7:40   Props to bring: prizes (candy?) for mental math contest, or use Sunny Hills Bills
put up on board:

"Find the _____ of _____ things taken _____ at a time."
combinations   number   number
permutations   "n"   "r"

Note: Our main goal is to review probability by working several homework problems from before Christmas break. The lesson on averages is relatively easy and should permit time to review the problems.

Note: If there is time in this lesson, describe how to use the $\sum +$ and $\bar{x}$ functions on their calculator to compute averages.

8:10   Warmups:

Take a doughnut, and **keep** your homework! *(these are complicated questions so it may be helpful if they look at their own work during discussion)*

Let's talk about homework problems:

2a) $\dfrac{7!}{6!} =$ *= 7*

2c) $\dfrac{88!}{86!} =$ *(most calculators can't do this!)*   *88 x 87 = 7656*

3) What is the largest number for which your calculator can show the factorial? (*Hint:* It is less than 100.) *You can work this out, even if your calculator has only the basic functions.*   *A: 69! = 1.71 E98*
Windows calculator can do 50,000! = 3.34 x 10^{213,236}

4a) $_5C_2$ $=_nC_r = \dfrac{n!}{r! \times (n-r)!} = \dfrac{5!}{2!(5-2)!} = \dfrac{5!}{2!3!} = \dfrac{5 \times 4 \times 3 \times 2 \times 1}{2 \times 1 \times 3 \times 2 \times 1} = \dfrac{5 \times 4}{2} = 10$

4c) $_5C_5$ $= \dfrac{n!}{r! \times (n-r)!} = \dfrac{5!}{5! \times (5-5)!} = \dfrac{5!}{5! \times 0!} = 1$

5a) $_4P_2$ $= \dfrac{n!}{(n-r)!} = \dfrac{4!}{(4-2)!} = \dfrac{4 \times 3 \times 2 \times 1}{2 \times 1} = 12$

5c) $_4P_4$ $= \dfrac{n!}{(n-r)!} = \dfrac{4!}{(4-4)!} = \dfrac{4!}{0!} = 4! = 24$

7) What is the probability of guessing 4, 2, 5 in the right order?
A: P(correct order) is #favorable / #possible.
 There is only one favorable, but how many possible?
The numbers are unique, so you have 3x2x1 = 6 possible. P = 1/6.

8) Eight people meet at a party and all shake hands. How many handshakes were there? (*Hint:* It takes two people to shake hands and order doesn't count.)
    A1: Combinations of 8 things taken 2 at a time = 28
    A2: 7+6+5+4+3+2+1 = 28

8:30   Turn in homework

Lecture: Averages

8:50   Mental math contest   Do this if you have **20** minutes
        (If less than 20 minutes, then discuss how to do averages on a calculator, or start
        doing homework.)
        Form teams of 3 or 4
        Note easiest questions are first
        Start with your most junior member up front first
        Have the most expert member last
        Each player answers their questions (5 for this practice)
        Next players *cannot* make any erasures or other marks on the sheet