

# Length Contraction

Physics II: Modern Physics

College of the Atlantic

1. Anastajia and Beowulf have a set of chopsticks. Each chopstick is 2 cm long. Beowulf gets on a spaceship traveling at half the speed of light, in a direction parallel to the chopsticks. The chopsticks remain behind on earth.
  - (a) What is the length of the chopsticks in Beowulf's frame?
  - (b) How fast would Beowulf have to go so that the chopsticks in his frame had a length of 1cm?
  
2. Beowulf runs with a speed of  $\beta = 3/5$  while carrying a pole with a rest length of  $10ns$ . He runs through a barn that is  $8ns$  wide in the at-rest frame.
  - (a) In the at-rest frame, what is the length of the pole?
  - (b) Note that your answer to the above question implies that there is a moment with the pole is entirely inside the barn.
  - (c) What is the length of the barn Beowulf's frame?
  - (d) Note that the answer to the above question implies that it is impossible for the pole to ever be entirely in the barn.