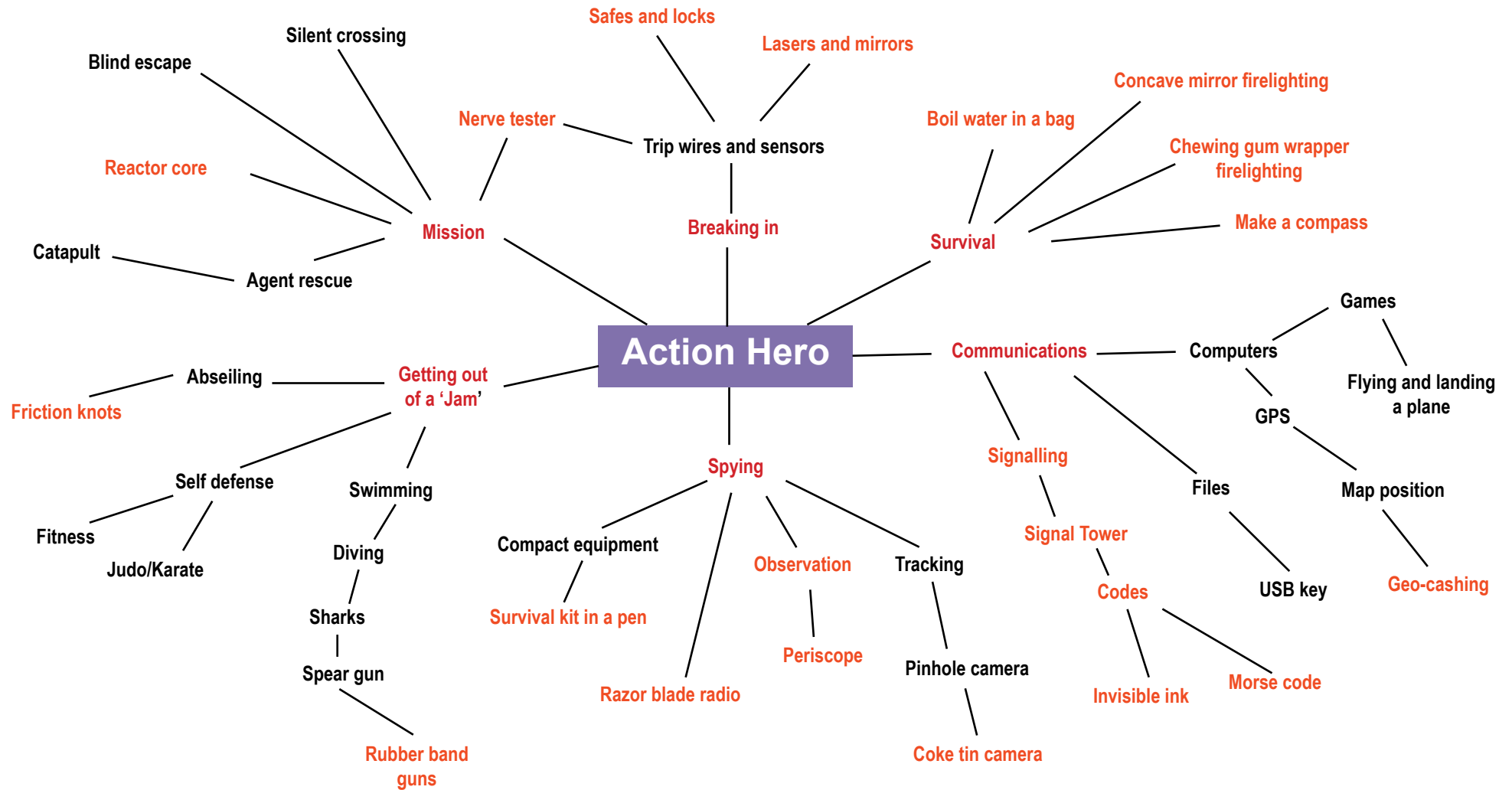
Therefore cracking a code or survival situations can be cloaked in mystery, suspense and excitement with the introduction of a creative storyline – 'defuse the bomb in 30 seconds or the world blows up' can make exciting the creation of an electrical circuit. Cracking a code is just a simple way of telling the team what is the next location they need to travel to.

By using story-lining and scenarios we allow young people to use their imagination and develop creative solutions to a challenge in context. Artificial time pressure is introduced – build this tower before the flood raises, or do this challenge before the door time lock engages. Time pressure enables leadership and organisation skills to be developed.

Real life scenarios such as accident setups are also useful for some situations and again relate to the subject matter under exploration.

In some incidences a storyline can run over a whole weekend or period of time. This involves a bit more work in organising the elements of the programme but often it adds to and enhances the overall experience – a Viking theme, Space camp or Desert island survival.

Wide games are another feature of story-lining to be considered. In general terms they are quest driven scenarios – a mission must be completed. So in the context of a wide game Patrols (small team system) are each competing to reach an objective – a treasure hunt for example – and must complete various challenges and situations to progress towards their objective.



 This resource has information on items coloured orange

Action hero theme chart



In all sections within a Group the programme is presented through a 'Programme Cycle'. This programme cycle can have any timeline but it contains three crucial features – Plan, Do, Review.

Each programme cycle is built around an adventure or series of adventures leading to a key highlight. Normally, a programme cycle will last around 4 weeks (but can be shorter or longer)

The 'adventure' is the main highlight of the Programme cycle – the weekend camp, for example, and the meetings or associated activities are the 'learning spaces' to enable the successful completion of the adventure. So, for example, the Scouts will need to be able to build an oven on the camp - so that they can bake a cake. The weekly meeting or a special day activity might be created for the Scouts to learn how to do this so it can be completed with success on the weekend camp.

Within this process all of the Scouts will be involved in the creation of the adventure, the weekly meetings and activities. The team system will be used at all times and all the interactions associated with this process will be focused on the programme cycle and the planned adventure.

The Plan, Do, Review method is used....so the adventure is planned, it takes place and finally the programme cycle is reviewed and learning is determined.

The process

The first step in the creation of a Programme Cycle This is where the ideas for adventures are created and selected. This resource will highlight some ideas based around the theme but additional ideas can be added and created as young people wish in the programme creation stage.

Doing and discovering

This STEM based resource is designed to enable young people to discover science, technology, engineering and maths all around them and as part of their daily lives.

They are not subjects primarily associated with school, and that as Scouts we can have a lot of fun using, exploring and discovering knowledge based on fun, play and group interactions.

Each idea therefore has a 'science idea' that Scouts need to discover as they undertake each activity. In the review process it is hoped that Scouts express in their own way the things they have learned and the knowledge and new understandings they have gained.

