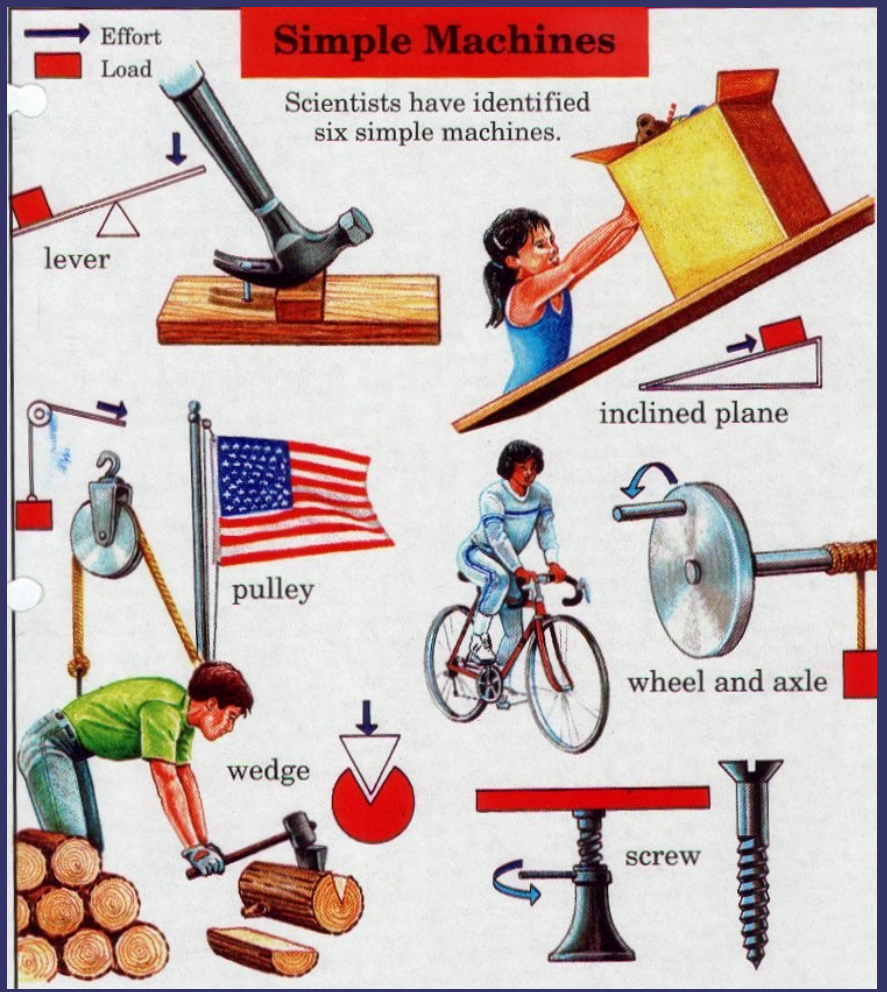
MECHANISMS

TECNOLOGY BILINGUAL SECTION

Simple Machines	Mechanical components	
--INCLINED PLANE -PULLEY -WHEELS AND AXLE -LEVER	MEDCHANICS TO TRANSMISSION THE MOVEMENT	MECHANICS TO TRANSFORM THE MOVEMENT
	- PULLEYS SYSTEM -GEARS SYSTEM	-RACK AND PINION -SCREW -CRANK CONECTING ROD -CRANKSHAFT

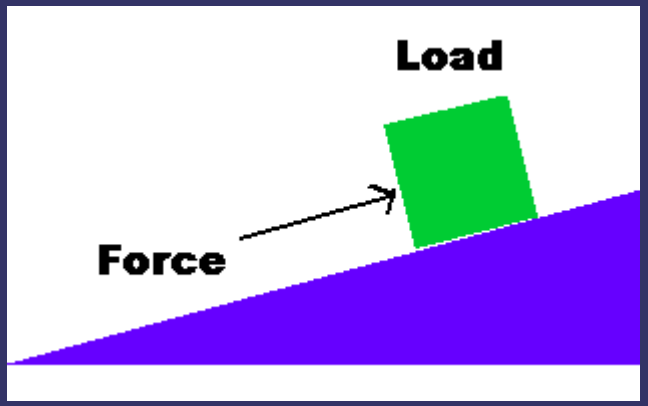
LINEAR MOTION MECHANISM OR SIMPLE MACHINES

- A simple machine has few or no moving parts
- Simple machines make work easier



Inclined Planes

- An inclined plane is a flat surface that is higher on one end
- Inclined planes make the work of moving things easier

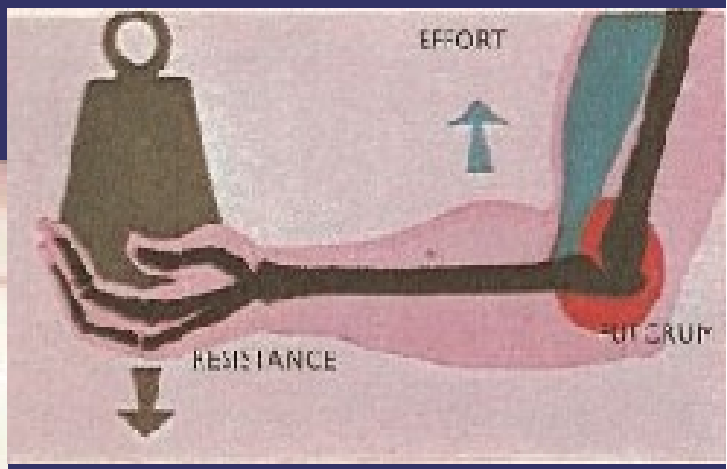


WEDGE

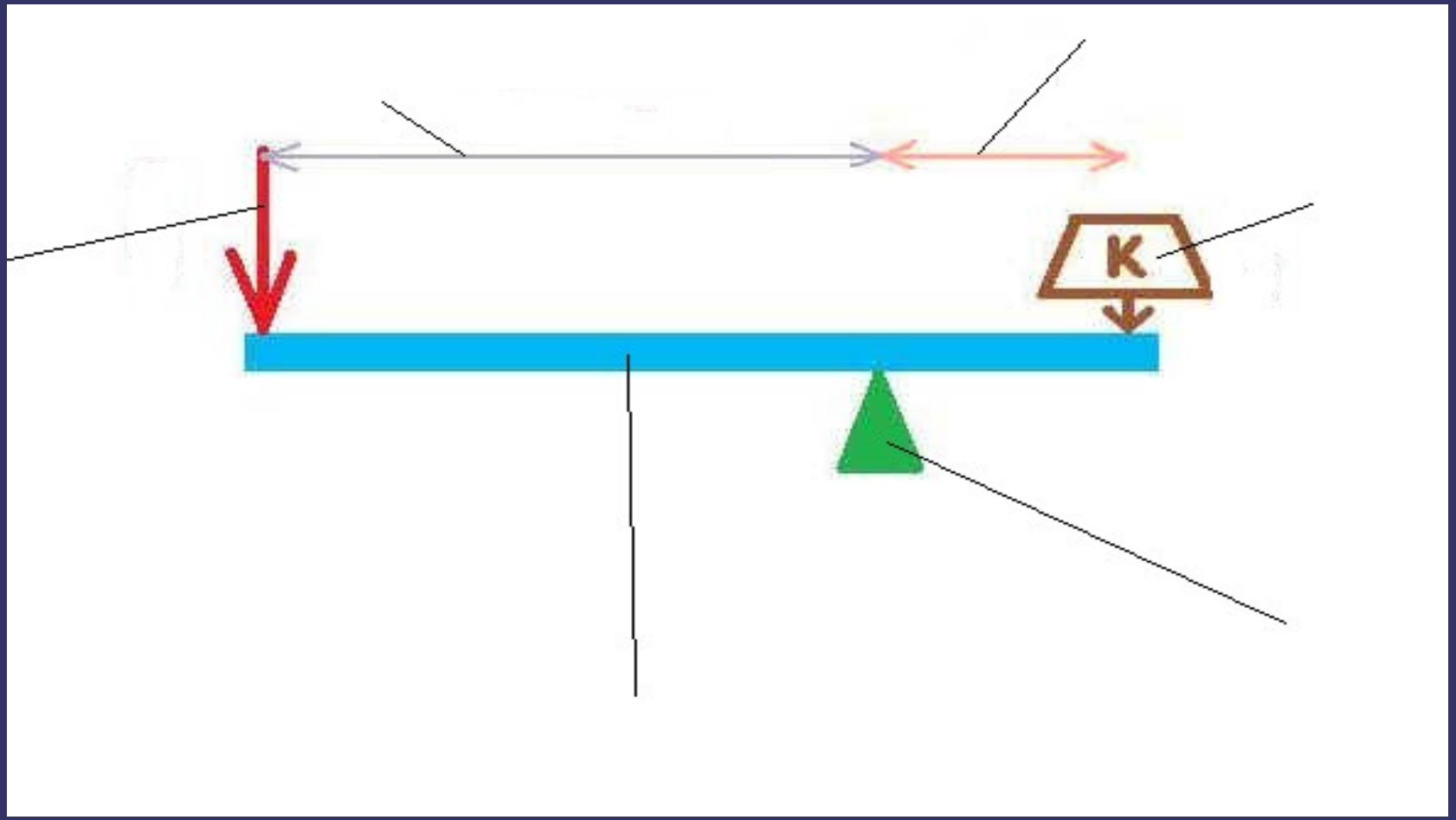
- A **wedge** is a triangular shaped tool, a compound and portable inclined plane

LEVER

A lever is a simple machine that makes work easier for use; itS A BAR THAT CAN ROTATE AROUND A FIXED POINT.It involves moving a load around a pivot using a force. In a lever there are a load, a pivot and an Effort (force).



Elements of a lever



LEVER

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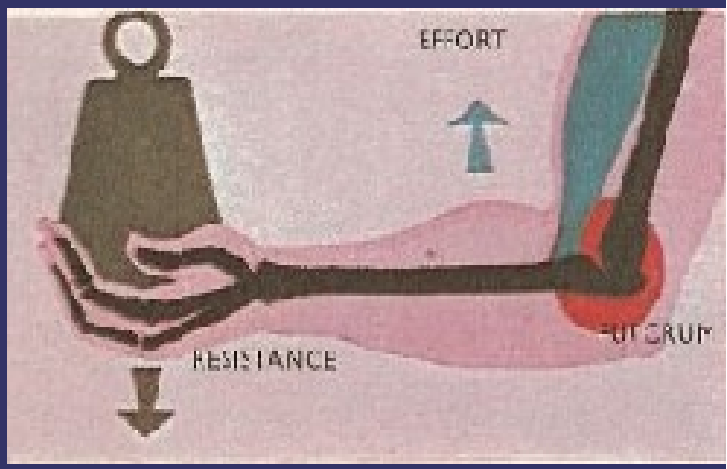
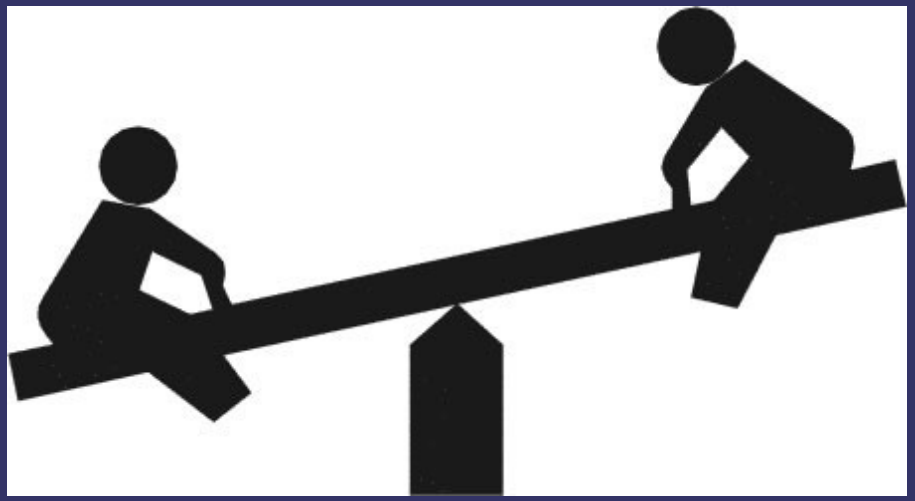
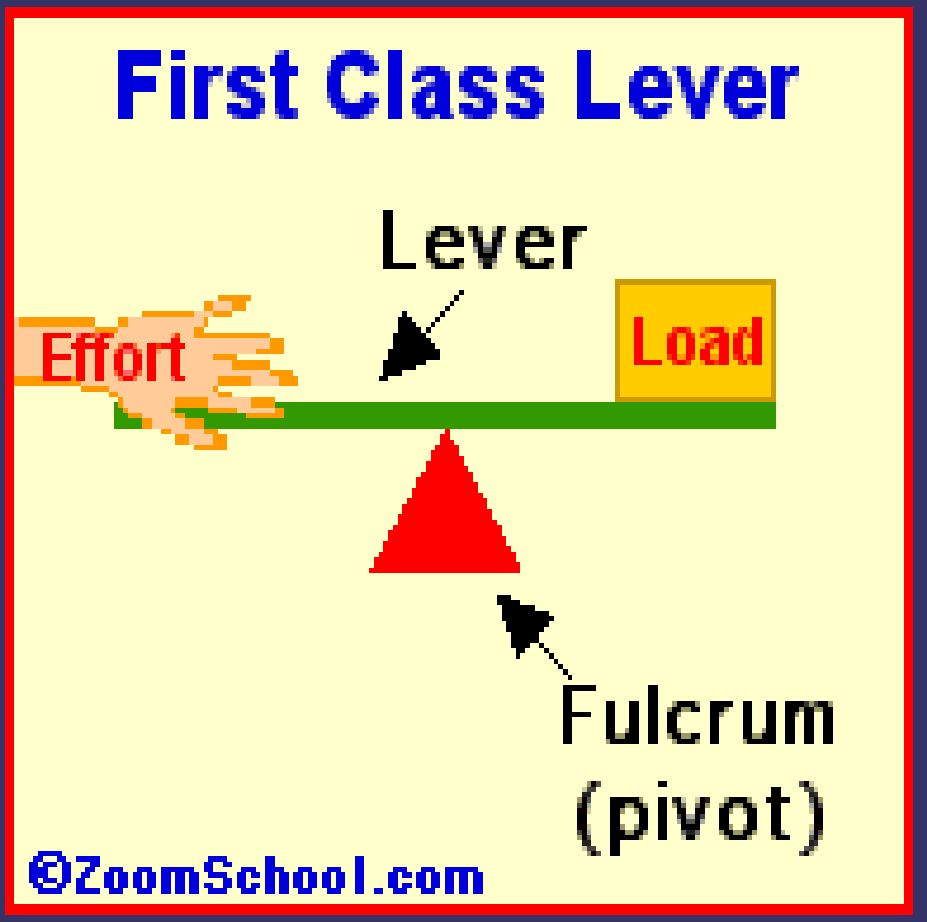


LEVER FIRST CLASS

In all first class levers the Fulcrum is between the resistance and the Effort (RFE).

Think in a see-barrow

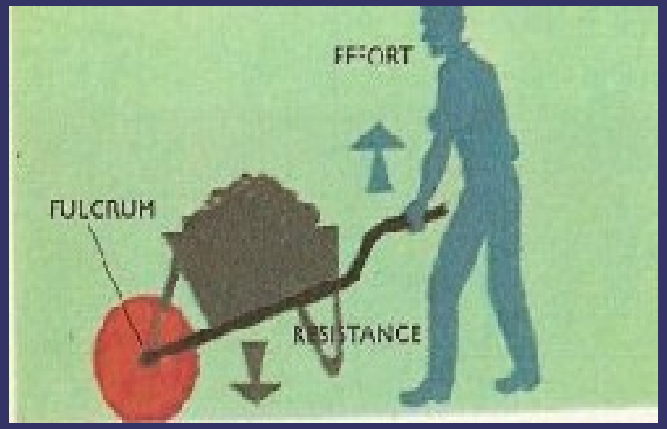


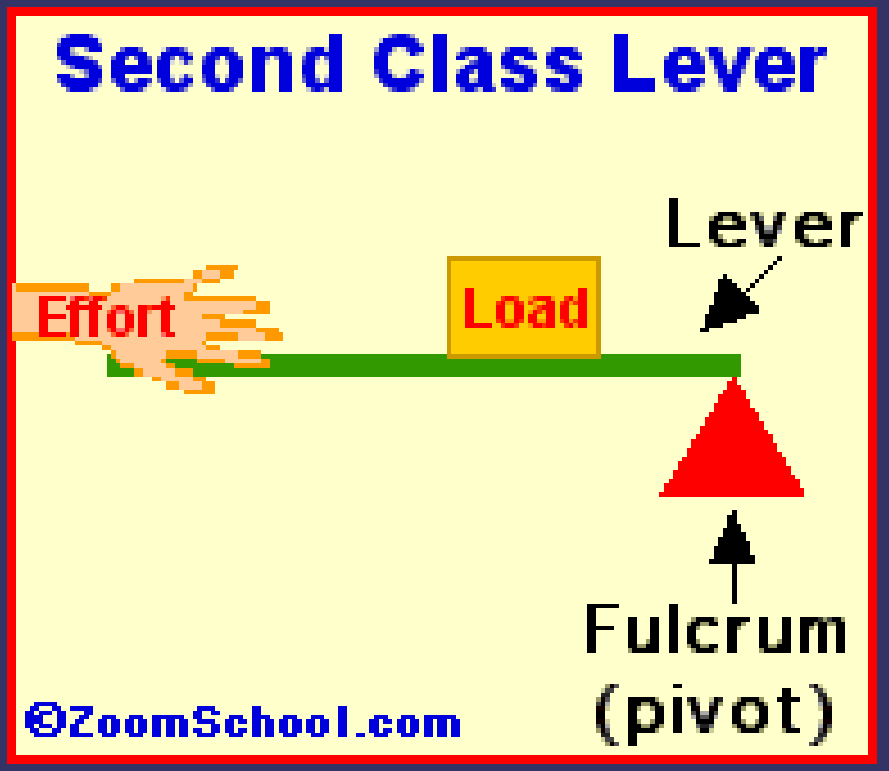


LEVERS-SECOND CLASS

In all second class levers the Resistance is between Fulcrum and the Effort (**FRE**).

