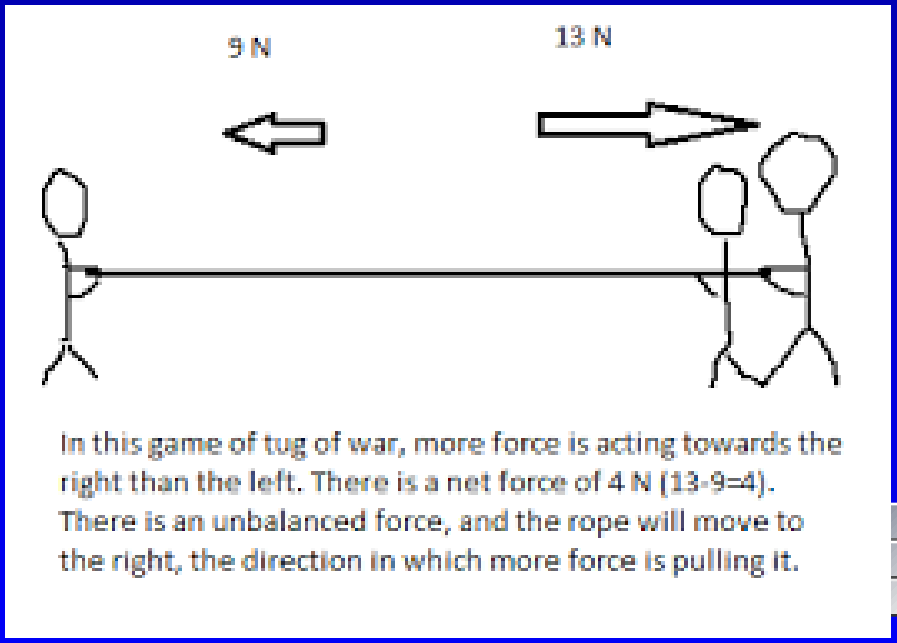
Chapter 5-1

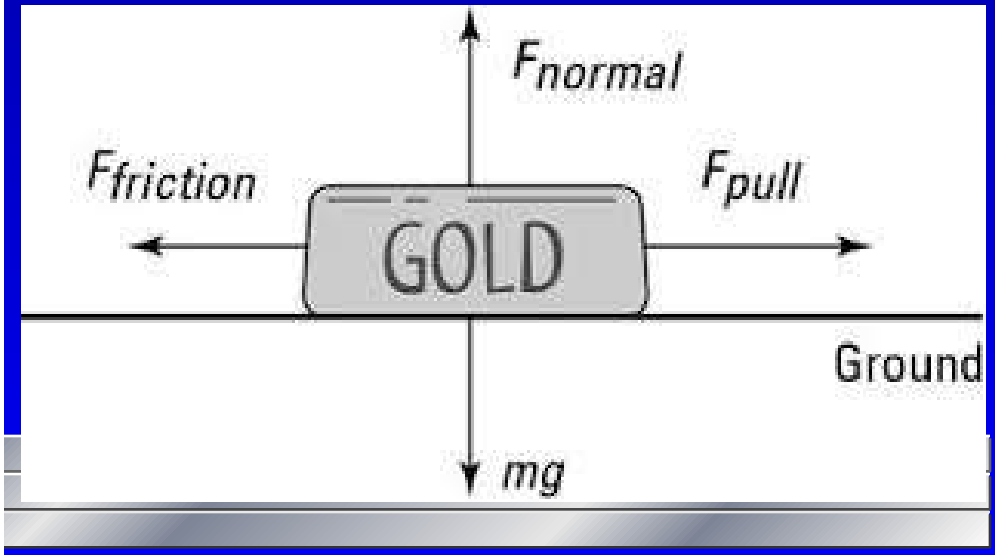
Work

- Work = force x displacement
- Work is not done unless the object moves.
- Distance = 0 then work = 0

- More than one force is on an object, find the net force.
- If friction is involved you subtract the frictional force



