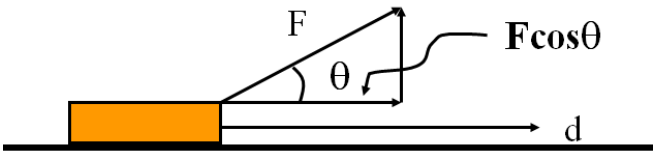
Noteguide for Work - Videos 5A **Name**_____

Work - Transfer of energy

Work = (Force)(Distance)

W = Fd cosθ



Example - Fred O'Dadark exerts 13.2 N on a rope that makes a 32^o angle with the ground, sliding a sled 12.5 m along the ground. What work did he do?

Work and Weight Example – Joe Dadi lifts a 5.0 kg mass 2.5 m. What work does he do?

W
F
d
m
μ

F = mg (lifting)
F = μmg (dragging)
W = Fd

Work and Friction Example – Herman Leftur drags a 150 kg sled 45 m across a lake where the coefficient of kinetic friction is 0.12. How much work does he do?

W
F
d
m
μ

F = mg (lifting)
F = μmg (dragging)
W = Fd

(Do the whiteboards on the back)

Whiteboards (simple work)

1. Jane Linkfence does 132 J of work lifting a box 1.56 m. What is the weight of the box? (What force did she exert?) (84.6 N)	2. Bob White does 2,345 J of work pushing a car with a force of 186 N of force. What distance did he push the car? (12.6 m)
3. Helena Handbasket brings a 5.2 kg box down from a 1.45 m tall shelf. What work does she do? (-74 J)	

Work and Weight:

4. Paul E. Wannacracker does 2375 J of work lifting what mass a height of 1.18 m? (205.4 kg)	5. Tubi O' Notubi does 137 J of work lifting a 5.25 kg mass to what height? (2.66 m)

Work and Friction:

6. Hugh Jazz drags a 125 kg sled with a coefficient of kinetic friction of .15 a distance of 34 m. What work does he do?	7. Seymour Butz does 1200 J of work dragging a 32 kg box with a coefficient of kinetic friction of .21 how far?

Noteguide for Power - Videos 5B **Name**_____

$$P = \frac{W}{t} \qquad P = Fv$$

A person does 48 J of work in 6.0 s. What is their power output?

My 30. HP van could go 25 m/s top speed. What was the force resisting its motion?
1 horsepower = 745.7 Watts, 1 kW = 1000 Watts

Whiteboards:

1. Joe Mama does 613 J of work in 2.13 seconds. What is his power output? (288 W)	2. Ima Wonder can put out 127 W of power. What time will it take her to do 671 J of work? (5.28 s)
3. What work does a 1.5 HP motor do in 1 minute? (P = 1.5x745.7 W) (67,113 J)	4. Bob N. Frappels slides a box with 43 N of force at a constant speed of 5.3 m/s. What is his power output? (230 W)
5. Frieda People can put out 430. W of power. With what speed can she push a car if it takes 152 N to make it move at a constant velocity? (2.83 m/s)	

Noteguide for Work and Power JAMBALAYA - Videos 5C Name_____

Work (J): W
Force (N): F
Distance (m): d
Mass (kg): m
Coeff. of Friction: μ
Power (W) : P
Time (s): t

Complex Power

Formulas:
F = mg (Lifting)
F = μmg (Dragging)
P = W/t (Power)
W = Fd (Work)

Example 1 - A 1.2 HP winch can lift a 2350 kg Land Rover up 14.5 m into a tree in what time? (1 HP = 745.7 W) (373.18 ≈ 370 s)

Work (J): W
Force (N): F
Distance (m): d
Mass (kg): m
Coeff. of Friction: μ
Power (W) : P
Time (s): t

Complex Power

Formulas:
F = mg (Lifting)
F = μmg (Dragging)
P = W/t (Power)
W = Fd (Work)

Example 2 - Gumi Baere drags a 45.1 kg box that has a coefficient of friction between it and the floor of .34 a distance of 16 m in 11.7 seconds. What is her power output? (205.5 ≈ 210 W)

(do the whiteboards on the back)

Whiteboards:

What must be the power rating of a motor if it is to lift a 560 kg elevator up 3.2 m in 1.5 seconds?