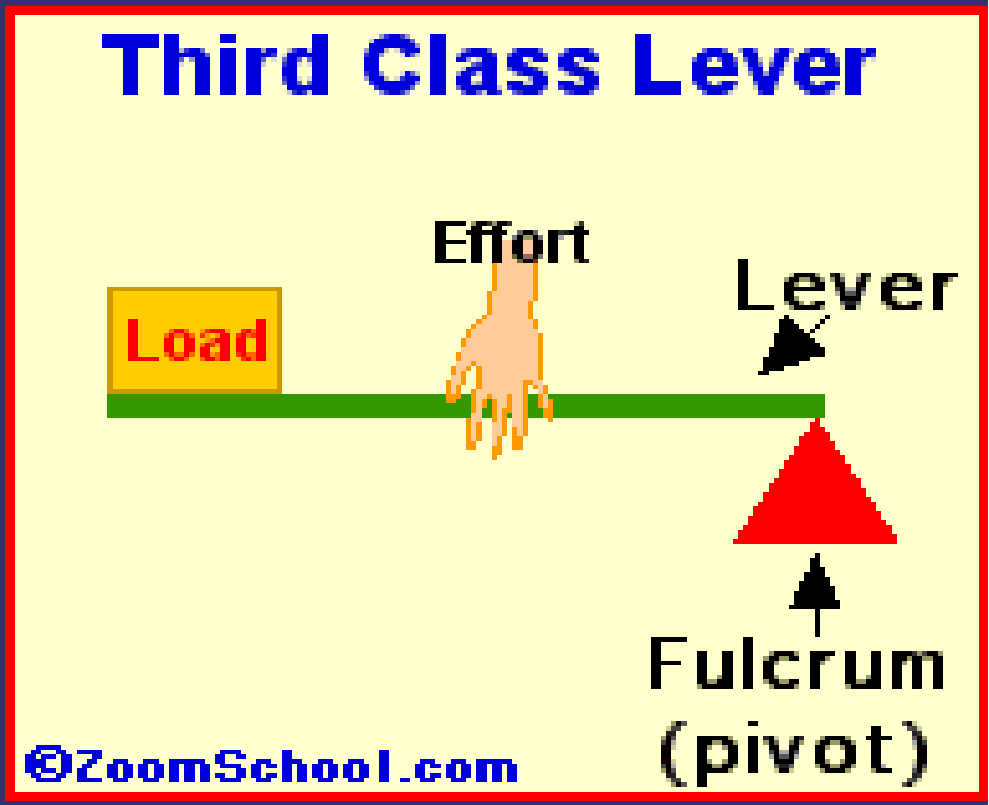
Think of a wheelbarrow





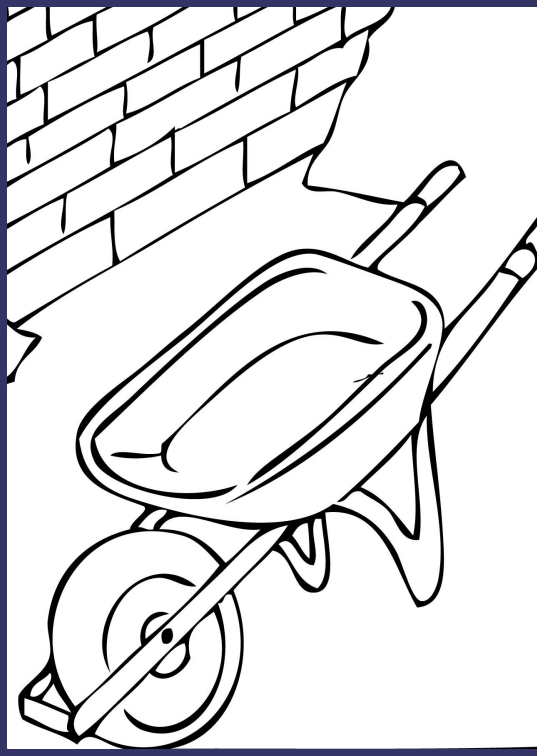
LEVERS-THIRD CLASS

In all Third class levers the Effort is between the Resistance and Fulcrum **(FER)**.
Think of a pairs of tongs



CLASSIFY THE FOLLOWING LEVERS AND IDENTIFY Effort,Load AND the FULCRUM

1-FISHING ROD 2 -TONGS 3-SEESAW 4-WEELBARROW 5-PLIERS



Maths vocabulary

A+ B Sum	**A PLUS B**	**THE SUM OF A AND B**
A-B	**A MINUS B**	**THE DIFFERENCE OF A AND B**
A X B	**A TIMES B**	**A MULTIPLIED BY B**
A/B	**A OVER B**	**A DIVIDED BY B**

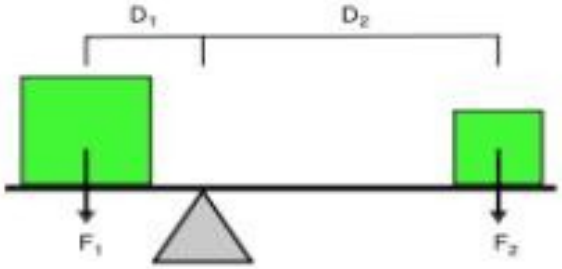
LAWS OF tHe LEVER

FORCE OR EFFORT, f	ARM FORCE OR EFFOR,d
Resistance or load, R	ARM resistence,r

$$R \times r = F \times d$$

Exercices

- 1º You need to lift a load of 200 kg (F1). The distance from the load to the pivot(D1) is 6 meters and the distance from the pivot to
- where the force is applied (D2) is 20 meters. Calculate the value of F1.

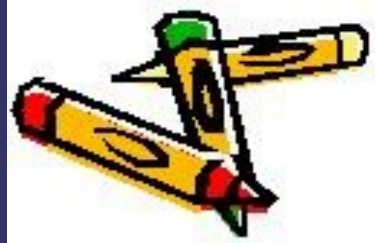


Exercices

- scissors 
- tongs 
- see-saw 
- plier 

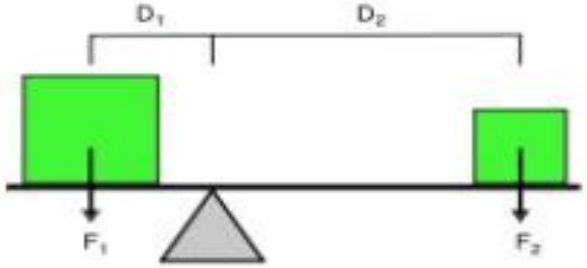
- Fishing rod 
- weelbarrow 

- Write the lever class of every object



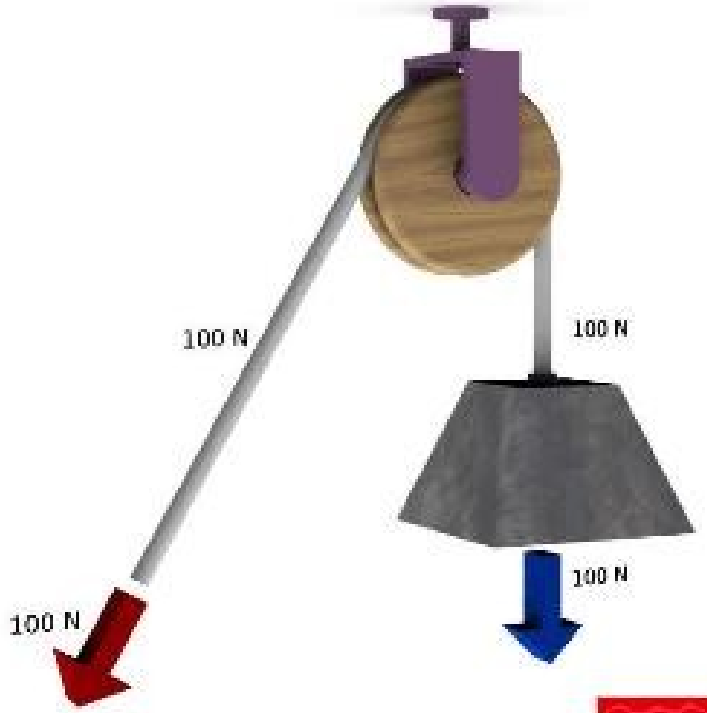
Exercices

- 2º On the lever showed in the image D1 = 20, D2 = 400 and F1 = 300 Kg. Calculate the value of F2
- 3º On the same image, calculate the value of D1 if D2 = 70m, F1 = 300Kg and F2 = 60kg



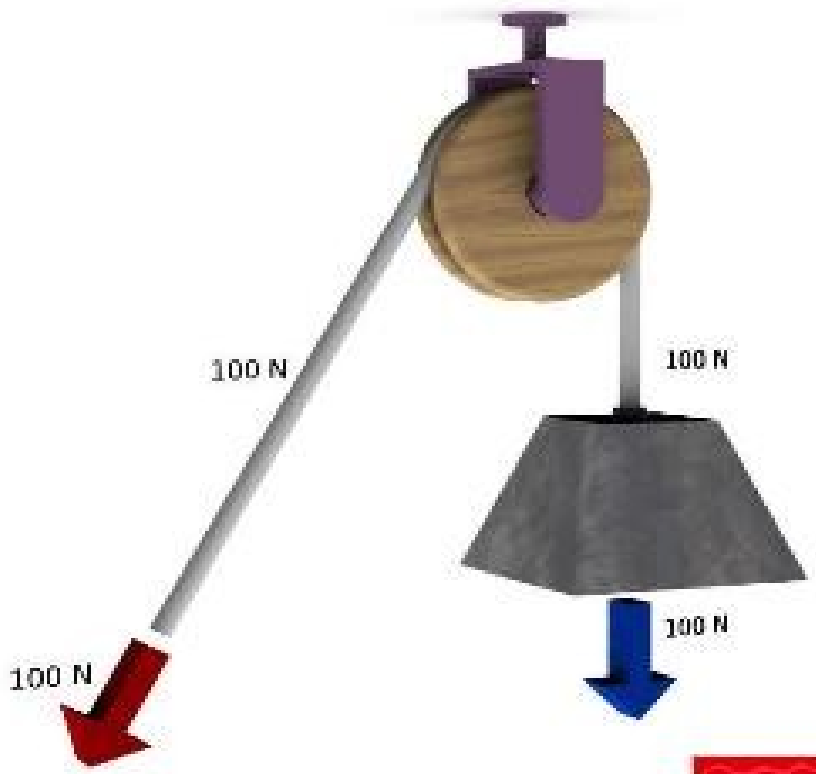
Pulley

- A pulley is a wheel with a groove along its edge, for holding a rope or cable.



Types of pulleys

- 1° Fixed: A fixed pulley has a fixed axle. That is, the axle is ""fixed"" or anchored in a place (maybe the roof, ..). A fixed pulley is used to redirect the force in a rope A fixed pulley has a mechanical advantage of 1
- 1. **mechanical advantage** (*MA*) is the factor by which a mechanism multiplies the force put into it

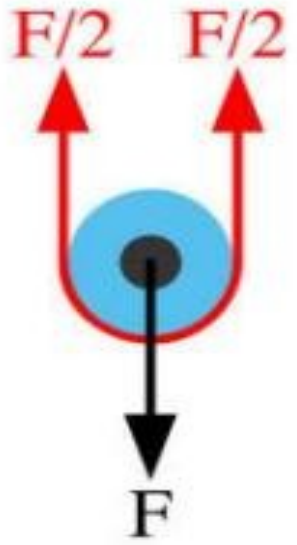


Types of pulleys

- 2° Movable: A movable pulley has a free axle. That is, the axle is "free" to move in space. A movable pulley is used to transform forces. A movable pulley has a mechanical advantage of 2.

