* Definition: Subproblem is a similar problem of smaller size.
* A greedy choice is called a safe move if there is an optimal solution consistent with this first move.
* **Car fueling** running time is O(n) not O(n\*n) because the inner cycle will influence the outer cycle running times, see detail: <https://www.coursera.org/learn/algorithmic-toolbox/discussions/weeks/3/threads/FCdP21QnQwanT9tUJ-MGQA>

First, notice that if the complexity of an algorithm is O(*n*) then it is also O(*n*2) and O(*n*3) etc. So your reasoning yields the O(*n*2) estimation but it doesn't mean that there is no more subtle reasoning that proves that in fact the algorithm has the complexity O(*n*).

So why is the complexity of this algorithm is O(*n*)? Notice that if the inner cycle stopped at an index x*x* at some iteration, then at the next iteration the inner cycle start from x*x*. Then let x\_i be the starting index of the cycle at the i*i*-th iteration of the outer cycle and y\_ibe the finishing index of the cycle. Then the total number of iterations is clearly  By our first observation x\_(i + 1) = y\_i so (assuming x\_{n+1} = n) the sum may be rewritten as. There it is, the total number of iterations of the inner loop is at most 3n.

* **Group children**, running time is O(n) if all ages of the children are sorted, the reason why the inner loop and outer loop give us O(n) is the same as that of car fueling.
* **Interactive Puzzle Balls in Boxes**, First of all, pick up all balls and put into one box, and the other box with no balls. Then, separate the balls into two halves, one is box with number that is 1 more than last box(for example first is zero, so this one should be 1), the other is all the number of balls subtract the number of this new box. Repeat this procedure.
* Greedy Algorithm main ingredients:
* Safe move
* Prove safety
* Solve subproblem
* Estimate running time

**Programming Assignments:**

1. The denomination of the coins 10, 5, 1 make sure we just need to choose the one with largest denomination first.

* Sort function, header file(include <algorithm>)

1. Default, Sorts the elements in the range [first,last) into ascending order.

std::sort(s.begin(), s.end());

1. Sorts the elements into descending order,

std::sort(s.begin(), s.end(), std::greater<int>()), greater(with header file, include<functional>)

* Control the precision and the number of digits for decimal digits,

<https://blog.csdn.net/xidian13071185/article/details/4672344>

#include <iostream>

#include <iomanip>

using namespace std;

int main( void )

{

    const double value = 12.3456789;

    cout << value << endl; // 默认以6精度，所以输出为 12.3457

    cout << setprecision(4) << value << endl; // 改成4精度，所以输出为12.35

    cout << setprecision(8) << value << endl; // 改成8精度，所以输出为12.345679

    cout << fixed << setprecision(4) << value << endl; // 加了fixed意味着是固定点方式显示，所以这里的精度指的是小数位，输出为12.3457

    cout << value << endl; // fixed和setprecision的作用还在，依然显示12.3457

    cout.unsetf( ios::fixed ); // 去掉了fixed，所以精度恢复成整个数值的有效位数，显示为12.35

    cout << value << endl;

    cout.precision( 6 ); // 恢复成原来的样子，输出为12.3457

    cout << value << endl;

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* Remember iterator must be initialized when it is declared.

1. Use greedy algorithm to find the farthest gas stop each time.

* The most important point is we need to use that the gas stations has limitation n to write our loop codes.
* To simpler our algorithm, we have to insert both start points and end points into our vector which can be 0 and n + 1
* We will have to consider next point is too far for us to reach and also the destination is too close and we do not to make another refill.

1. 略
2. The idea of this assignment is :

First, we sort the end in ascending order. The first end point must be stored into the vector.

Second, we compare each start point with the previous end point, if start is after that end point then the corresponding new end point should be inserted into the vector either.

1. 略
2. Here we need to write a compare function to define the sort regulation by ourself.

String s1 + s2 and s2 + s1 are not the same,

Stoi converts string to int.