Formulas:
F = mg (Lifting)
F = μmg (Dragging)
P = W/t (Power)
W = Fd (Work)

Work (J): W
Force (N): F
Distance (m): d
Mass (kg): m
Coeff. of Friction: μ
Power (W) : P
Time (s): t

11700 W

A 0.75 HP winch can lift a car 5.2 m in 37 seconds. What must be the mass of the car? 1 HP = 745.7 W

Formulas:
F = mg (Lifting)
F = μmg (Dragging)
P = W/t (Power)
W = Fd (Work)

Work (J): W
Force (N): F
Distance (m): d
Mass (kg): m
Coeff. of Friction: μ
Power (W) : P
Time (s): t

406 kg

Red Elk leads a dog team that can put out 2.5 kW of power. They skid a 312 kg sled a distance of 340 m in 93 seconds. What must be the coefficient of friction?

Formulas:
F = mg (Lifting)
F = μmg (Dragging)
P = W/t (Power)
W = Fd (Work)

Work (J): W
Force (N): F
Distance (m): d
Mass (kg): m
Coeff. of Friction: μ
Power (W) : P
Time (s): t

0.22

A 150 HP tractor can drag a 350 kg load how far in a minute if the coefficient of friction between the load and the ground is 0.78. 1 HP = 745.7 W

Formulas:
F = mg (Lifting)
F = μmg (Dragging)
P = W/t (Power)
W = Fd (Work)

Work (J): W
Force (N): F
Distance (m): d
Mass (kg): m
Coeff. of Friction: μ
Power (W) : P
Time (s): t

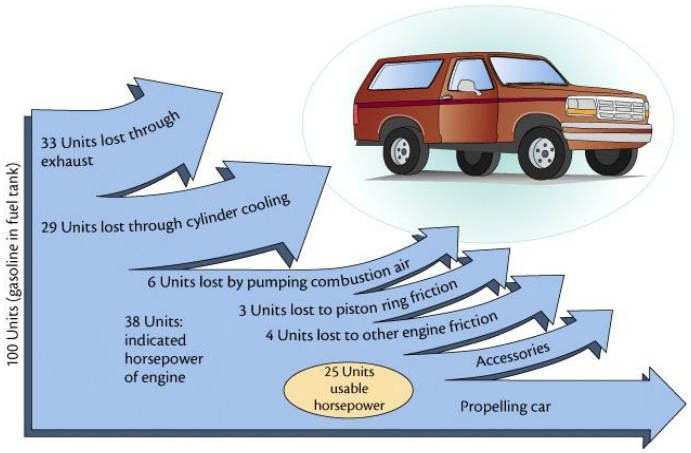
2500 m

Noteguide for Efficiency - Videos 5D **Name**_____

$$e = \frac{W_o}{W_i} = \frac{P_o}{P_i}$$

- W_o - Work output
- W_i - Work input
- P_o - Power output
- P_i - Power input

Example - 1 HP motor consumes 815 W of power



Whiteboards:

1. A motor consumes 425 J of energy and does 300 J of work. e = ? (0.71, or 71%)	2. A person is 13% efficient. How much food energy to do 600. J of work? (4615 J)
3. A 60.% efficient heater uses 800. J of energy. What is its heat output? (480 J)	4. A car is 25% efficient. What energy input does it need to climb a 320 m tall hill if its mass is 1200 kg? (15,052,800 J) (Hint - Wo = (F)d = (mg)h)

Noteguide for Energy - Videos 5E **Name**_____

Energy - the ability to do work.

1.
2.
3.
4.

(Come up with a type of energy that you feel is not nuclear, and I will try to show that it is in class...)

Your example:_____

Electromagnetic – Energy of photons. (Einstein, big bang)

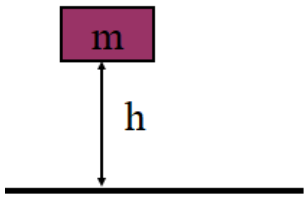
Potential - Energy of position. Stored energy.
Examples: Gravitational, chemical, springs

Kinetic - Energy of motion.
Examples: Baseballs, hammers

Thermal - Random potential and kinetic energy of molecules and atoms.
Examples: Hot stuff

Noteguide for Gravitational Potential Energy - Videos 5F Name_____

Gravitational Potential Energy



PE= mgh

PE- gravitational potential energy
h - Change in height
m - Mass
g - 9.8 N/kg on Earth

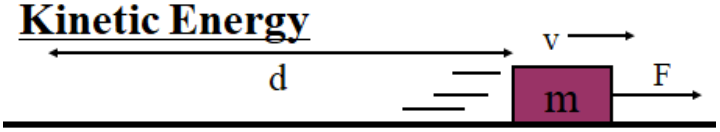
Example: What is the Potential Energy of a 5.0 kg mass 2.1 m from the ground?

