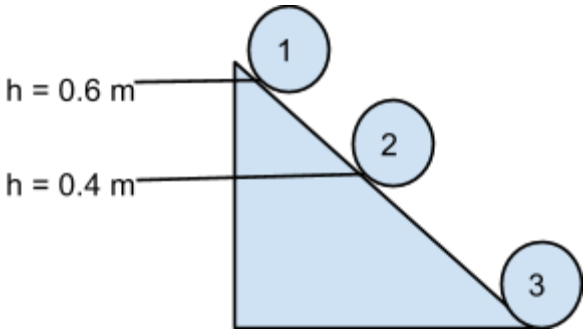
Energy tables

1. Fill in the heights given in the picture for each point. The first row of your table should now be full.
2. Fill in the velocity at point 1.
3. Use the appropriate height, mass and potential energy equation (GPE = mgh) to calculate and fill in GPE at each point. Remember g = 10 m/s^2 on earth. The 2nd row of your table should now be full.
4. Use the mass and velocity from point 1 to calculate and fill in the kinetic energy (KE = ½ mv^2) at point 1.
5. For point 1, add the KE and GPE from that row to calculate Mechanical Energy. Mechanical energy is total energy.
6. **In a closed system (ex. no friction) mechanical/total energy remains constant!** Copy the ME you calculated for point 1 into every box in the ME row. The final row of your table should be full and every box in that row should have the same number.
7. Since ME = GPE + KE, KE = ME - GPE. Use this information to calculate and fill in the kinetic energy at all points (i.e. by subtracting the GPE you calculated from the ME you know is present everywhere.) The 4th row of your table should now be full.
8. Use the KE you found for each point and the KE equation (KE = ½ mv^2) to calculate the velocity at each point. Remember basic algebra rules: get v^2 on one side of the equation and square root in the end.

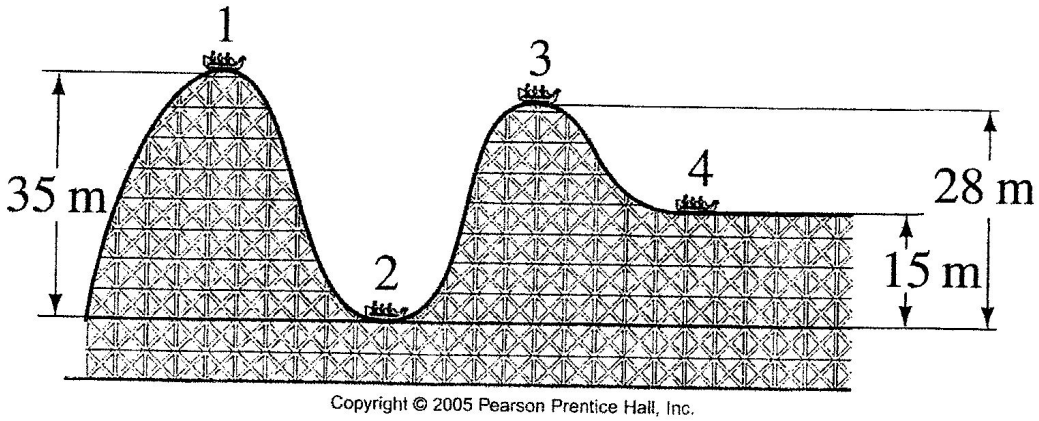
Question A: Assume the initial velocity at point 1 is 0 m/s and the mass of the marble is 0.05 kg. Fill in the energy table below.



Point	1	2	3
height			
GPE			
velocity			
KE			
ME = KE +GPE			

Use this space for scratch work/calculations:

Question B: Assume the initial velocity at point 1 is 0 m/s and the mass of the roller coaster car is 25 kg. Fill in the energy table below.



Point	1	2	3	4
height				
GPE				
velocity				
KE				
ME = KE +GPE				

Use this space for calculations:

Question C: Use the same roller coaster picture as Question C. This time, assume the initial velocity at point 1 is 4 m/s and the mass of the roller coaster car is 25 kg. Fill in the energy table below.

