Math 22, Winter 2009 , Quiz 1 Name: ___________________________

Names of group members: ____(you must answer this!!)

Given n objects in a pile, split the pile into two smaller piles, and find the product of the numbers of objects in each of these piles. Continue to split each pile into two smaller piles until there are n piles of size one. At each splitting, compute the product of the sizes of the two smaller piles you just produced.

Once there are n piles, sum all the products computed. Is the result always the same, no matter how you split the piles? Call the sum of the products F(n), when you start with n objects (that answers the previous question!!) Conjecture a formula for F(n), and prove your conjecture correct. (Hint: you ~~may want to~~ MUST use the strong law of induction! Another hint: start by examining this question for piles of small size!)

(1 pt.) Experimental findings:

F(1) = __ F(2) = ___ F(3) = ___ F(4) = ___ F(5) = ___ F(6) = ___

(1 pt.) In order to calculate F(7), using the above results, you could do what calculations?

F(7) = ( )( ) + F( ) + F( ) or F(7) = ( )( ) + F( ) + F( ) or

F(7) = ( )( ) + F( ) + F( )

(1 pt.) Conjecture S(n): The result when beginning with n objects is F(n) = _________________

(1 pt.) "Basic step" (first case) in induction argument:

F(__) = _____ (experimental result) = also ____________________ (result of formula)

(1 pt.) Explain why you must use the strong law of induction:

(1 pt.) Induction step: Assume ______________________________________,

and then prove ______________________________

(4 pts.) Actual proof of induction step: