HW Solution #6

Only P1-P5 will be graded.

P1:

The table with entry 0-10:

(1) 88, /, /, 4, 15, 28, 17, 59, 31, 10

(2) 88, /, /, 4, 15, 28, 17, 59, 31, 10

(3) /, 59, 17, 4, 15, 28, 88, /, 31, 10

P2: In the end, the table will be looking like Table 1.

0	null
1	$10 \rightarrow 19 \rightarrow 28$
2	20
3	12
4	null
5	5
6	$33 \rightarrow 15$
7	null
8	17

Table 1: Problem 2

P3: The pseudocodes are:

```
HASH-DELETE(T, k)
    i = 0
    repeat
        j = h(k, i)
        if T[j] == k
            T[j] = DELETE
            return j
        else i = i + 1
```

```
    until T[j] == NIL or i == m
    error "element not exist"

HASH-INSERT(T, k)
    i = 0
    repeat
        q = h(k, i)
        if T[q] == NIL or T[q] == DELETE
            T[q] = k
            return q
        else i = i + 1
    until i == m
    error ``hash table overflow''
```

P4: $\binom{m}{1}\frac{1}{m^4} = \frac{1}{m^3}$

```
    vector<int> twoSum(vector<int>& nums, int target) {
        unordered_map<int, int> lookup;
        for (int i = 0; i < nums.size(); ++i) {
            if (lookup.count(target - nums[i])) {
                return {lookup[target - nums[i]], i};
            }
            lookup[nums[i]] = i;
        }
        return {};
```

P6: Denote event A be the probability of finding a no collision.

$P(A) = \frac{\text{n-permutations of m}}{m^n} = \frac{\frac{m!}{(m-n)!}}{m^n}$

Similar to birthday problem