Answer Key Pd 1

Work & Energy Test

AT Work and Energy (18)

Directions: Solve the following problem. Show all work. Be neat. Your solution should mathematically read like an essay.

1) A 45 kg cart with frictionless wheels is up a 35m long ramp to a height of 4 m. How much work was done to pull the cart up the ramp.

$W = PE = mgh$

$W = (45kg)(9.8 m/s^2)(4m)$

$W = 1764 J$

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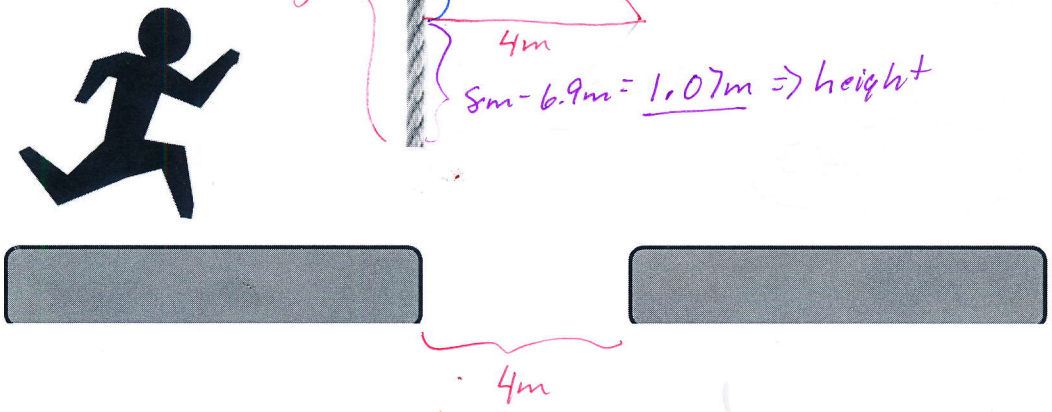
2) A person is looking to run fast, grab a rope as shown in the diagram, and swing across the ravine. The ravine is 4 m wide and spans a 12 m deep pit filled with hungry alligators. The rope is 8 m long. Determine how fast the person would need to run to ensure they make it across the ravine (When they let go of the rope, they are on the other side of the ravine). The person has a mass of 72kg.



$x^2 + 4m^2 = 8m^2$

$x = 6.9m$

$8m - 6.9m = 1.07m \Rightarrow$ height

$PE = KE$

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

$\sqrt{2gh} = v$

$\sqrt{(2)(9.8m/s^2)(1.07m)} = 4.5 m/s$

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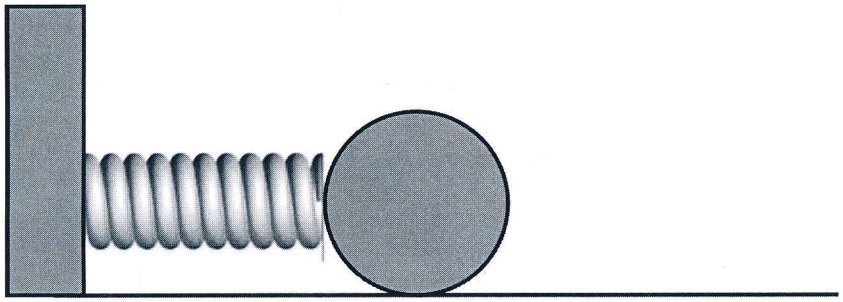
3) A 0.004 kg ball is compressed against a spring that has a rate of 194N/m. The spring is compressed 32cm. How fast will the ball be traveling when it leaves the spring?



Work To Compress = PE of Spring = KE of Ball

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

$Kx^2 = mv^2$

$\sqrt{\frac{Kx^2}{m}} = v = \sqrt{\frac{(194\,N/m)(.32m)^2}{.004kg}}$ ~~45 m/s~~

70.5 m/s

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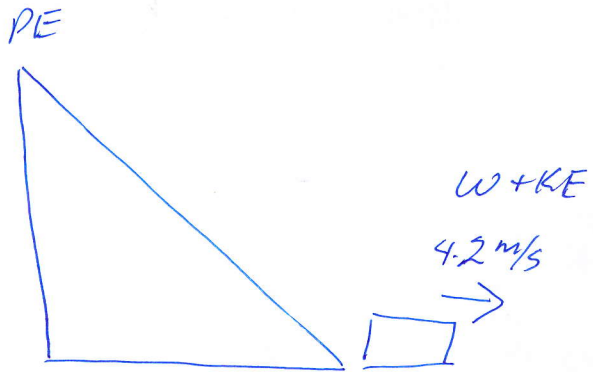
1 kg

4) A box slides down a 4 m long ramp that is 2 m high. At the bottom of the hill, the box was sliding at 4.2 m/s. Determine the average force of friction acting on the box as it slid.



$PE = W + KE$

$mgh = Fx + \frac{1}{2}mv^2$

$$\frac{mgh - \frac{1}{2}mv^2}{x} = F$$

$$\frac{m(gh - \frac{1}{2}v^2)}{x} = F$$

$$\frac{(1kg)\left[(9.8 m/s^2)(2m) - \left(\frac{1}{2}\right)(4.2 m/s)^2\right]}{4m} = 2.695 N$$

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5) A 12 kg cart is moving along at 4 m/s. If the "brakes" on the cart provide a total of 26 N of friction, determine the stopping distance of the cart.

$W = KE$

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

$x = \frac{\frac{1}{2}mv^2}{F}$

$x = \frac{(12\,kg)(4\,m/s)^2}{(2)(26\,N)}$

$x = 3.7\,m$

6) A 12 kg cart is moving along at 8 m/s. If the "brakes" on the cart provide a total of 26 N of friction, determine the stopping distance of the cart.

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

$$x = \frac{mv^2}{2F} = \frac{(12\,kg)(8\,m/s)^2}{2(26\,N)}$$

$$x = 14.7\,m$$

4x #5