

$PE = \frac{1}{2} kx^2$

When a 13.2-kg mass is placed on top of a vertical spring, the spring compresses 5.93 cm. Find the spring constant of the

$F_s = -kx$ 2200 N/m

If a spring has a spring constant of 400 N/m, how much work is required to compress the spring 25.0 cm from its undist

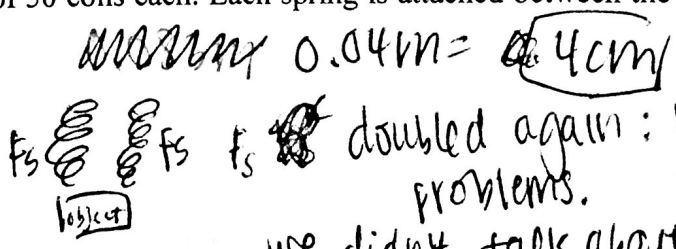
~~work~~ $PE = W = \frac{1}{2} (400 \text{ N/m}) (0.25 \text{ m})^2$
 $= 12.5 \text{ J}$

3. A compressed spring that obeys Hooke's law has a potential energy of 18 J. If the spring constant of the spring is 1000 N/m , find the distance by which the spring is compressed.

$\sqrt{0.09 \text{ m}^2} = 0.3 \text{ m} = 30 \text{ cm}$

4. An object is attached to the lower end of a 100-coil spring that is hanging from the ceiling. The string stretches by 0.04 m. If the string is then cut into two identical springs of 50 coils each. Each spring is attached between the ceiling and the object. By how much do the springs stretch?

$\frac{1}{2}$ coils = double K
 = double F_s



$(F_s = -kx)$
 Power ($P = W/t = KE/t = PE/t$)

is done on your car by applying 200 N of force a distance of 12 m in 2 minutes

Kinetic Energy ($KE = \frac{1}{2}mv^2$), $W = \Delta KE$

1. A car with occupants has a mass of 1000-kg. If it is going 30m/s, what is its kinetic energy?

$$450,000 \text{ J}$$
$$(4.5 \times 10^5 \text{ J})$$

3. A car with occupants has a mass of 1000-kg. If it accelerates from 70 to 100 m/s, how much kinetic energy is added to the car?

$$2,550,000 \text{ J}$$

$$(2.55 \times 10^6 \text{ J})$$

work

4. How much kinetic energy must be removed from the 1000-kg car that is going 20 m/s in order to make it stop? How much for the same car going 40 m/s or 60 m/s?

a) $200,000 \text{ J}$ ($2 \times 10^5 \text{ J}$)

b) $800,000 \text{ J}$ ($8 \times 10^5 \text{ J}$)

c) $1,800,000 \text{ J}$ ($1.8 \times 10^6 \text{ J}$)

5. A 70-kg man is falling at 70 m/s. How much kinetic energy is that?

$$1.7 \times 10^5 \text{ J}$$

6. How much work is required to accelerate a 1000 kg car from 20 m/s to 30 m/s?

$$2.5 \times 10^5 \text{ J}$$

Potential Energy ($PE = mgh$)

1. An apple has a mass of 0.40 kg and is hanging 3 meters above the ground. What is its potential energy?

$$12 \text{ J}$$

2. A 100 kg object is pulled vertically upward 5.0 m by a rope. Find the work done by the tension force in the rope.

$$5000 \text{ J}$$

3. How much work is done by a crane lifting a 200.0 kg crate from the ground to a floor 21.0 m above the ground? What is the change in gravitational potential energy of the crate?

$$42,000 \text{ J}$$

4. A 25.6 kg child pulls a 4.81 kg toboggan up a hill inclined at 25.7° to the horizontal. The vertical height of the hill is 27.3 m. Friction is negligible. Determine the change in potential energy of the toboggan.

$$1300 \text{ J}$$

5. A 1000-kg cart of a rollercoaster is pushed with up a 50-m incline. There is a change of 30-m in height. How much potential energy was added to the cart?

$$294,000 \text{ J}$$