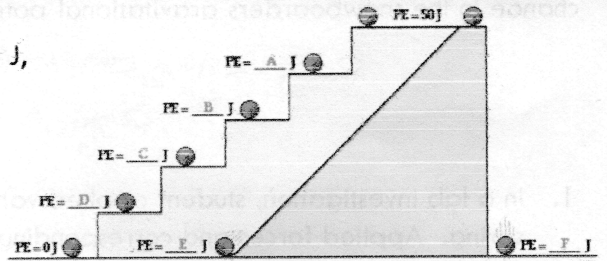


Potential Energy Homework -

Name: _____

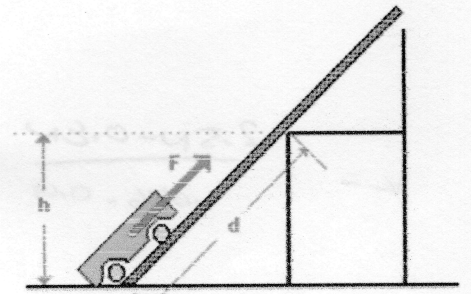
Use this principle to determine the blanks in the following diagram.

Knowing that the potential energy at the top of the tall platform is 50 J, what is the potential energy at the other positions shown on the stair steps and the incline?



- A PE = 40 J
- B PE = 30 J
- C PE = 20 J
- D PE = 10 J
- E PE = 0 J

A cart is loaded with a brick and pulled at constant speed along an inclined plane to the height of a seat-top. If the mass of the loaded cart is 3.0 kg and the height of the seat top is 0.45 meters, then what is the potential energy of the loaded cart at the height of the seat-top?



$$PE = mgh$$

$$= (3 \text{ kg})(9.8)(0.45) = 13.2 \text{ J}$$

If a force of 14.7 N is used to drag the loaded cart (from previous question) along the incline for a distance of 0.90 meters, then how much work is done on the loaded cart?

$$W = Fd \cos \theta$$

$$W = (14.7)(0.9)(\cos \theta) = 13.2 \text{ J}$$

1. Determine the kinetic energy of a 625-kg roller coaster car that is moving with a speed of 18.3 m/s.

$$KE = \frac{1}{2}mv^2 = \frac{1}{2}(625)(18.3)^2$$

$$= 1.05 \times 10^5 \text{ J}$$

2. If the roller coaster car in the above problem were moving with twice the speed, then what would be its new kinetic energy?

$$KE = \frac{1}{2}mv^2 = \frac{1}{2}(625)(36.6)^2 = 4.19 \times 10^5 \text{ J}$$

3. Missy Diwater, the former platform diver for the Ringling Brother's Circus, had a kinetic energy of 12 000 J just prior to hitting the bucket of water. If Missy's mass is 40 kg, then what is her speed?

$$KE = \frac{1}{2}mv^2 =$$

$$\sqrt{v^2} = \sqrt{\frac{2KE}{m}} = \sqrt{\frac{2(12000)}{40}} = 24.5 \text{ m/s}$$

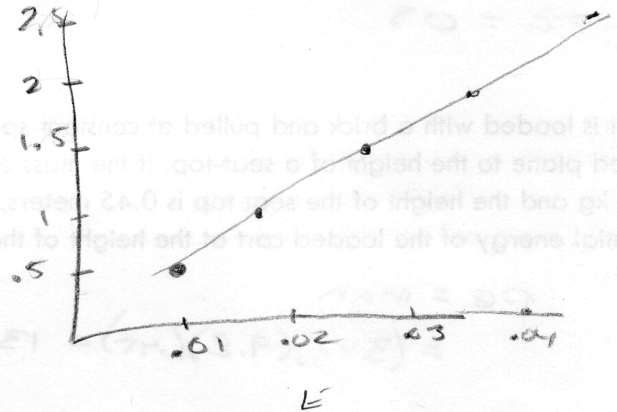
While riding a chairlift, a 55kg snowboarder is raised a vertical distance of 370 meters. What is the total change in the snowboarder's gravitational potential energy?

$$PE_g = mg\Delta h = (55)(9.8)(370) = 2 \times 10^5 \text{ J}$$

- In a lab investigation, student applied various downward forces to a vertical spring. Applied forces and corresponding elongations of the spring from are recorded.
- Construct a graph - marking appropriate axis. Plot data points and draw best fit line or curve. Then calculate spring constant.

Force (newtons)	Elongation (meters)
0	0
0.5	0.010
1.0	0.018
1.5	0.027
2.0	0.035
2.5	0.046

$$k = \frac{2.5 \text{ N} - 0.5 \text{ N}}{0.046 - 0.01} = 55 \text{ N/m}$$



- An unstretched spring has a length of 10 centimeters. When the spring is stretched by a force of 16 N, its length is increased to 18 centimeters. What is the spring constant?

$$F_s = k|\Delta x|$$

$$k = \frac{|F|}{|\Delta x|} = \frac{16}{8} = 2 \text{ N/m}$$

- A pop-up toy has a mass of 0.020 kilogram and a spring constant of 150 newtons per meter. A force is applied to the toy to compress the spring 0.050m.
 - Calculate the potential energy stored in the compressed spring.
 - The toy is activated and all the compressed spring's potential energy is converted to gravitational potential energy. Calculate maximum height to which toy is propelled.

$$PE = \frac{1}{2} kx^2 = \frac{1}{2} (150)(0.05)^2 = 0.1875 \text{ J}$$

$$PE_g = mg\Delta h$$

$$\Delta h = \frac{PE}{mg} = \frac{0.1875}{(0.02)(9.8)} = 0.96 \text{ m}$$

