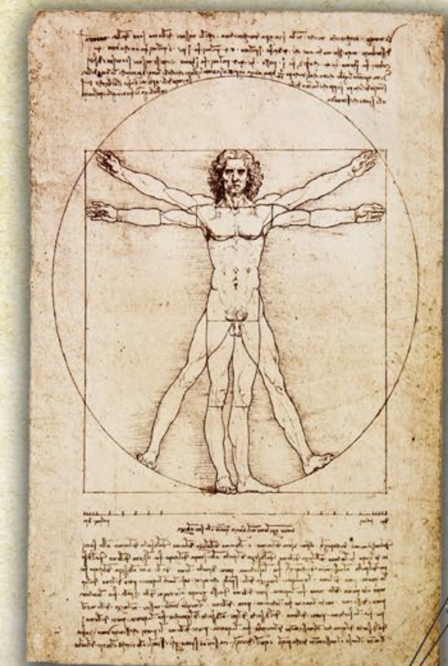
Leonardo De Vinci



Insight

Science Foundation Ireland sfi For what's next

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).

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 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.

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.

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.

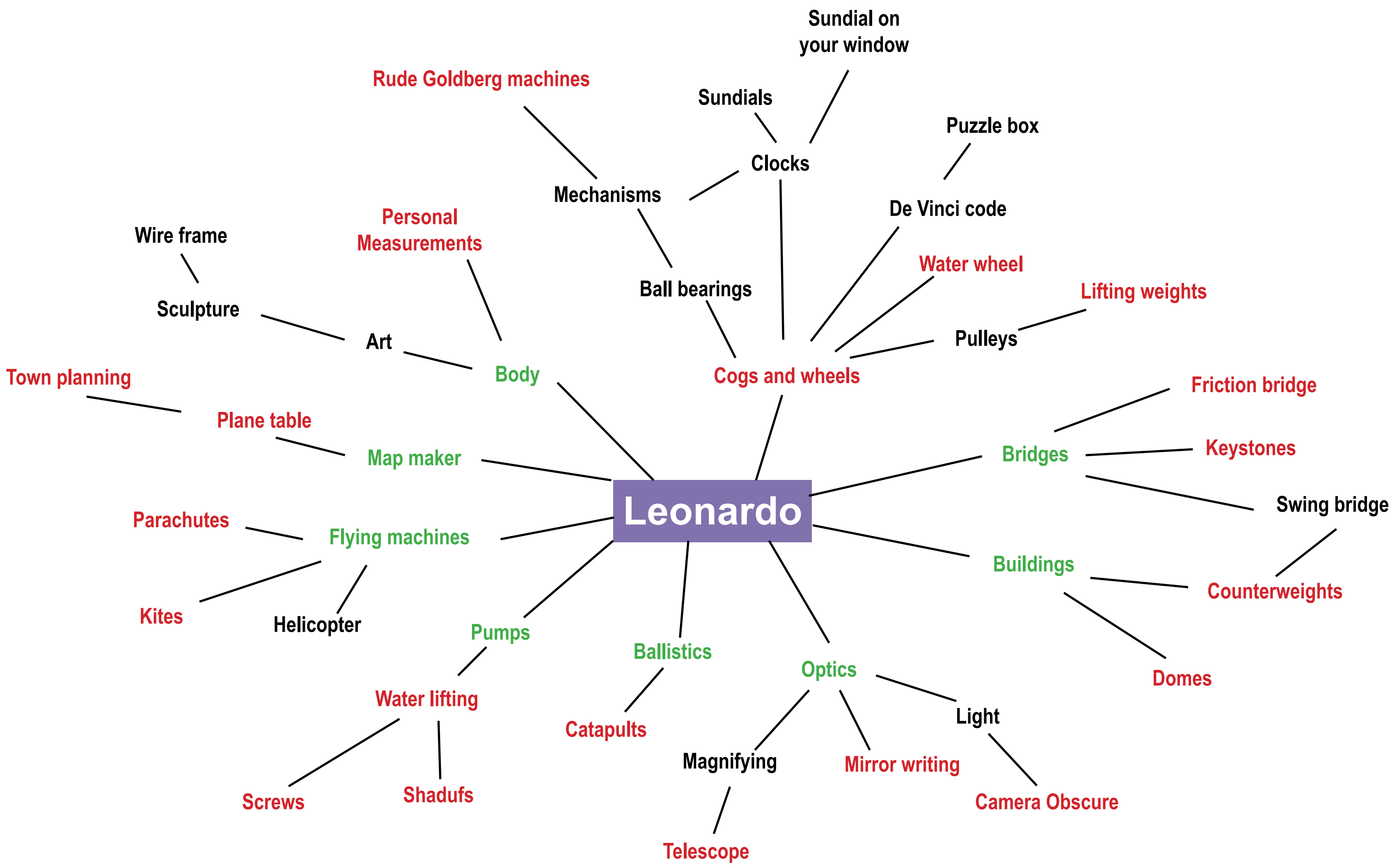
Each idea therefore has a ‘science idea’ that Scouts need to discover as they undertake each activity. In the review process it is hoped that Scouts express in their own way the things they have learned and the knowledge and new understandings they have gained.

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.

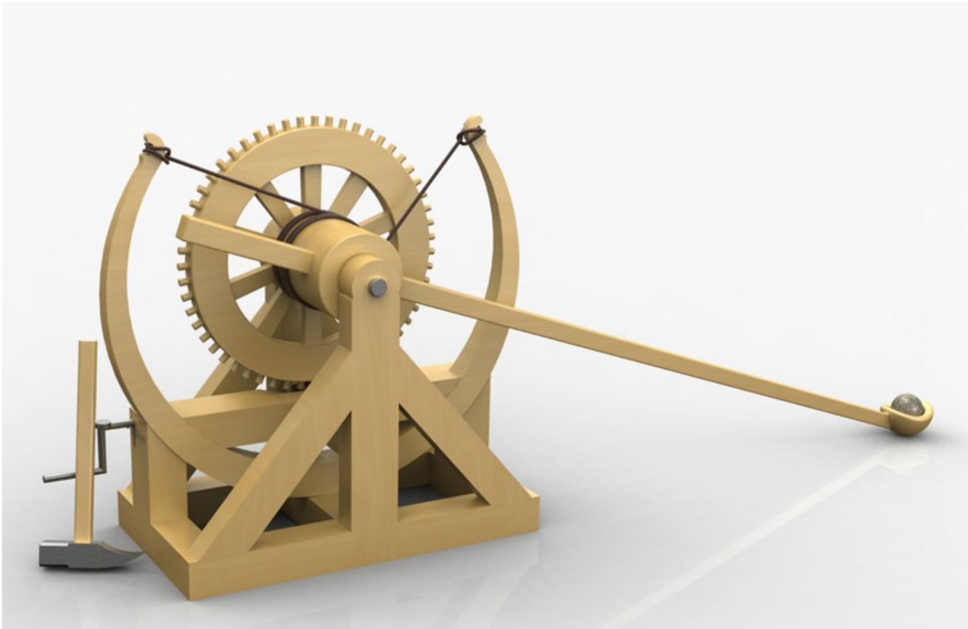
Reviewing is critical to the learning process. Until a Scout takes time to internalise and access what they have learned through an experience it serves no real value - bar entertainment.

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.



This resource has information on items coloured orange

Leonardo theme chart



Science Bit

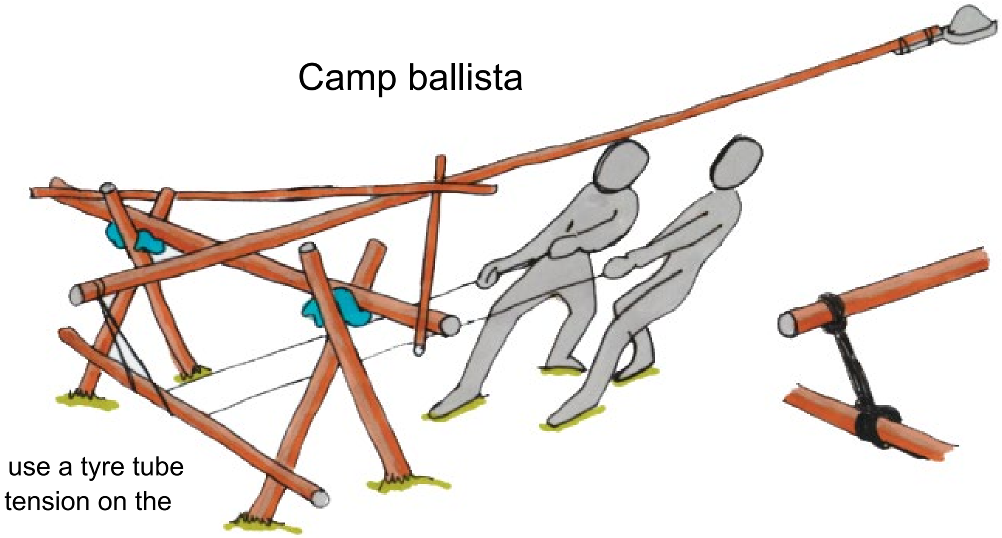
Catapults use energy stored in the machinist to produce a force that will send a projectile - (weighted object) towards a target. Leonardo designs used the energy potential stored in compressed wooden curves/arms. These material will compress and expand and return to normal after each firing.

To make a projectile cover the most horizontal distance possible, it should be launched from a 45º angle. A projectile is controlled by two independent motions that work together to create a precise mathematical curve as it travels. The force sending it forward and gravity that is pulling the projectile towards the earth. Each design therefore needs experimentation and refinment to discover the best combination of angle of takeoff and applied force.

Catapults

Camp Trebuchet

Camp ballista

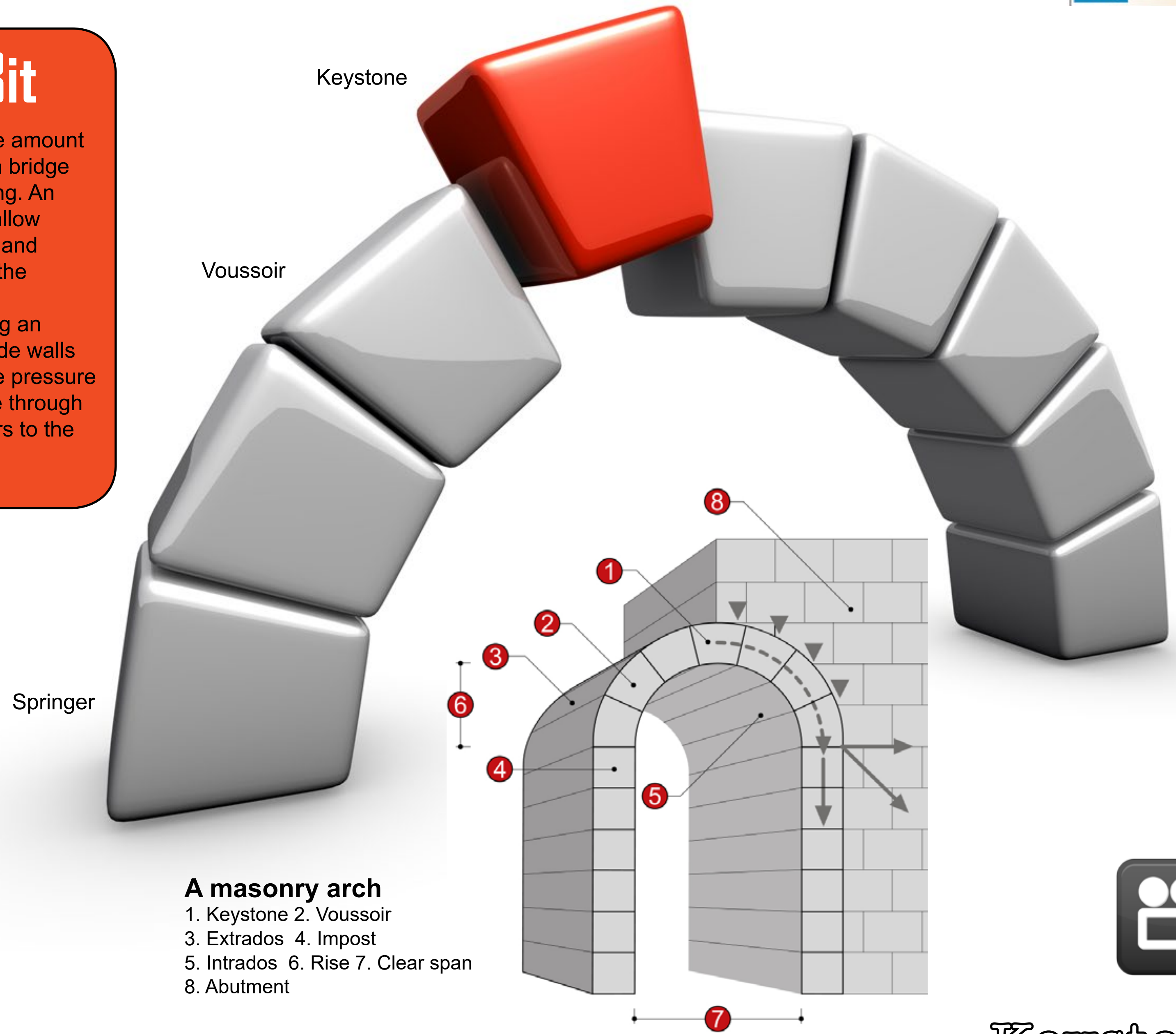


You can also use a tyre tube to create the tension on the ballista.

