- Due by 1559 AST Friday, January 21, 2011
- Show your work

1. (a) How many ways are there for two dice to sum to 6 or 8?
   (b) What is the probability of rolling two dice and getting 10 or more?
2. (a) How many words of length 1 to 4 can be made from the letters in MATH?
   (b) How many words can be made using all the letters in PARTITIONS?
3. Ayn, Bob, Cyd, Dan, Edy, and Fan will form an executive for their club.
   (a) How many ways are there to pick a President, VP and treasurer?
   (b) If Dan refuses to serve with Edy, how many ways are there to pick just a President and a VP?
4. (a) January has 31 days. This year January has 10 weekend days, 8 days that are either Tuesday or Thursday, and there was one Monday that was not a scheduled class day for Dal. How many classes were scheduled for us in January?
   (b) In a round-robin tournament each team faces off against each other. How many games are there in a 5 team tournament?
5. (a) How many outcomes, in flipping 6 coins, have at least one head and at least one tail?
   (b) A particular incorrect algorithm gives the correct answer 80% of the time. With what percentage will it work on of the first two times I try?
6. How many numbers from 1 to 1000000:
   (a) are divisible by 7, 11 and 13?
   (b) are divisible by 7, 11 or 13?
7. In a survey of 100 people about their vitamin consumption, it was determined that:
   - 30 were deficient in vitamins A, B and C,
   - 11 were deficient in vitamins A and B but not C,
   - 50 were deficient in vitamin C,
   - 53 were deficient in vitamin A and at least B or C,
   - 8 were deficient in vitamins B and C but not A,
   - 6 were deficient in vitamin B only, and
   - the number of people that are deficient in vitamin A only is 5 less than the number that are not deficient at all.

   (a) How many are not at all deficient?

(b) How many are vitamin B deficient?

(c) How many are only vitamin C deficient?

8. (a) How many times must you roll a die to guarantee that one roll is a repeat?

   (b) How many people do you need to guarantee that two have the same birthday?

9. (a) If you are dealt 13 cards, you can guarantee that you will have at least one suit with how many cards?

   (b) What is the maximum length of the repeating section of the decimal expansion of $\frac{7}{203}$?

10. What is the largest number of elements in a subset of $\{1, 2, \ldots, 100\}$ such that no two elements have gcd > 1? (Hint: think about what this means and do not try all possibilities by hand; you may wish to look up which elements have a certain property.)

11. A group of 6 is to be divided into 3 groups of size 2. How many ways can this be done?

12. Order the following from largest to smallest:

- $\binom{500}{499}$
- $\binom{1000}{0}$
- $\binom{100}{2}$
- $\binom{10}{5}$
- $\binom{7}{4}$
- $\binom{20}{3}$

13. What is the probability of being dealt a three-of-a-kind in a 5 card poker hand?