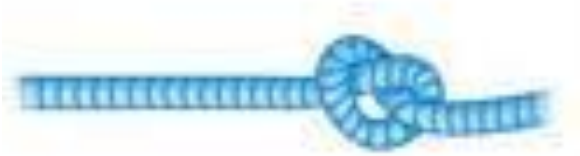
Knots
Levers & Blocks
Lift loads with lines and blocks

windsixty+

Knots



Overhand Knot

Figure 8 Knot

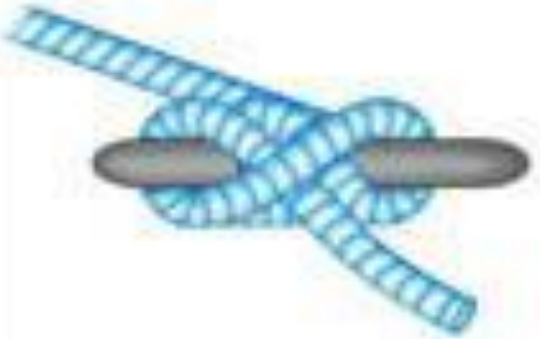
Square (Reef) Knot

Sheet Bend

Knots

Half Hitch

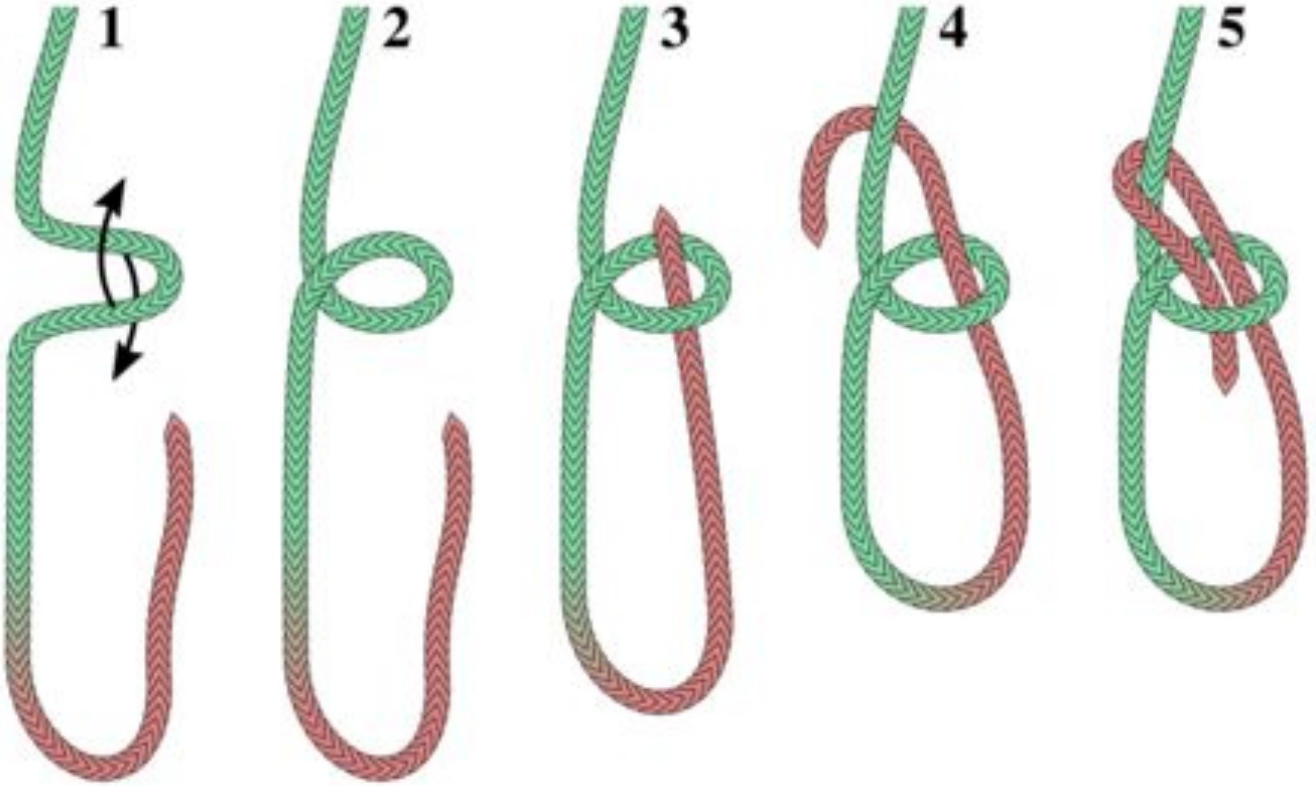
Clove Hitch



Cleat Hitch

Knots

Bowline Knot



BLOCK

- The block is a simple machine suitable for lifting loads, by sliding a line (or a steel cable) inside a rotating pulley (made of metal, plastic or wood).