Catapults

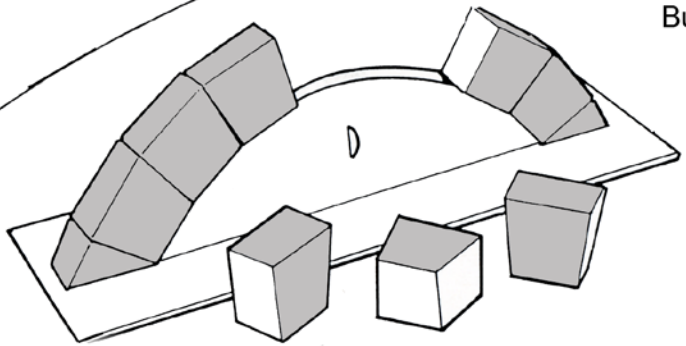
Science Bit

An arch can support a large amount of weight and is favoured in bridge construction and engineering. An arch acts as a pathway to allow pressure and forces above and around the arch to pass to the ground.
The key element for building an arch is the strength of its side walls which have to withstand the pressure discharged by the keystone through the wedge shaped voussoirs to the springers at its base.



A masonry arch
1. Keystone 2. Voussoir
3. Extrados 4. Impost
5. Intrados 6. Rise 7. Clear span
8. Abutment

Keystones



Building Frame

Cut slot

Create a model bridge with keystones

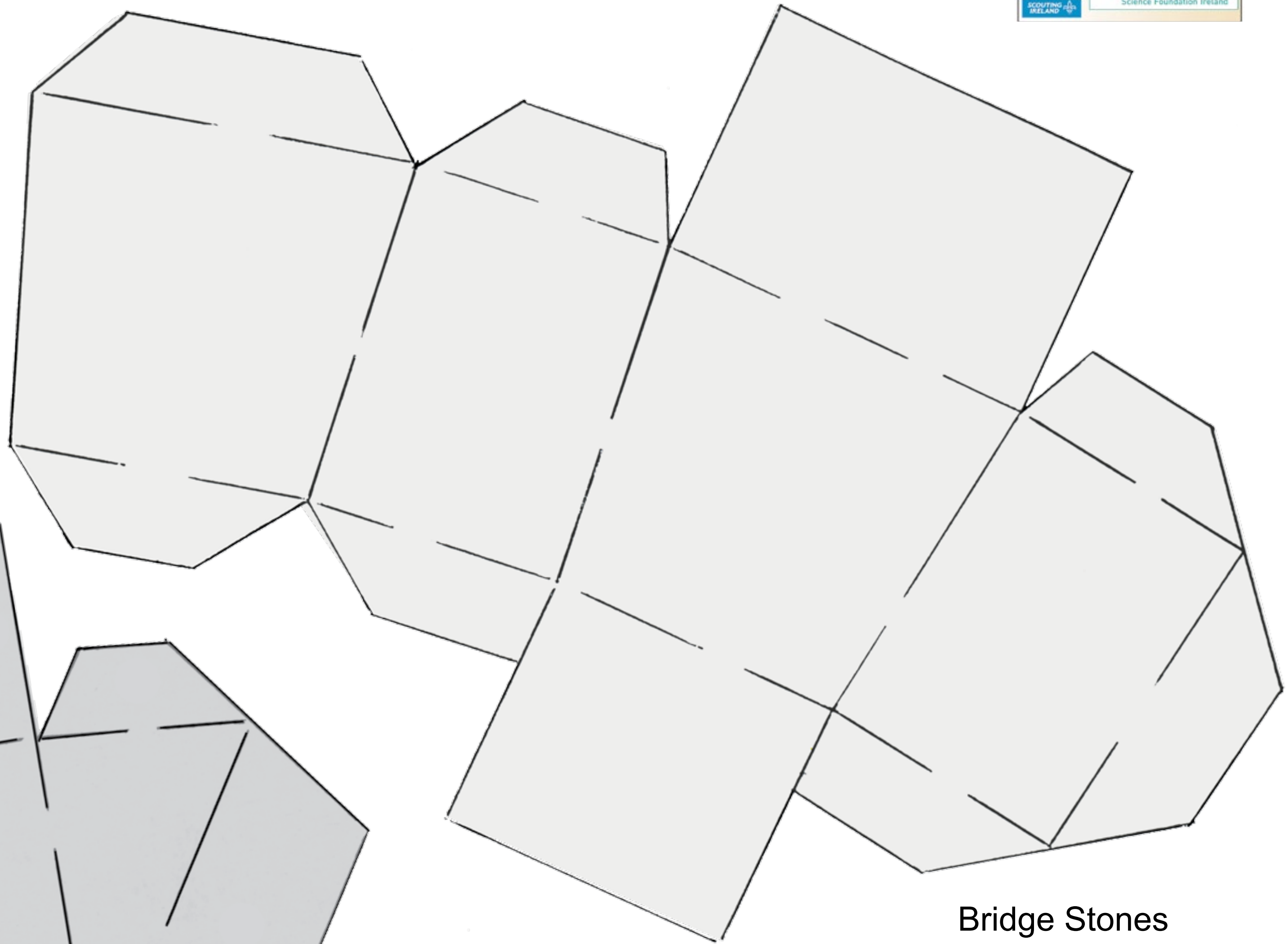
Score and fold along this line

Score and fold along this line

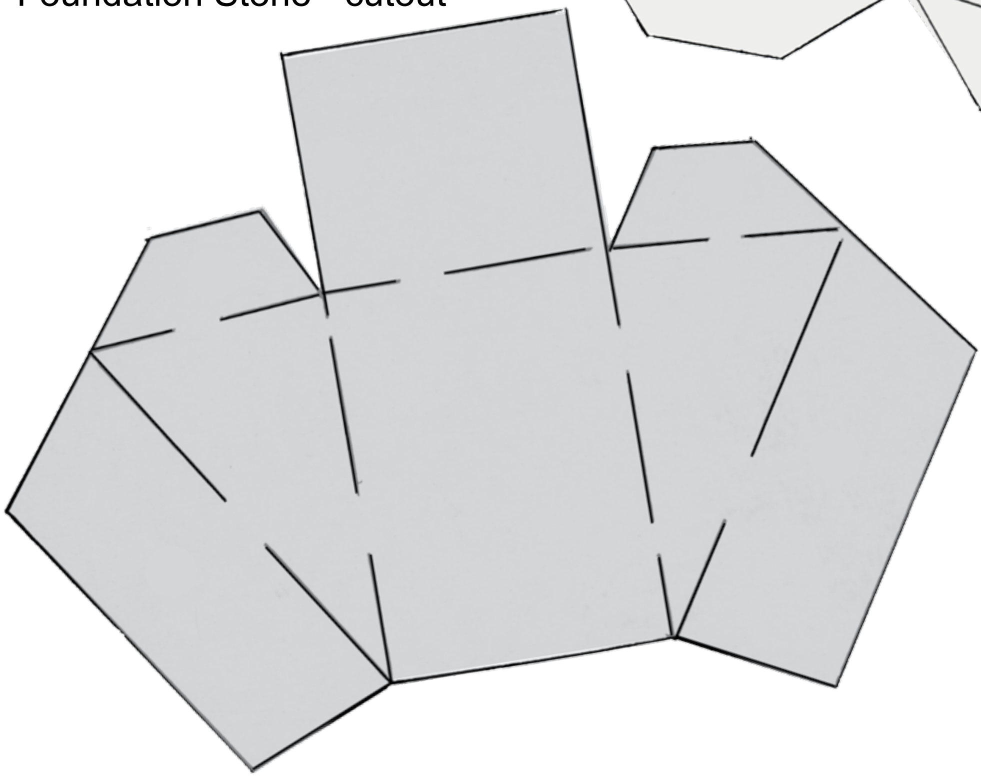
Fold back

Cut along line to create a tab. Fold back and insert in slot.

Print off on card the bridge stone cutout and keystone cutout on the following pages.

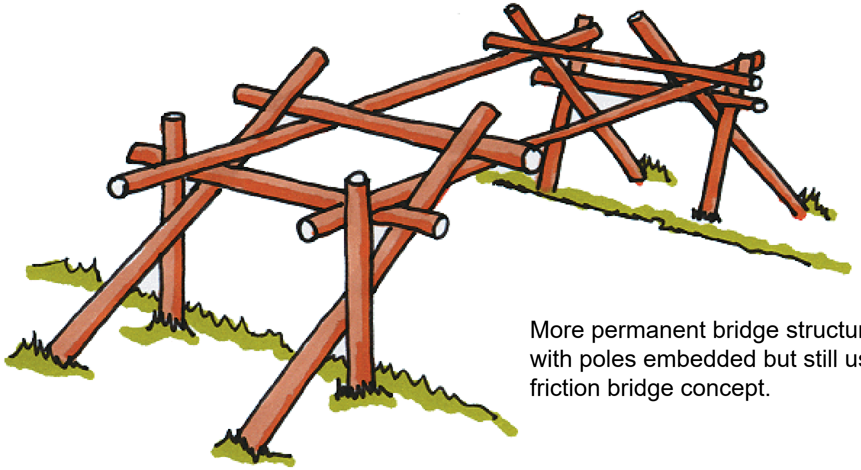


Foundation Stone - cutout

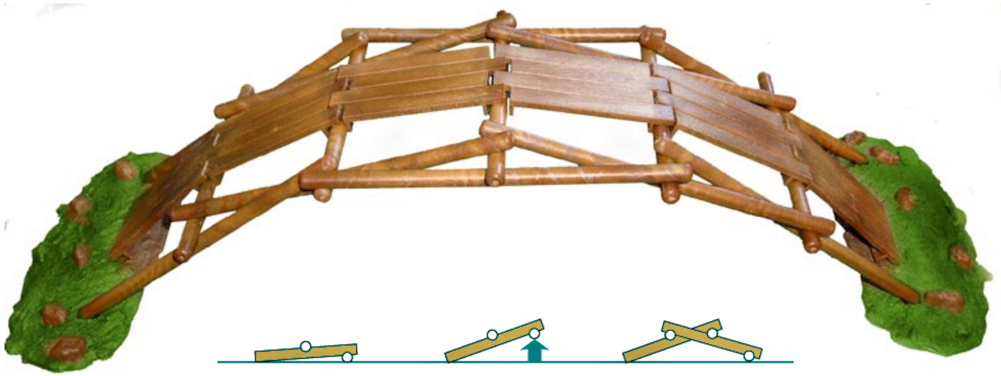


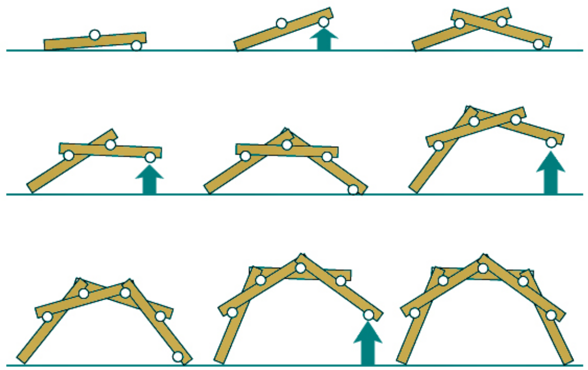
Bridge Stones

Print off these templates - cut out and glue. You will need two foundation stones and 8 bridge stones