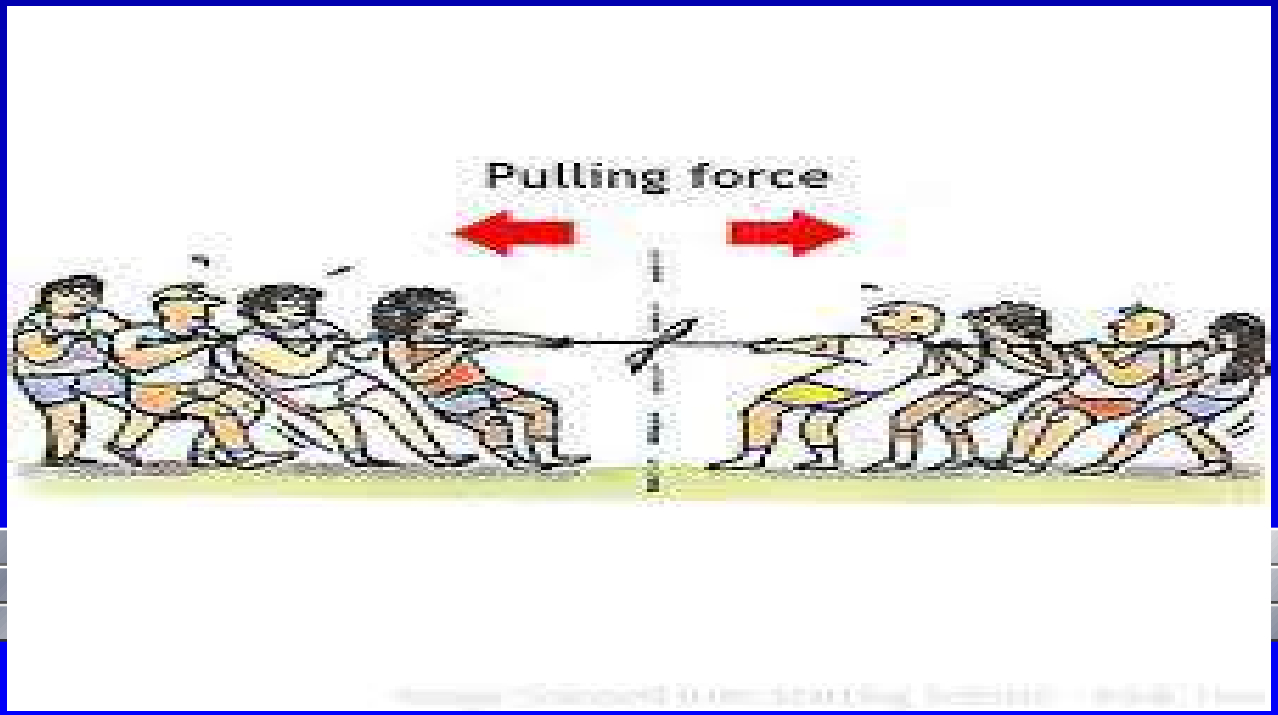
In this game of tug of war, more force is acting towards the right than the left. There is a net force of 4 N (13-9=4). There is an unbalanced force, and the rope will move to the right, the direction in which more force is pulling it.



Units

- Work is force x length
- Force – newtons
- Length – meters
- Work = Nm

- Work can be positive or negative
- Work is positive when the force is in the same direction of the movement.
- Work is negative when the force is in the opposite direction of movement.



A pulley system is used to lift an engine. The operator pulls the rope 5 m with a force of 600 N. Calculate the input work done by the operator.

- ○ 1500 Nm
- ○ 0.008 Nm
- ○ 3000 Nm
- ○ 120 Nm

A pulley system is used to lift an engine. The operator pulls the rope 5 m with a force of 600 N. Calculate the input work done by the operator.

- ○ 1500 Nm
- ○ 0.008 Nm
- ● 3000 Nm
- ○ 120 Nm

Work = Force * Distance

Work = 600 * 5 = 3000 Nm

Power

- The rate at which work is done is called power.
- P = Work/time
- Work = force x distance
- P = Fv

Units

- Units of power = watt (W)
- Watt = 1 Joule / second
- Horsepower is another unit of power.
- 1 Horsepower = 746 Watts

5-2 Notes

Energy

Kinetic Energy

- Kinetic energy is the energy of motion.
- $KE = \frac{1}{2} mv^2$
- Units for energy = joule (J).

