Question

What does the ratio of forces depend on in blocks and pulleys?

Answer

It depends on the arrangement of pulleys in a block.

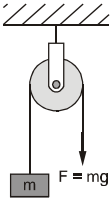
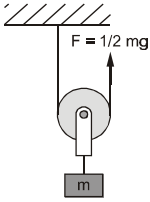
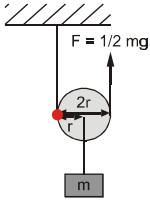


Fig. 1
fixed pulley



loose pulley



loose pulley

A **fixed pulley** only varies the direction of a force and leaves its absolute value constant.

A **loose pulley** on the other hand functions as a lever, since it instantaneously rotates around the fulcrum on the fixed side of the rope (red dot in Fig. 1).
The "force" lever has twice the length of the "load" lever and hence the forces is doubled.

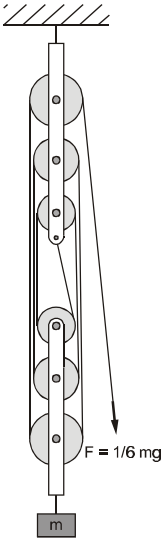


Fig. 2
block with three fixed and three loose pulleys

A block is a mounting for one or more pulleys. The block in Fig. 2 consists of three fixed and three loose pulleys.

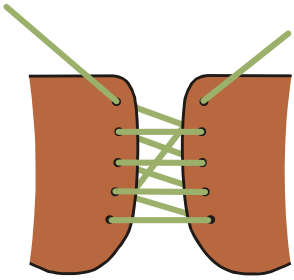


Fig. 3 shoestring

The **ratio of forces** may easily be determined with most blocks by counting the ropes the load is pending on. (Fig. 2, load is pending on 6 ropes, ratio of forces = 1:6)

A common example of applications of blocks and pulleys is shoestrings pulling our shoes to fit properly.