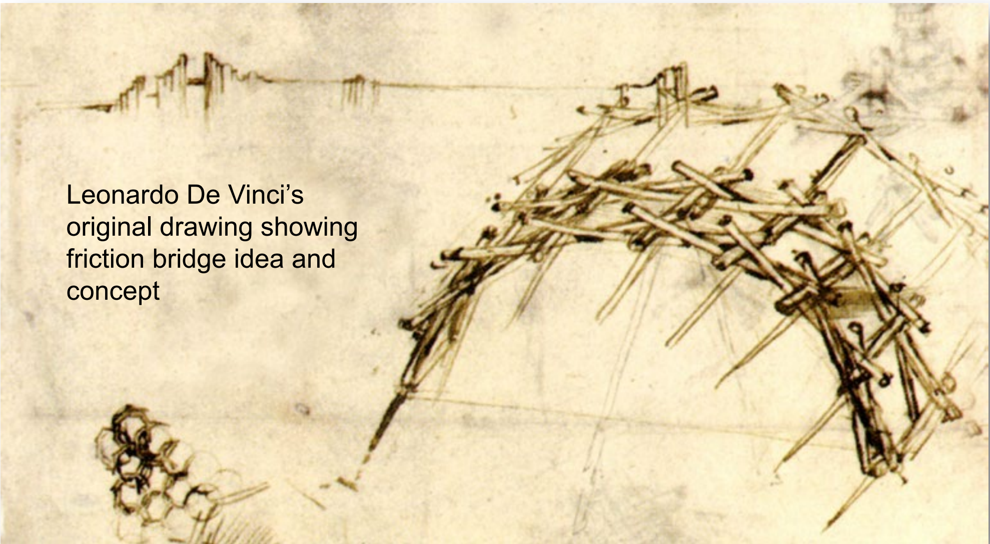


More permanent bridge structure with poles embedded but still using friction bridge concept.





Construction method - sequence

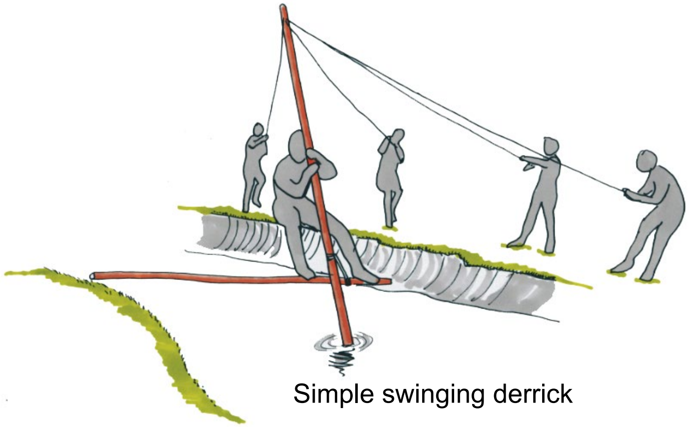


Leonardo De Vinci's original drawing showing friction bridge idea and concept

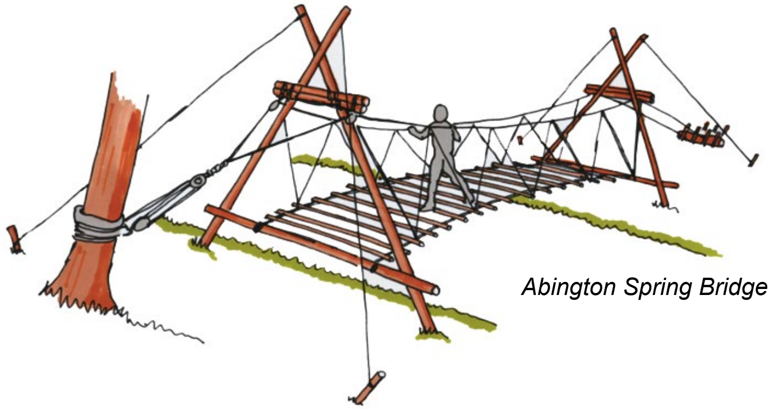
Leonardo's original idea was to come up with a method of quick bridge building that would allow an army to cross streams,and rivers easily. The idea was to have a kit of poles and planks that would allow the engineers to quickly build and dismantle a bridge as the army progressed. This would save a lot of time and the need to find wood as obstacles were met.

The self supporting bridge is ingenious in its simplicity and construction. It relies on friction and downwards pressure to allow it to stand and bear weight without breaking. While Leonardo's design does not show notched logs in reality notched logs are needed to provide better friction between the touching parts.

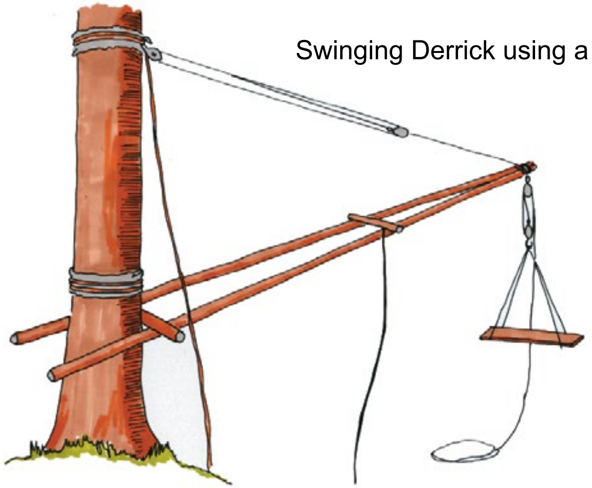
Friction Bridge & Dome



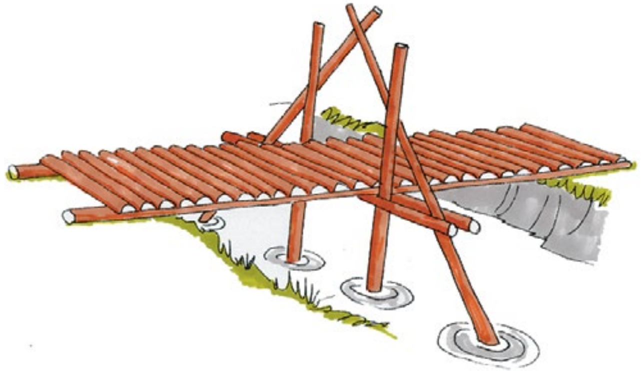
Simple swinging derrick



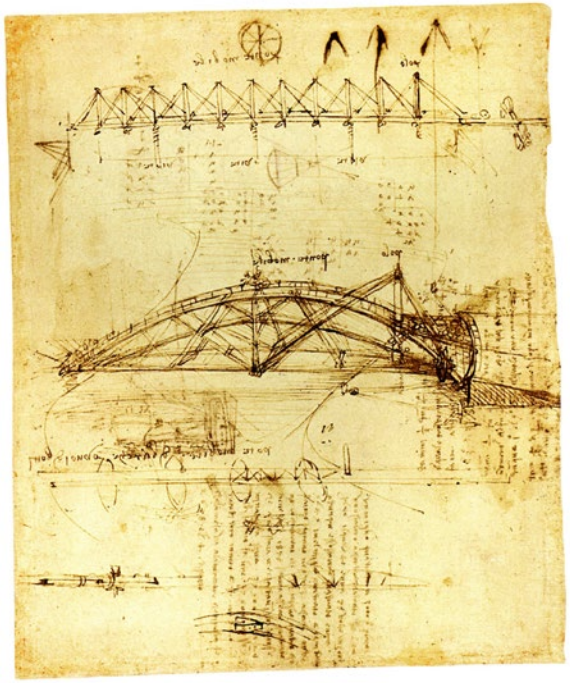
Abington Spring Bridge



Swinging Derrick using a tree



Simple 'A frame design' Bridge



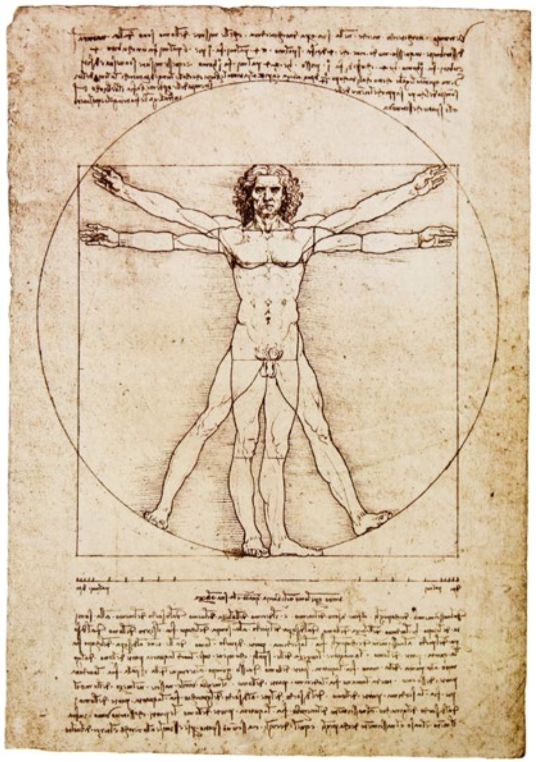
Bridge Building

Personal Measurements

Science Bit

Measurement was among one of the first intellectual achievements of early humans. People learned to measure and it was through measurement that people learned to count. Since humans have ten fingers, we learned to count by tens,and ways were soon found to relate units to each other.

Of course, these units varied from person to person, creating many difficulties. When individuals worked together, the leader would use his body as the sole authority. Measurements would be matched to samples made by him. As measurement and tools became more sophisticated, measuring sticks were made.



Leonardo De Vinci measured various distances on the body in order to make accurate drawings. He determined, generally, that the ratio of a knelling person to their standing height was three quarters.

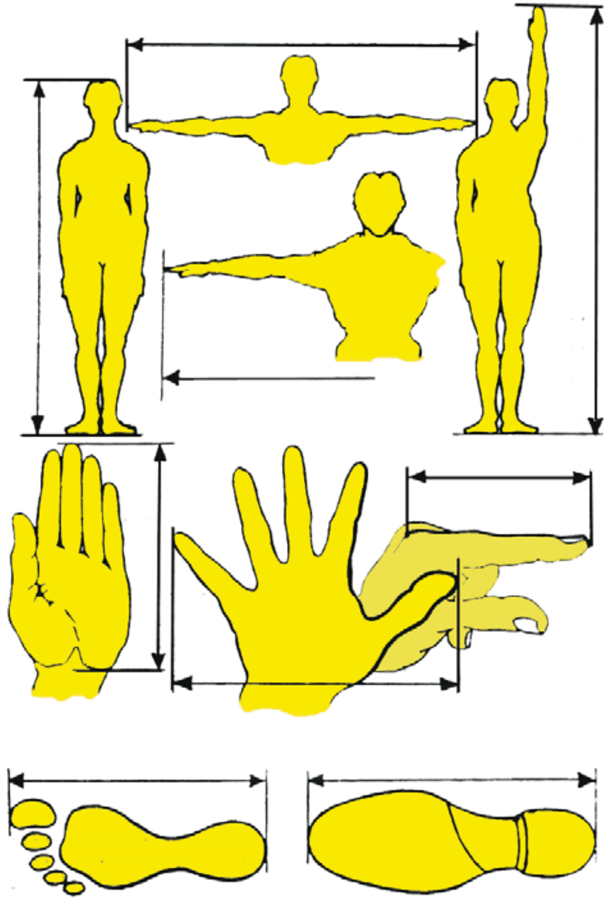
Knowing your ‘body ruler’ measurements allow you to make quick estimations of measurements.

Your known hand-span will often be particularly useful. If fully developed your measurements will be close to this:

Breadth of thumb, and nail joint
of forefinger = 2.54 cm.
Span of the thumb and forefinger = 17 cm.
Span of thumb and any other finger - 21.6 cm
Wrist to elbow = 25 cm
Elbow to tip of forefinger = 43 cm
Your reach, arms out-stretched, will nearly equal your height.