A toy car has an average speed of 1.6 m/s through a section of track. With a mass of 0.035 kg, what would be the average kinetic energy of the car through that section of track?

- 0.0896 J
- 0.0560 J
- 0.0448 J
- 0.1792 J

A toy car has an average speed of 1.6 m/s through a section of track. With a mass of 0.035 kg, what would be the average kinetic energy of the car through that section of track?

- 0.0896 J
- 0.0560 J
- 0.0448 J
- 0.1792 J

$$KE = .5 * mass * velocity^2$$

$$KE = .5 * .035 * 1.6^2 =$$

$$.0448\ J$$

Gravitational Potential Energy

- Potential energy is stored energy.
- Gravitational Potential energy is the energy due to height
- PE = mgh
- Units are joules (J)

A 30 kg object rests on a table that is 2 meters high. Calculate the gravitational potential energy of the object.

- 588 J
- 15 J
- 120 J
- 60 J

A 30 kg object rests on a table that is 2 meters high. Calculate the gravitational potential energy of the object.

- 588 J
- 15 J
- 120 J
- 60 J

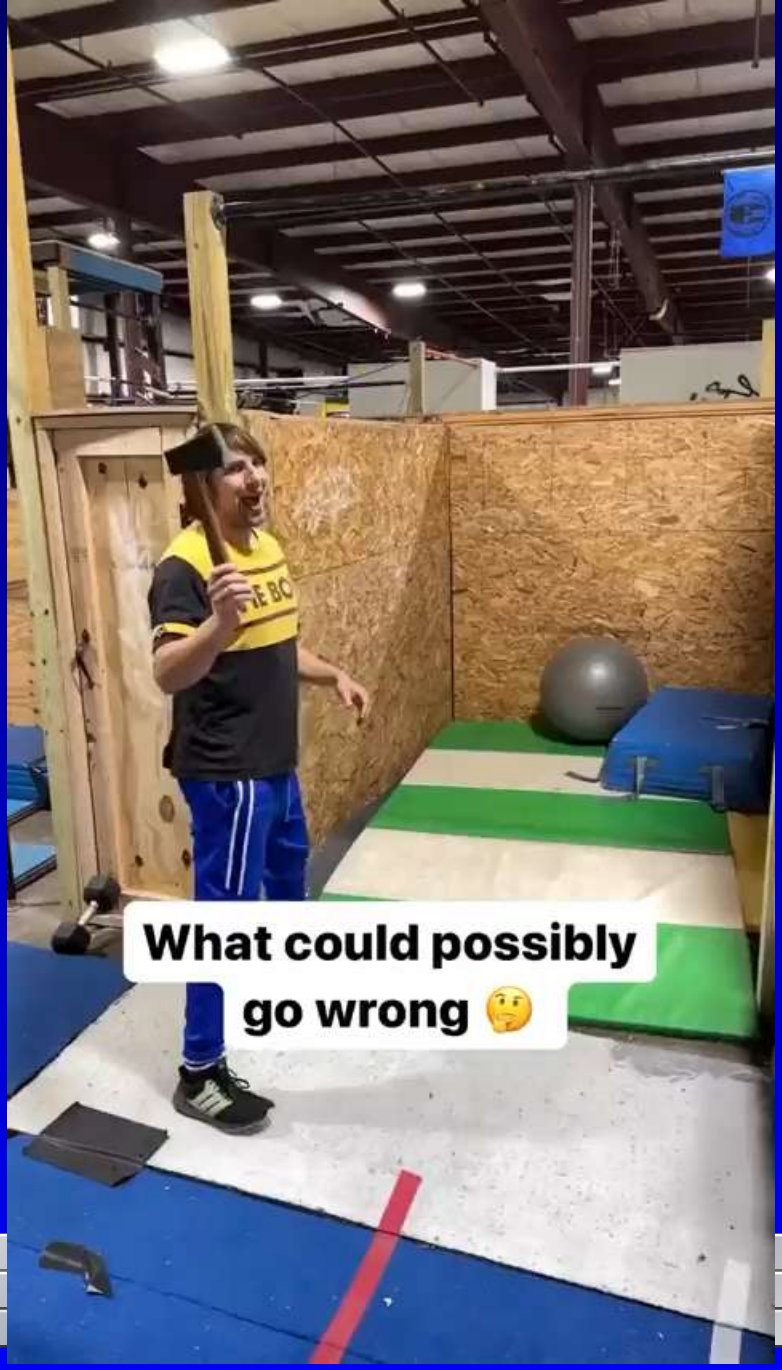
PE = mass * gravity * height

PE = 30 * 9.8 * 2 = 588 J


ELASTIC POTENTIAL ENERGY OCCURS WHEN OBJECTS ARE COMPRESSED AND STRETCHED, OR GENERALLY DEFORMED IN ANY MANNER, CREATING POTENTIAL ENERGY.

