

Reading on Mesopotamia

The Fertile Crescent: Ancient Mesopotamia is nicknamed "The Fertile Crescent". Today, The Fertile Crescent includes the countries of Iraq, Syria, Lebanon, Cyprus, Jordan, Palestine, Kuwait, the Sinai Peninsula, and Northern Mesopotamia. It is a big place.

The Land Between Two Rivers: Ancient Mesopotamia was located in a piece of The Fertile Crescent, in what is now southern Iraq. It covered an area about 300 miles long and about 150 miles wide.

The word Mesopotamia actually means (in Greek) "the land between the rivers." The two rivers referred to by the ancient Greeks are the Tigris and the Euphrates Rivers.

Why would anyone wish to build a civilization in the middle of the desert in what is now lower Iraq? Because it was a great place to live!

In Northern Mesopotamia, the land is fertile. There is seasonal rain. The rivers and streams are fed from the hills and mountains of the region.

In Southern Mesopotamia, the land is mostly flat and barren. Temperatures can rise over 110 degrees Fahrenheit. There is very little rainfall. Storms do blow in from the Persian Gulf, which cools things off. The area does have some change of seasons. It can get quite cool at certain times of the year.

Many thousands of years ago, early settlers wandered into the land between two rivers. Natural vegetation and wildlife kept the people well fed. The rivers provided fresh drinking water, and a place to bathe. These early people settled down, invented a system of irrigation, and began to farm the land.

<http://mesopotamia.mrdonn.org/geography.html>

Pulley Vocabulary

lift	to bring upward
energy	the ability to do work
machine	a device that makes work easier
simple machine	a device with few or no moving parts
pulley	a grooved wheel with a rope around it
groove	a cut in the surface

#1 The Pulley

Taken directly from

http://www.sciencetech.technomuses.ca/english/schoolzone/Info_Simple_Machines2.cfm#pulley/

A pulley is a wheel with a groove that allows a rope, belt or chain to ride securely on it.

A pulley is a circular lever, with the wheel rotating freely on the axle. A fixed pulley is fastened to one spot and does not move around. It provides no gain in force, distance or speed, but it changes the direction of the force. A fixed pulley acts as a first class lever. The fulcrum is the axle (the point at which the pulley is supported).

The force arm is the radius of the pulley - that is, the distance from the fulcrum (axle) to the side of the rope on which we pull. The load arm is also the radius of the pulley - the distance from the fulcrum (axle) to the load-carrying side of the rope. Examples of fixed pulleys can be seen on flag poles, drapes, or on a sail mast. In each case, the pulley changes the direction of the applied force, to enable work to be accomplished.

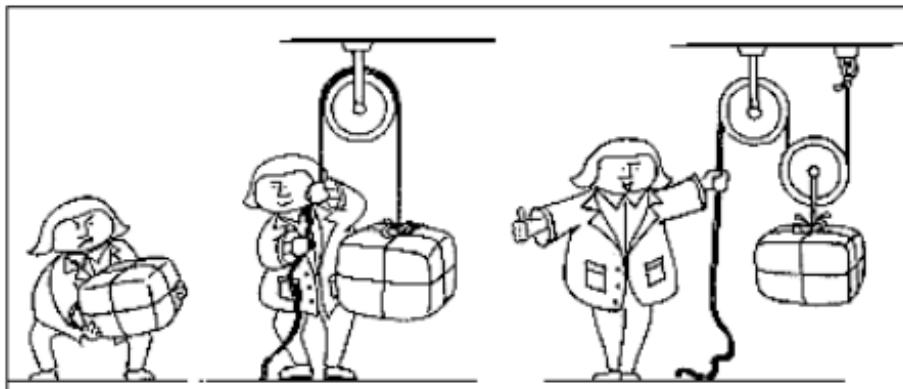
A movable pulley moves along a rope or wire. It provides a gain in force, but a loss in distance. (You have to pull the rope twice as far!) A movable pulley works like a turning second class lever. The fulcrum is at one rim of the pulley wheel, the load is at the axle, and the force is at the other rim of the pulley wheel.

Why do moving pulleys make lifting easier?

More sections of rope are supporting the weight. This is like having someone help you carry something heavy. The more help you have, the lighter the load seems to be.

Mechanical advantage is determined by the number of supporting ropes of the movable pulley(s).

A compound pulley, also called a block and tackle, is a combination of a fixed and a movable pulley. This type of pulley changes direction and yields a gain in force at the same time.



What does "work" mean in science?

The simple machines all require human energy in order to work. What does work mean? "Work" has a special meaning in science. "Work" is only done when something is moved. For example, when you push on the locomotive in the Museum, you actually are not doing work, because you cannot move it.

