

pounds, and the work accomplished is 15×1 , or 15 foot pounds.

Again in (3), 5 lbs. of force moves 3 ft. to raise 15 lbs. 1 foot. Again, the work put into the pulley is 5×3 or 15 foot pounds, and that accomplished is 15×1 , or 15 foot pounds. Similarly in (4) the work put into the pulley equals the work done by it.

This gives us the very important "Law of Machines," viz., if there is no friction, "The work done by a machine is equal to the work put into it."

This law applies to every machine ever made, no matter how simple or how complicated.

In every machine, however, there is always friction, so that the work we get out is always less than the work we put into it. Part is always wasted in friction. We oil machines and use roller and ball bearings to make this waste as little as possible.

Suggestions for experiment at home :

Experiment with any pulleys you have. Show that the force equals the weight divided by the number of ropes supporting the weight when we eliminate friction. Also show that when the weight is raised 1 foot the force must move 2 ft. if two ropes are supporting the weight, or 6 ft. if six ropes are supporting the weight, etc.

Exercises

1. Draw systems of pulleys in which 1, 2, 3, 4 and 5 ropes are supporting the weight.
2. In a system of pulleys in which two ropes are supporting the weight, the lower block weighs 5 lbs., and 25 lbs. is attached to the lower block. What is the force? By experiment, the reading on the balance when raising the weight slowly is 18 lbs., and when lowering it slowly is 12 lbs. What is the force? What is the friction?