Playsheet 10
To Infinity and Beyond! (Really!)

MATH 130-02
Tuesday, March 3, 2009

Directions: Groups should consist of three or four people. Work together on each problem; do not delegate different problems to different people. Submit one **neatly written** write-up per group. Remember to use complete sentences as appropriate and explain your reasoning. That is, **show your work!**

1. A **set** is a collection of objects, often indicated between curly braces { and }. For example, $\{1, 2, 3, 4\}$ is the set containing 1, 2, 3, and 4. A **subset** of a set consists of some or all of the elements of the original set. There is also a special case: the empty set, $\{\}$, which has no elements, is a subset of every set.

   List **all** of the subsets of each set: $\{1\}, \{1, 2\}$, and $\{1, 2, 3\}$. How many subsets would you guess $\{1, 2, 3, 4, 5, 6\}$ has? The set of all subsets of a set A is called the **Power set** of A, denoted $\mathcal{P}(\mathcal{A})$.

2. Counting.

   (a) Suppose you have three shirts and four pairs of pants. How many different outfits can you make from these? (Assume that you must wear exactly one shirt and exactly one pair of pants!)

   (b) Now suppose that you have 10 coins in a line. How many different "heads-tails" arrangements can you make?

   (c) Armed with the last example, determine the size of the power set of a set with n elements.

3. Consider again the set $\{1, 2, 3\}$ and its power set (from above).

   (a) Match each element of $\{1, 2, 3\}$ with some element of its power set. (Just draw arrows.)

   (b) Create a new set M as follows: for each member of $\{1, 2, 3\}$, M will contain that member if that member does *not* belong to the set with which it is matched. (You may need to read that a couple of times!)

   (c) Is 1 a member of M? What about 2? 3? Explain.