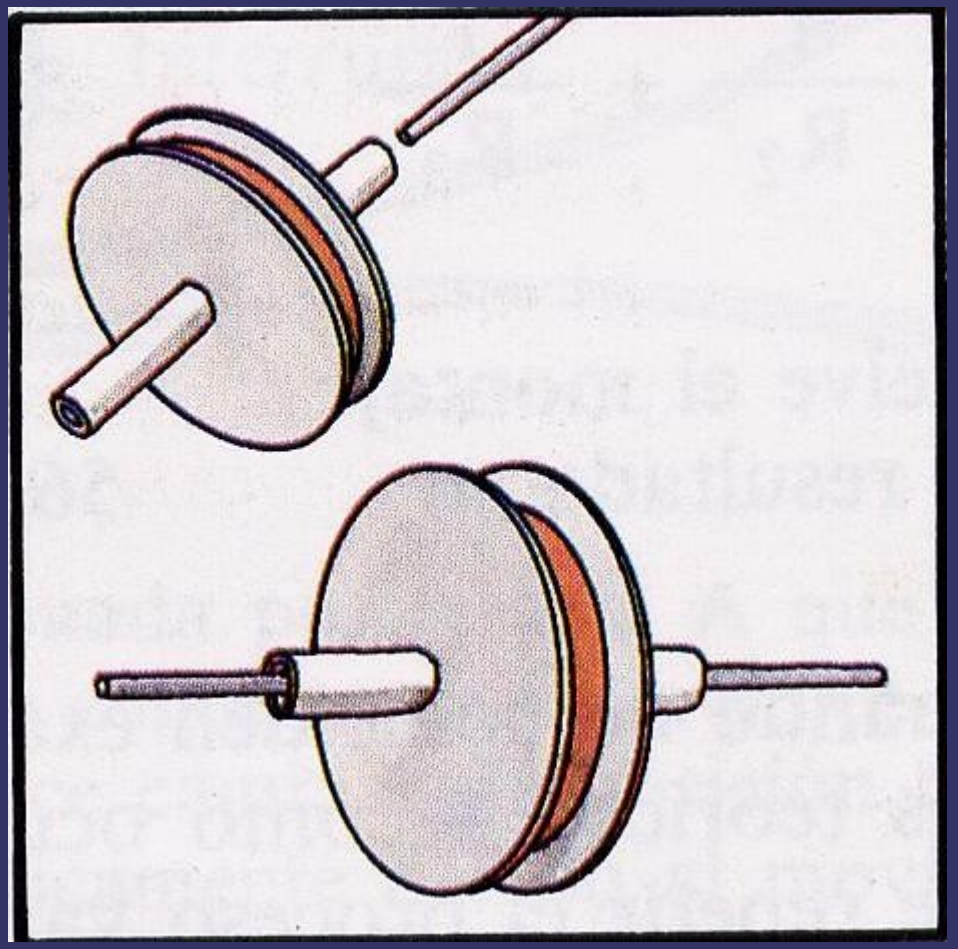
compound pulley

- 1º A basic equation for a pulley: In equilibrium, the force *F* on the pulley axle is equal and opposite to the sum of the tensions in each line leaving the pulley, and these tensions are equal.



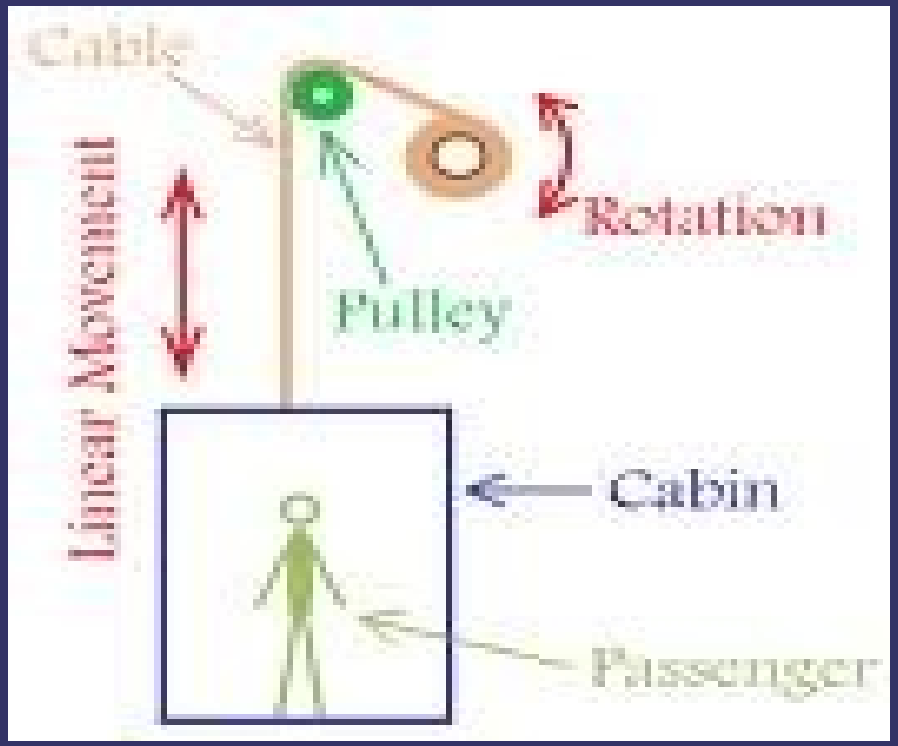
WHEEL AND AXLE

A **wheel and axle** is a lever that rotates in a circle around a center point or fulcrum
Bicycle wheels, ferris wheels and gears are all examples of a wheel and axle.



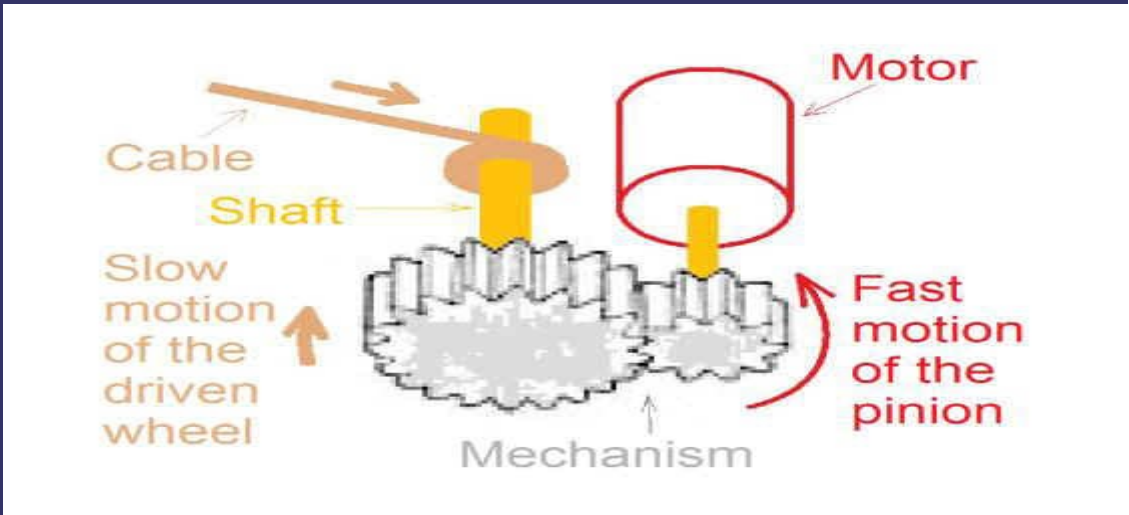
TRANSMISSION MOTION

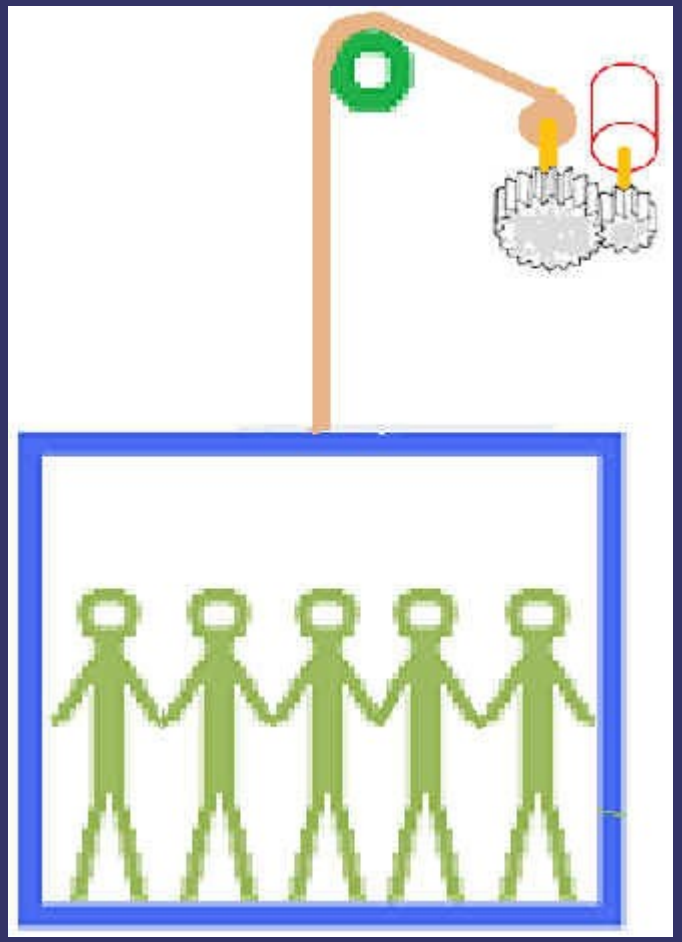
Imagine ,for example te motor that moves the lift Spins very quickly .



T

These mechanism reduces the speed so that the lift moves at a reasonable speed.





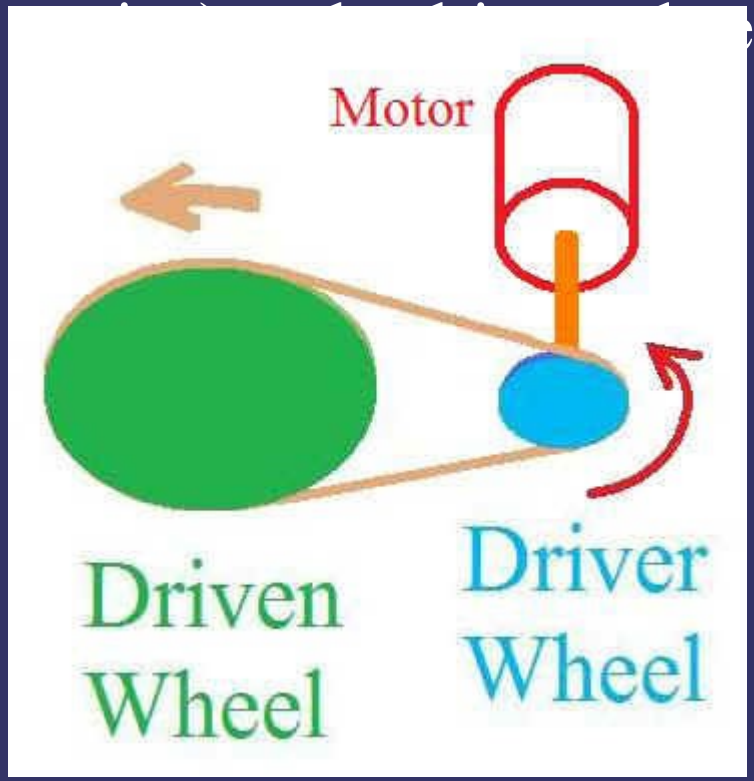
so tha

The mechanism reduces the speed, but increases the force.

