

# Santa's Sleigh

Allegedly, every Christmas, Santa flies in his sleigh to every house in the world and drops off presents. (At least for those who deserve them, which I'm sure is all of you!) We are going to calculate some of the measurements behind Santa's flight (assuming he still follows the laws of physics). First, we have some simplifying assumptions to make. The total land area of the world is 200 million square miles, and the percentage of land that is inhabited by humans is approximately 10%. Also, Santa only needs to visit every house, not every person, so we only need to know how many houses there are, which is about 35 houses per square mile. How fast does Santa have to fly to visit every house in the world within 10 hours? We can also assume that Santa doesn't have to stop at every house since his elves simply jump out of his sleigh to deliver the presents at every house even during mid-flight.

1. The first thing to do is write out a  $5 \times 7$  grid where each box represents a house.
  - (a) What is the length and width of this grid in terms of miles?
  
  
  
  
  
  
  
  
  
  
  - (b) What is the total distance Santa has to travel to visit each house within it (measuring between the centerpoints of each box)?
  
  
  
  
  
  
  
  
  
  
2. Now, simply follow the units and multiply the ratios you are given so that you end up with the total distance traveled by Santa.
  
  
  
  
  
  
  
  
  
  
3. Finally, divide the total distance by 10 hours to get Santa's speed in miles per hours. Compare this to the speed of light which is 186,000 miles per second. What percentage of the speed of light is Santa going?