Whiteboards:

1. What is the potential energy of a 4.5 kg bowling ball, 13.5 cm above the ground? (5.953 J)	2. Toby Continued lifts a 75.0 kg box doing 1573 J of work. What is the change in height of the box? (2.14 m)
3. Colin Host lifts himself up 15 m doing 9555 J of work. What is his mass? (65 kg)	

Noteguide for Kinetic Energy - Videos 5G **Name**_____

Kinetic Energy



$KE = {}^1/_2 mv^2$

KE - Kinetic energy

v - velocity

m - mass

Example: What is the kinetic energy of a 4.20 g bullet going 965 m/s? (units?)

Whiteboards:

1. Ex1 - What speed must a .563 kg hammer move to store 34 J of energy? (11 m/s)	2. Ex2 - A European swallow has 2.055 J of kinetic energy when it is flying at 14.23 m/s. What is its mass in grams? (0.020297 kg, 20.3 g)
3. Ex3 - A 4.0 kg shot is sped up from 6.0 m/s to 9.0 m/s. What is the change in kinetic energy? (90 J) - (calculate two KEs and subtract)	

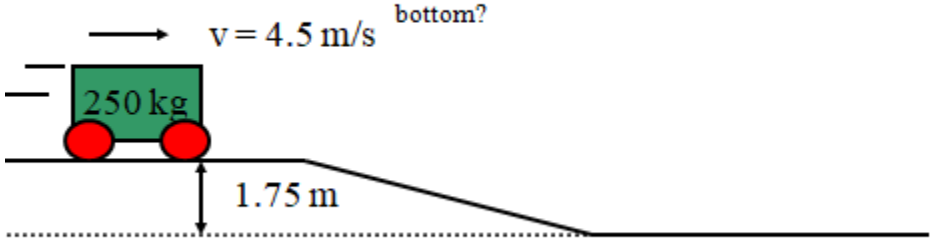
Noteguide for Conservation of Energy - Videos 5K **Name**_____

Conservation of Energy

Total Energy before = Total Energy After
Comes from = Goes to
Assets = Expenditures

$Fd + mgh + {}^1/_2mv^2 = Fd + mgh + {}^1/_2mv^2$

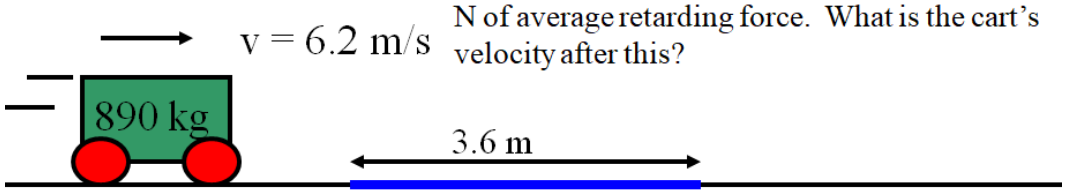
A 250 kg cart going 4.5 m/s rolls down a 1.75 m tall hill. What is the velocity of the cart at the bottom?



$Fd + mgh + {}^1/_2mv^2 = Fd + mgh + {}^1/_2mv^2$

Example 1

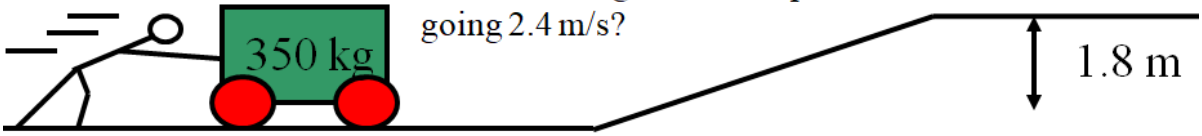
An 890 kg cart rolling 6.2 m/s along a level surface hits a 3.6 m long puddle that exerts 3200 N of average retarding force. What is the cart's velocity after this?



(Puddle - Exerts 3200 N of retarding force)

Example 2

u = 4.6 m/s



A 350 kg cart is going 4.6 m/s. For what distance must a person exert a forward force of 53 N so that when the cart gets to the top of a 1.8 m tall hill it is going 2.4 m/s?

Example 3

A 0.124 kg pine cone falls 45.0 m from a tree. It is going 22.0 m/s when it strikes the ground. What is the average force of air friction that acts on the pine cone as it falls?