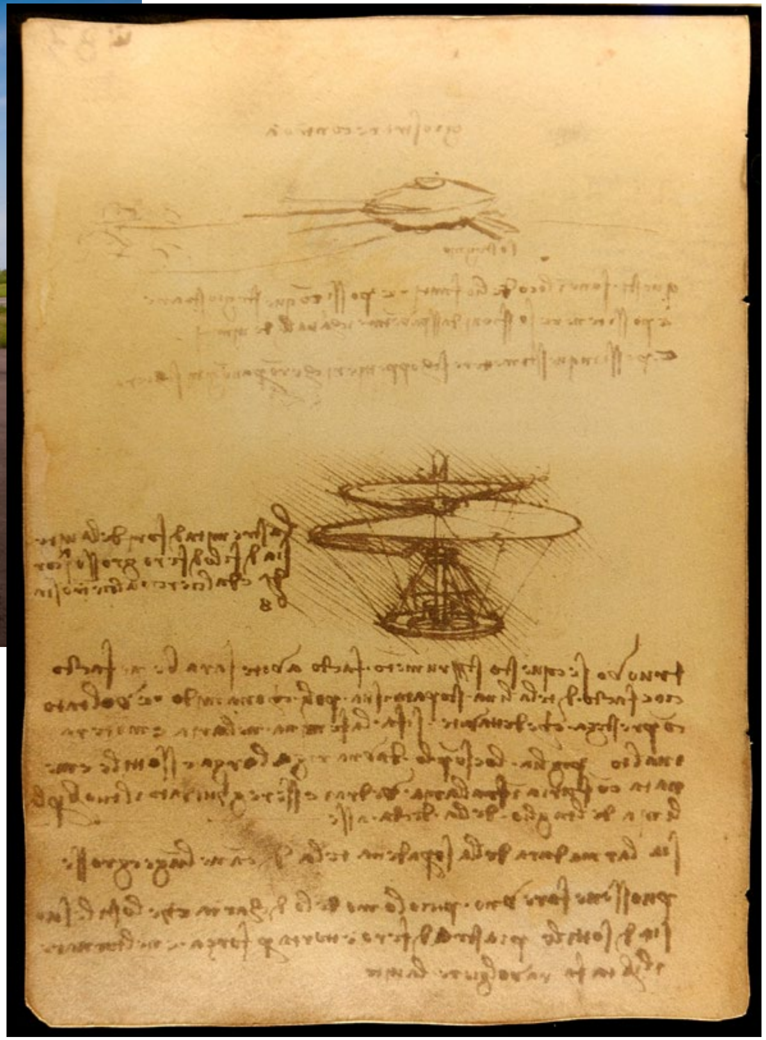
Some Further Hints

At 800 meters a man looks a post.
At 700 meters the head is not yet visible.
At 600 meters the head is visible as a dot.
At 400 meters) movements of the legs can be seen.
At 300 meters the face can be seen.
At 200 meters buttons and details of clothing are recognizable.
At 100 meters eyes and mouth can be seen clearly.



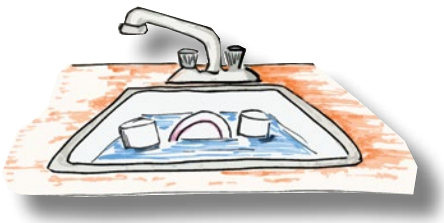
Science Bit

The rotor blades work like spinning wings. Helicopters fly upward against the force of gravity by using their rotors to throw air down beneath them. Like the wings of an airplane, each blade in a helicopter's rotor is an airfoil (aerofoil): a wing with a curved top and a straight bottom. As the blade spins around, it forces air over its curved upper surface and then throws it down behind it toward the ground, producing an upward force called lift.
According to the laws of motion, any force (or action) produces an equal force (or reaction) in the opposite direction. This means the torque (rotating force) produced by a helicopter's blades tends to turn the fuselage (the main helicopter body) in the opposite direction. All helicopters have either a second propeller or another device to counteract the torque of the main blade.



Helicopter

Water



Water is our most precious resource. Without it we would not survive. A person in the developing world uses a fraction of the water that a person in the developed world does. On average, a person in the developing world has about 10 litres of water a day for drinking, food preparation, cooking and cleaning. The average per person use of water in the developed world is 135 litres a day. A shower uses 5 litres of water a minute, flushing the toilet uses 10 litres and a dishwasher uses 35 litres.

Only 1% of the water on Earth is suitable for daily human use. Over 97% is salt water in the seas and oceans and approximately 2% is ice. The 1% that is available for drinking forms part of a continuous cycle. Some will fall into the seas and oceans and some will fall onto the land. There are three sources of clean, usable water: rainwater, underground water and surface water.

The carrying and transportation of water is a daily chore for young people and women in many countries of the world. In some areas women will travel 5 km to a water well and 5km back with a few litres of water for their family. In camp you will no doubt have travelled a short distance to get water and know how difficult it is to carry a full water container back to your site. A trek cart or trolley is a good method to use or perhaps a device made from an old bike.

Activity for your Patrol
With your Patrol sit down and design or invent a simple water transporter that could be made from an old bike or two. Build it and experiment with load carrying and how durable it is to use on rough terrain.

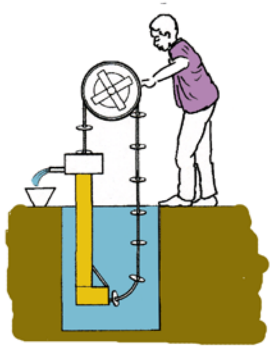
'More than 1 billion people do not have access to safe drinking water and 4000 children die every day from lack of safe drinking water' says WaterAid.

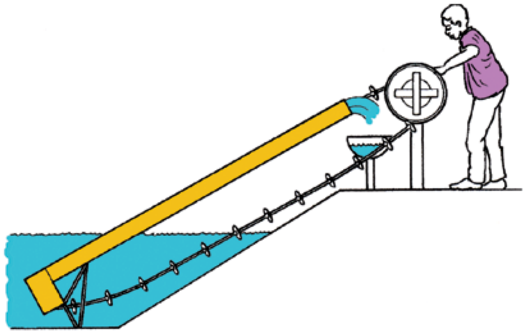
Water Pumps

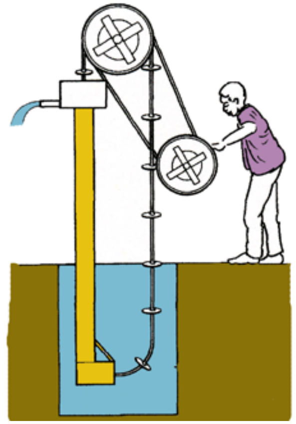
Water Pump

Water is the basis of life. Without it the world would not exist as we know it. For most people in the industrialized world, water is not an issue. We simply turn on the tap. It is not the same for people living in poorer countries. Some people might have a pump or well near them but many have to walk long distances to get this vital necessity. Many countries simply have wells - a hole in the ground and the problem is getting the water out of the well. Simple pumps and water lifters called shadufs are often employed for this task.
Water has many functions: drinking, cleaning, irrigation, industry, washing. In all case this means hard physical labour to transport water to villages or farmland.

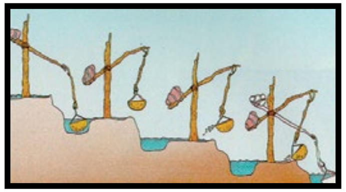
Simple Treadle pump in use in India







Construct a simple shaduf using poles and lashings. See how long it takes to lift a large quantity of water up an incline or hill. How easy it is to turn on a tap by comparison

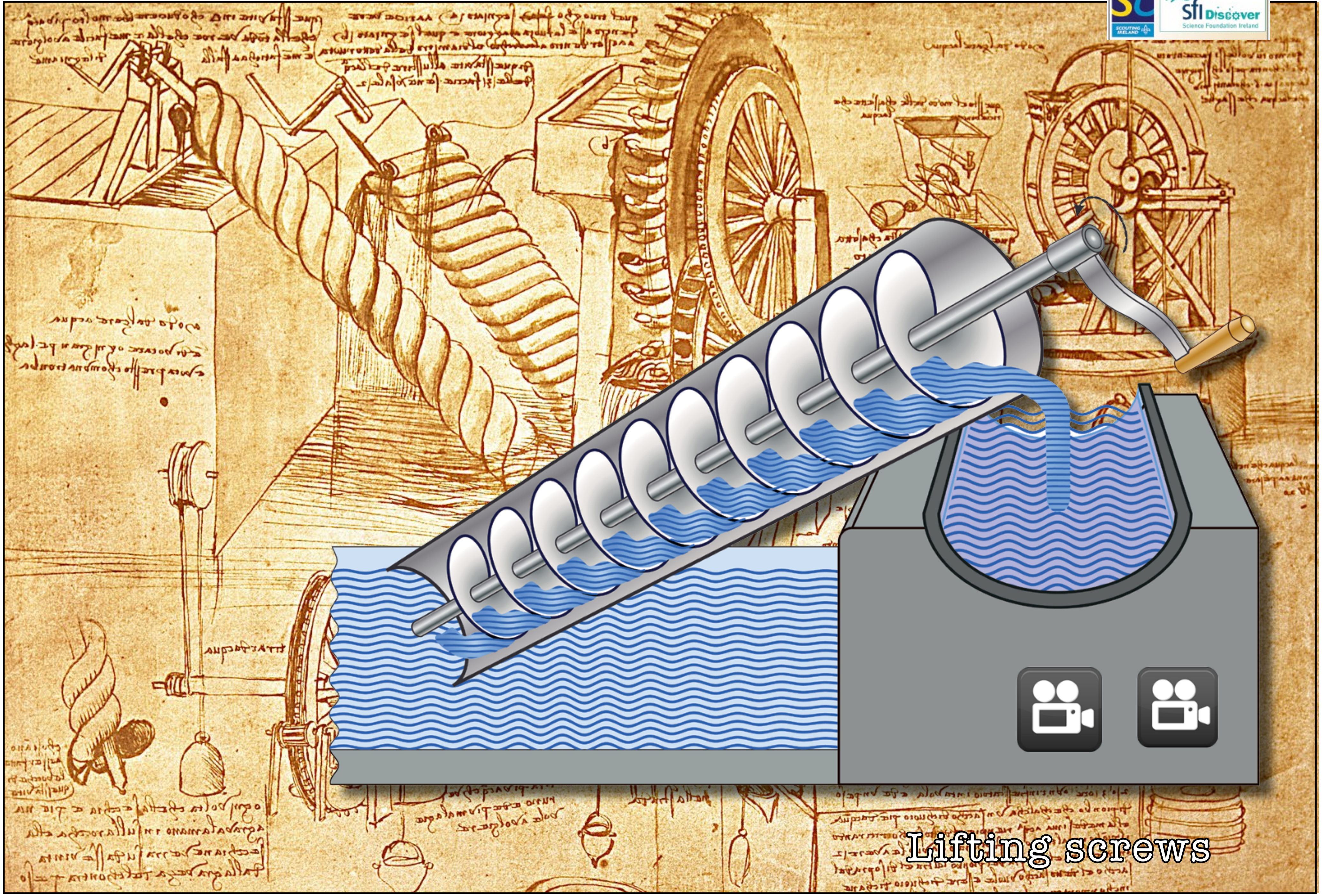


This is a simple water pump that a Patrol can make. It is made from a pipe, rope and car tyres. Circles of tyre are cut so that then fit tightly in the pipe. The pieces are put on the rope using a knot in the rope to hold them in place. A loop is created so that the rope passes through the pipe and around a turning device.

