Hello!

- Please take a moment to check the homework problems on either side of the room.
- I will take requests for one problem to be solved.
- I can do more if time permits at the end of the period.

Requested Homework

Today

- Conservation of energy.
- Kinetic and potential energy.
- Power.

Homework:
Conservation of Energy WS
~~Power WS~~

Potential Energy

- We know GPE is mgh.
- We can relate this to kinetic energy.
- If we know how much energy is put into a system by raising it a certain distance, the same amount of energy is released when the object returns to it's original position.

You put a 1kg ball on top of a 10m building and then drop it. How fast is it going when it hits the ground?

- Gravitational Potential energy is mgh. This is kgm^2/s^2.
- How much energy is in the system when it hits the ground?
- How fast it is going?

Kinetic Energy

- Energy an object has when moving.
- Just as forces cause accelerations, objects with mass and velocity have energy.
- KE = (1/2)mv^2

J kg m/s

Potential and Kinetic Energy

- Energy is neither created nor destroyed.
- If a system's potential energy is released in the form of kinetic energy, the two values are equal.
- Energy in = energy out.

You put a 1kg ball on top of a 10m building and then drop it. How fast is it going when it hits the ground?

- What is the potential energy of the system? $mgh = 98\,j$
- If the ball is dropped and all of the potential energy is converted to kinetic energy, what is the velocity of the ball as it hits the ground. $14\,m/s$
- GPE=KE=(1/2)mv^2.

You put a 1kg ball on top of a 10m building and then drop it. How fast is it going when it hits the ground?

- GPE=KE=(1/2)mv^2.

Do Now:

1) Calculate the GPE of the ball.

2) Calcuate the velocity of the ball just before it hits the ground using KE=1/2mv^2.

3) Calcuate the velocity of the ball just before it hits the ground using kinematics.

Roller Coaster Physics

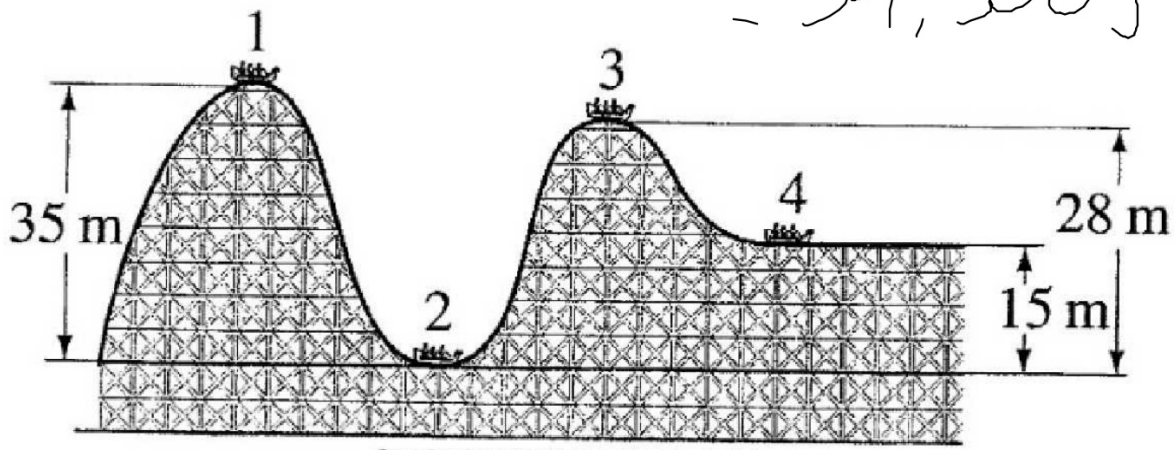
- Gravitational Potential Energy is converted into Kinetic Energy.
- mgh = (1/2)mv^2.
- Ignore air resistance and other dissipating forces.

100 kg

A roller coaster climbs from ground level to 35m above the ground where it is essentially stopped. What is it's Gravitational Potential Energy?

