Question - 1

Implementation

SCORE: **25 points**

Red envelope is Chinese tradition during the Spring Festival. This year is no exception, but it's a little different. Your parents want to know whether you are working hard abroad or not. So they decide only you pass their test can you get your lucky money. Sad to have parents knowing algorithms :(
First they will give you 3 different numbers, say, representing three denominations of banknotes. Then they tell you how much is in your red envelope and ask you how many pieces of bills **at least** in your red envelope. If it's impossible to get that number, return -1;

Here is an example:
3 denominations : 1,2,5
your luck money is 21
The answer should be 5 : 4*5+1*1. 4+1 =5
Although 10*2 +1*1 = 21, 10+1 =11 > 5.

Happy new year. (o o)

Question - 2

Quick Find, Quick Union

SCORE: **5 points**

Statement 1 : Quick-Find union operation is too expensive
Statement 2 : Trees formed in Quick-Union are always flat
Statement 3 : Find / connected operation can be N-array access in Quick-Union, hence it is too expensive
Statement 4 : It takes O(N) array accesses to process one union operation on N objects in Quick-Find
Which statements are true ?

- ( ) All of these
- ( ) Statement 1 and 3
- ( ) Statement 1 and 2
- ( ) Statement 3 and 4
- ( ) Statement 1, 2 and 4
- ( ) Statement 1, 2 and 3
- (•) Statement 1, 3 and 4
- ( ) None of these

Question - 3

SCORE: **5 points**

Quick Union

If we are going to apply quick-find algorithm to solve the dynamic connectivity problem until all components are connected, how many times of array operations is necessary.

- (●) N^2
- ( ) NlogN
- ( ) N
- ( ) logN

Question - 4

SCORE: **5 points**

Weighted Quick-Union

What's the worst case of find(), connected() and union() method applying weighted quick-union algorithm with N sites?

- ( ) N^2
- ( ) N
- ( ) NlogN
- (●) logN

Question - 5

SCORE: **10 points**

Stability of Selection Sort

A sorting algorithm is said to be **stable** if two objects with equal keys appear in the same order in the sorted output as they appear in the input array before sorting.
So is selection sort stable? Why?
Tips: only take learned implementation into consideration.