

Practice goalless problems

Take a look at the posted guidelines for goalless problems on MyPoly before tackling these. Remember that your task is to think about the situation big picture first – what would be interesting or useful to calculate or find out? – then use your physics knowledge from each unit to analyze the situation. Sample solutions will be shared in class/posted on MyPoly before the block days.

Problem A

Tammy and Timmy are headed to Chipotle for a physics review session, and get there early. They love their spicy food and so after ordering their burritos, they go to see how many Tabasco bottles are available. However, the day before, students from another high school had a contest to see how many Tabasco bottles they could steal (they are terrible students) from Chipotle. They were nice enough, however, to leave one bottle left for all of the customers. Now since Tammy and Timmy love their burritos so spicy, they decide to take the bottle to their table. The bottle weighs 2.94 N and has a coefficient of friction of 0.019 with the table they are sitting at. Tammy and Timmy sit across from one another at a table that is 2.37 m long. Tammy is currently drizzling the Tabasco sauce on her burrito when Timmy asks for it. She starts pushing (not rolling) the bottle from her edge of the table with a force of 1.67 N and stops pushing when it reaches a velocity of 0.95 m/s (this was not a conscious decision, it just happened to occur this way).

Problem B

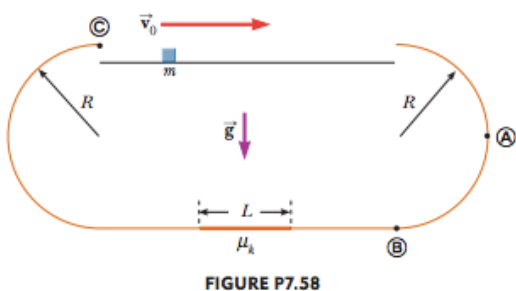


FIGURE P7.58

A small block of mass $m = 0.50$ kg is fired with an initial velocity $v_0 = 4.0$ m/s along a horizontal section of frictionless track as shown. The block then slides along the *vertical*, frictionless semicircular track of radius $R = 1.5$ m (through point A towards point B), until it reaches the level bottom portion of the track. A small section of length $L = 0.40$ m provides a friction force of 0.83 N before the track becomes frictionless again and the object slides towards point C.

Problem C

Theo has a little brother named Bruce. For fun, Theo rides Bruce around the neighborhood in a red wagon because he likes to feel like he's riding in a fire truck (Theo is a very nice older brother). Bruce and the red wagon have a combined weight of 117.72 N and Theo pulls the red wagon at an angle of 24.7 degrees. Theo pulls his brother with a force of 6.91 N until he reaches a speed of 3.83 m/s and then he lets Bruce fly like the wind. The coefficient of friction between the wagon and the ground is 0.0035, and there is a cross street 245 m away from where Theo began to pull Bruce from rest.

Problem D

A new event at the Winter Olympics in Sochi is uphill log pulling. This event requires athletes to pull a log up a hill as far as they can and for as long as they can. Since it's a new event, not many individuals applied to compete. The hill is at an angle of 27.1 degrees and the coefficient of friction between the log and the hill is 0.23. The first individual, representing the Island of Madagascar, pulled a log that has a mass of 7.8 kg for 11.2 s with a force of 54.6 N. The second athlete, from Mongolia, pulled a log that has a mass of 3.9 kg for 16.167 s for a total distance of 32.67 m.