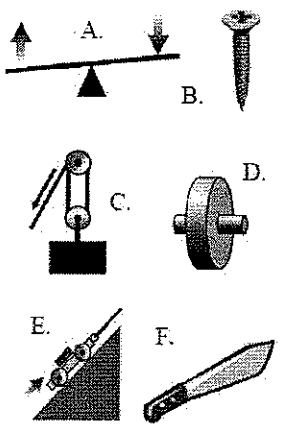
Simple Machines + MA

11

Identify these simple machines:

A. Lever
B. Screw
C. Pulley
D. Wheel + axle
E. Incline plane
F. wedge



1. Mechanical Advantage A	A. How much a machine amplifies or reduces your force.
2. None B	B. The units for mechanical advantage.
3. D_E D	C. How far the object would move without the simple machine.
4. D_R C	D. How far the object moves with the simple machine.

1. Machine B	A. The force you put into a machine.
2. F_{in} A	B. A device that has moving parts and can do work.
3. F_{out} D	C. A block and tackle is another name for this.
4. Pulley C	D. The force you get out of a machine.

Input Force (F_{in}) or Output Force (F_{out})?

O You lift a 200 N object.
I How hard you push with the simple machine.
I A wedge applies 400 N of force to a piece of wood.
I You push 240 N on a lever.
I You turn a screw with 30 N of force.
O A pulley applies 48 N of force up. You would lift up w/ less force
O The weight of the object you are lifting.

Distance of Effort (D_E) or Distance of Resistance (D_R)?

R You use an incline plane to lift a car up 4 meters.
E You use a 10 meter long ramp to raise up a car.
R You lift a 200 kg object up 2 meters to the back of a pickup truck.
E The distance *you* push down on a lever.
R The distance the object moves *up* with a lever.
R Vertical distance you lift against gravity.

What is the difference between a machine and a simple machine? A Simple machine does something in 1 step

How can time be used to measure mechanical advantage? More MA if speeds up your work

In a simple machine which is bigger: D_E or D_R?
In a simple machine which is bigger: F_{in} or F_{out}?

You have to lift a 15 kg object. What is your output force?

$F_W = mg$
$15kg \cdot 10m/s^2 = 150N$

Using a lever, you push down 20 N to lift a 10 kg object.
A) Find the output force.
$F_W = 10kg \cdot 10m/s^2 = 100N$
B) What is the input force?
20 N
C) How much does the ramp multiply your force?

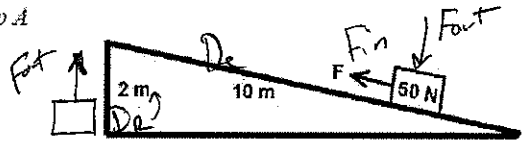
$\frac{F_{out}}{F_{in}} = \frac{100N}{20N} = 5x$

You push with 10 N up a ramp to move a 40 N object to the top of a table. By how much does the ramp multiply your force?

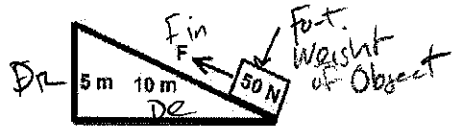
$\frac{F_{out}}{F_{in}} = \frac{40N}{10N} = 4x$

For both ramps, label D_E, D_R, F_{in}, and F_{out}.

Ramp A



Ramp B



Which ramp has the greatest mechanical advantage? A
To give a greater MA, what would you have to do?
Make ramp longer

Give three examples of simple machines you have at home (be sure to specify which simple machine it is).

Varies

Give three examples of simple machines in your body (and specify which simple machine they are).

arm (lever) + fingers + jaw
teeth (wedge) + fingernails