Thanks to that, the lift can move a big load with a relatively small motor

PULLEY SYSTEMS

A belt passes around two pulley wheels. If the driver wheel moves, it moves the belt and the belt moves the driven wheel.
If both wheels have the same size, then the only purpose of the belt is to transmit the movement from the driver wheel (connected to the motor or to the [illegible]el.



If the wheels are different sizes, then the smaller wheel will move faster, but with less force. In this case there is a transformation of the characteristics of the movement.
Belts cannot transmit as much power as gears and are less efficient, but the transmission is smoother and quieter and the wheels do not have to be so close to each other.

Gears normally have the function of reducing the speed of rotation and increasing the force, but it is sometimes the opposite. The teeth of the wheels must be identical for the two wheels to mesh with each other. We can calculate the speed of the driven gear:

$$\text{Angular speed of driven wheel} = \text{Angular speed of pinion} \times \frac{\text{Number of teeth of pinion}}{\text{Number of teeth of driven wheel}}$$

GEARS

They are the most common type of gears. When using spur gears noise can be a problem at high speeds.

-The smaller gear (with fewer teeth) will be faster but will move with less force.
-The larger gear (with more teeth) will be slower but will move with more force.

Compounds Gears

In a compound gear, all gears are fixed on the same axel moving at the same speed.

This is an example of a "*compound gear train*". Gear A rotates in a clockwise direction at 30 revs/min. What is the output in revs/min at D and what is the direction of rotation ?

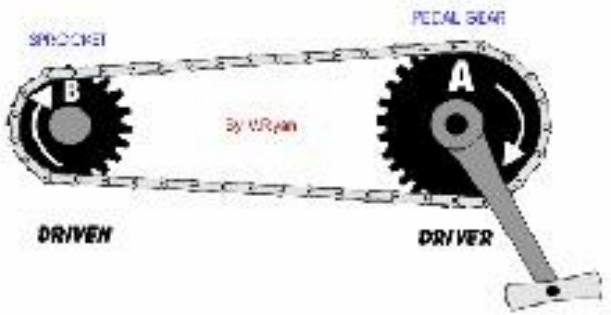
GEAR A	GEAR B	GEAR C	GEAR D
120 T	40 T	80 T	20 T

Gear and belt

The advantages of chains and belts are light weight, the ability to separate the two gears by some distance, and the ability to connect many gears together on the same chain or belt

Gear wheels and chains

Everyone has used a bicycle and noticed that it is driven by a large driver gear wheel (pedal gear) with pedals attached. Smaller gears at the back are driven round, in turn driving round the back wheel. As the back wheel turns the bicycle moves forwards. Gears driven by chains are used in motorcycles, in car engines , etc.



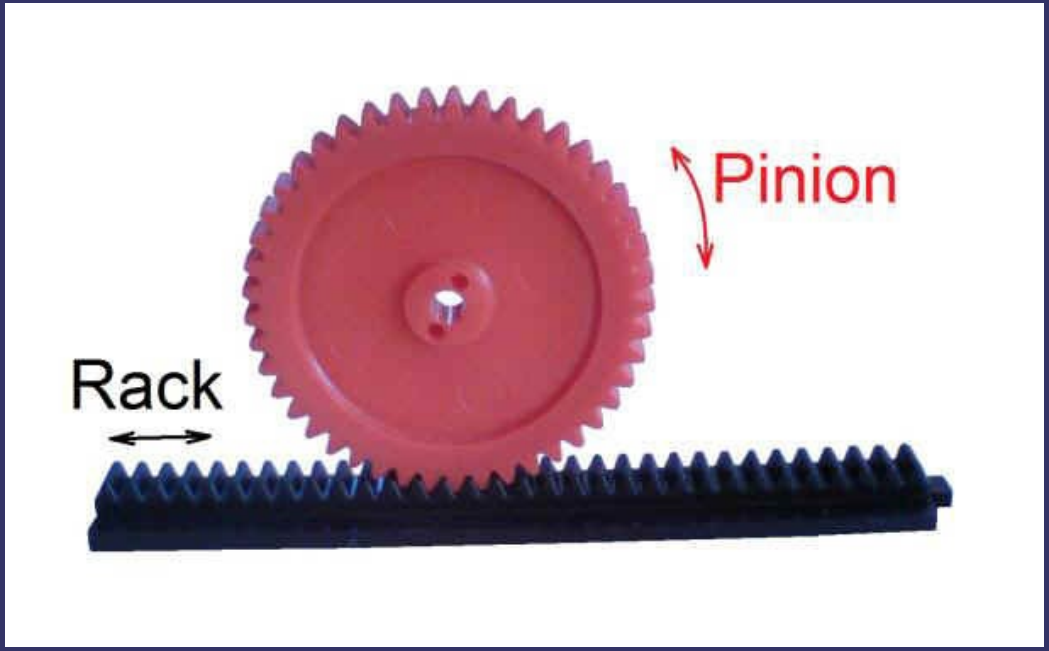
Sección bilingüe

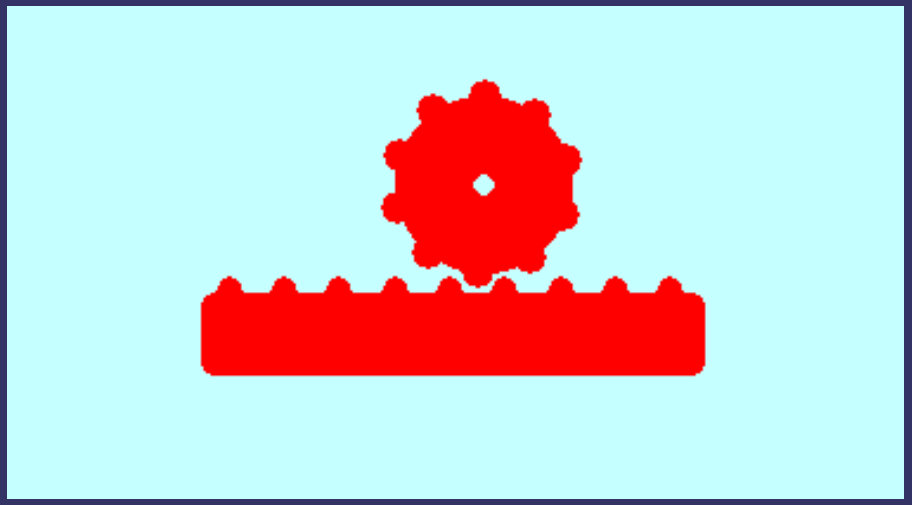
TRANSFORM MOTION

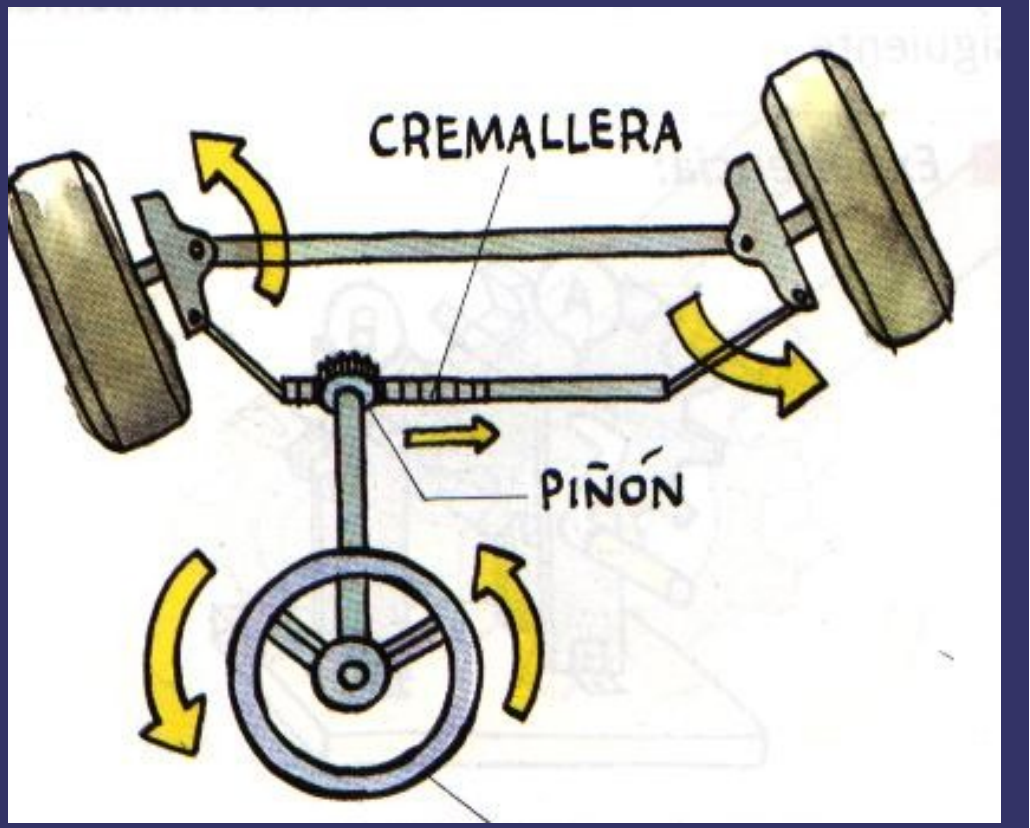
Rack and pinion

The rack and pinion gear system allows rotary motion of the steering wheel to be converted to linear motion.

Rack and pinion gears normally change rotary motion into linear motion, but sometimes we use them to change linear motion into rotary motion.
They transform a rotary movement (that of the pinion) into a linear movement (that of the rack) or vice versa.
We use them for sliding doors moved by an electric motor. The rack is attached to the door and the pinion is attached to the motor. The motor moves the pinion which moves the rack and the door moves.



