CS311, Fall 2003
Homework 2. Due Tuesday January 27

Note: I have corrected some minor mistakes.

**Question 1** Expand \((x - 4y)^4\) using the binomial theorem.

**Question 2** What is the coefficient of \(x^4y^3\) in \((x - 2y)^7\)?

**Question 3** Determine \(n\) such that \(\binom{n}{5}\binom{n-5}{3} = \frac{n!}{3!}\).

**Question 4** Questions concerning combinations with repetition:
(a) How many ways can 15 identical candy bars be distributed among 5 children?
(b) How many ways can 15 identical candy bars be distributed among 5 children if the youngest gets exactly 1?
(c) How many ways can 15 identical candy bars be distributed among 5 children if the youngest gets exactly 1 or exactly 2?
(d) How many ways can we distribute 4 different candy bars among 4 children if each child gets exactly one? (e) We have 15 different candy bars. How many ways can we distribute one to each of 4 children?

**Question 5** (a) Express \(\frac{1}{2^1} + \frac{1}{3^1} + \ldots + \frac{1}{n!}\) as a summation. Assume \(n\) is an integer and \(n \geq 2\).
(b) Express: \(1 - \frac{1}{2^1} + \frac{1}{3^1} - \frac{1}{4^1} + \ldots\) as a summation. Here the summation goes to infinity.

**Question 6** Evaluate:
(a) \(\sum_{i=1}^{n}(i^2 + 1)\)
(b) \(\sum_{i=1}^{n}i(-1)^i\)
(c) \(\sum_{i=0}^{n}2^{-i}\) Do this out and also use the formula.

**Question 7** Give an algebraic expression for:
(a) \(\sum_{i=1}^{n}(i + 1)\)
(b) \(\sum_{i=2}^{n}2^i\)