Reviewing

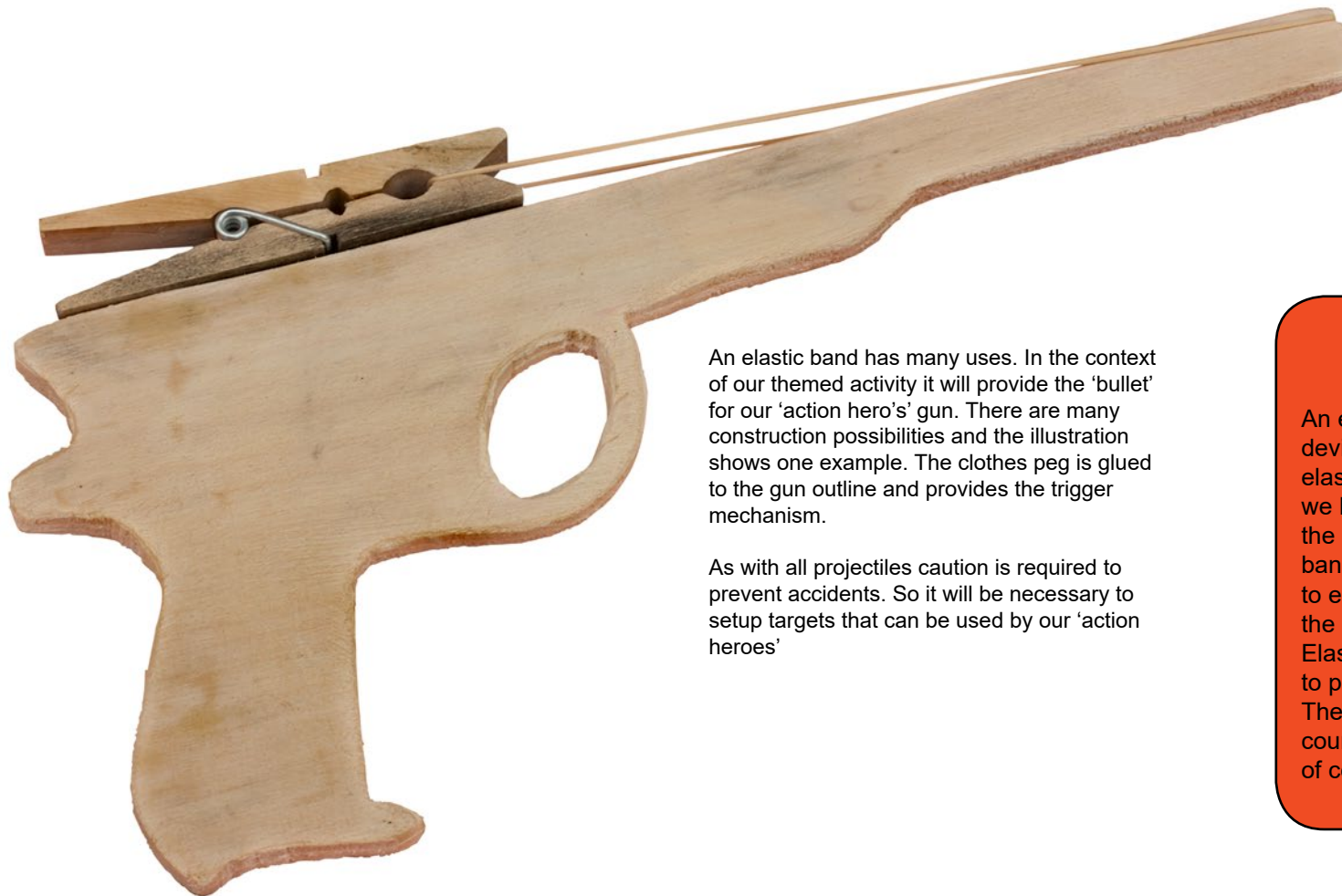
The object of the review session is to understand what has happened, what we learned along the way and to 'mark up' and acknowledge how every Scout has progressed.

Reviewing is critical to the learning process. Until a Scout takes time to internalise and access what they have

learned through an experience it serves no real value - bar entertainment.

As Scouting is in the business of assisting young people in their development the review process is a vital component of the Scout programme. There are many ways of conducting the review – it can be done as the activity progresses or at the end of each day or in a sit down discussion at the end of the programme cycle.





An elastic band has many uses. In the context of our themed activity it will provide the 'bullet' for our 'action hero's' gun. There are many construction possibilities and the illustration shows one example. The clothes peg is glued to the gun outline and provides the trigger mechanism.

As with all projectiles caution is required to prevent accidents. So it will be necessary to setup targets that can be used by our 'action heroes'

Science Bit

An elastic band is a energy storage device. When we pull back on the elastic band we transfer the energy we have used to do this action into the band under tension. When the band is released this energy is used to enable the band to travel through the air.

Elastic bands can be used - twisted, to power model planes and cars. They can also be used to provide a counter action or cushion action and of course to hold things together.



Rubber Band Guns

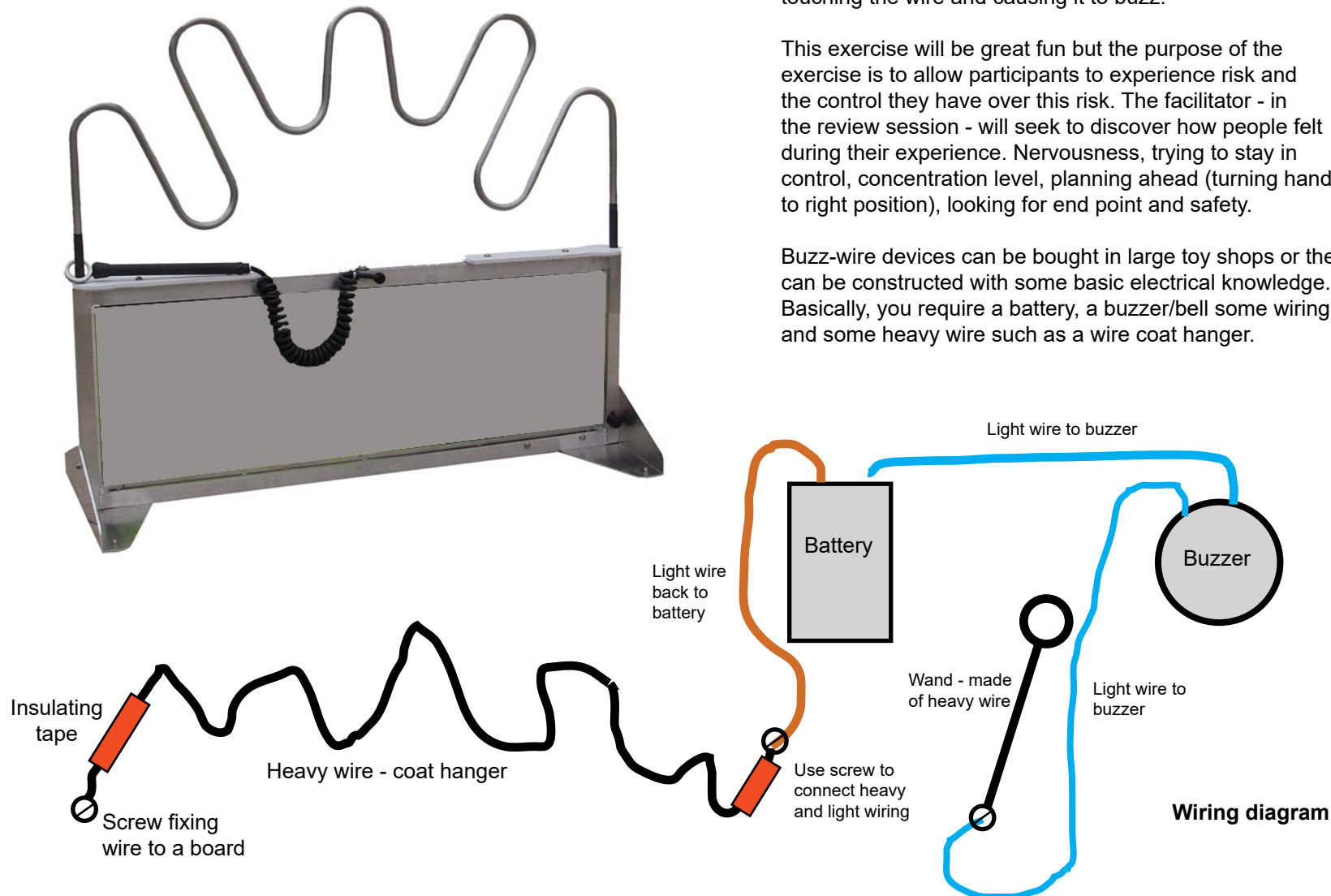
Buzz - wire

The buzz - wire exercise is related to risk and danger.