- The block can be single, double, multiple, with or without becket.
- The pulley is supported by lateral supports, called flanges, which can be movable (pastel) or fixed.

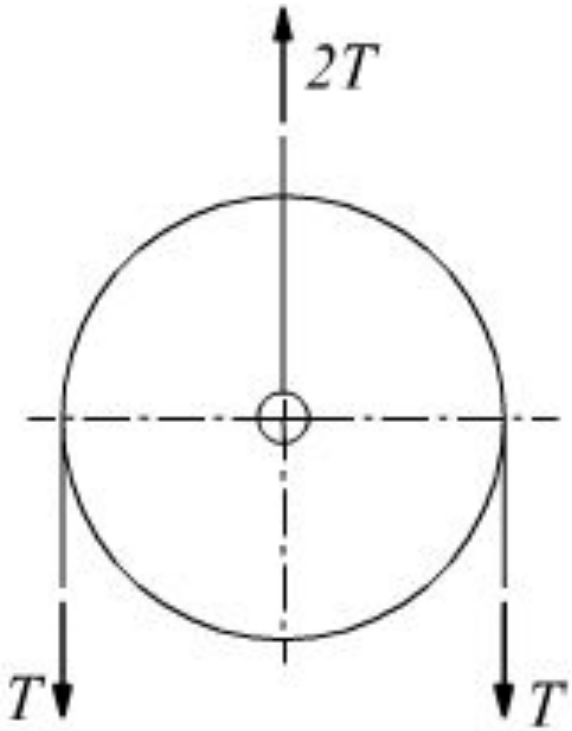
PULLEYS

Between the axis and the rotating disc, solutions are adopted to reduce friction as much as possible, such as ball bearings.

The greater the diameter of the pulley in proportion to the diameter of the line it contains, the greater its efficiency will be.