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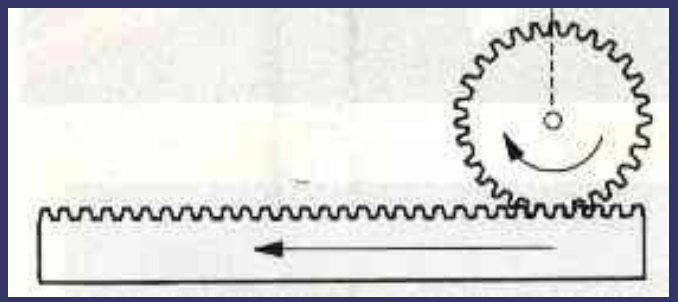
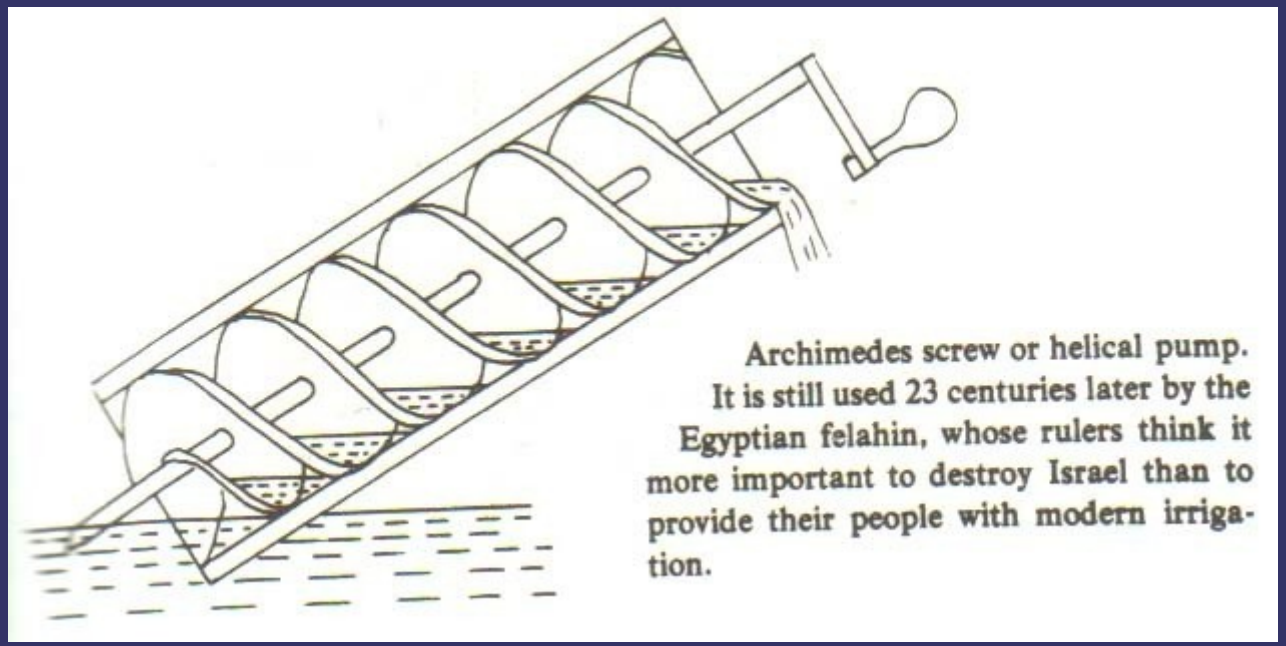
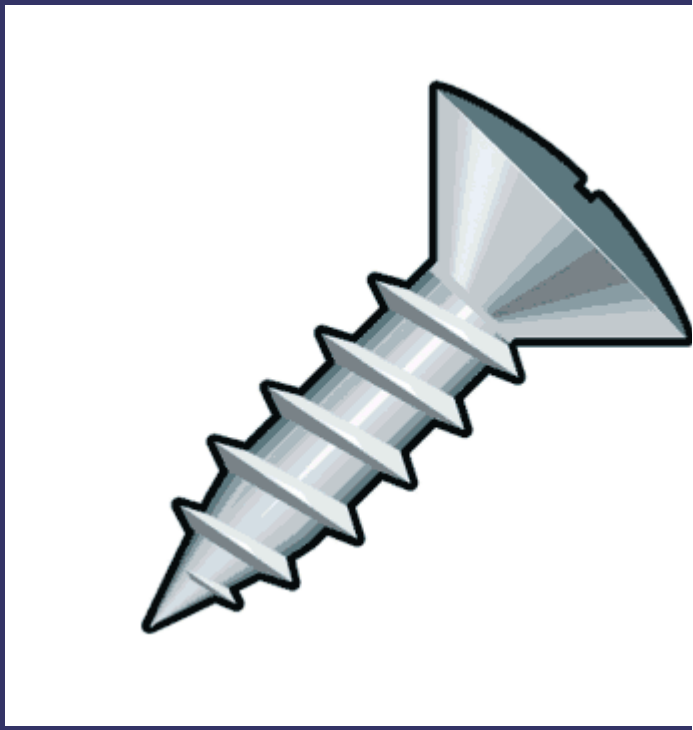


SCREW

A **screw**, like a wedge, is another form of an inclined plane. A screw is an inclined plane wrapped around a cylinder to form a spiral.

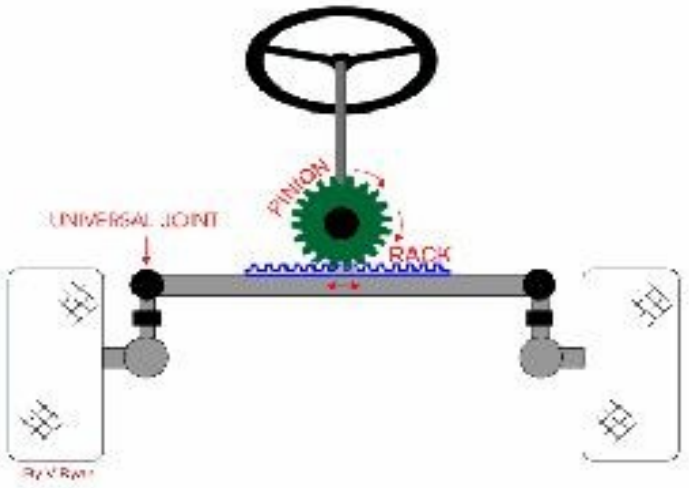


Archimedes screw or helical pump. It is still used 23 centuries later by the Egyptian felahin, whose rulers think it more important to destroy Israel than to provide their people with modern irrigation.



Rack and pinion

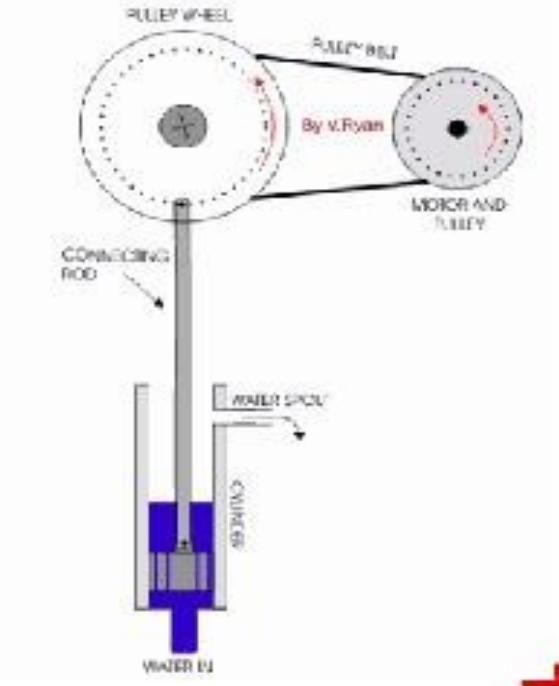
The diagram shows a vehicle and its steering system. This allows the steering wheel to turn the wheels left and right so that it can be steered.



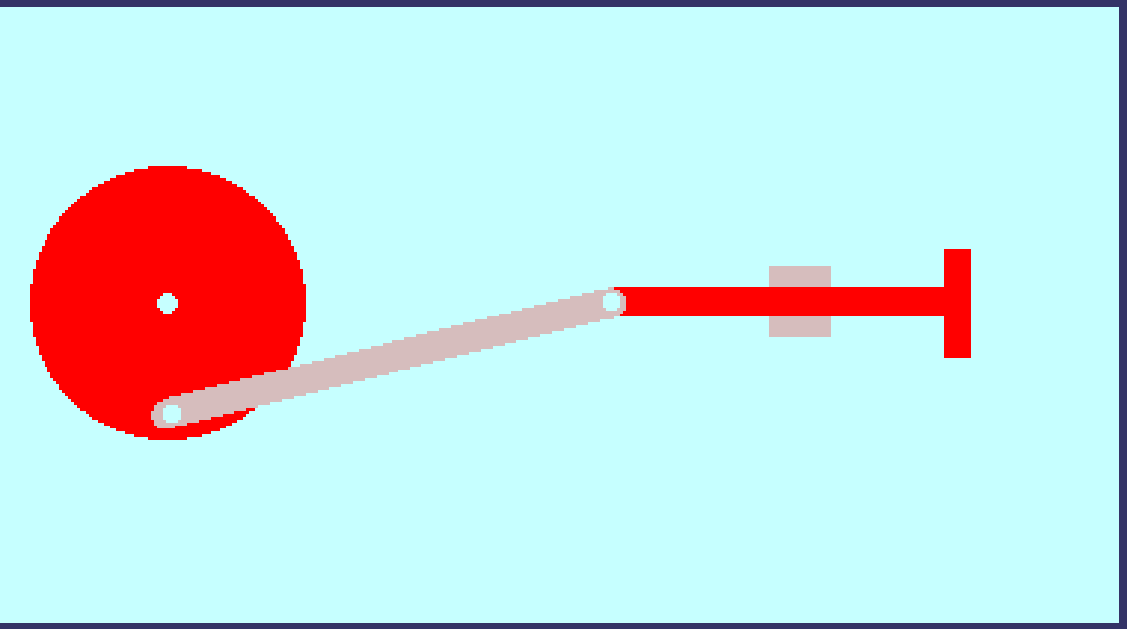
Crank-link slider or crank-conecting rod