Participants are asked to complete the route without touching the wire and causing it to buzz.

This exercise will be great fun but the purpose of the exercise is to allow participants to experience risk and the control they have over this risk. The facilitator - in the review session - will seek to discover how people felt during their experience. Nervousness, trying to stay in control, concentration level, planning ahead (turning hands to right position), looking for end point and safety.

Buzz-wire devices can be bought in large toy shops or they can be constructed with some basic electrical knowledge. Basically, you require a battery, a buzzer/bell some wiring and some heavy wire such as a wire coat hanger.



Science Bit

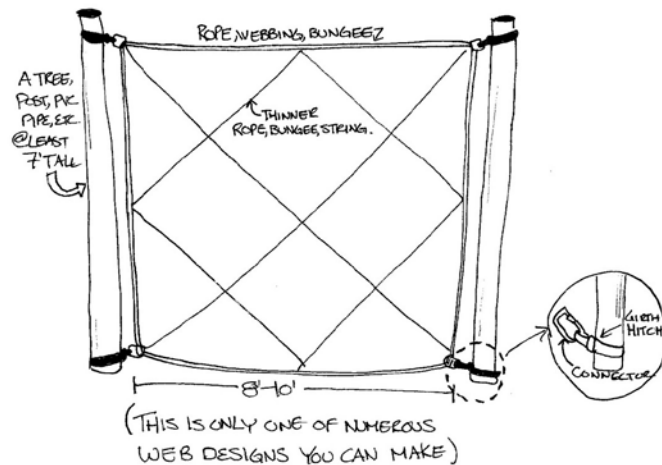
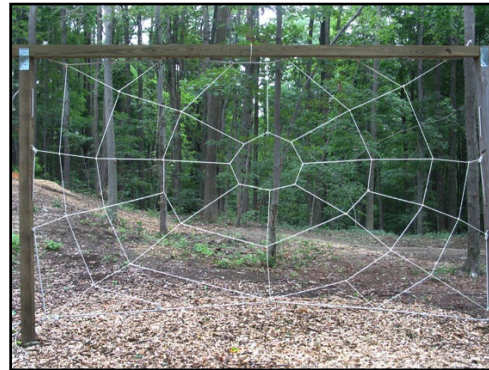
A laser beam is a beam of light that travels in a straight line. A sensor is an electronic devise that detects light - put the two of them together with an alarm circuit and you have a laser beam security system.

The laser light is directed to the sensor using a series of small mirrors. This can create an unseen criss-cross of beams. When the light is shining on the sensor the switching mechanism stays open if the beam is broken then the switch turns on and causes the alarm bell to ring

**Challenge - Get
your team through
the laser security
system**



Lasers and Mirrors



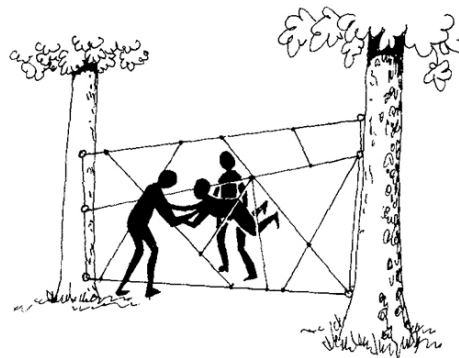
Spiders web challenge

The spiders web is constructed as shown.

Teams have to get every member of their team through the web without touching it and setting off the alarm.

The strings of the web represent security laser beams. Small 'jingle' bells can also be attached to the web that ring if any disturbance to the string is detected.

Each member of the team should pass through a different hole in the web or through a group of selected holes.



An indoor version of the laser beam challenge can be created with duct tape or ribbon that is placed in a crisscross fashion along a corridor. As this version is a straight through transverse it can be a timed event - quickest team or it has a set time to get all the team through. You can also blindfold members of the team to add further complexity and difficulty.



Re-direct laser beams

More complex games can be devised - teams are challenged to redirect a laser beam around a series of obstacles using mirrors so that the light connects to a sensor device and switches something on or off. Laser light pointers can be used for this purpose.



A mirror or a CD disk can be used to signal in an emergency or as a fun activity on camp. Two fingers are used (as shown) to aim the signal and by flashing the disk it is possible to send a message using Morse Code.



Signalling



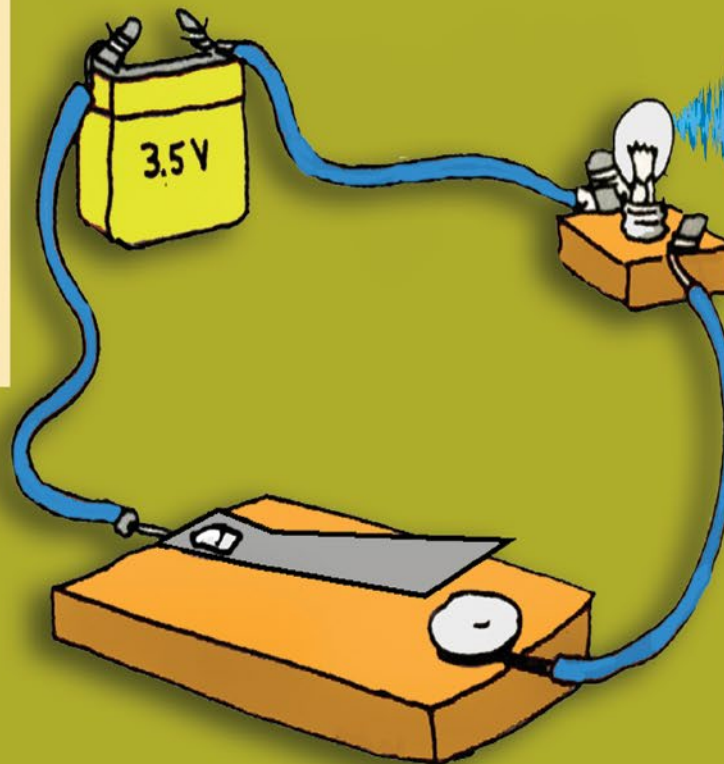
A	••	N	••
B	••••	O	••••
C	••••	P	••••
D	••••	Q	••••
E	•	R	••••
F	••••	S	••••
G	••••	T	•
H	••••	U	••••
I	••	V	••••
J	••••	W	••••
K	••••	X	••••
L	••••	Y	••••
M	••	Z	••••

1	•••••	6	•••••
2	•••••	7	•••••
3	•••••	8	•••••
4	•••••	9	•••••
5	•••••	0	•••••

Create two Morse signallers as shown and send some messages to your friends

You will need some wood, wire, battery, small bulb holder and bulb, strip of copper or tin and some screws.

Morse is transmitted by a series of dots and dashes...a dot is a quick flash and a dash a longer flash.



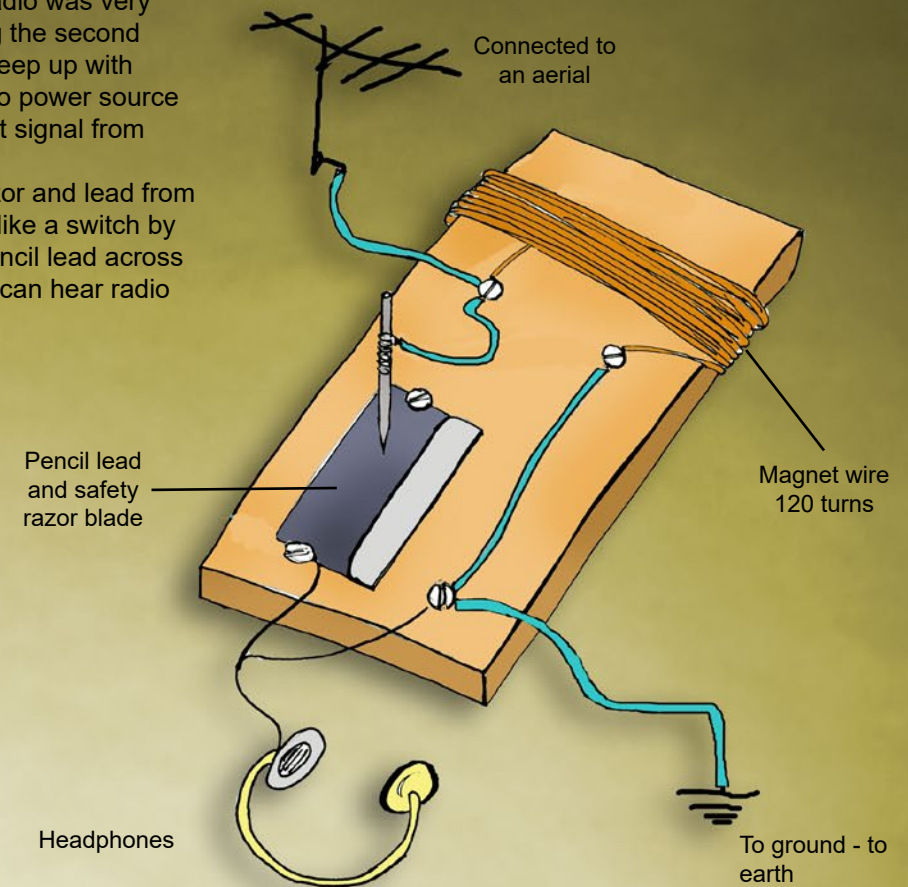
Morse Signalling

Foxhole Radio



The foxhole radio was very popular during the second world war to keep up with news. It has no power source as it picks up it signal from radio waves.

The safety razor and lead from the pencil act like a switch by moving the pencil lead across the blade you can hear radio broadcasts

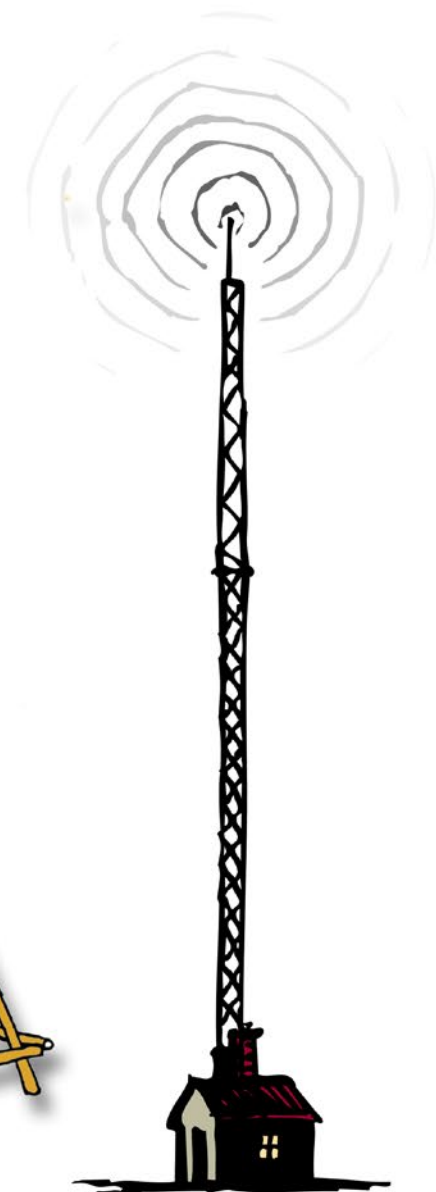
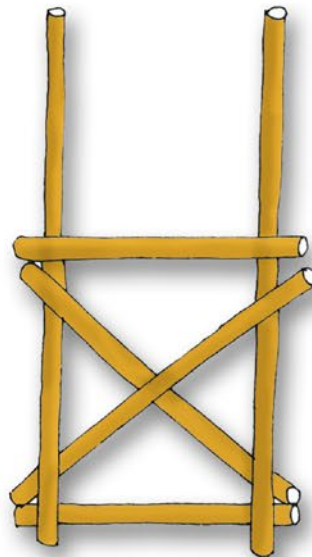
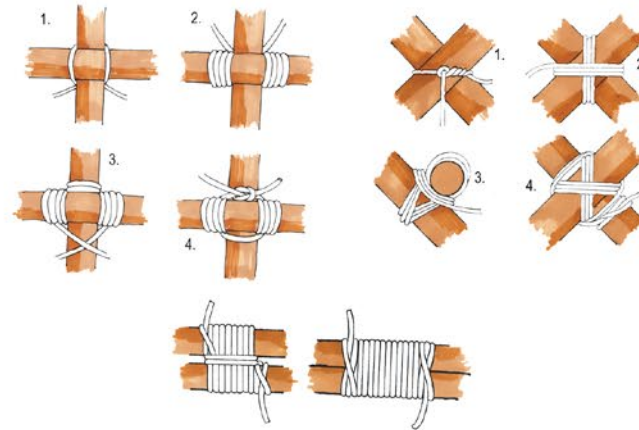
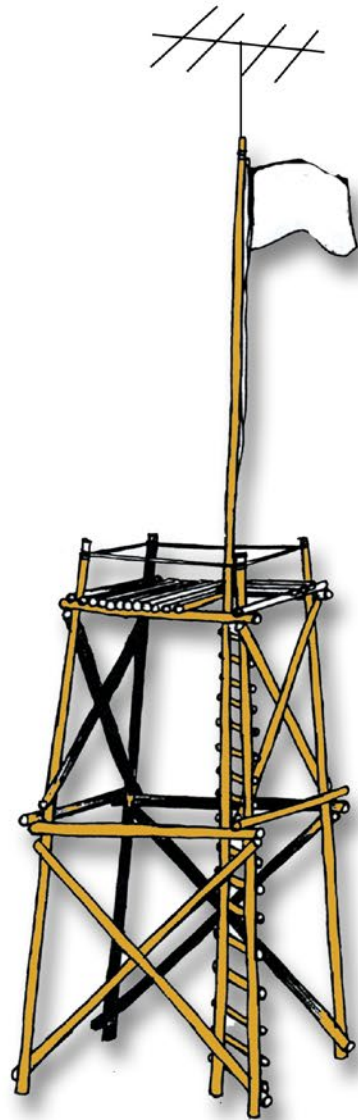


Science Bit

Radio signals are sent into the atmosphere as radio waves. To hear the signals you need a radio receiver. The foxhole radio is a device

to capture these signals in the air. The lead and razor blade act as a diode (a one way channel/switch). The diode is the basic switching device used in electronics micro chips



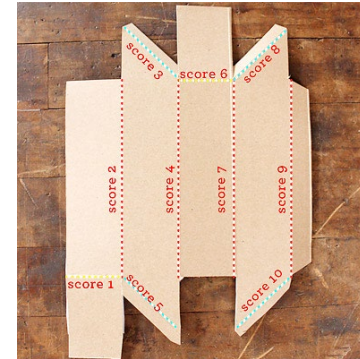


Radio Tower

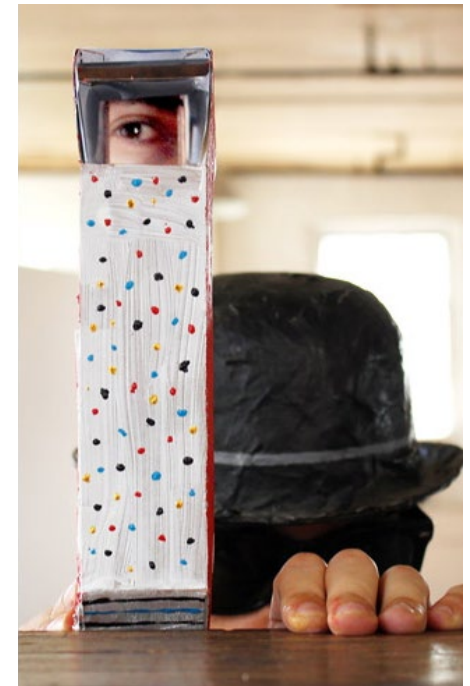
Science Bit

Light travels in a straight line and mirrors and shiny surfaces can refract light and change its direction. The two mirrors in a periscope placed at 45 degree angles enable light to travel around corners.

The container keeps the mirrors in line and at the correct angle.



Make a periscope for looking around corners undetected



Place the paper template on some cardboard and cut out the box shape. Glue all the seams together to create the periscope box.

Finally place and glue in the mirrors.



Periscope



Science Bit

Safes and locks

Science Bit

When heat is applied to chemicals and substances they change states. Milk for example is white and when used for writing it disappears when dry. If heat is applied the dried milk will brown allowing the message to appear. Lemon juice or sugared water will also work in this way. Juices of most fruits contain carbon compounds which are colourless at normal temperatures but when heat is applied they release the carbon into the air through a process called oxidation and as a result the invisible writing turns brown and can be read.

Create invisible messages using milk, sugared water, lemon juice or other fruit juices.

Use a cotton bud or an old nipped pen to write your message on a sheet of paper.

Spies sometimes use printed paper with a simple 'on connected' message on it and 'hide' their secret message in invisible ink between the lines of the text.

When the message is finished wait for it to dry and disappear.

To reveal the message hold the paper over a heat source such as a light bulb or rest it on a hot plate or 'press it' using a hot iron.



Invisible Ink



Frame Code

The frame code uses a grid system to determine the position of letters. The message is then written graphically as shown.

The dot indicates the second letter in the frame.

AB	CD	EF
GH	IJ	KL
MN	OP	QR



The Romans invented the stick code. This was created by winding a leather strip around a stick of a special thickness. The message was then written on the leather and when unravelled would appear to be random letters.

It could only be decoded if you has a similar sized stick.



Code Wheel

A Code wheel is used to create secret messages by replacing one letter for another.

The first letter in the message is the letter that matches with A on the outer circle so it can be encoded.

MEET AT THE CLOCK

PHFFJ PJ JAF NTVNC



Secret Codes



Geocaching

What is geocaching? Geocaching is an outdoor adventure where players use our free mobile app or a GPS device to find cleverly hidden containers around the world.

How many people geocache? There are more than 10 million registered users on Geocaching.com, with more than 800,000 in the U.S., more than 275,000 in Germany and more than 160,000 in Canada.

How many geocaches are hidden? More than 2.5 million geocaches are waiting to be found in over 180 countries.

Why do people geocache? People geocache because it's a way to explore the world around them with friends and family and because it's fun. Geocaching is a game that reveals a world beyond the everyday, where the possibility of a new discovery hides under park benches, in the forest and probably a short walk from where you are right now (literally).

Watch the What is Geocaching? video to learn more.



Geocaching



Geocaching Basics

A geocacher hides a geocache, lists it on Geocaching.com and challenges other geocachers to find it.

At minimum, geocaches contain a logbook for finders to sign. After signing, finders log their experience on Geocaching.com or with the Geocaching app and earn a reward in the form of a digital smiley.

Some geocaches contain small trinkets for trade. If a geocacher takes something from the geocache, they replace it with something of equal or greater value.

Geocaches are put back where they were found for the next geocacher.

Geocaches are never buried.

Who are geocachers?

Geocachers are united by the spirit of exploration and the joy of discovery. Geocachers live in nearly every country on Earth. Geocachers are families with children, grandparents, tech geeks, photographers, hikers—anyone can be a geocacher. Geocaching offers a broad appeal in large part because it's bound only by a location and someone's imagination.

What should not be placed in a geocache?

Food, sharp objects, illicit or illegal items and alcohol should never be placed in a geocache. Everyone should respect their local laws. Geocaching offers advice to geocache hidere from law enforcement around the world.

Where are geocaches found?

Geocaches can be in forests, parks, urban locations—nearly anywhere you can think of. It is common for geocaches to be placed in story-worthy locations. Most people in North America and Europe live within a short walk of at least one geocache. Geocache listings include difficulty and terrain ratings (1 being the easiest and 5 being the most difficult) to help geocachers choose an adventure that is right for them.

How do you hide a geocache?

A geocacher chooses a waterproof container and a location to hide it. Once a geocacher has accurate coordinates for their chosen location and has land-owner permission, they submit it for publication on Geocaching.com. Geocaching provides a set of guidelines for geocache placement. The guidelines include important rules that keep geocaching fun (and legal) for everyone involved. If a geocache clearly violates one of these rules, community members who review new geocaches may ask the hider to fix the issue.

Science Bit

The GPS (Global Positioning System) is a “collection” of 24 well-spaced satellites that orbit the Earth and make it possible for people with ground receivers to pinpoint their geographic location. The location accuracy is anywhere from 100 to 10 meters for most equipment.

A mobile phone or GPS device can pick up these signals and give you an exact position on the earth.

This is then displayed by a series of numbers - longitude and latitude.

Science Bit

Fire is created when the three elements of the fire triangle are present - fuel, heat, and air.

By burning fuel - such as wood - we are releasing the energy from the sun that was used to create it to produce heat. To do this we need a source of heat that is hot enough and oxygen from the air to create fire.

Matches and lighters can provide this heat source but in firelighting we can also use friction, sparks of hot metal, rays of the sun, chemical reactions and compressing air.

Fire will easily transfer to smaller pieces of fuel - tinder, paper, fluff before enough heat is generated to cause bigger fuel to catch alight.

