

Problem Set 3: Newton's Laws of Motion, Motion: Force, Mass, and Acceleration, Vectors in Physics

Design Engineering Challenge: "The Big Dig" 2.007 Contest

Scoring *Concept Investigation: Shot-Put Vehicle*

For the Spring 2004 contest table ("The Big Dig", see <http://pergatory.mit.edu/2.007>) assume you are going to adopt a strategy "c". You have decided to acquire one of the shot-puts from the spinable platter and then race off with it to your scoring bin:

1. Draw a free-body-diagram of a vehicle carrying a shot-put and accelerating towards the scoring bin.
2. Draw a free-body-diagram of a vehicle rolling a shot-put across the table and accelerating towards the scoring bin.
3. Given that the tractive effort (ability to accelerate without the wheels slipping) is proportional to the normal force between the wheels and the ground and the coefficient of friction, is it better to get the shot-put onto your vehicle and then transport and dump it, or, should you push (roll) it to the scoring bin?
4. What are the risks of each strategy, and what are possible countermeasures?
5. Create a concept sketch of your design

