726. Number of Atoms

```
/*
   Time complexity: O(mlogm+n)
   Extra space complexity: O(2m+2m+2m+2m) (formula_array,stack,array,count map)
*/
class Solution {
   public:
      void store_in_array(std::string& formula,std::vector<string>& result){
         int n=formula.size();
         int i=0,j=0;
         while(i<n){
            char c=formula[i];
            if(c==')') {
               result.push_back(")");
               if(!isdigit(formula[i+1])) result.push_back("1");
               i++;
            }
            else if(c=='(') {
               result.push_back("(");
               i++;
            }
            else if(isupper(c)){
               std::string atom="";
               atom+=c;
               for(j=i+1;j<n;++j){
                  c=formula[j];
                  if(!islower(c)) break;
                  atom+=c;
               }
               i=j;
               result.push_back(atom);
               if(!isdigit(formula[j])) result.push_back("1");
            }
            else if(isdigit(c)){
               std::string number="";
               number+=c;
               for(j=i+1;j<n;++j){
                  c=formula[j];
                  if(!isdigit(c)) break;
                  number+=c;
               }
               i=j;
               result.push_back(number);
            }
         }
      }
```

```
    std::string countOfAtoms(std::string formula) {
        std::vector<std::string> formula_array;

        // O(n)
        store_in_array(formula,formula_array);

        int m=formula_array.size();

        std::stack<int> multiplicators_st;
        std::vector<int> multiplicators_arr(m);
        int mul=1;

        // O(m)
        for(int i=m-1;i>=0;--i){
            std::string c=formula_array[i];
            if(c==")"){
                int x=stoi(formula_array[i+1]);
                multiplicators_st.push(x);
                mul*=x;
                multiplicators_arr[i+1]=mul;
            }
            else if(c=="("){
                int x=multiplicators_st.top();
                multiplicators_st.pop();
                mul/=x;
            }
            multiplicators_arr[i]=mul;
        }

        // Compute the frequency of each atom: O(mlogm)
        std::map<std::string,int> count;
        for(int i=0;i<m-1;++i){
            std::string s=formula_array[i];
            int w=1;
            if(std::isdigit(formula_array[i+1][0])) w=stoi(formula_array[i+1]);
            int cnt=multiplicators_arr[i];
            if(std::isupper(s[0])) count[s]+=(w*cnt);
        }

        // Generate the answer
        std::string ans="";
        for(auto p: count){
            ans+=p.second==1?p.first:(p.first+std::to_string(p.second));
        }
        return ans;
    }
};
```