Firelighting is a key Scouting skills that every Scout must master.

Firelighting and maintaining a fire for heat and cooking is a craft mastered by experience. It is not as simple as throwing a match onto a pile of logs and bingo a fire appears - it is an ancient skill that is mastered by care and attention and an understanding of the fire triangle.

Many different techniques can be used to create the initial spark but equally important is how to develop that spark into a flame and a useful fire for your camp.



Firelighting



Tinder

Tinder is light dry materials that ignites quickly. They are essential to lighting a fire quickly and successfully, using only one match and no paper or fire lighters. The simplest of tinder is fluff from pullovers and fleeces. You can also use frizzed up sisal or dry moss. Another good tinder is paper thin bark strips. By far the best natural tinder is dry curly timber shavings created by carving a dry stick. These shavings must be from a dry deadwood stick rather than a green sapling. If you cannot find a dry stick carve off the wet bark; usually the timber is dry underneath.



A fuzz stick is an excellent way to create dry tinder. You need a sharp knife and a dry - dead wood - stick. Carve the stick into a fuzz as shown. Create long curly shavings if you wish, and collect these to add to your tinder pile. A number of fuzz sticks will be required to light your fire. A fuzz stick is an excellent way to create dry tinder. You need a sharp knife and a dry - dead wood - stick. Carve the stick into a fuzz as shown. Create long curly shavings if you wish, and collect these to add to your tinder pile. A number of fuzz sticks will be required to light your fire.

The art of fire lighting is a real scouting skill, to be mastered by all. Scouts should be able to light a fire using only natural materials and one match. No fire lighters allowed. Every Scout worth his or her salt should be able to do it and it is a skill that should be learned from the beginning of their time in Scouting.

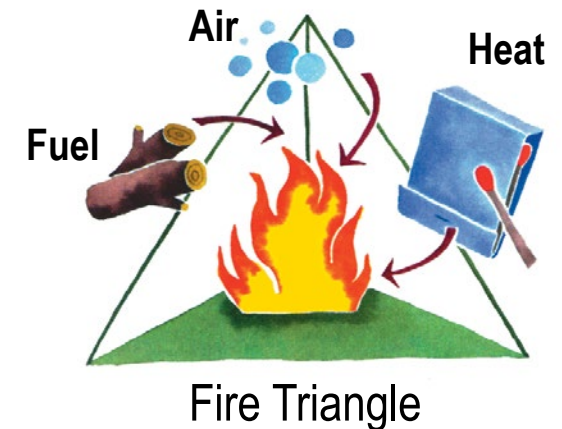
There are three parts of the triangle of fire; fuel, heat and air. In order to light, a fire must have all three elements. It needs fuel to survive, like we need food. It builds up heat gradually, from your match, to tinder, twigs and bigger fuel. Finally, like us, fire needs to breathe!

When you want to extinguish the fire, simply remove one or more of the parts of the triangle; keep unused fuel out of the fire, cool the fire down with water or snow, or smother it with water or clay.

The stones and logs surrounding your fire need to be spaced to allow air to be drawn into the fire base

Start building your fire by first placing your tinder on the ground in a light pile. Light your match and let your flame catch hold on the matchstick. Then place it carefully under the tinder and hold it there until the tinder lights. As the fire burns place light tinder and twigs on top of the flame, taking care not to kill the flame as you do so. As fire flares up create a pyramid of timber over the fire.

Once this timber has taken hold introduce heavier logs onto your fire.



Firelighting



Science Bit

The water in the bag draws or absorbs the heat from the fire by convection. Water boils at 100 degree whereas paper catches fire at 233 degrees. The paper therefore between the water and the heat never gets hot enough to burn nor does it get to wet or soak through.

Once the water is boiled and taken from the fire the paper bag then starts to absorb the water and weakens the structure of the paper so it will need to be moved to another container.

Clean water is essential for survival - but what do you do if you don't have a pot to boil it in to purify it or cook a meal?

Did you know you can use a paper or plastic bag? Well, you can - it is slightly tricky to do and as long as you are careful you can have boiling water for tea in a few minutes.

The trick is to ensure that heat from the fire only touches the area of the bag that has a liquid (water) on the other side.

Be careful to use a low flame or ember fire and not to scald yourself as you remove it from the fire when it boils.

Boil water in a bag



Science Bit

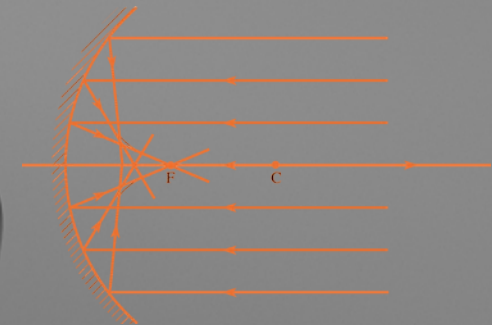
When light hits a rounded surface it causes the light to change direction. A concave mirror is like a rounded dish and as sunlight hits the surface it causes it to be bounced off at different angles. There is a point however where all of the light bouncing off the surface of the mirror meets. This is the key energy point and it produces a hot spot of energy that can be used to create fire or heat an object.

A television satellite dish works the same way but the television dish is focusing radio and television waves.

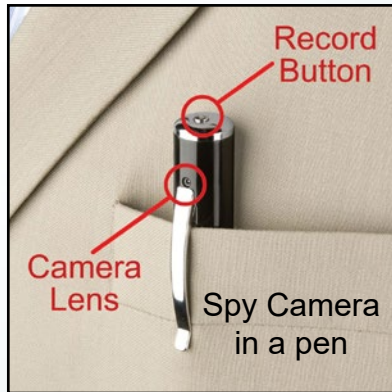
A drinks tin and some chocolate can be used to light a fire in a survival situation.

This is done by creating a concave mirror lens using the bottom of the tin. The tin will need to be shiny and the piece of chocolate is used as an abrasive to shine the metal.

Once the bottom of the tin is shiny it can be used to focus the sun's energy and produce fire on a piece of charred cloth.



Drinks tin firelighting



The challenge is to create a pinhole camera and produce an photograph



Pin hole camera

Science Bit

To make a photograph two sciences are applied physics and chemistry. A camera is a black box with a small hole in it. Light rays pass through the pinhole of the camera and an image appears on the back of the camera body.

The light rays hit a light sensitive film that will produce an image.

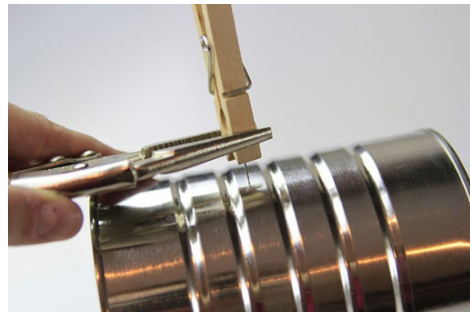
In order to see the image the film is placed in chemicals that detect light sensitive silver halide crystals elements that exist on the film and the picture appears. Modern cameras use light sensors rather than film



A pinhole camera is simply a light-sealed black box with a pinhole to allow light to pass into the box and land on photo sensitive paper or film. Any sized box can be used - we demonstrate here how to make a paint tin or can camera.



Firstly you need a clean tin that has a lid -(paint tin). The inside of the tin and lid needs to be painted black - A tin of black spray paint is a simple way to do this.



The pinhole needs to be very small and you need to use a sewing needle to create the hole. First thing you need to do is file away a bit of the surface of the tin to make it thinner then punch the hole in the tin - otherwise it will be hard to do and will break your needle

You will need to create a small shutter using black insulation tape. The will be in place before you take the picture then you lift it carefully for the exposure and then seal the hole again from the light.



Place your camera on steady surface to prevent movement or blurry images. The exposure time can be a few seconds long.

Make a pin hole camera



Pinhole "Selfie":



Developed Negative:



Inverted:



Tray #1:
Developer

Tray #2:
Stop Bath

Tray #3:
Fixer



Tray 1 Developer

Place your B&W paper in the tray. Rock tray gently until the paper develops to the desired darkness. Lift paper with tongs, drip and place into Tray 2

Tray 2 Stop bath

Rock tray gently for about 10 seconds. Lift paper, drip and place in Tray 3

Tray 3 Fixer

Rock tray gently for at least 2 minutes. Lift paper with tongs, drip and rinse paper with warm water for 4 minutes



To develop your picture you will need to set up a small darkroom. This can be a cupboard or small room under the stairs, a basement room perhaps.

If it has a window cover it with black plastic. It must be completely dark inside. You will be able to work safely when you have the red light bulb on.

You also need some equipment - 3 small development trays, some development chemicals, a tongs for lifting prints and a red safety bulb.

Mix up the developers as instructed on the pack. One chemical is the developer, the second the stop bath and the third the fixer.

The photo paper is first placed in the developer until the picture appears. This happens very quickly and if you leave the picture in the developer for too long it will go completely black. It is then placed in the stop bath to stop the developer from working. Lastly the paper is placed in the fixer to 'fix' the image. The paper is then washed in water to remove all chemicals and hung on a line to dry.

Pin hole camera are very basic so you will need to experiment to get it to work perfectly for you.

Developing your picture

Getting out of tricky situations is a constant challenge for an action hero. Mini survival kits provide a collection of small objects and items that can be carried in your pocket. These items are useful and if combined together or used with small pieces of wood, bone or metal can be key to your survival.

To miniaturise is to make something smaller so that it can be carried easily. For example a mobile phone or a watch. Within science, electronics for example, the aim is to get all the components as small as possible so that they can be used to create powerful mobile devices.

Nano technology is the creation of extremely small devices and processes - for example micro chips, tiny motors and robots that can bring drugs to locations in your body



Mini survival kits



Science Bit

Nuclear power uses fission (splitting atom nuclei) to produce energy. As the reaction happens it produces heat that is used to drive steam turbines that in turn generate electricity.

Control rods are a collection of metal rods that are lowered and raised within the reactor core to control the reaction process between uranium and plutonium by absorbing stray atoms.

If the reaction process is not controlled it will continue to produce heat and cause a melt down with vast environment radioactive fallout for many thousands of years.

Around 6% of the world's energy and 14% of the world's electricity is produced by nuclear power.

The Mission

Saboteurs have infiltrated a nuclear power plant and have interfered with the stabilising rods in the reactor causing it to overheat to dangerous levels.

Immediate action is required to prevent the plant blowing up and causing a major nuclear incident.



Reactor Core

The Mission

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You enter the reactor room and approach the safety zone (outside the cornered play area). Before you is the core interface - gridded area on which are placed 'rods' with a unique power rating number.

There are nine rods and each has a unique number.

To stabilise the reactor core you must place the rods so that their number total 30 on each branch - vertically, horizontally and diagonally.

Only two rods can be removed from the core at any time. So firstly you must work out the correct position of each rod; then work out what rods need to change position and the sequence in which they should be moved.

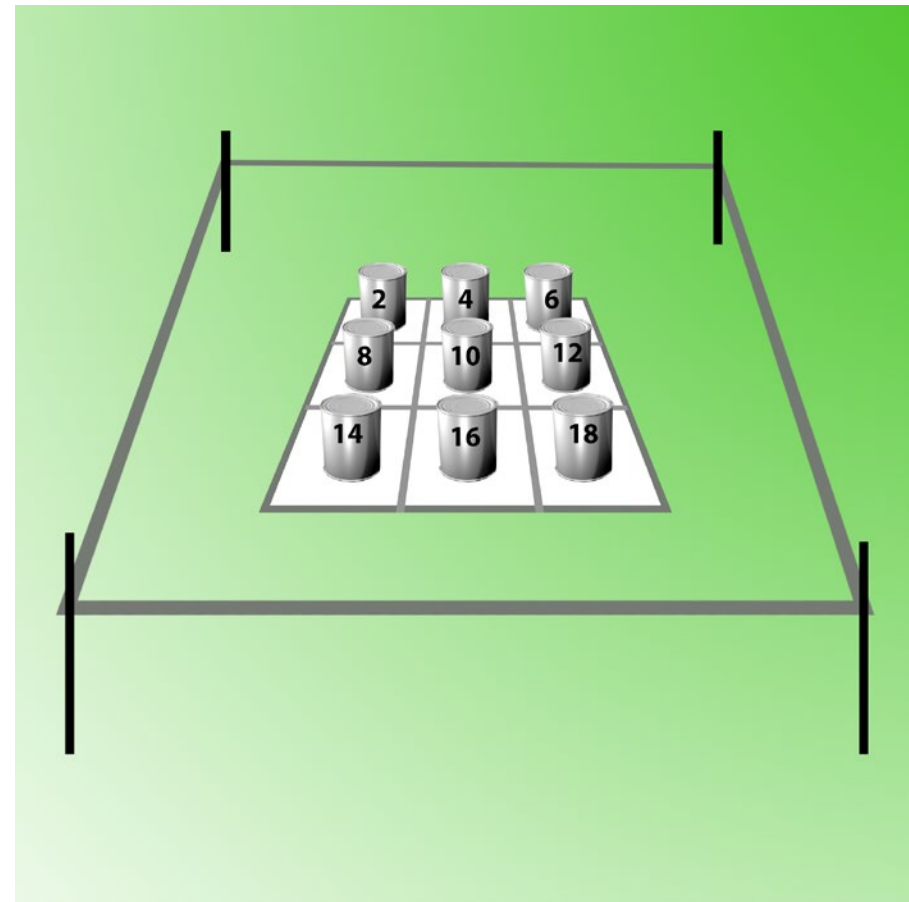
Touching a rod or entering the core area (even by leaning over it) will mean instant death so they must be lifted from the core using the equipment provided and from a safe distance /perimeter from the core itself.

The core is already unstable and you and your team do not have time on your side so work quickly.

Equipment provided:

A large rubber band and 8 lengths of string (a length of string for each member of the team/patrol.

If available white safety suits and masks



Reactor Core



Science Bit

Compasses contain a magnetic needle that will seek to align itself with the North magnetic pole that is positioned at the top of the earth.

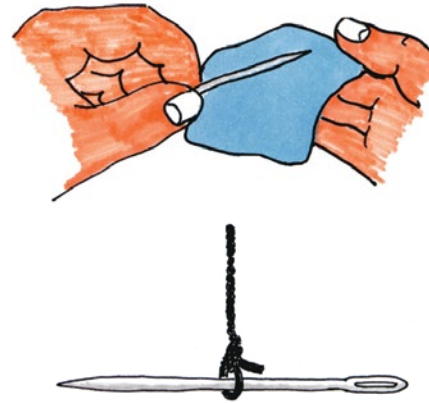
All magnets have two poles a north and a south and are attracted to each other. Around the magnet are line of magnet flux - like power field and if any other metal is close to a magnet they to cna be attrcted to the magnet.

The compass needle spinning on a pin is picking up the magnet flux that projects around the earth's surface. However, it can easliy be pulled away from these invisile power field by other metal object that come close to it.

In expensive compasses the needle is surrounded by liquid to stablise the needle. Once you know the position of north and south - east, west and other directions can be determined.

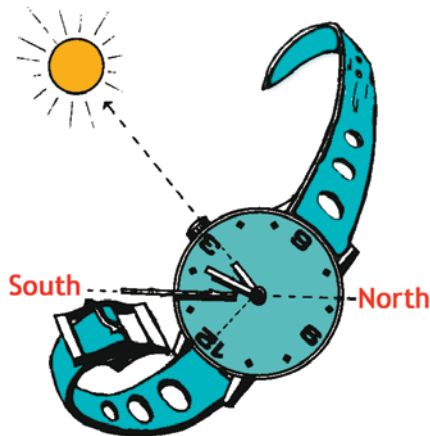


Make a compass



Needle Compass

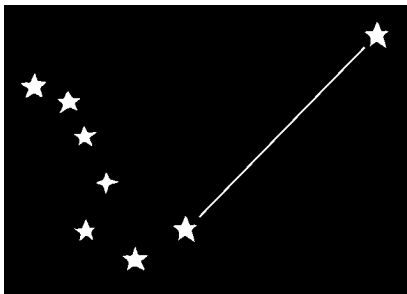
It is a good idea to have a magnetised needle in your personal survival kit. You can magnetise a needle by rubbing it in the same direction towards the point of the needle using a small magnet or a piece of silk or nylon based cloth. In order to find direction, the needle needs to be suspended so that it moves freely. This can be done in two ways, either by suspending it from a thread as shown or by floating it in a pool of water on a piece of grass or a small leaf. The pointed part of the needle points north.



Using your watch as a compass

You can use your watch to tell the direction. This is done by using the hour hand and the 12 o'clock mark on your watch.

To discover where South is. Point the hour hand towards the sun. Then divide the angle between the hour hand and the 12 o'clock mark on your watch. This will give you the North - South line, the direction towards the sun is South. Once you know where one of the directional points lies it is easy to discover the others.

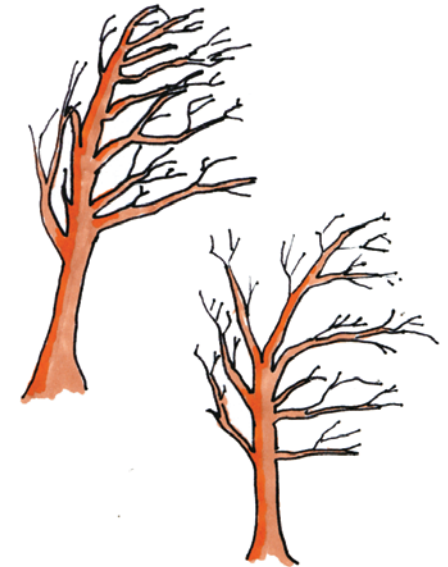


The location of North can also be determined from the stars using the Pole Star. The 'Plough' Constellation is visible all year round as it moves around the Pole Star. On a clear night the Pole Star can be found by plotting a line through the 'pointers' As with the sun and the moon, the stars also appear from the East and sink in the West. So, if you face a rising star you are facing East, if you face a descending star you are facing West.

The wind

Almost every area has what is called a prevailing wind - that is a wind that blows longest and strongest from a particular direction. (in Ireland it blows from the South West). Prevailing winds have their impact on trees. You can very often observe how trees in a given area have been influenced by a prevailing wind to lean in a particular direction. There are but a few exceptions to this general rule - such as with the trees on some of our coastlines which always lean away from the sea. Trees are affected by many factors, and you should not jump to conclusions after studying a single tree, but confirm your findings by observing several trees in the same vicinity.

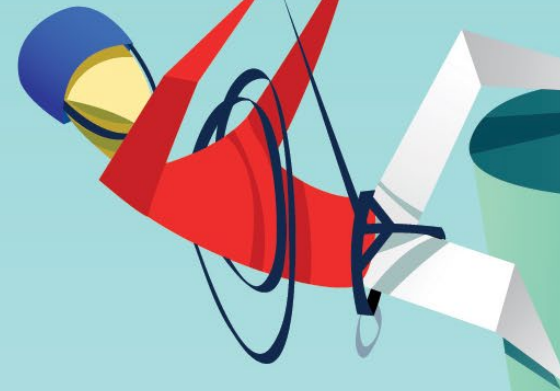
Most trees tend to develop more foliage on the sunny side. Mosses and lichens will tend to grow more on the North side of a tree trunk, rather than on the Southern sun facing side.



Make a compass

Science Bit

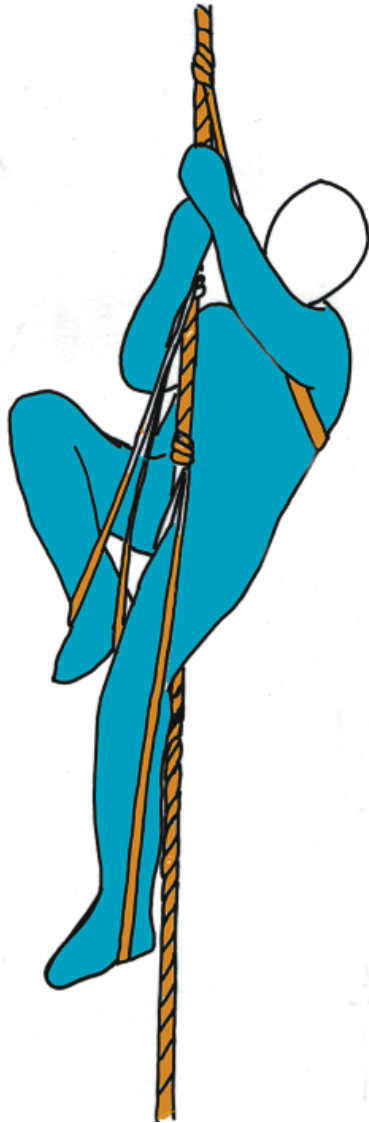
Friction - This is where “kinetic” energy (the energy of movement) is converted into heat energy by two or more objects rub against one another. Even friction through the air can generate intense heat – think of a meteor falling through the atmosphere.



Friction Knots

Prusik Knot

The prusik knot is a friction knot, which allows it to slide on a rope when free of a load, but will grip the rope when under strain. To climb a rope you will need three prusik loops fixed onto the main rope - 2 for the feet and 1 as an underarm loop. The rope is climbed by sliding the knots, one at a time, so that it is possible to 'step up' the rope using the foot loops. With practice, a rhythm can be developed which will allow you to climb the rope with ease.



Abseiling

Abseiling is a means of lowering yourself from a height, using a rope in a controlled manner. It is not a sport in itself but rather a technique used in rock climbing, mountaineering and caving. Specialised training is required and abseiling should not be attempted until you know what you are doing. The technique is an important skill to know for emergency situations, in the case of a quick escape in bad weather, to assist people on difficult terrain, or in case of an accident.