$GPE = mgh = 100kg \cdot 35m \cdot 9.8\ m/s^2$

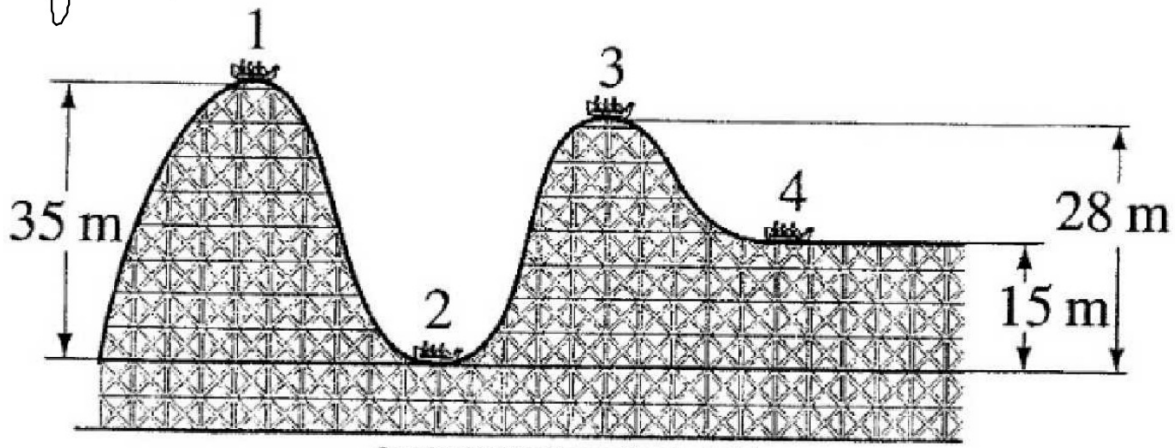
$= 34,300\ j$



A roller coaster climbs from ground level to 35m above the ground where it is essentially stopped. Find the velocity of the coaster at point 2.

$$KE = \frac{1}{2} m v^2 \Rightarrow v^2 = \frac{2KE}{m}$$

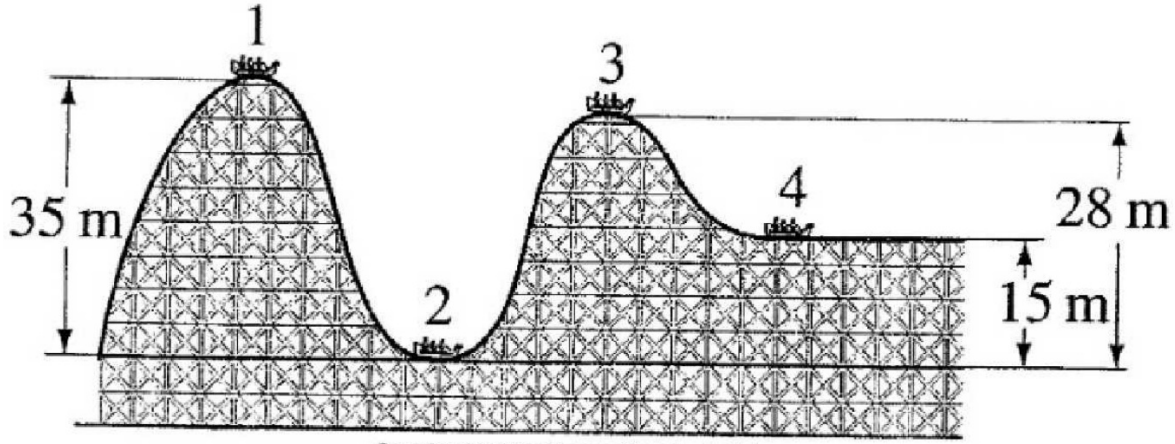
$$v = \sqrt{\frac{2KE}{m}} = 26.2 \text{ m/s}$$



A roller coaster climbs from ground level to 35m above the ground where it is essentially stopped. Find the velocity of the coaster at point 3.

$KE = 6860\,J$ $\quad KE = \frac{1}{2}mv^2$

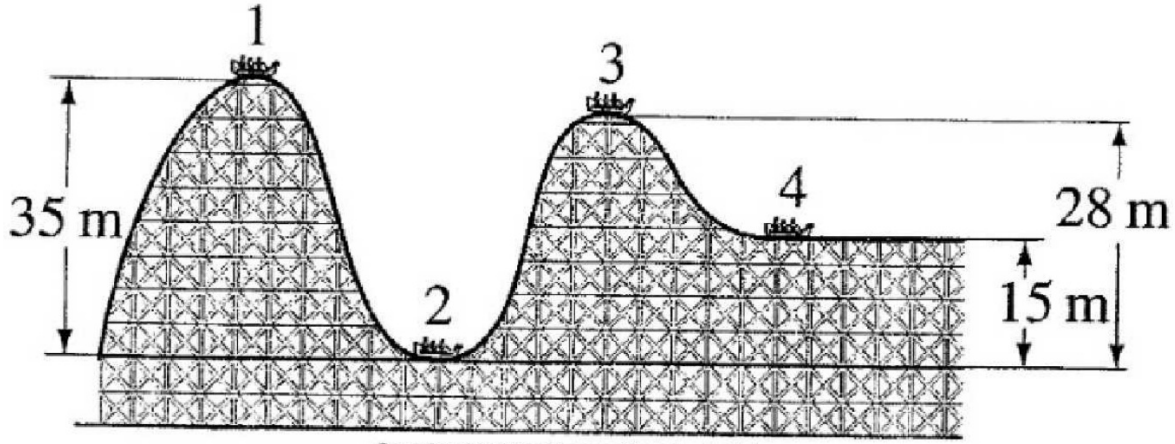
$$v^2 = \frac{2KE}{m} \Rightarrow v = \sqrt{\frac{2KE}{m}} = 11.7\ m/s$$



A roller coaster climbs from ground level to 35m above the ground where it is essentially stopped. Find the velocity of the coaster at point 4.

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

$v = \sqrt{\frac{2KE}{m}} = 19.8\ m/s$



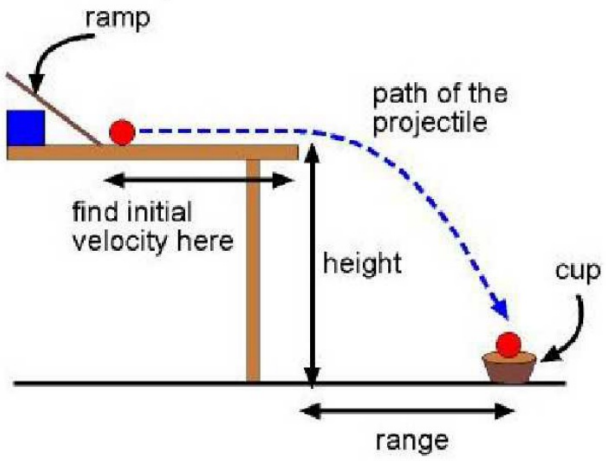
A skateboarder is going 11.2m/s across the ground when a ramp turns him upward. How high up the wall does he go?

$$KE = GPE$$

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

$$\frac{\frac{1}{2}v^2}{g} = \frac{gh}{g} \Rightarrow h = 6.4\,m$$

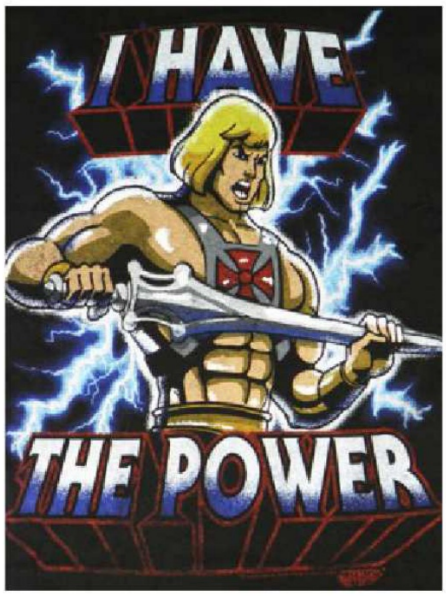
A ball is released and rolled down a ramp. It then rolls across a flat table and off the edge. If falls a height of 1m and hits a cup 0.75m away. What is the height of the top of the ramp tot he table?



Determine the enery of the ball as it hits the ground. Observe the motion.
-How can I determint the horizontal speed of the ball when it is released from the table?
-How can I determine the vertical speed wher it hits the ground?
-How can I determine the total speed of the ball?

Power: energy/time

- You need more power to move something more quickly.
- Think stronger acceleration means more force.



Say Watt??

- Watt [W]: unit of power.
- W=J/s [joules per second]
- Also work/time

Watt's more powerful: a person who can lift 50kg 1m in 2 seconds or a person who can lift 150kg 4m in 20 seconds?

$$\frac{150\text{kg} \cdot 9.8\,\text{m/s}^2 \cdot 4\text{m}}{20\text{s}}$$

$$294\text{W}$$

A hair dryer on high consumes about 1440 watts of power. How long could you use a 30 watt light bulb with the power needed to blow dry hair for 5 minutes?

$HD: 1440\frac{J}{s} \cdot 300s$

$= 432{,}000j$

$SP = \frac{J}{s}s \Rightarrow \frac{SP}{P} = \frac{J}{P}$

$14{,}400s = 4hrs$

Horse Power: hp

- Unit of power.
- 1 hp = 746 W.
- Imperial system of measurement.
- Also 33,000 ft pounds/min.

How fast can a 55 hp engine lift a 400kg hot tub to my 85m penthouse condo?

Quest: You have the reamiander of the class to work on Quest.

Please ask questions about material.