You will also need to design a guiding 'scoop' to guide the tyre circles into the pipe and a frame to support the mechanism

The weight of water that women in Africa and Asia carry on their heads is commonly 20kg, the same as the average UK airport luggage allowance. (WaterAid)

Water Pumps


Lifting screws

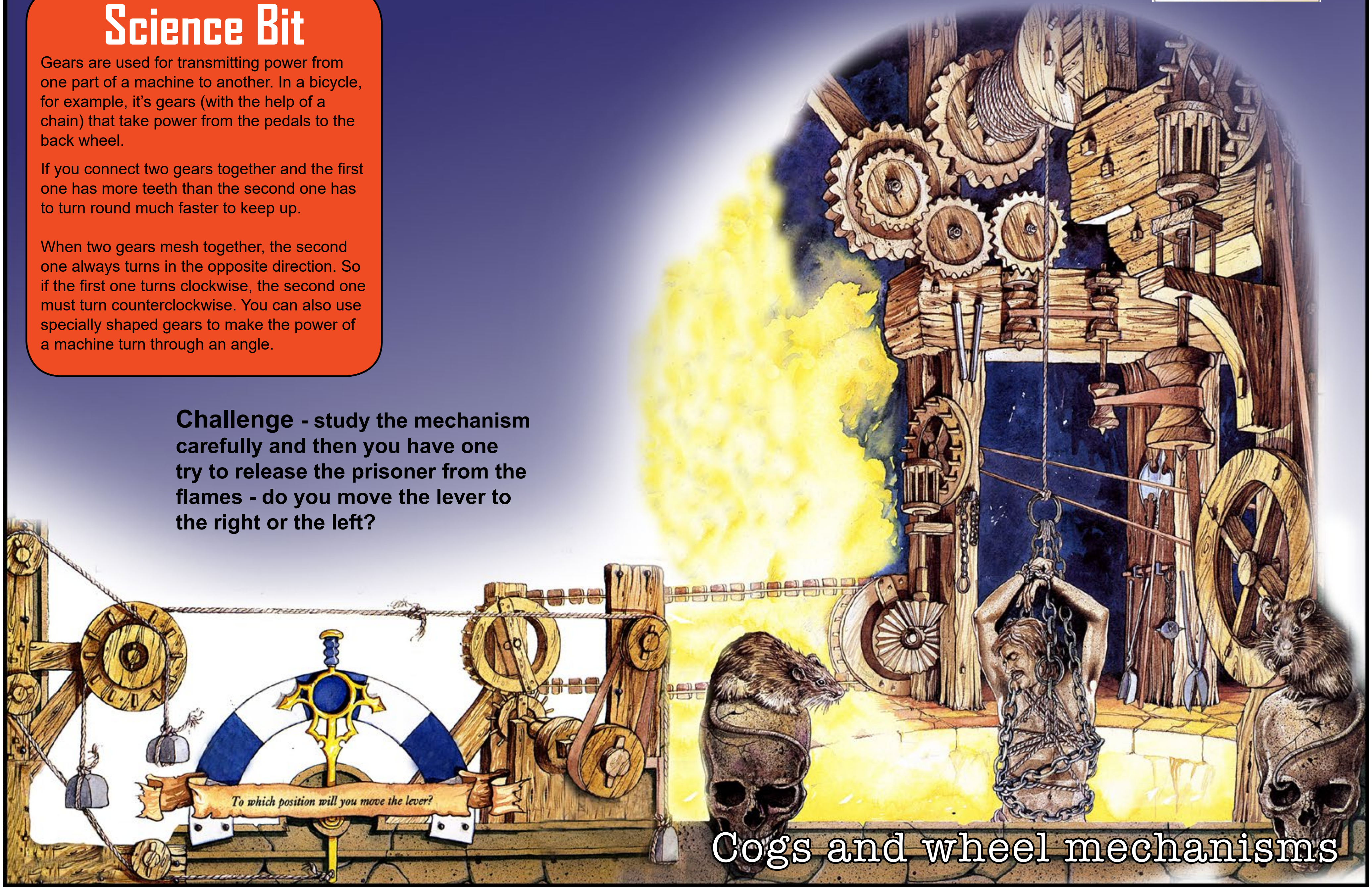
Science Bit

Gears are used for transmitting power from one part of a machine to another. In a bicycle, for example, it's gears (with the help of a chain) that take power from the pedals to the back wheel.

If you connect two gears together and the first one has more teeth than the second one has to turn round much faster to keep up.

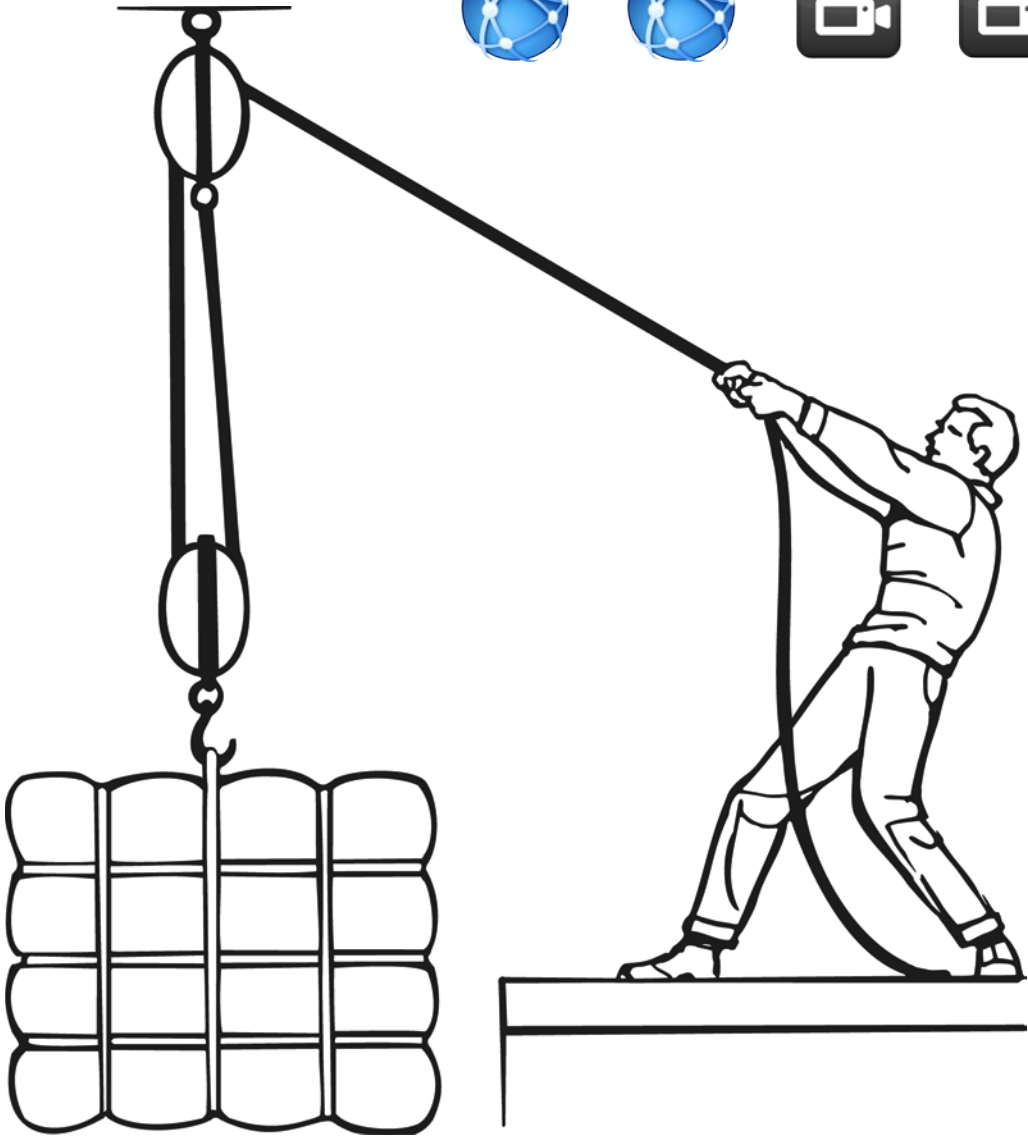
When two gears mesh together, the second one always turns in the opposite direction. So if the first one turns clockwise, the second one must turn counterclockwise. You can also use specially shaped gears to make the power of a machine turn through an angle.

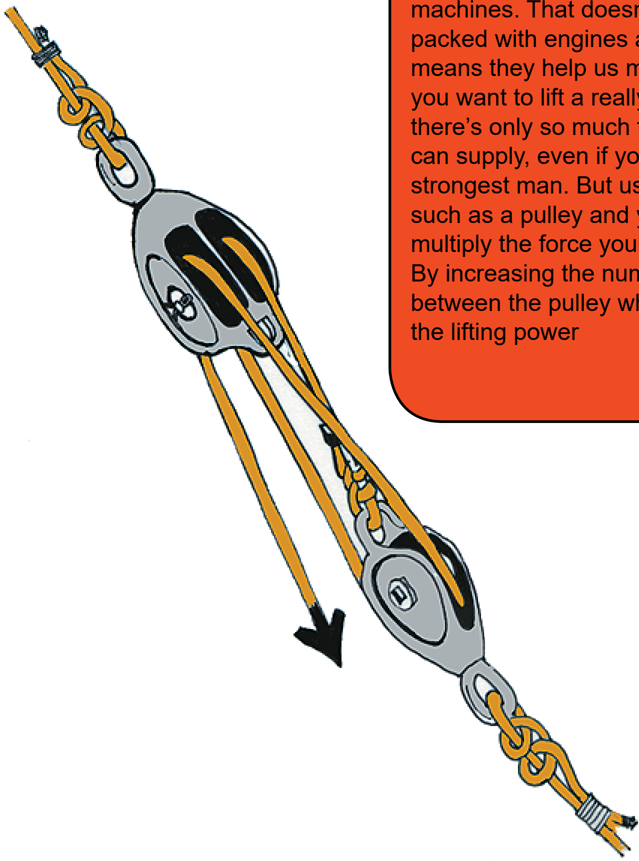
Challenge - study the mechanism carefully and then you have one try to release the prisoner from the flames - do you move the lever to the right or the left?



Cogs and wheel mechanisms


Cogs and wheel mechanisms





Science Bit

A pulley is simply a collection of one or more wheels over which you loop a rope to make it easier to lift things. Pulleys are examples of what scientists call simple machines. That doesn't mean they're packed with engines and gears; it just means they help us multiply forces. If you want to lift a really heavy weight, there's only so much force your muscles can supply, even if you are the world's strongest man. But use a simple machine such as a pulley and you can effectively multiply the force your body produces. By increasing the number of loops between the pulley wheels you increase the lifting power

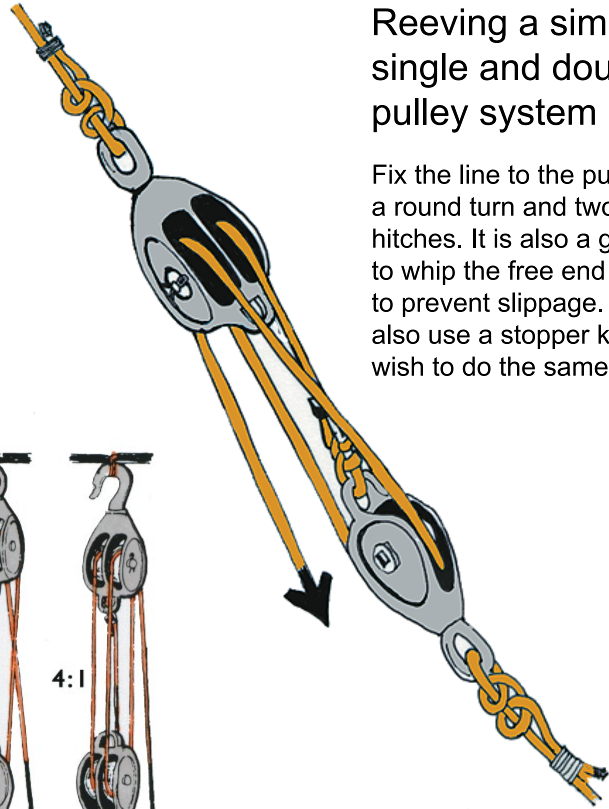
Lifting weights

Pulleys and lifting

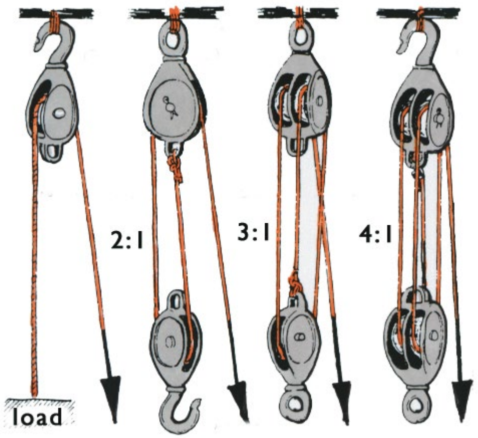
Most pioneering projects can be completed using 2 pulleys- a single block and a double block. However, it is best to aim for 2 single blocks and 2 double blocks and perhaps a number of small blocks - the ones used for clothes lines and sailing. This will allow you to complete most projects you will venture to undertake.

