Homework 8

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Problem 13:

Problem 14:

The goal of this problem to to find a solution to the polynomial

$$\left(\sum_{i=1}^{n} x_i v_i\right) \bmod n = \ L \bmod n$$

given a series of positive values for v and L. Also, x can be 0 or 1.

This problem is similar to the subset sum problem, except that values larger than L can not be immediately pruned. Instead, at a given level, if two nodes have the same value *modulo* n, one can be arbitrarily pruned.

Additionally, since the goal is to find a solution to the polynomial, a bit string can be created to consider the possibilities in which a value was included or discluded in the sum.

Enumerating all possibilities and then considering the above pruning rule gives way to the following algorithm.

Function: *Modular Subset Sum*
Input: *Positive Integers* $v_1, \ldots, v_n, L$
for *i to n* **do**
  for *s to* $L \bmod n$ **do**
    if *A[k,s] is defined* **then**
      `/* :: is the concatentation operator.` $a :: c \rightarrow ac$ `*/`
      $A[k+1, s] = A[k, s] :: 0$
      $A[k+1, (s + v_{k+1} \bmod n) \bmod n] = A[k, s] :: 1$
Return: $A[n, L \bmod n]$

When this algorithm completes, the answer, if it exists, will be the bit string at $A[n, L \mod n]$. This bit string starting, read from left to right, will represent the coefficient of each v in the polynomial.

Problem 15:

Problem 16: