The Lever.

Can you imagine primitive people trying to protect the entrance to their cave by putting a large boulder in front of it? They were strong people, but not strong enough to lift the rock – not even strong enough to roll it. Nobody knows who first had the idea – nobody is credited with the invention of this primitive machine, but one day somebody tried to move the stone by resting a long, strong branch on a smaller stone, pushing the end of the branch under the boulder, and pressing down on the branch.

Can you imagine the pride that this person must have felt when he/she succeeded, without even too much effort, in moving the rock? This person did not know that he/she had invented the machine, which we call the "simple lever." By experience, primitive people found that the longer the lever, the more weight could be lifted with less effort. They learned this in the same way you found out where you have to sit on a seesaw to stay in balance, or that the farther you move from the point where a seesaw hinges on its rest, the easier it is to lift your heavier playmate on the other end. The seesaw, too, is a lever.

The smaller stone in the first picture and the middle point of the seesaw have the same function: to provide a rest for the lever. This rest is called the Fulcrum. The side where you apply the force is called the effort. The opposing side is called the resistance.

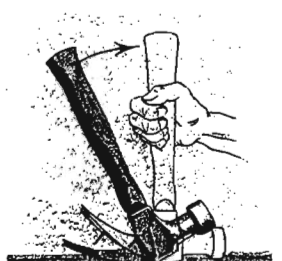
The lever need not always be straight, like the cave man's branch or the board of the seesaw. Sometimes the lever is curved. When you pull a nail with a claw hammer, you are using a curved lever. The fulcrum is at the head of the hammer. You push down on the handle and the nail comes out. So, you see, we started with a primitive machine and find that it is still in use, in practically its original form, on the playground, in the house, and as part of more complicated machines.

What Is The "Law Of The Lever"?

Early people used the lever, as we have seen, but it was not until thousands of years later – about 240 B.C.–that the Greek scientist, Archimedes, discovered what we call the Law of the Lever: Two loads, A and B, balance when the scale-pan weight of A multiplied by its distance from the fulcrum is the same as the scale-pan weight of B multiplied by its distance from the fulcrum. As the force exerted on a machine is called effort, we call the distance from the effort to the fulcrum the effort arm, and the distance from the resistance to the fulcrum the resistance arm.

What Are The Three Classes Of Levers?

There are three classes of levers, depending on the relative position of the effort (E), fulcrum (F), and resistance (R). The fist class lever has F between E and R. Examples of the first-class lever are the crowbar, the seesaw and the



Using a hammer to remove a nail is using a lever.

pump handle. Now that you know Archimedes' Law of the Lever, you can surprise your friends, after you know their weight, by figuring out exactly where you have to sit on the seesaw to balance your heavier or lighter companions- or, better still, where you have to put the lever on the fulcrum to be able to lift them up.

Why Are Scissors A Double Lever?

Sometimes two levers are used together to form a double lever. A pair of scissors is such a double lever. The screw joining the two blades is the fulcrum. Try to cut a piece of cardboard with a regular pair of scissors and demonstrate for yourself the Law of the Lever; You will find that if you try to cut with the points of the scissors, you will not succeed. But when you use the scissors so that you cut close to the fulcrum, you will succeed because you have more force.

What Is A Second Class Lever?

We have seen that by using the long end of a lever we get more power and are able to do a hard job using little force. Look at the oars of a rowboat. The ends of the oars are the effort, the oarlocks are the resistance, and

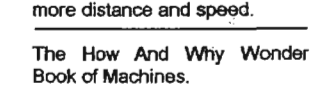
the pivotal points of the Oars (the ends in the water) are the. fulcrum.

Watch closely when you row. The end of the oar in your hand - the effort end- moves farther than the resistance part in the oarlock. There is more force at the resistance. Just as in the case of the seesaw, we move the effort through a greater distance to get, in return, a greater force. So, in both cases, we trade distance or speed for more force. Other common examples of the second-class lever are the nutcracker and the wheelbarrow.

What Is A Third Class Lever?

If you are amazed that you use a lever by riding a seesaw and another kind of lever rowing a boat, think how much more surprising it is that you use the third kind of lever when you fish with a rod. Stop for a moment and try to figure it out for yourself. Does it help if we tell you that in the third-class lever, the effort is between the fulcrum and the resistance? E is between F and R. The end of the fishing Pole nearest you is the fulcrum. The effort is the part you are holding and the resistance is at the far end of the pole. Here, for the first time, we exert more force at the effort than there is at the resistance. When you pull a fish out of the water, you will notice that the distance the resistance moves is greater than the distance the effort moves. Sugar tongs, our arms and legs, a broom and a baseball bat are other examples of this type of lever. In the third-class lever, we trade force for more distance and speed.

The How And Why Wonder Book of Machines.

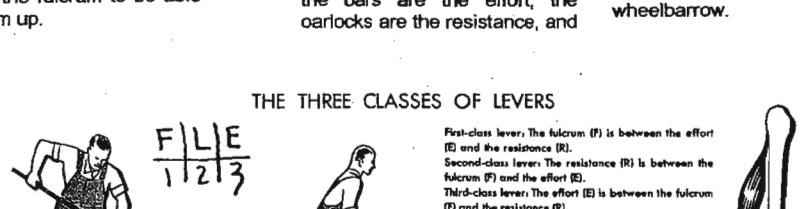


law of the lever

effort (weight) × length of the effort arm = length of the load arm × load (weight)

one side of the see saw is balanced by the other.

THE THREE CLASSES OF LEVERS



In the 1st Class Lever, the fulcrum is between the effort and the load.

In the 2nd Class Lever, the load is between the fulcrum and the effort.

In the 3rd Class Lever, the effort is between the fulcrum and the load.

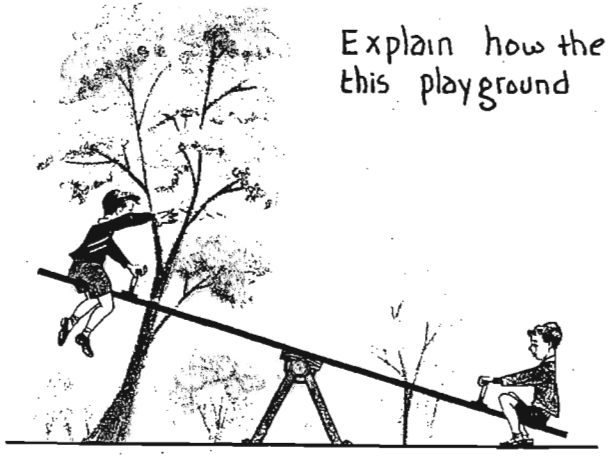
Our goal is to develope a background of information on lever systems

building big things

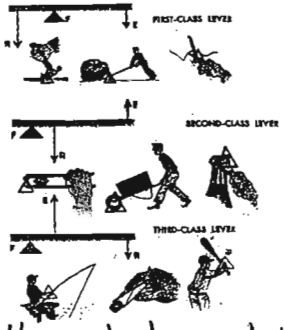
the lever

name _____

class___ team___ seat_ date_



Explain how the lever is used in this playground drawing.



What makes first, second and third class levers different from each other?

How do levers help you lift things?

after being handed in and graded glue onto page

bob

Standard S6c