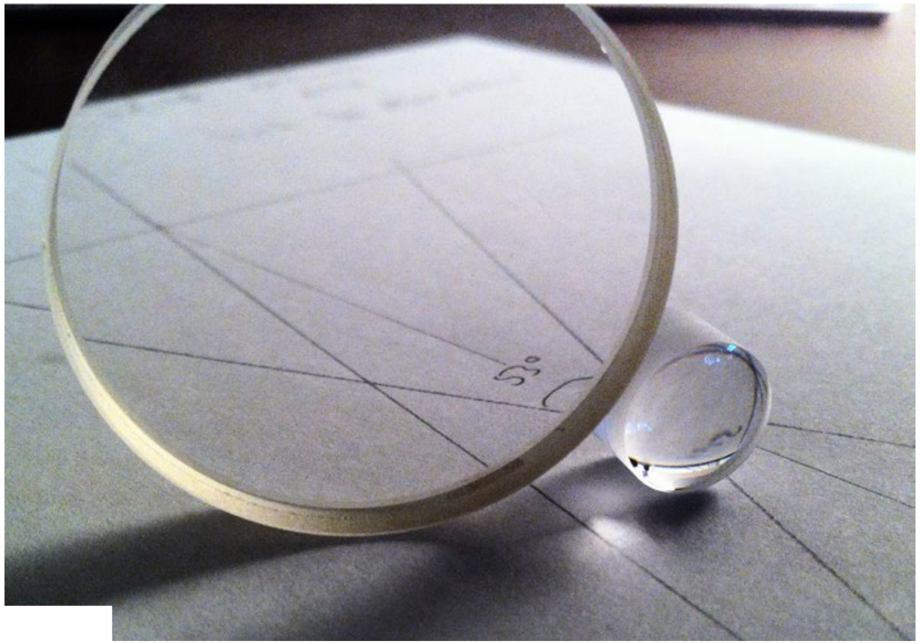
Reeving a simple single and double pulley system

Fix the line to the pulley using a round turn and two half hitches. It is also a good idea to whip the free end of the line to prevent slippage. You can also use a stopper knot if you wish to do the same job.



Pulleys allow you to increase your load lifting and pulling capacity. By employing single and double pulleys, different pull ratios can be achieved

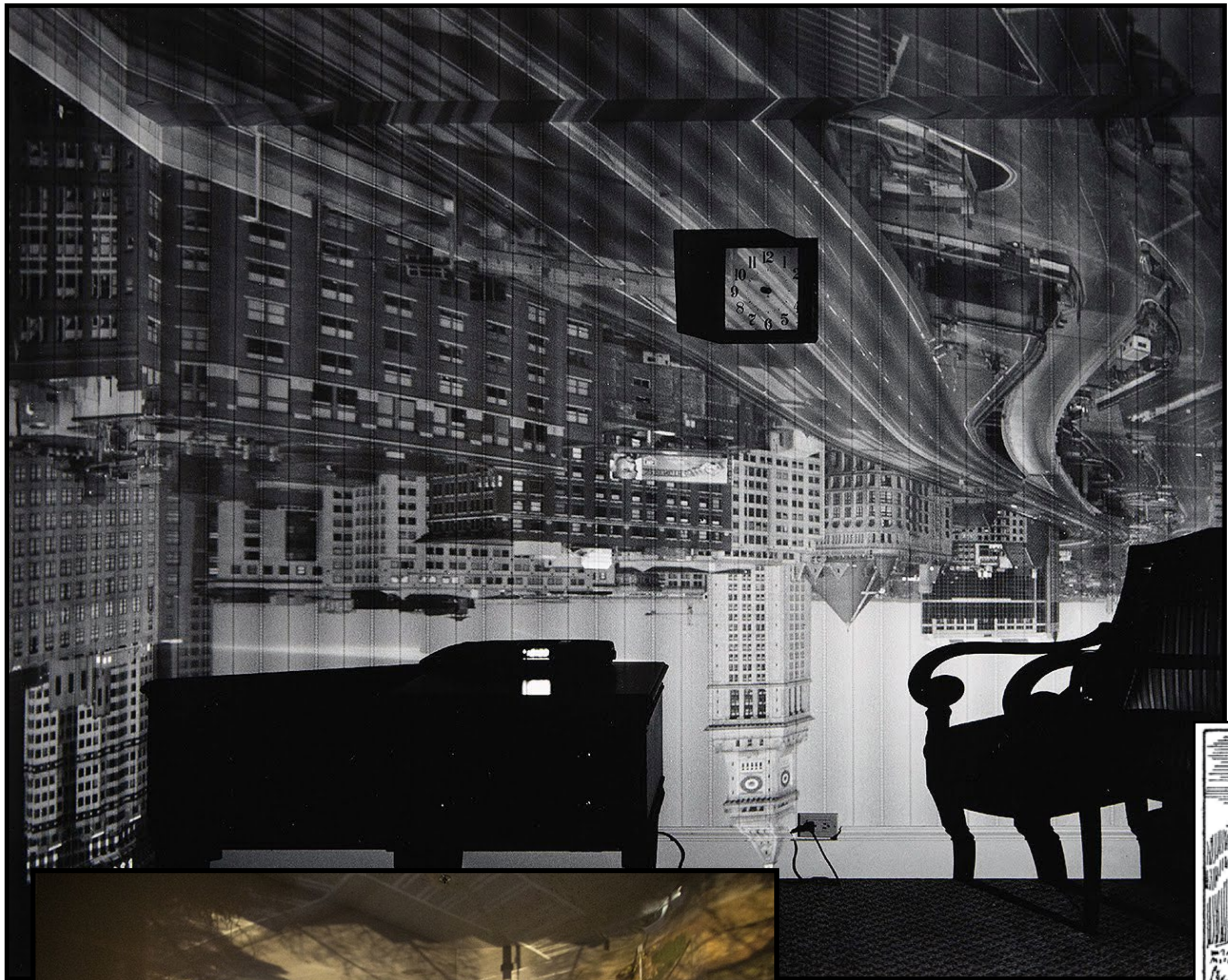




Science Bit

Optics is the science of light and how it behaves with objects - such as glass, mirrors and reflective surfaces.
A lens is a transparent device with two curved surfaces, usually made of glass or plastic, that uses refraction to form an image of an object.
A magnifing lens can be used to refine or combine rays of light to produce heat. It can also be used in combination with other lens to magnetfy such as a telescope, a microscope or a projector.

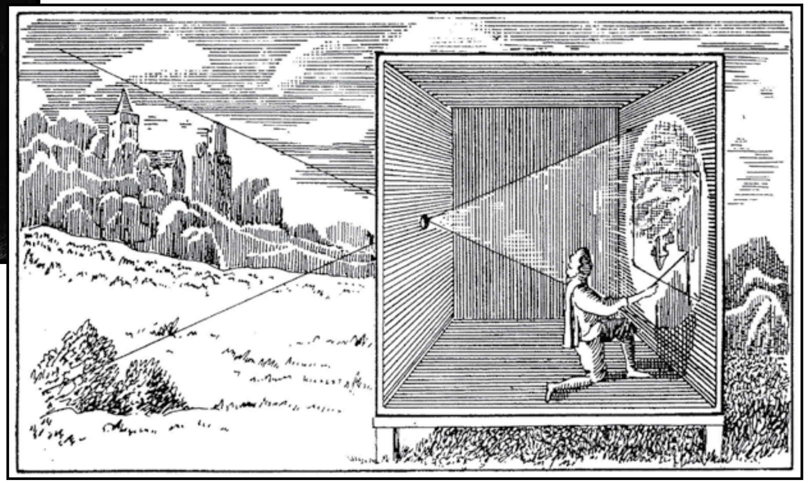
Telescopes and optics



Science Bit

A camera obscura is a large pinhole camera. A darken box in which a pinhole is created. Light from the outside passes through the pinhole - that acts as a lens - and inverts the light ray to produce an upside down image. Our eyes work in a similar way. An image is created on the retina nerves in the eye and transmit this information to our brain and this is how we see.
In the camera obscura we also use a magnifing lens covering the pinhole to focus or sharpen the outside image

Turn your bedroom into a giant camera obscura

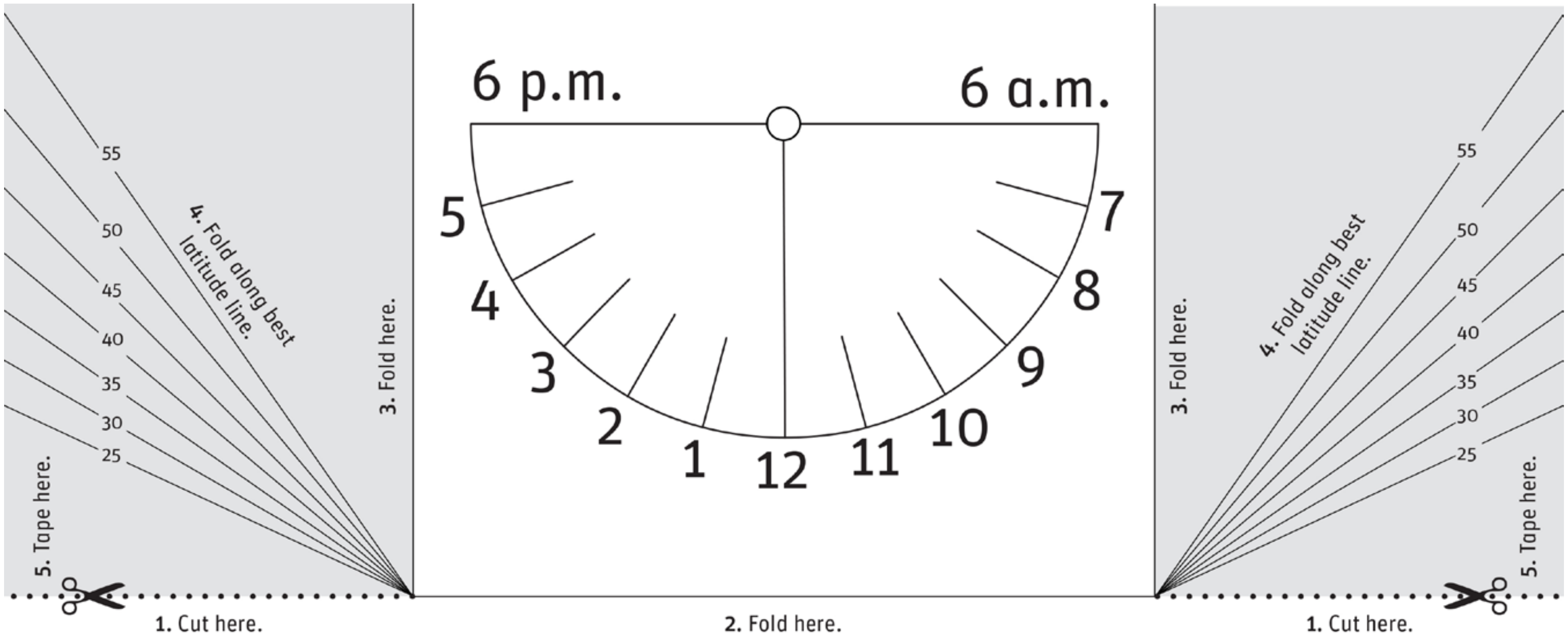


Camera Obscura

Science Bit

Sundials are a geometery device to calculate the time from the rotation and movement of the sun. This is determined by the place or location of the earth that the sundial is located and the track of the shadow created by the sun.
The working of a sundial is not so simple due to the tilted axis of the earth. If this is not accounted for, the sundial will have a different time each week. By aligning the gnomon - shadow casting triangle piece with the earth's axis, the difference can be compensated.

Sundial



Northern Hemisphere Sundial

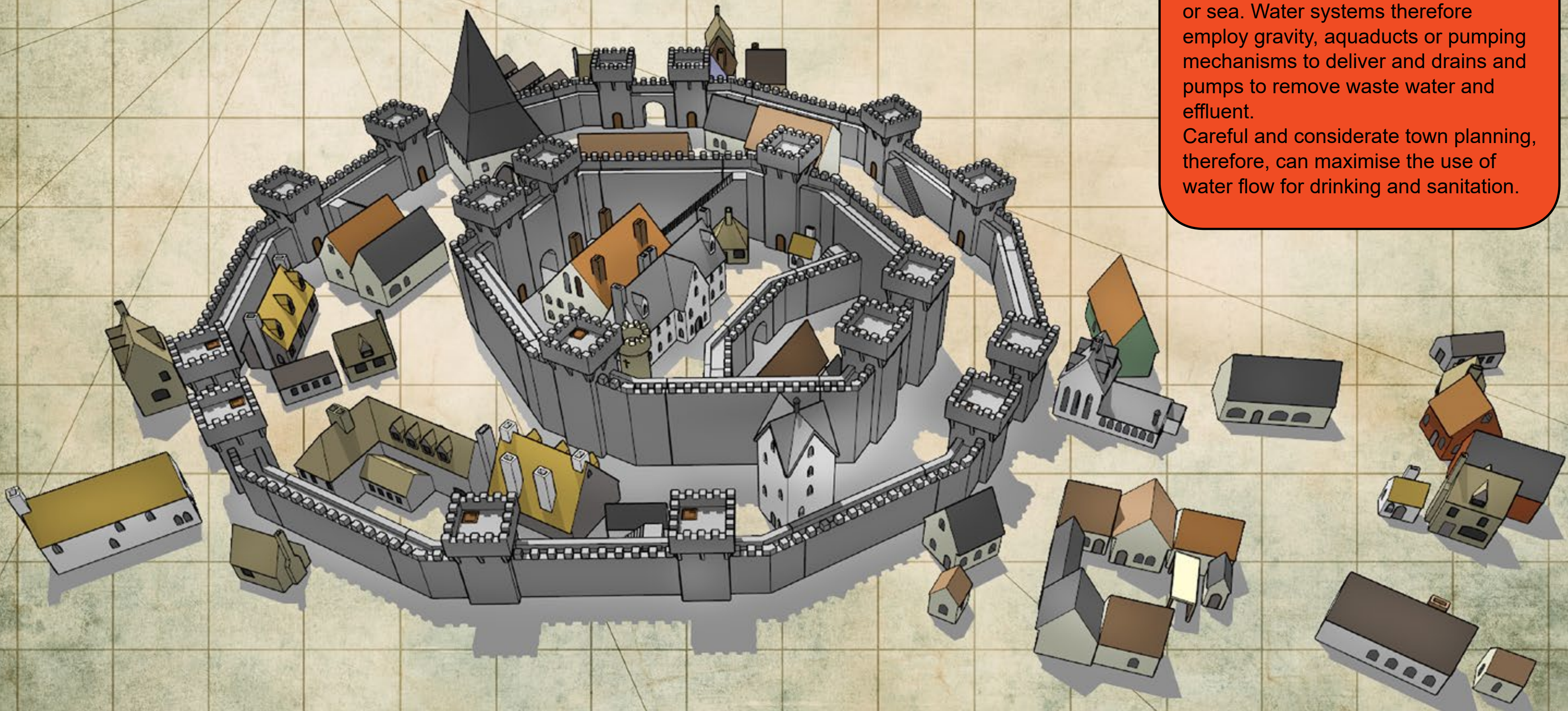
1. Cut in from edge of paper along dotted lines. Stop at solid lines.
2. Fold along solid horizontal line with line on outside. Crease, then open flat again.
3. Fold along solid vertical lines with lines on outside. Crease, then open flat again.
4. Select the latitude line closest to your latitude. Fold with line outside, crease, and fold again with line on *inside*.
5. Tape the paper together as shown at right.
6. Insert a sharp pencil point-first through the small circle at top center. Remove pencil and reinsert it with the eraser first.
7. If needed for stability or durability, tape the whole thing to a sheet of cardboard.
8. Turn the sundial so the pencil points due north, as determined by a map or a compass.
9. If you can't find north, orient the sundial so that it agrees with your clock. (Subtract one hour from the clock time if you're on daylight-saving time.)

Sundial

Your challenge is to design a better medieval town/city

Science Bit

The science of designing a city encompasses many areas - engineering, water supply and sanitation, movement of people, living conditions, care and hospitals. Having a clean water supply and an effective sanitation system is critical. Water essentially travels downwards on a journey back to the ground or sea. Water systems therefore employ gravity, aquaducts or pumping mechanisms to deliver and drains and pumps to remove waste water and effluent.
Careful and considerate town planning, therefore, can maximise the use of water flow for drinking and sanitation.



Town Planning

The Medieval Town or City

At the core of most medieval towns was a castle. Many towns were at least partially walled Gates controlled access to the town, kept out undesirables, allowed taxes to be collected and were a base for the town guards.

By the 14th century it became necessary to provide a water supply in many towns as the distance to the nearest unpolluted river grew too great for people to walk. Pipes were laid to a clean uphill source and water diverted to wells.

Unfortunately less attention was paid to sewers and open ditches took most waste, at least it rained a lot to carry it all away.

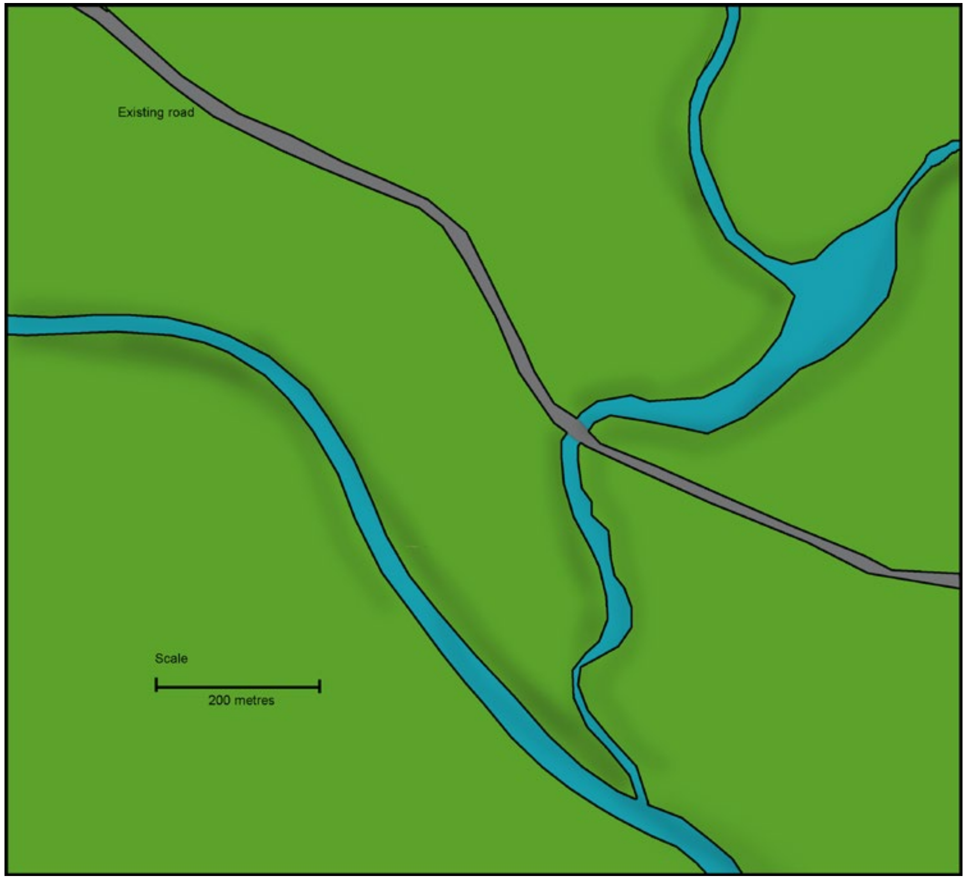
Somewhere downwind of the marketplace would be the shambles or slaughter yard. As the name suggests it was a mess of blood and guts, although the butchers did their best to waste nothing.

The hospital was not only for in-patients but gave out-relief to all sorts of distressed people, like a local charity. Almshouses were found in most towns for respectable old people who could not care for themselves. In return for accommodation they were expected to spend much of their time in prayer and listening to sermons.

Around any medieval town you would notice how many churches, friaries and abbeys there are. These were not only important as places of worship they were also major economic centres owning land and often having industrial enterprises from milling, to wool processing and brewing. Wool was the mainstay of many medieval economies and huge quantities were exported.

All towns had a town hall, generally it was on an upper floor with an open area beneath for the town weighing machine to check merchants were giving fair measure. Sometimes one corner was walled up as the local lock-up for prisoners awaiting sentence.

The town hall would stand in the Market Place. Most trading took place from stalls formed from the workshop shutters beneath houses, but every town with a charter could hold a market, usually weekly, and people with produce to sell could pay a fee to come to market.



Your challenge is to design a better medieval town/city

Your team have been commissioned by a local Prince to design a new town on recently acquired land.

Using only medieval knowledge and some ingenuity and a desire for better living conditions create a large town containing the following infrastructural elements.

A Castle
Defenses for the castle
Defenses for the town
2 no. Military Barracks
2. no. Military stables
A monastery incorporating a school, hospital, brewery and a water powered mill.
A market place
Guild Hall
Town Hall
4 no blacksmiths/armorers
a Cathedral
2 smaller churches
Warehouses
A docks and jetty

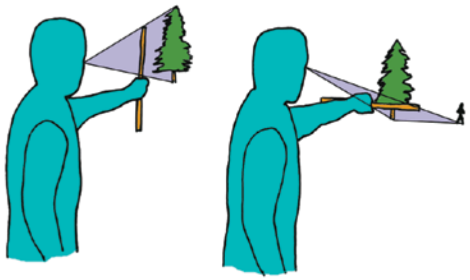
Clean water - wells and aqueducts
New ideas on Sanitation - rubbish, cess pits.

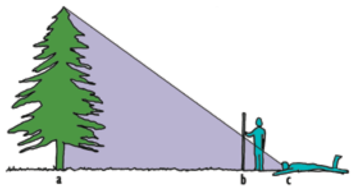
Plane Table mapping

Estimation techniques

Lumberman method

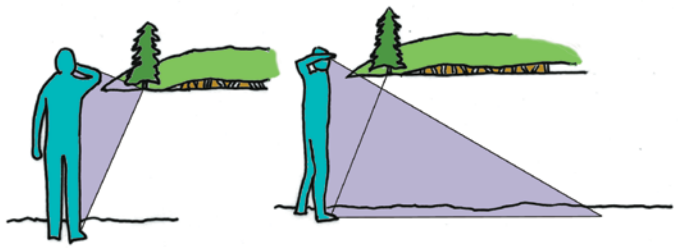
Hold a stick out in front of you and place the tip in line with the top of the tree. Move your thumb until it is in line with the bottom. Turn the stick 90 degrees and have a friend walk from the base to the tip of the stick counting as they go. The distance travelled is the approximate height of the tree.



