Montlake Math Challenge

April 30, 2009

Math is Cool!

Problem 1: Nine people attend a party and each person shakes hands with everyone else. How many total handshakes occur? (Try to answer the question without writing out all the possible handshakes!)

Problem 2: Sam has 8 white socks, 7 black socks, and 4 polka dot socks in his sock drawer. If it is dark in his room and he can't see, how many socks does he have to take out of his drawer before he is GUARANTEED to have a pair of matching socks?

Problem 3: A cow is tied to the corner of a square barn with side length 20 feet. If the cow is tied to a piece of rope that is 25 feet long, what is the area of the region of grass in which he can graze?

Problem 4: Ron and Harry are sitting on their broomsticks, 100 meters apart. They start flying towards each other at a speed of 5 meters per second. At the same time, a fly takes off of Harry's shoulder and flies towards Ron at a speed of 13 meters per second. Once the fly reaches Ron, it immediately turns around and flies back towards Harry. The fly continues to fly back and forth between Ron and Harry until the boys meet. How far did the fly travel?

Problem 5: On an 8 × 8 chessboard, how many queens can you legally place so that no queen attacks any of the others? What if you use bishops instead? How about kings?

Problem 6: Jeff has 100 marbles – 50 of them are white, and 50 are black. He also has two bags, Bag A and Bag B. Jeff is going to put some of the marbles in Bag A and some of the marbles in Bag B. Jeff will then flip a coin. If the coin shows heads, he will pick a marble out of Bag A. If it shows tails, he will pick a marble out of Bag B.

(a) If Jeff puts all the white marbles in Bag A and all the black marbles in Bag B, what is the probability that he will get a white marble?

(b) Instead, suppose Jeff puts 25 white marbles and 50 black marbles in Bag A. What is the probability that he will get a white marble?

(c) (CHALLENGE!) Jeff wants to maximize the probability that he will get a white marble. How can he do this?