1. Juliette (m = 59.0 kg) uses a giant kite to pull herself along a smooth surface. A s she approached a ramp, she gains a speed of 11.3 before letting go of the kite and launching off the skate ramp. Using ENERGY equations calculate how high above the ramp she goes (*Hint: use the top of the ramp as h1 = 0 m*).
2. The Swedish Koenigsegg supercar CCR is the second most powerful series-produced car today. It is 1,180 kg of raw power! Gus is an extreme test car driver and finds out that this car can go from 0-100 mph (0 - 44.7) in 7.90 seconds.
   1. How much kinetic energy does the car have at the end of 7.90 seconds?
   2. How far does the car travel in the 7.90 seconds assuming a uniform acceleration? *(Hint: You need to go back to your Unit 2 motion equations for this!)*
3. Now suppose that Shawn (mass = 75 kg) decides to head over to the local ski jump. He takes the lift up and gets ready to jump as shown.



**A**

**B**

**C**

**100.0 m**

**30.0 m**

**EK = 15,000 J**

* 1. What is Shawn’s potential energy, kinetic energy and mechanical energy at points A, B and C?
  2. How fast is Shawn going at point B?
  3. If Shawn’s kinetic energy is 15,000 J at point C, how high up from the baseline level is he?

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1. Lassie is trying to solve a crash case by using crash test data. A car (mass = 1200 kg) is crash tested against a rigid wall. The car is accelerated from rest by a cable underneath it; just before impact the kinetic energy of the car is 7500 J. The car’s “crumple zone” crumples up 2.3 meters upon impact.
   1. Calculate the velocity of the car before impact.
   2. If the average impact force is 3300 N, calculate (using impulse equations) the time it took the car to stop.
   3. How is momentum conserved in this case? How is energy conserved?
2. **CHALLENGE PROBLEM!!** *(Hint, break the initial velocity vector into a horizontal and a vertical velocity, before you solve this problem.)*

Henry is watching the Billiard Championships on ESPN18. A top down view shows 2 billiard balls (each with a mass = 0.400 kg), Ball A (dark) is at rest and Ball B (light) has a velocity of 2.00 at 45° to the horizontal.

**2.00**

**45°**

After the collision, Ball A is moving at 1.41 and the balls are moving at a right angle to each other as shown below:

**1.41**

Calculate the resulting velocity of Ball B.

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