Elastic Potential Energy

- Elastic potential energy in a stretched or compressed elastic object.
- $PE_{elastic} = \frac{1}{2} kx^2$
- PE = Joules (J)


What could possibly
go wrong 🤔

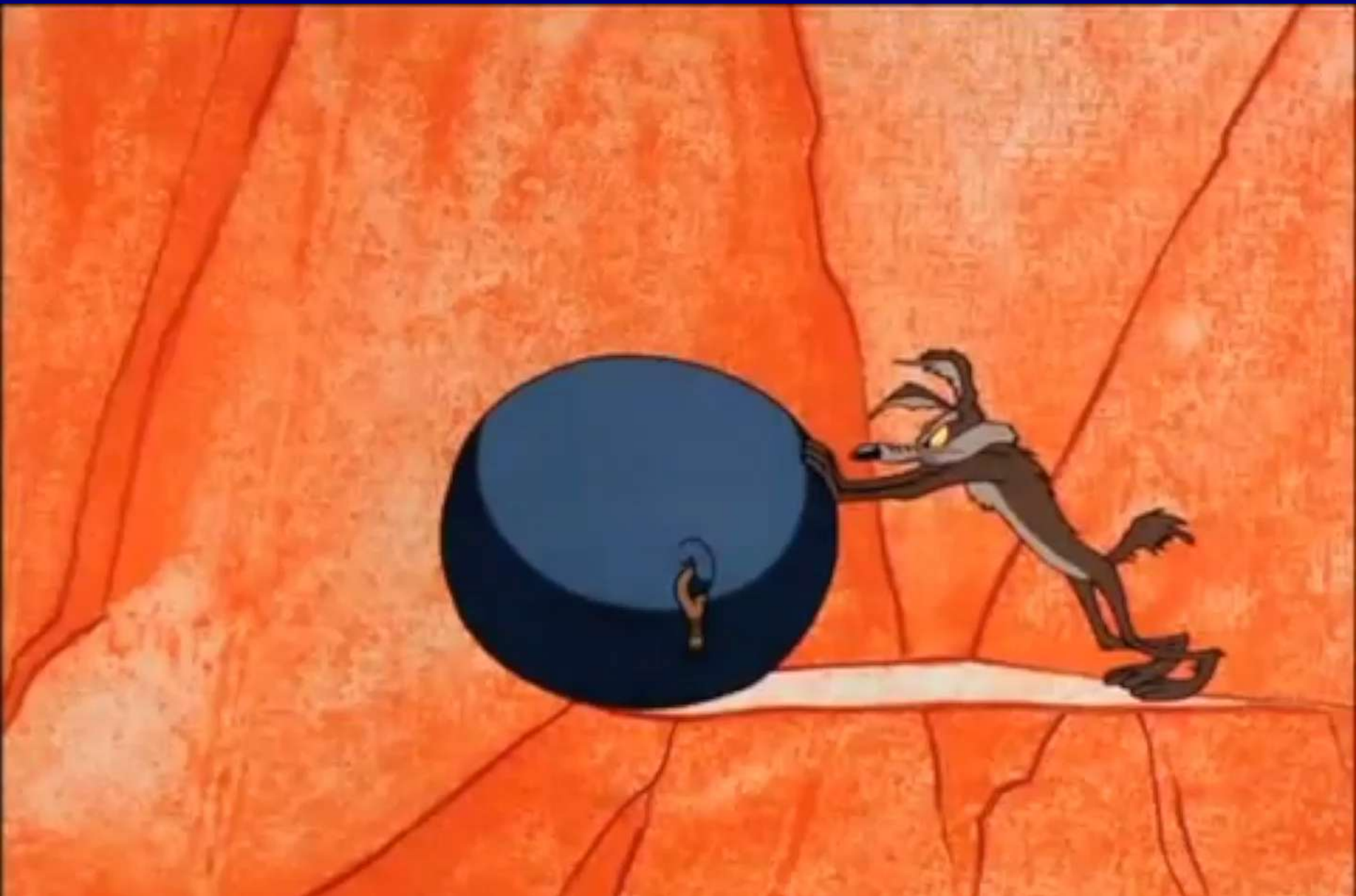