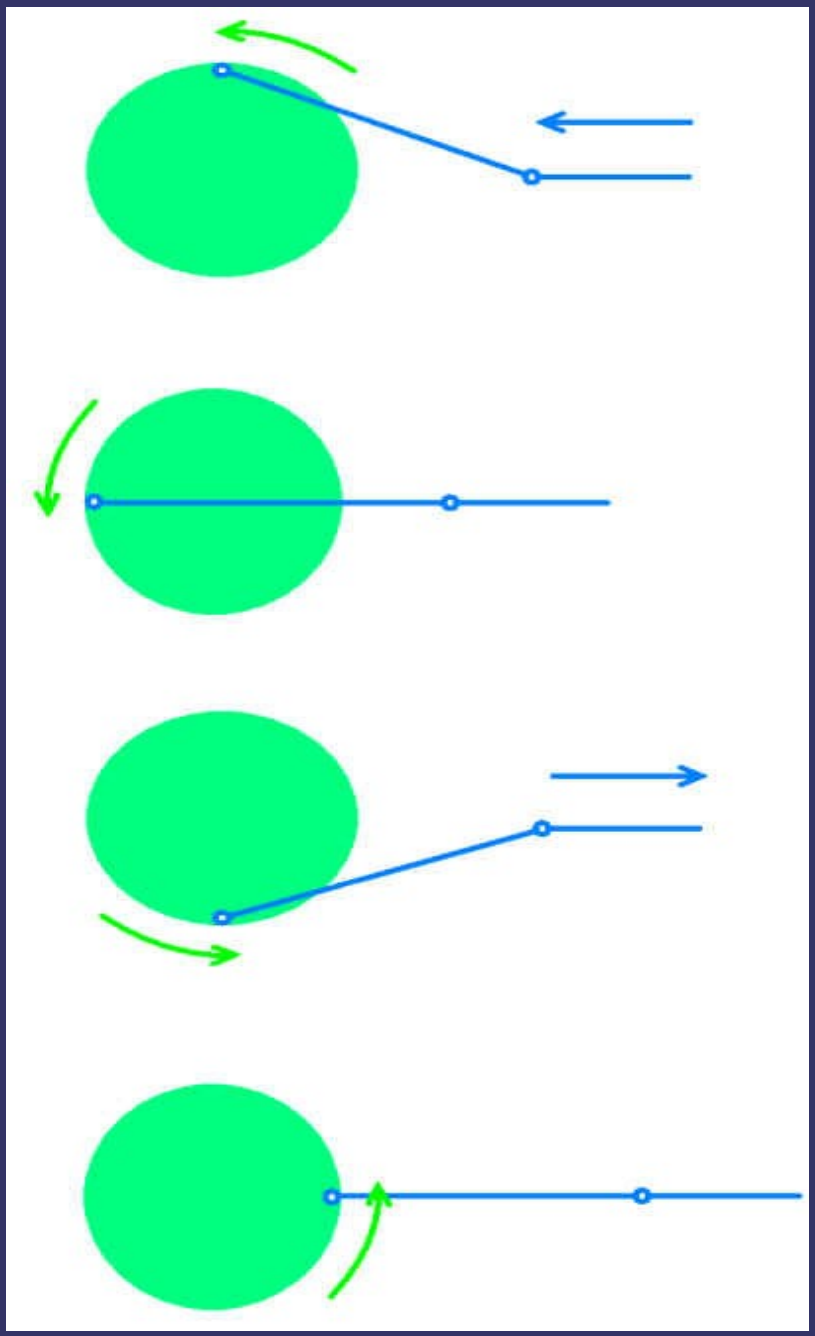
Crank-connecting rod

- *A Crank-connecting-rod is a* **Mechanism for transformation of rectilineal motion in rotatory one and vice versa.**



CRANK – CONNECTING ROD



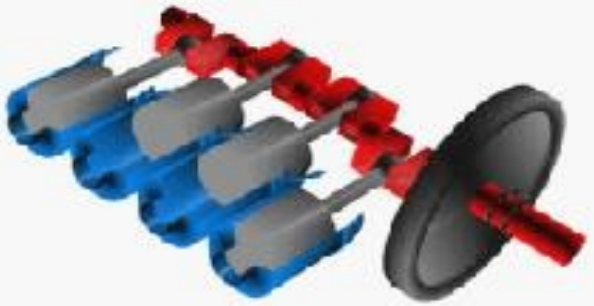


The distance that runs the piston is equal to the diameter of the handle (looks).

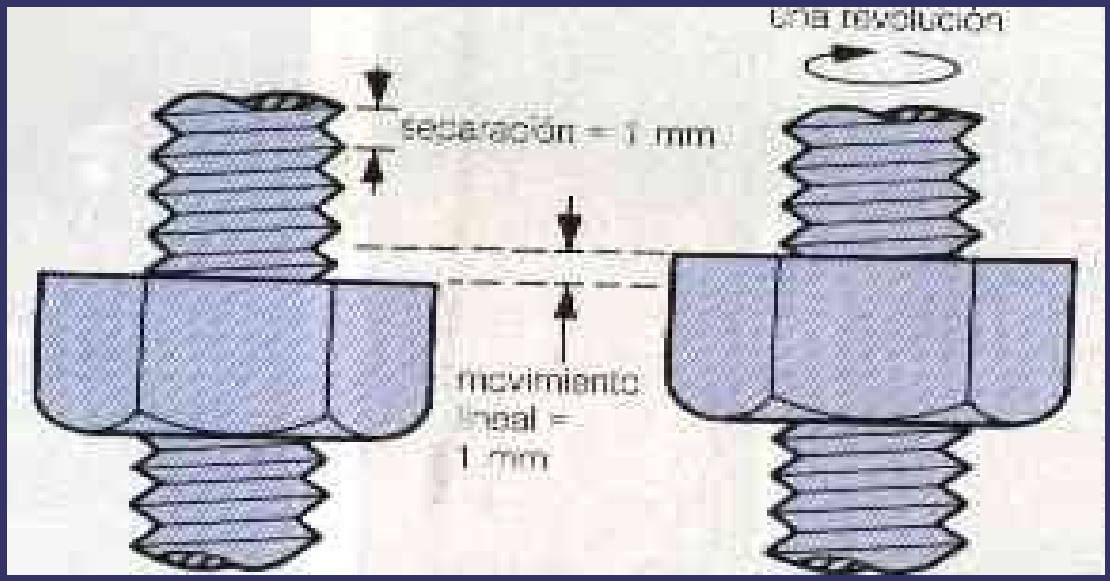
Crankshaft

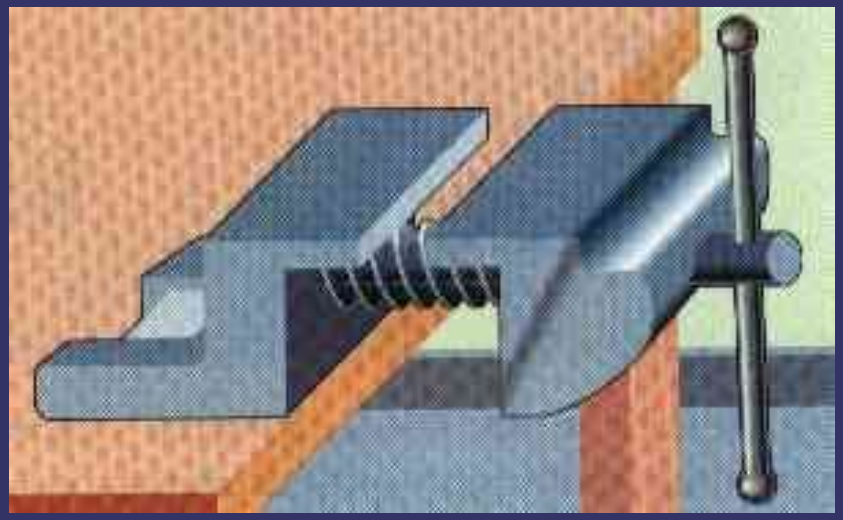
The crankshaft(in red), sometimes casually abbreviated to crank, is the part of an engine which translates reciprocating linear piston motion into rotation.