Point	1	2	3	4
height				
GPE				
velocity				
KE				
ME = KE +GPE				

Use this space for calculations:

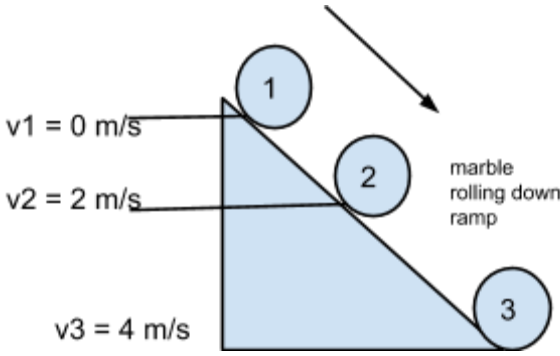
Now you are going to fill in an energy table for situations where velocity is given but heights are not. The big ideas are the same, but the order of steps is a little different. It's

OK if you struggle a little at first! Just remember…

- **Total Mechanical Energy is the same everywhere!**
- **KE = ½ mv^2**
- **GPE = mgh**
- **ME = KE + GPE**
- **g = 10 m/s^2 on earth**

Question D: Assume the initial velocity at point 1 is 0 m/s and the mass of the marble is 0.05 kg. Fill in the energy table below.

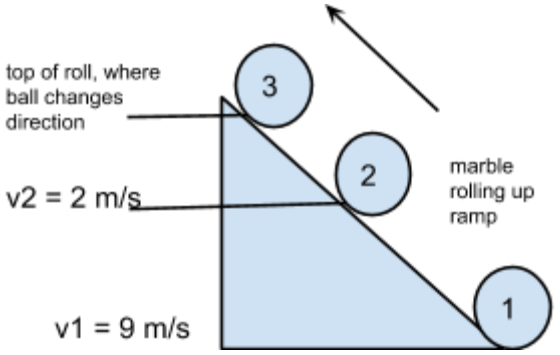
Point	1	2	3
height			
GPE			
velocity			
KE			
ME = KE +GPE			



Use this space for scratch work/calculations:

Question E: Now the marble is given a push up the ramp. It rolls up, slowing down as it moves higher, and then comes to a stop and rolls back down. Assume the initial velocity at point 1 is 9 m/s and the mass of the marble is 0.05 kg. Fill in the energy table below.

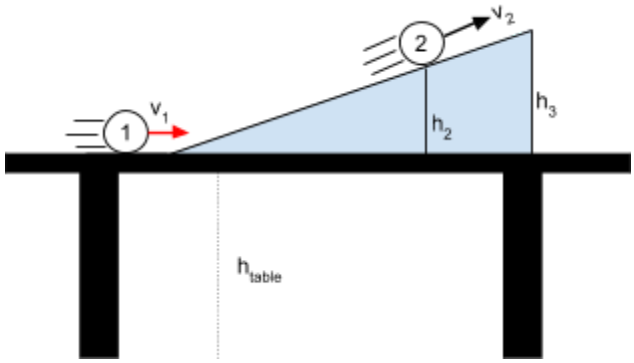
Point	1	2	3
height			
GPE			
velocity			
KE			
ME = KE +GPE			



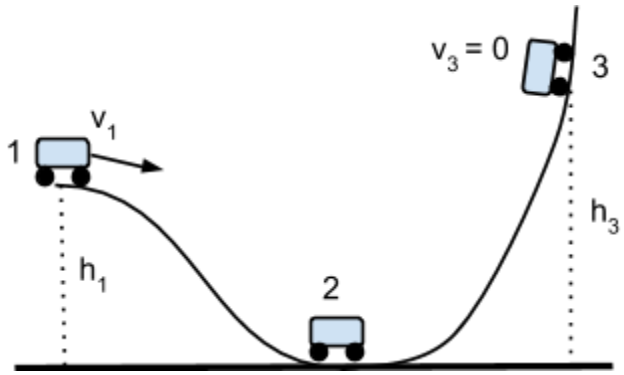
Use this space for scratch work/calculations:

The following problems don't have numbers of energy tables. You may use energy tables to solve them, or start with E1 = E2 and go from there.

F. A marble rolls up onto a ramp as shown in the drawing to the right. Determine an equation for h_2 in terms of v_1, v_2, and g.



G. Assume the cart with mass *m* shown is isolated from its environment. It is moving at v_1 at point 1, rolls down the hill to point 2, then up the next hill to a stop at point 3. Find the following:



a. Determine an equation for v_2 in terms of v_1, h_1, and g.	b. Determine an equation for h_3 in terms of v_1, h_1, and g.