Work consists of two parts. One is the amount of force (push or pull) needed to do the work. The other is the distance over which the force is applied.

The formula for work is: $\text{Work} = \text{Force} \times \text{Distance}$. Work is measured in joules. Force is the pull or the push on an object, resulting in its movement. Force is measured in newtons. Distance is the space the object moves. It is measured in metres/meters. Thus, the work done (in joules) is the force moved (in newtons) multiplied by the distance moved (in metres/meters).

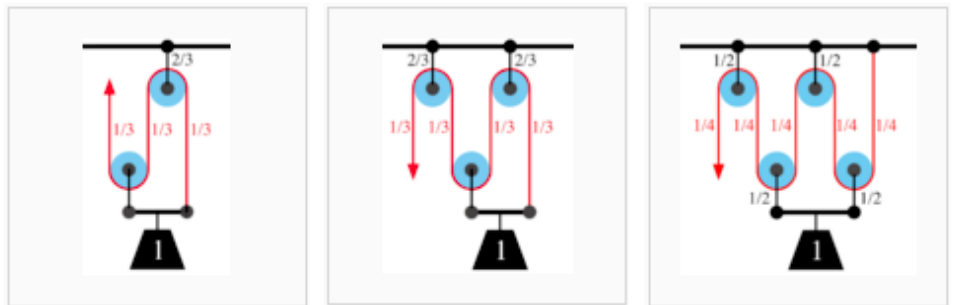
When we say a machine makes it easier for us to do work, we mean that it requires less force to accomplish the same amount of work. Apart from allowing us to increase the distance over which we apply the smaller force, machines may also allow us to change the direction of an applied force.

#2 The Pulley Taken directly from <http://www.newworldencyclopedia.org/entry/Pulley>

A pulley is a wheel with a groove along its edge for holding a rope or cable. It is a simple machine that helps change the direction and point of application of a pulling force. Pulleys are usually used in sets designed to reduce the amount of force needed to lift a load.

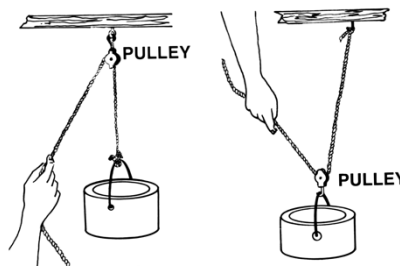
As is the case with all the simple machines, the origin of the pulley is unknown. When early peoples lifted heavy objects by throwing vines or other crude ropes over tree limbs, they used the idea of a single fixed pulley to change the direction of a force. But since there was no wheel to turn, this use resulted in considerable friction. It is believed that by 1500 B.C.E. people in Mesopotamia used rope pulleys for hoisting water.

It is not recorded when or by whom the pulley was first developed. It is believed however that Archimedes developed the first documented block and tackle pulley system, as recorded by Plutarch. Plutarch reported that Archimedes moved an entire warship, laden with men, using compound pulleys and his own strength.

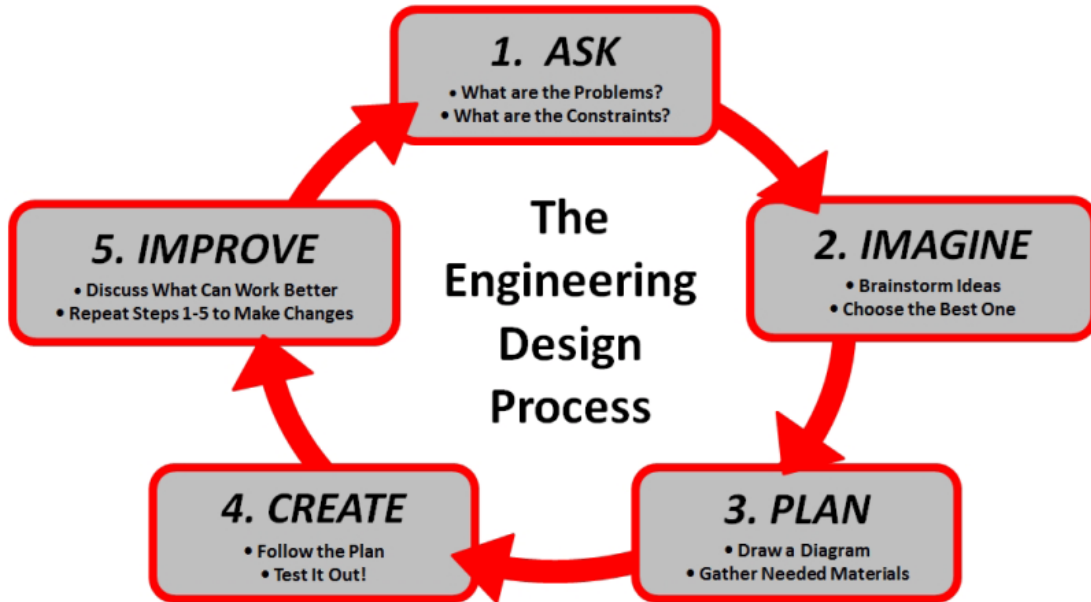


Pulleys have been used for lifting for thousands of years. The oldest examples are their uses on ships and boats. The block and tackle have been a key tool for raising sails and cargo. Another major use for pulleys is with cranes.

Pulleys have been used also in modern times with various machines and systems. Even in the space age, pulleys have been an important aspect for the construction and operations of spacecraft and aircraft. It is with a pulley system that rudders for an aircraft are controlled.



Teammates _____



1. Ask: What is the problem? What are the rules by which we must operate?

2. Imagine: What ideas do we have? What is our best idea?

Continued on back---

3. Plan: What will our device look like? Make a drawing. What materials do we need?

4. Create: What does our device look like? Build it. Did our device work?

5. Improve: How would we improve our device?

NAME: _____

Group Work Score Sheet

Participation in my group:

I give myself a score of: _____/10 Points

Reasons:

I give my teammate _____/10 Points

Teammate's name: _____

Reasons:

I give my teammate _____/10 Points

Teammate's name: _____

Reasons:

I give my teammate _____/10 Points

Teammate's name: _____

Reasons:

I give my teammate _____/10 Points

Teammate's name: _____

Reasons:

Writing Assignment

Pretend you are a writer for a kids' history and geography magazine called The World and Its Fun Places. You want to share what you know about ancient Mesopotamia and how water played such an important role in its greatness as a civilization. In your magazine article, you need to include:

1. Where was Mesopotamia located?
 2. What rivers were important to Mesopotamia?
 3. What did the rivers provide for the people?
 4. How did the pulley help the people of Mesopotamia?
5. You also need to include at least one image that you draw or download from the Internet. If you do use an Internet source, be sure to cite what website was used.
6. Be sure to use words in your writing that would make people want to visit Mesopotamia if they could go back in time.

Name(s) _____

Scoring Rubric for Building a Pulley

	1	2	3	4	Score
	Beginning	Developing	Applying	Innovative	
Knowledge of concepts	Does not understand how a pulley works	Understands some of how a pulley works	Able to explain how a pulley works and can design one on paper	Able to take and make improvements to a pulley design	
Design of A Pulley	Design does not work.	Design is adequate	Design is good	Design is advanced	
Construction of a Pulley	Structure is not very strong	Structure is weak	Structure is stable	Structure is solid with use of minimal materials	
Function of Pulley	Does not work	Works with some difficulty	Works with little issues	Works smoothly	
				TOTAL:	
Teacher comments					

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What is Civil Engineering? (optional)

Civil engineering is arguably the oldest engineering discipline. It deals with the built environment and can be dated to the first time someone placed a roof over his or her head or laid a tree trunk across a river to make it easier to get across.

The built environment encompasses much of what defines modern civilization. Buildings and bridges are often the first constructions that come to mind, as they are the most conspicuous creations of structural engineering, one of civil engineering's major sub-disciplines. Roads, railroads, subway systems, and airports are designed by transportation engineers, another category of civil engineering. And then there are the less visible creations of civil engineers. Every time you open a water faucet, you expect water to come out, without thinking that civil engineers made it possible. New York City has one of the world's most impressive water supply systems, receiving billions of gallons of high-quality water from the Catskills over one hundred miles away. Similarly, not many people seem to worry about what happens to the water after it has served its purposes. The old civil engineering discipline of sanitary engineering has evolved into modern environmental engineering of such significance that most academic departments have changed their names to civil and environmental engineering.

These few examples illustrate that civil engineers do a lot more than design buildings and bridges. They can be found in the aerospace industry, designing jetliners and space stations; in the automotive industry, perfecting the load-carrying capacity of a chassis and improving the crashworthiness of bumpers and doors; and they can be found in the ship building industry, the power industry, and many other industries wherever constructed facilities are involved. And they plan and oversee the construction of these facilities as construction managers.

Civil engineering is an exciting profession because at the end of the day you can see the results of your work, whether this is a completed bridge, a high-rise building, a subway station, or a hydroelectric dam.

Please look at the Web pages of our individual faculty members to learn more about their special interests as examples of what civil engineering and engineering mechanics is and can be about.

<http://civil.columbia.edu/what-civil-engineering>