

14.2 Work and Machines

All cars come equipped with simple machines designed to make changing a tire a fairly easy task.



Machines Do Work



How do machines make work easier?

A **machine** is a device that changes a force.





Machines make work easier to do. They change the size of a force needed, the direction of a force, or the distance over which a force acts.

Machines Do Work

Each complete rotation of a jack handle applies a small force over a large distance.

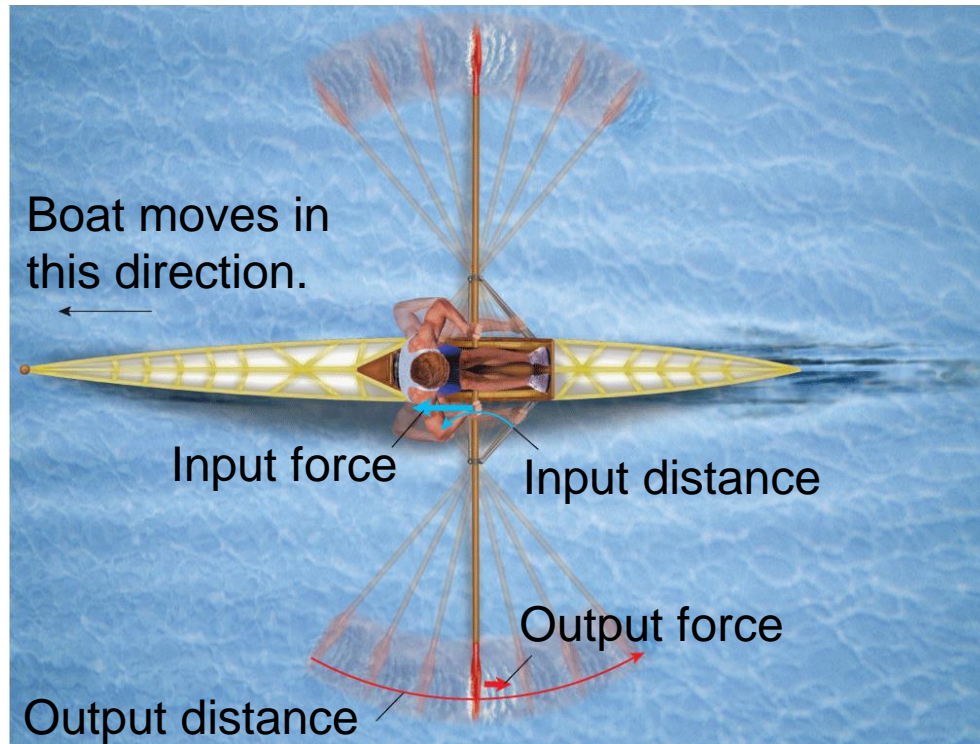
- A small force exerted over a large distance becomes a large force exerted over a short distance.
- Each rotation lifts the car only a very short distance.

Work Input and Work Output

-  **How are work input and work output related for a machine?**
-  **Because of friction, the work done by a machine is always less than the work done on the machine.**

Work Input and Work Output

The oars of the boat act as machines that increase the distance over which the force acts.



Work Input and Work Output

Work Input to a Machine

- The force exerted on a machine is the **input force**.
- The distance the input force acts through is the **input distance**.
- The **work input** equals the input force multiplied by the input distance.

Work Input and Work Output

Work Output of a Machine

- The force exerted by a machine is called the **output force**.
- The distance the output force is exerted through is the **output distance**.
- The **work output** of a machine is the output force multiplied by the output distance.

Assessment Questions

1. What is the output distance of a machine that requires 2 newtons of force exerted over 6 meters and whose output force is 4 newtons?
 - a. 2 meters
 - b. 3 meters
 - c. 6 meters
 - d. 12 meters

Assessment Questions

1. What is the output distance of a machine that requires 2 newtons of force exerted over 6 meters and whose output force is 4 newtons?
 - a. 2 meters
 - b. 3 meters
 - c. 6 meters
 - d. 12 meters

ANS: B

Assessment Questions

1. The work output of a machine is always greater than the work input to the machine.

True

False

Assessment Questions

1. The work output of a machine is always greater than the work input to the machine.

True

False

ANS: F, never