Spring Constant

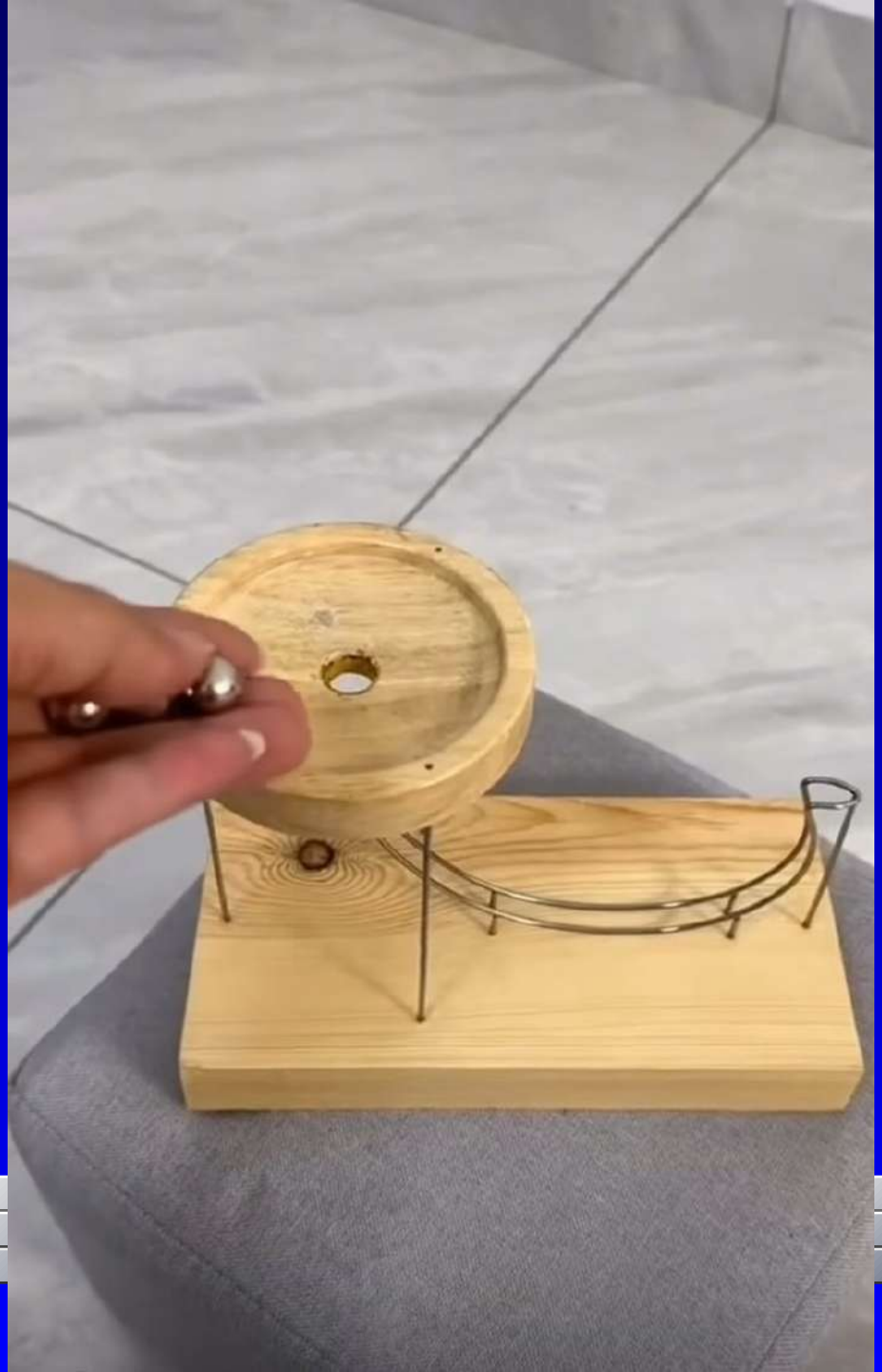
- k = spring constant
- Spring constant is how stretchy a spring is.
- Spring constant unit = N/m

5-3 Notes

Conservation of Energy

Is this possible?