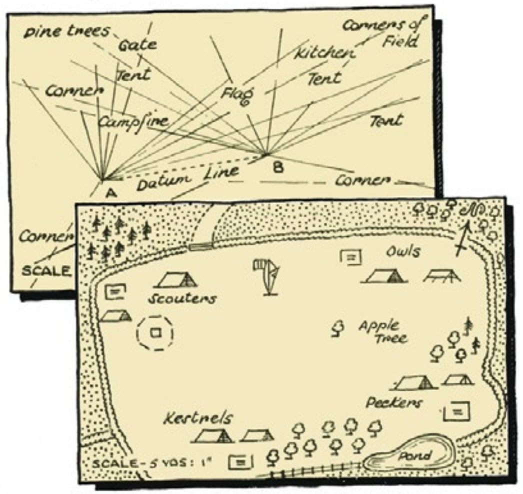


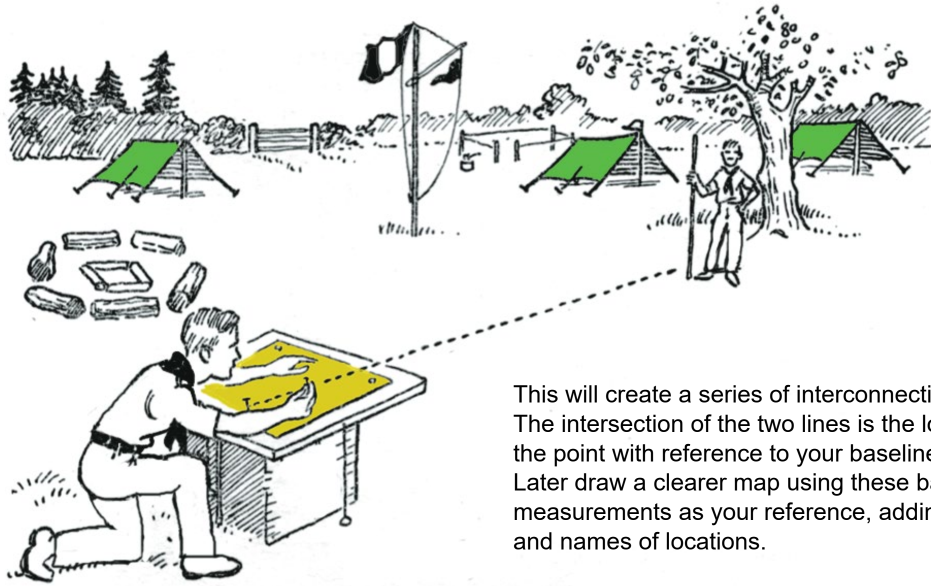
Napoleonic method

Stand on one bank and hold your hand against your eyebrows, with the palm facing downwards.
Slant your hand until it appears to touch the opposite bank.
Turn 90 degrees and note the point where the edge of your palm appears to touch the ground. The distance from where you stand to this point is the width of the river.



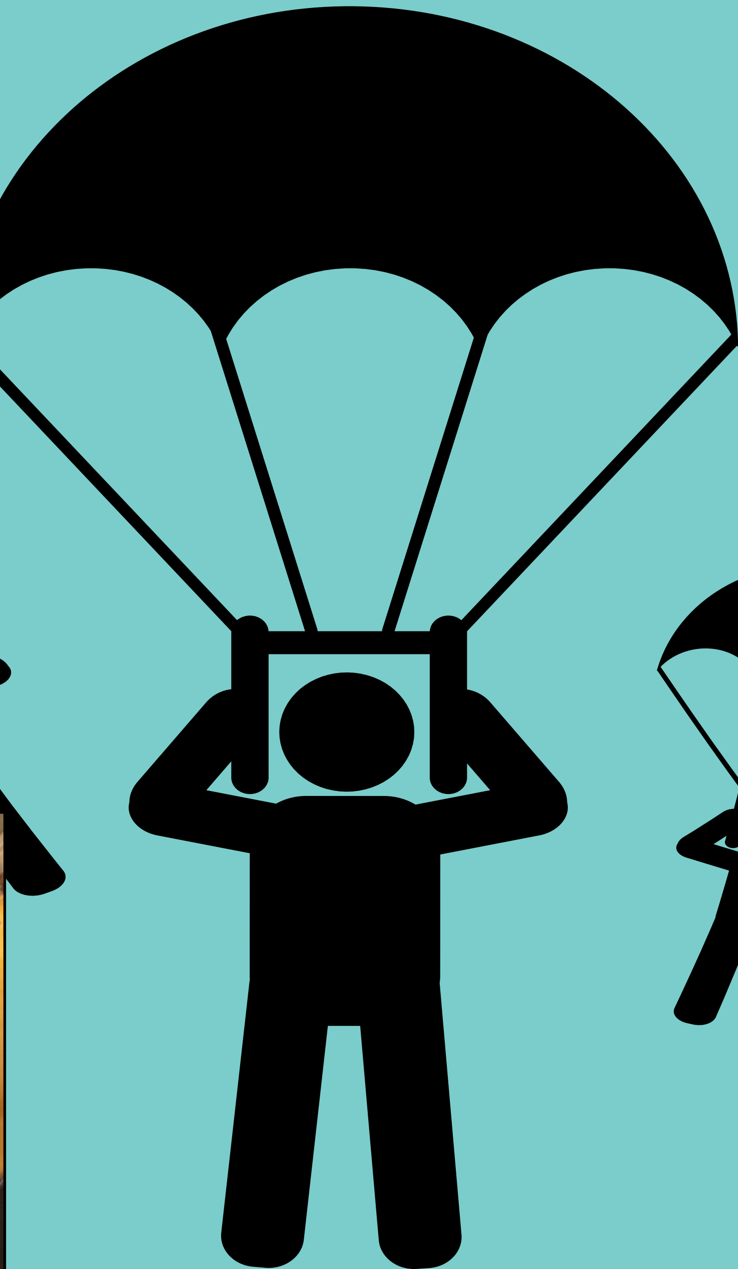
Plane table surveying is a method of making a simple map. You will require graph paper, pencil, ruler and a drawing board or base.
Before you start you need to determine the basic size of the area so that a scale can be struck for the survey. Walk the field and work out the number of paces along each side and from this select a scale.
Next decide on location for the two sighting positions. Select a position that is roughly central and from which each corner can be seen.
Place a pin in your drawing board and draw a line. Sight along this in the direction of your second point and mark its location exactly according to the scale decided. Place a second pin in this spot.
Now working from the two pin points sight features and key points of your camping field on the map and measure distances. Use your ruler to scale their positions on the drawing board.





This will create a series of interconnecting lines. The intersection of the two lines is the location of the point with reference to your baseline.
Later draw a clearer map using these base measurements as your reference, adding colour and names of locations.

Plane Table mapping



Science Bit

When a force pulls on something, it makes that object move more quickly, causing it to gain speed. Like any other force, gravity makes falling objects accelerate. If you fall from a plane without a parachute, your relatively compact body zooms through the air like a stone; open your parachute and you create more air resistance, drifting to the ground more slowly and safely—much more like a feather. Simply speaking, then, a parachute works by increasing your air resistance as you fall.

Just because the air's invisible, doesn't mean it's not there. Earth's atmosphere is packed full of gas molecules, so if you want to move through air—by dangling from a parachute—you have to push them out of the way. We only really notice this when we're moving at speed.

Parachute

Your mission—if you choose to accept it—is to construct a parachute that will deliver an egg safely to the ground when dropped. No fancy materials allowed! You can only use familiar household items like plastic bags and string.

Do you think you have what it takes to construct this gravity-defying wonder? Be careful: a sloppy parachute will result in a yolky mess!

Materials

Plastic heavy-duty trash bag
Plastic sandwich bags
String
Scissors
Hole punch
Eggs

Contest Rules

Only one egg will be given for testing purposes, and one egg for final test.
Eggs may not be taped
In the construction of the craft / devise you may not use padding of any type to protect the egg.

Marking the contest

Suggested marking system

Design	25
Teamwork	25
Result	40 (Does it work)
Effort	10

The Mess

It is an excellent idea to cover the floor of your test area with a sheet of plastic taped to the floor. Each team is responsible for cleaning up their mess (the best part of it at least). When the challenge is over, the plastic can be rolled up and placed in the bin.

The largest parachute falls the slowest and should cause the least amount of damage to the egg.

Why?
When you drop the egg, the strings that are attached to the sandwich bag pull down and this open the bag to full size, which creates a large surface area and more wind resistance. More wind resistance slows down the descent of the egg.

You can explain the results of this experiment with the concept of resistance. Wind resistance, also called drag, is simply a force that acts on a solid object. The largest parachute creates more resistance and slows the descent of the egg the most.

The experiment shows that the size of the parachute makes a difference in the speed of descent, but what if you tried different materials for the parachute? Repeat the experiment with a parachute made from construction paper, plastic grocery bags or other items.

Rube Goldberg Machines are overdone machines or device that performs a simple task in a complicated way. The expression is named after Rube Goldberg, American cartoonist and inventor.

The challenge is to produce a devices from ordinary stuff so that a marble or small ball can travel the greatest distance.

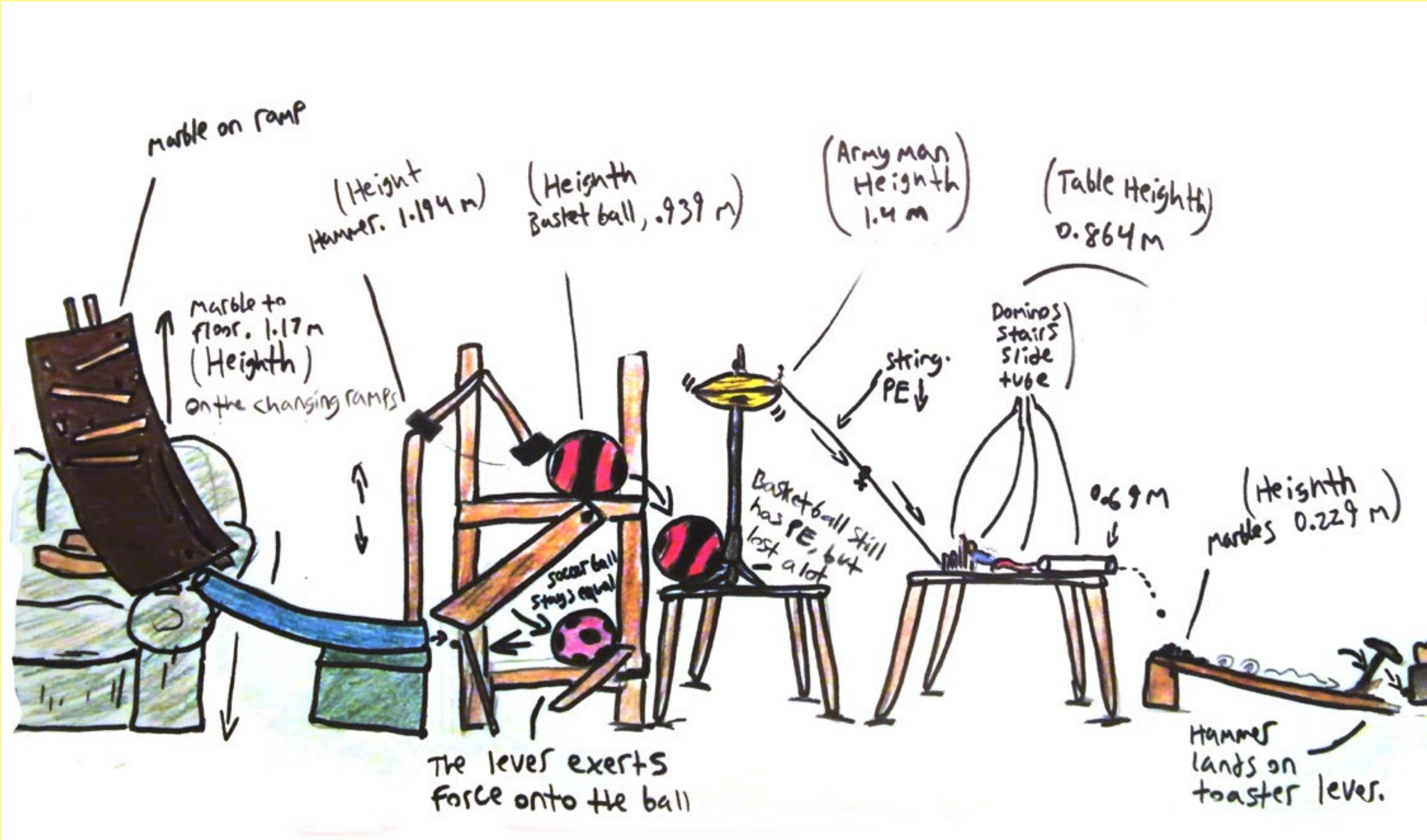
Points will be awarded for best and most creative devices and how far your marble or ball travels.

- Step 1: Watch the videos below. They will inspire you and give you great ideas for devices to create.
- Step 2: Design and build your runways and devices.
- Step 3: Display them to other teams
- Step 4: Make a video and upload it to youtube to share with the world.

Get some inspiration for Rube Goldberg Machines here

http://www.youtube.com/watch?v=_ve-4M4UsJQo

http://www.youtube.com/watch?v=dF-WHbRApS3c
Perform



Rude Goldberg Machine