Different Blocks

The game of forces

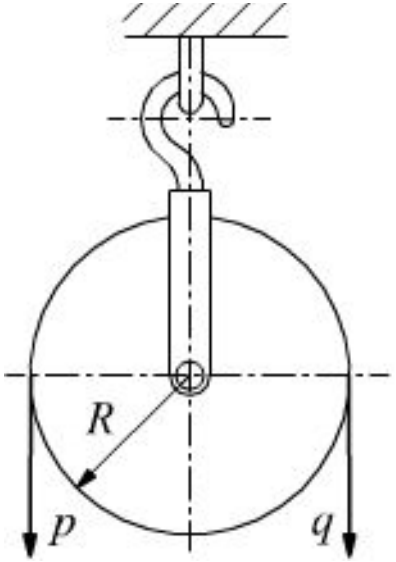


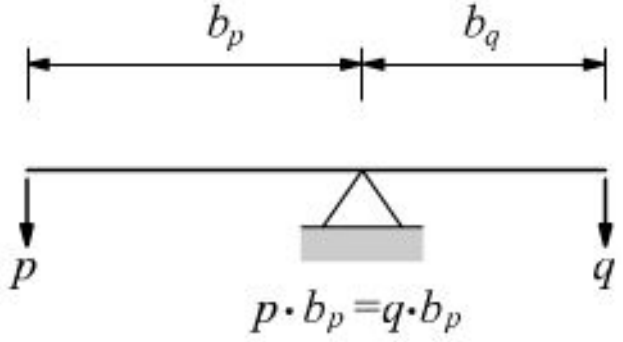
- A force is a vector physical quantity which induces a variation of the state of rest or motion of a body; in the presence of several forces, it is the resultant of their vectorial composition that determines the variation of the motion.
- As in any physical system, two bodies of equal mass resting on a block are in equilibrium (their weight forces are equal and opposite).
- To create a state of motion, an external force must be applied, which must also overcome the friction and inertia of the system.
- The sum of the weight forces and any applied forces weighs on the anchor, and will undergo the greatest stresses at the beginning and at the end of each movement

Blocks and Levers

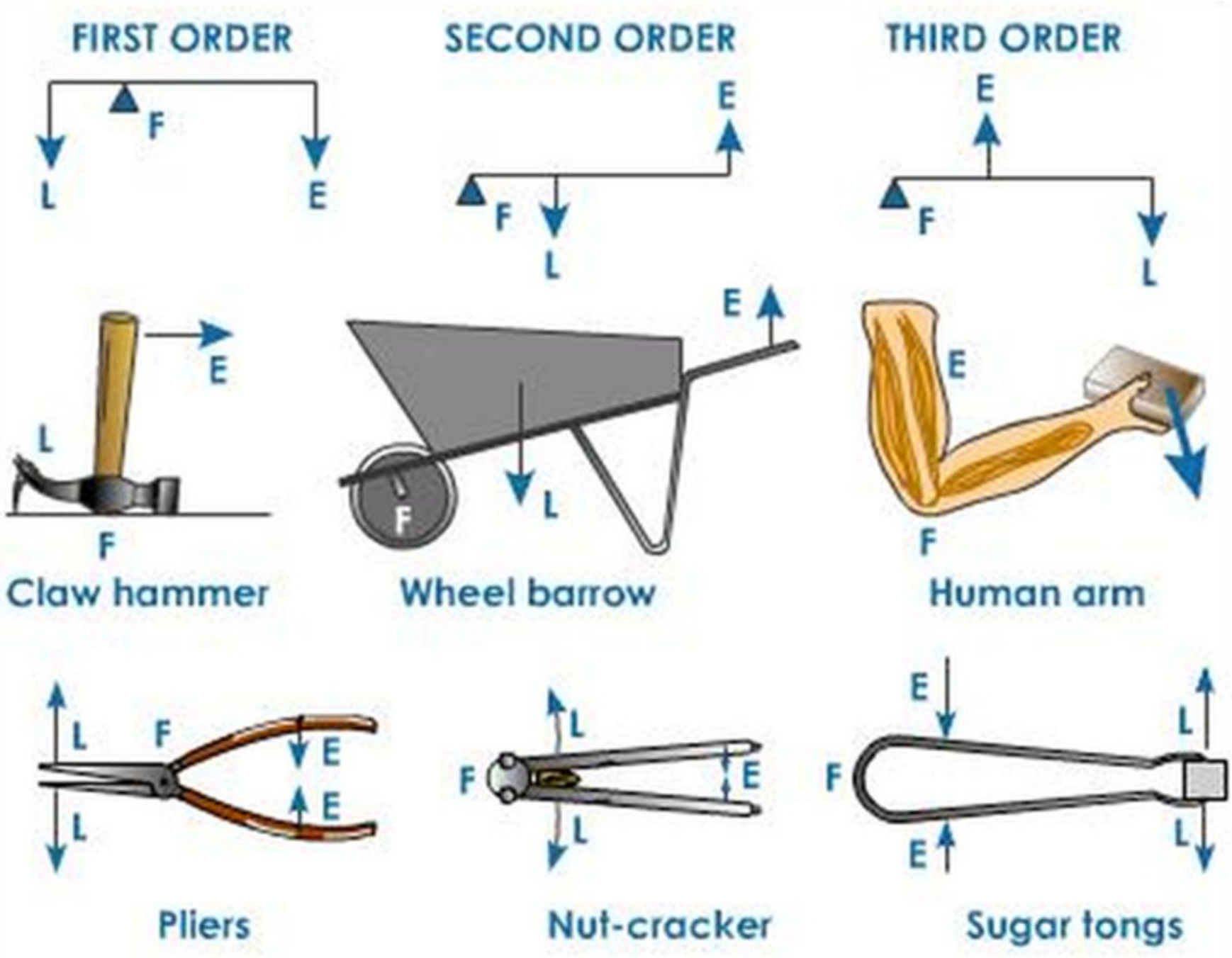
The block works according to the lever principle. The difference between a lever and a block is that in the latter case the arm of the driving force **p** and the resisting force **q** is the same (**R**).