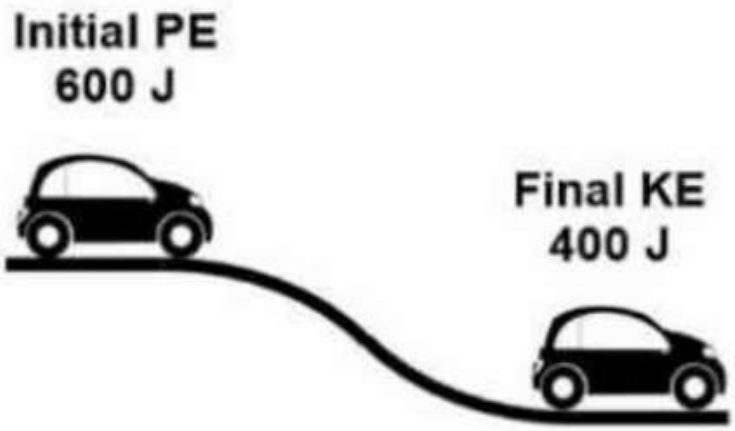


DEMO

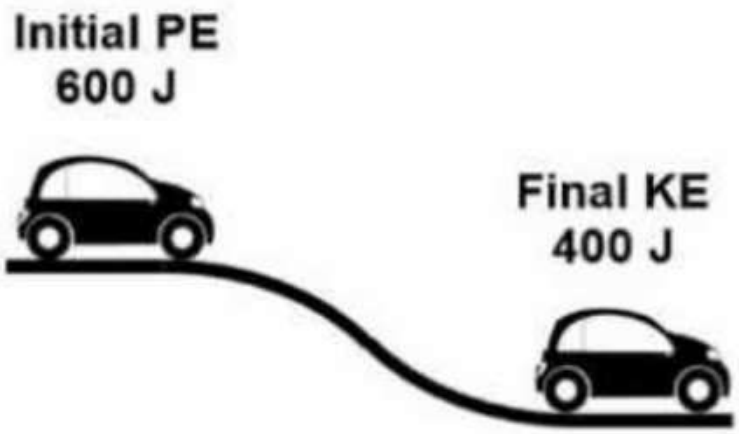
Energy cannot be CREATED

- Perpetual
- Infinite
- NOPE

A car at rest on the top of a hill has potential energy of 600 J. At the bottom of the hill, the car has 400 J of kinetic energy. How much energy was lost?



A car at rest on the top of a hill has potential energy of 600 J. At the bottom of the hill, the car has 400 J of kinetic energy. How much energy was lost?



Conservation of Energy

- Energy cannot be created or destroyed but can be changed.
- Where friction is involved, kinetic energy is not all converted to potential energy but some is lost to **heat** and **sound**.
- Car accident (lost to heat and sound)


DASH CAM
CENTRAL

- When we say something is conserved, we mean it remains constant.
- If we have a certain amount, we will have the same amount at a later time.
- This does not mean the quantity can't change forms though.
- How efficient something is shows how much energy is **NOT** lost.

(Output/Input)*100 = Efficiency

A pulley system is used to lift an engine. The operator has an input work of 2000 Nm. The work output of the pulley is 1800 Nm. Calculate the percent efficiency of the pulley system.

- ○ 20%
- ○ 90%
- ○ 50%
- ○ 111%

A pulley system is used to lift an engine. The operator has an input work of 2000 Nm. The work output of the pulley is 1800 Nm. Calculate the percent efficiency of the pulley system.

- ○ 20%
- ◉ 90%
- ○ 50%
- ○ 111%

Efficiency = output / input * 100

Efficiency = 1800/2000 * 100 =

.9 * 100 = 90

Energy Classification