

## MATH 3/4: ASSIGNMENT 8

MARCH 14, 2010

Today we study problems related to notions of speed (or velocity) and time. The basic rule is

$$\text{distance} = \text{speed} \times \text{time}$$

This also allows you to find time if you know the speed and distance, or speed if you know distance and time:

$$\text{time} = \frac{\text{distance}}{\text{speed}} \quad \text{speed} = \frac{\text{distance}}{\text{time}}$$

If you have two persons moving and want to know when they meet, the trick is to find how fast the distance between them changes. For example, if two people are walking towards each other, each at 3 miles per hour, then the distance between them is closing at the rate of 6 miles per hour. If one person is walking at 3 miles per hour, and the other running after him at 5 miles per hour, then the distance is closing at the rate  $5 - 3 = 2$  mph.

To find where two persons meet, it is usually best to find out first when they meet; after this, finding where they meet is easy.

- Andrew has to walk from village A to village B, which are 12 miles apart. He walks at 3 miles per hour and starts at noon.
  - How long will it take him to get to B?
  - Assume now that Jeff is riding his bike from B to A, starting also at noon. When and where will they meet if the bike speed is 12 miles per hour?
  - What if Jeff started not at noon but at 1 pm? When and where would he meet Andrew? [Hint: where will Andrew be at 1 pm?]
- The police is chasing a criminal. The criminal was reported driving on the highway at 80 miles per hour towards New York City; currently he is 120 miles away from NYC. The police car is 10 miles behind, doing 90 miles per hour. Assuming they both keep driving on the highway at the same speed, how long will it take the police to catch up with the criminal? Will they be able to do it before he reaches NYC?
- Katerina's and Rachel's houses are 3 miles apart. At exactly 4pm, Katerina and Rachel start walking, each starting at her own house and walking to her friend's one. Each of them walks at 3 miles per hour.

Katerina has a dog, and as soon as they start walking, the dog runs towards Rachel at 7 miles per hour; reaching Rachel, he immediately turns back and runs to Katerina; reaching Katerina, he again starts running to Rachel, and so on, until the friends meet.

  - How long will it take the dog to reach Rachel for the first time? And how many miles will he have to run for it?
  - When and where will Rachel and Katerina meet?
  - \*How many miles will the dog run overall?
- Villages A and B are several miles apart. John can walk this distance in 2 hours; Bill, in 3 hours. If Bill starts at A and John at B at the same time and start walking towards each other, when would they meet?
- Find in any of the books you have – or online, if you know how to use the Internet – the distance from Earth to Sun (in miles). How long would it take you to get from Earth to Sun if you have a spaceship capable of doing 5,000 miles per hour? If you could drive a car in space (at the usual speed of 70 miles per hour)?