See more about the engine here

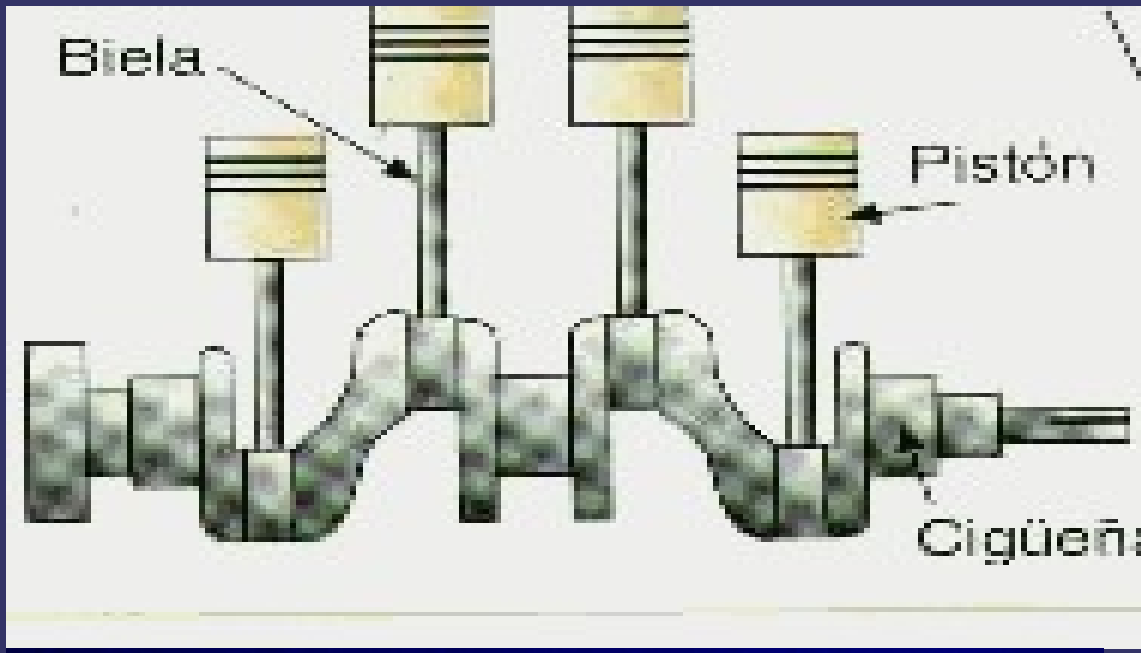


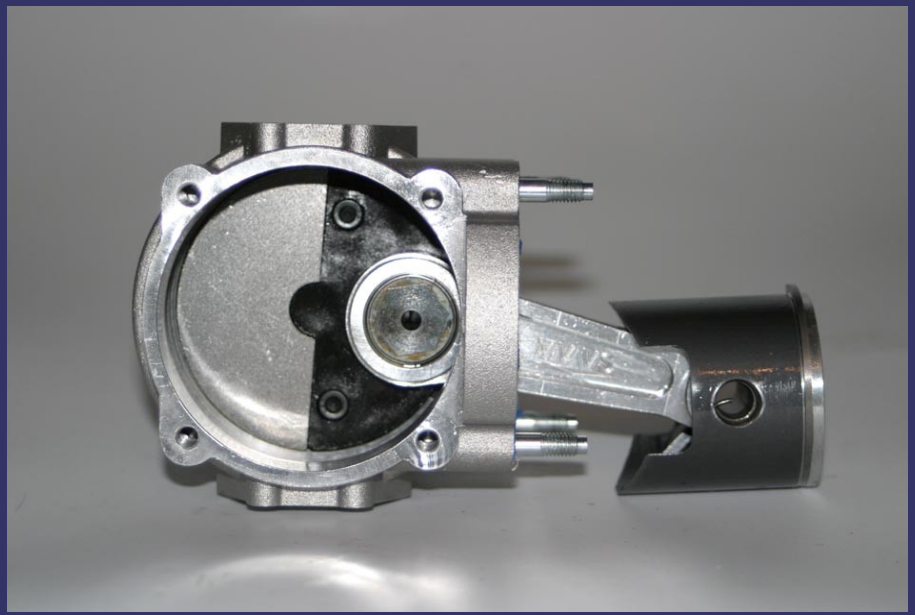
SCREW MECHANICS

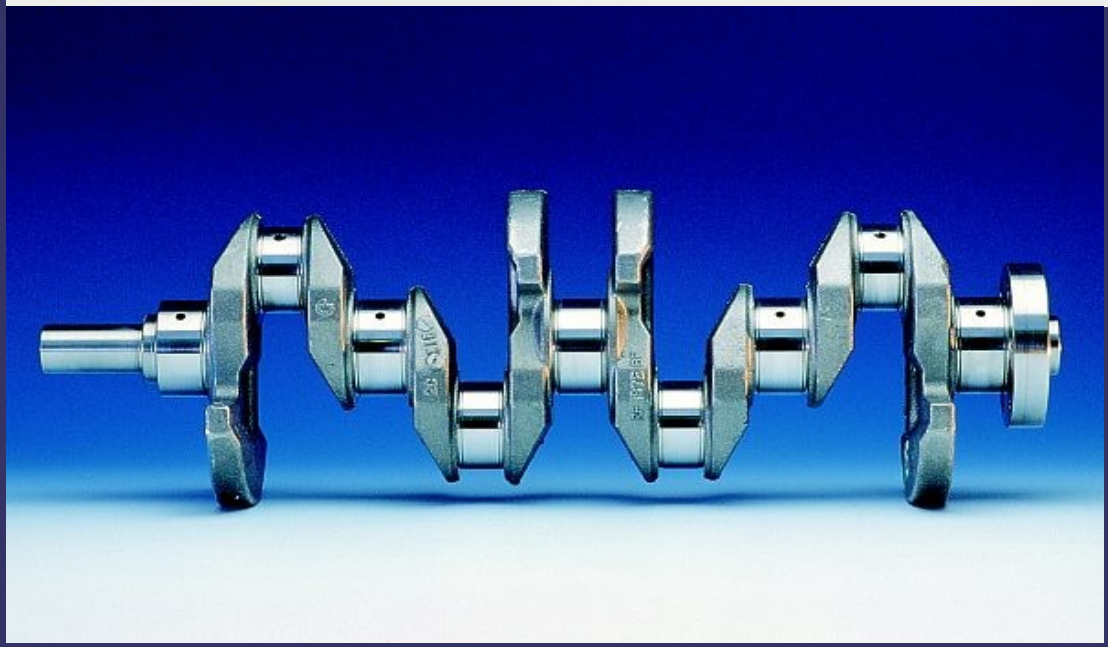




CRANK AND *CRANKSHAFT*



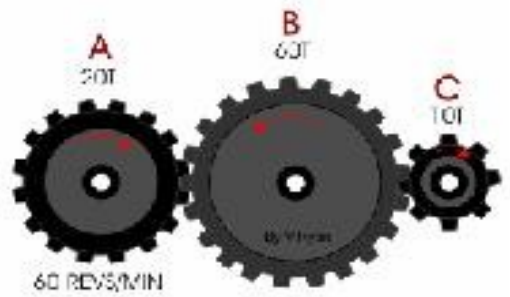




EXERCICES

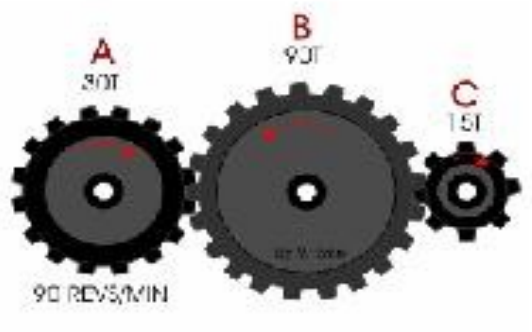
Gear

Exercices. What is the output in revolutions per minute at Gear C?



Gear

Exercices. Gear A revolves at 90revs/min. What is the output and direction at Gear C.



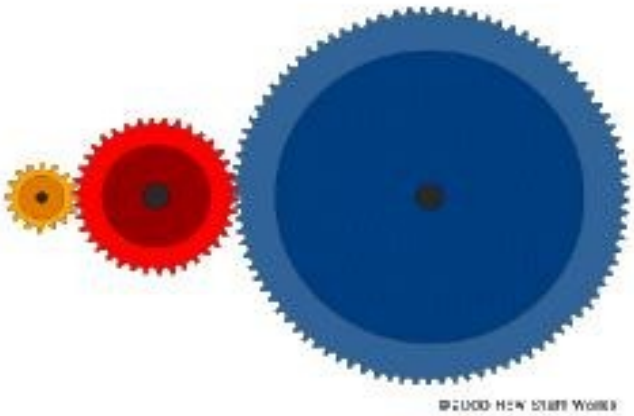
Gear

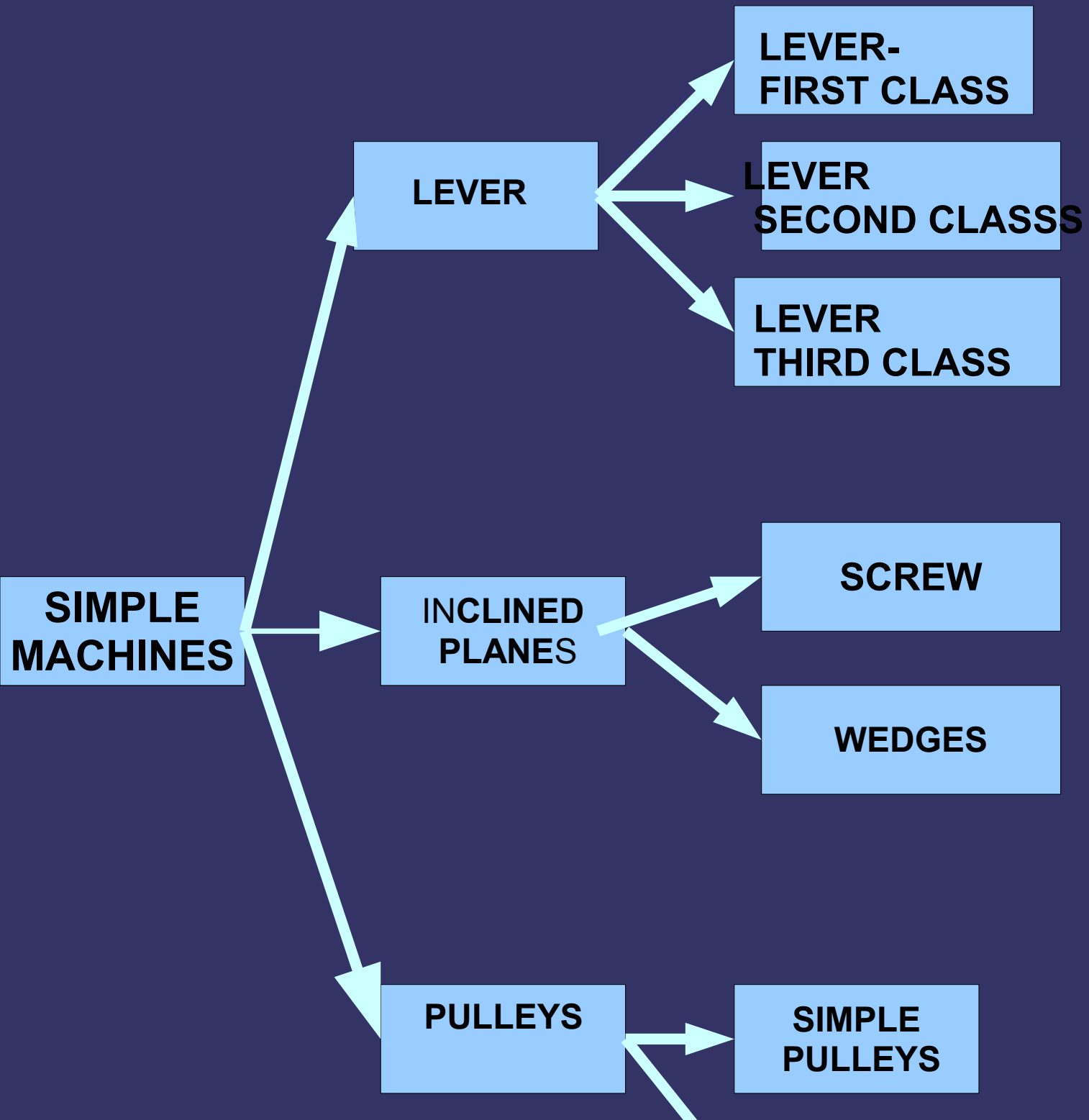
Exercices. Calculate the output speed (the speed at which the blue gear move) if:

V1= 3000 (Orange gear) and t1=20 teeth

T2 = 50 teeth

T3 = 200 teeth




SIMPLE MACHINES
LEVER
LEVER- FIRST CLASS
LEVER SECOND CLASSS
LEVER THIRD CLASS
INCLINED PLANES
SCREW
WEDGES
PULLEYS
SIMPLE PULLEYS