The advantage in moving a body is inversely proportional between the force used and the distance accomplished in the movement.





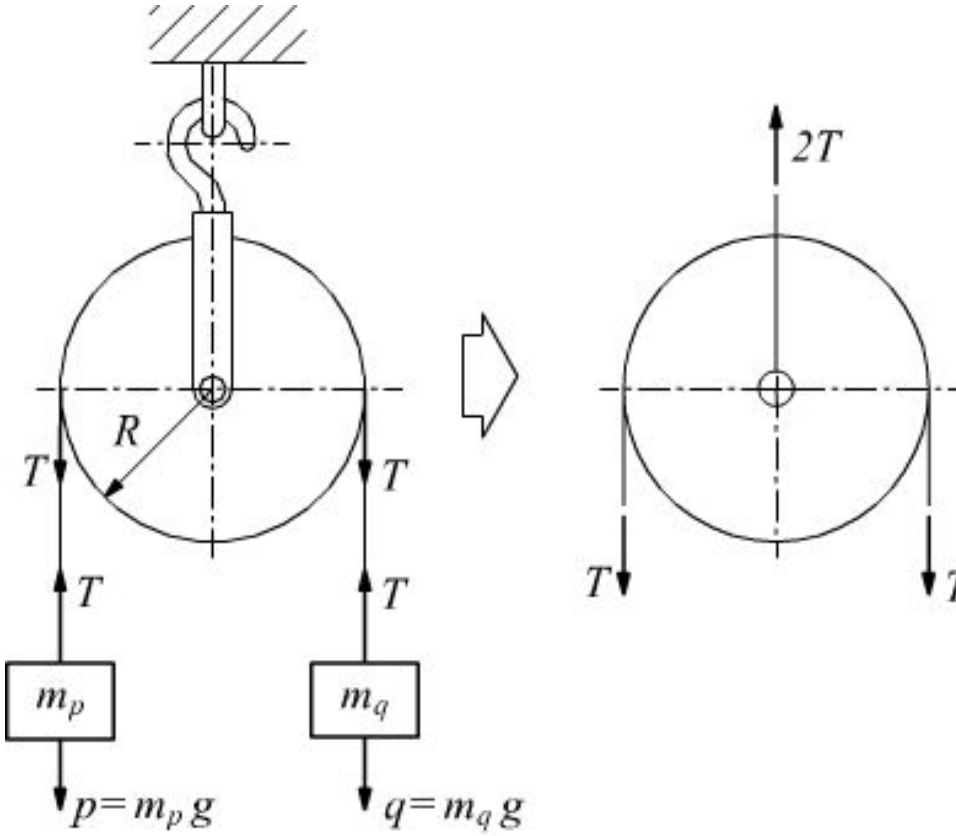
Class Lever


FIRST ORDER
F
L
E
SECOND ORDER
E
F
L
THIRD ORDER
E
F
L
E
L
F
Claw hammer
E
F
L
Wheel barrow
E
F
Human arm
L
F
E
E
L
Pliers
L
F
E
L
Nut-cracker
E
F
L
E
L
Sugar tongs

Load Applied To Fixed Block

It is a first class lever: the fulcrum coincides with the block, the resisting force **p** is the object to be lifted, the applied force **q** is that applied muscularly by the hand. If the applied force is equal to the resisting force, the load is in equilibrium; if it is different, the load moves.

There is no mechanical advantage: a single fixed block is used only to change the line's direction of pull and is not a tackle.

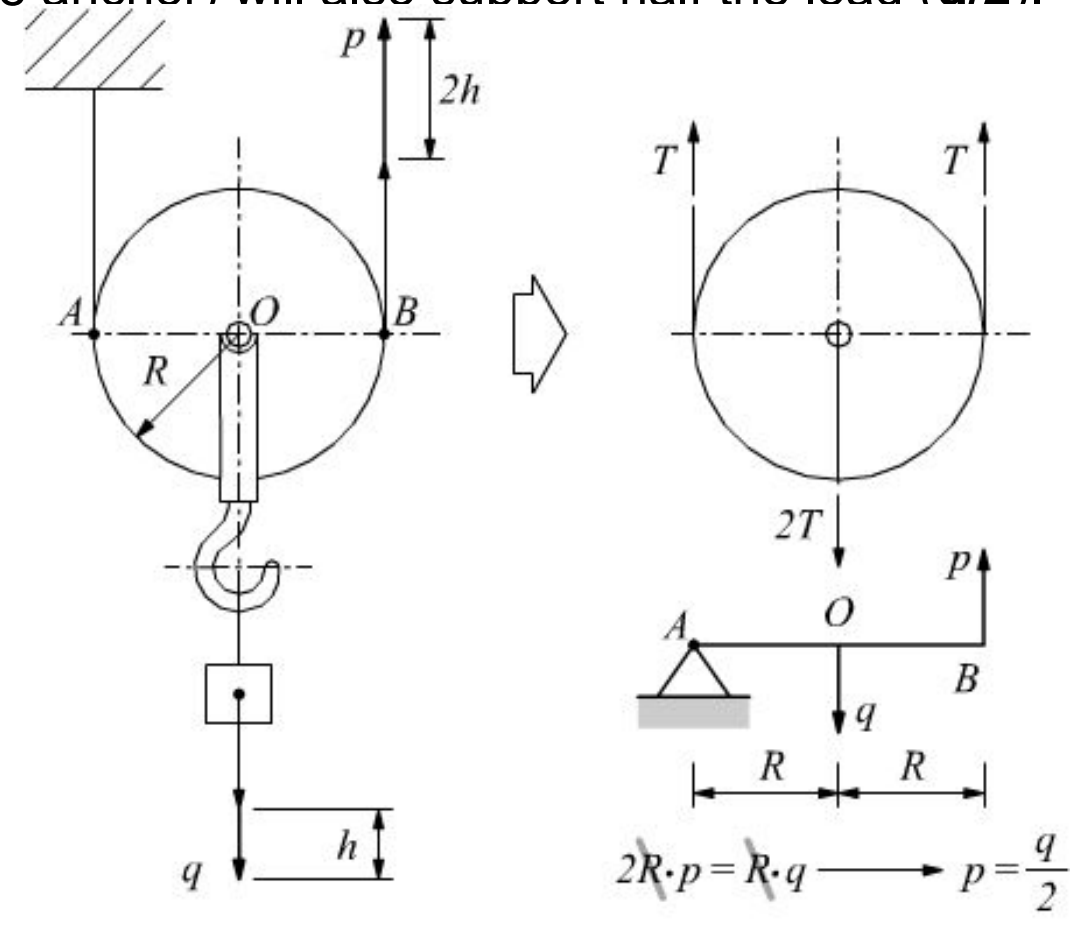


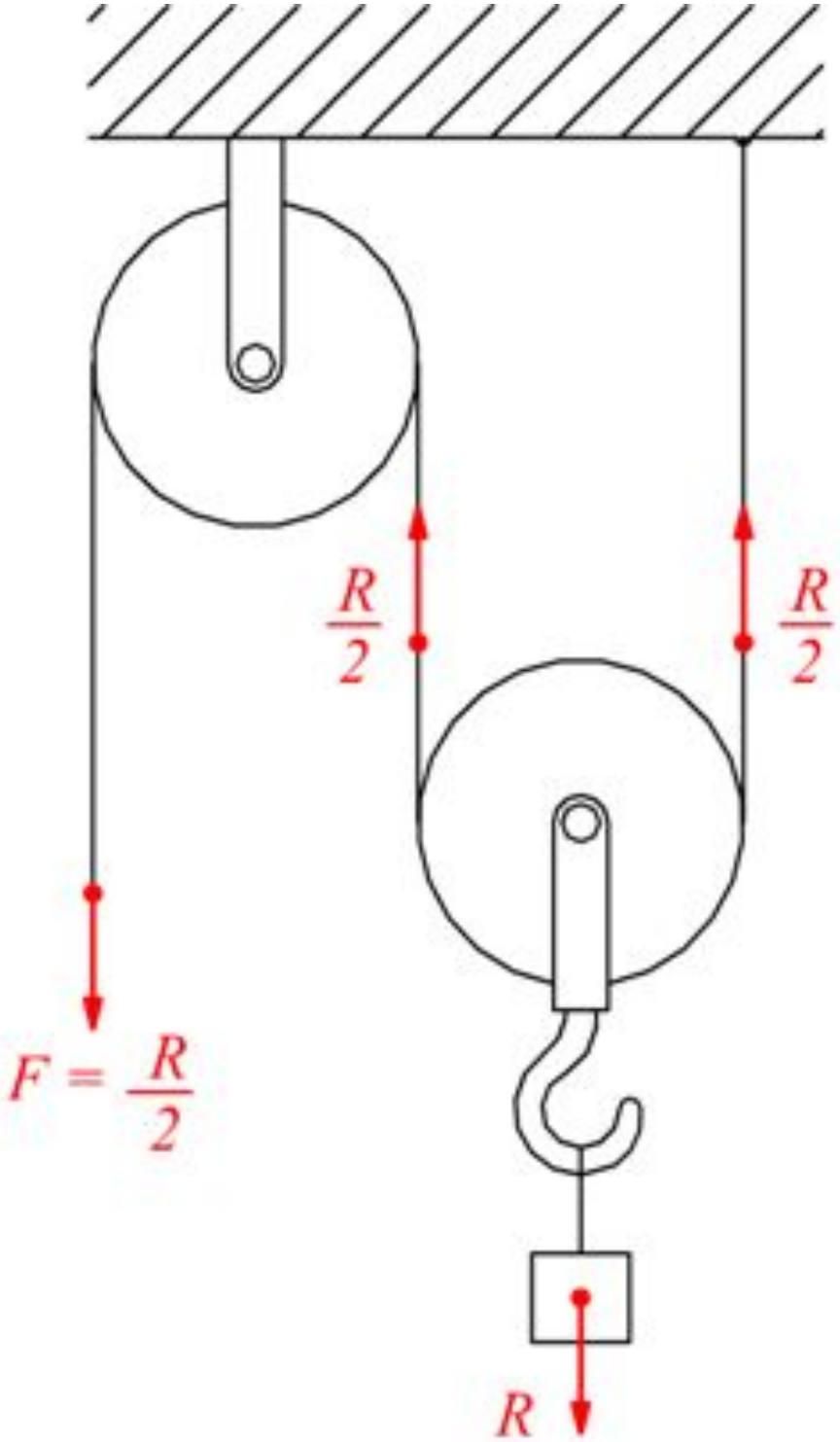
Load Applied To Mobile Block

It is a second class lever: the fulcrum is the anchor point (point A of the block), the resisting force **q** is the object to be lifted, the applied force **p** is that applied to point B.

Second class levers are always advantageous.

In static equilibrium, the applied force is always half the resisting force (**p=q/2**), and the fulcrum (the anchor) will also support half the load (**q/2**).





Example of single tackle with transmission.

In static equilibrium (**F=R/2**), the two anchors carry half the load.