Question 1.

Jin-Ao Olson Zhang
z5211414

(a)

m^2+s and p^2+k is One number in the list plus the square of another number in the list, so for each numbers x in list, we have (n-1) combinations to constitute m^2 + s

let's first create a new list B = A^2(squared every number in A), its complexity is **O(n)**

then create a new list C and add the sum of each number in A plus each number in b except of tis own square, Its complexity will be n*(n-1)/2 = **O(n^2)**

so then we just need to find if their exist two numbers in c are the same ,in that way their exist m, s, p, k in a distinct list which m^2+s = p^2 +k (otherwise not exist), so what we have do it to sort list c to find them, its complexity is to sort a O(n^2) list which is **O(n^2logn^2) = O(2n^2logn) = O(n^2logn)**

so total complexity = O(n)+O(n^2)+O(n^2logn) = O(n^2logn)

(b)

create a new list B = A^2(squared every number in A), its complexity is **O(n)**

create a hash c and first put the sum of the first number in A and the first number is B(except its own) into the hash as a key, then move to the next sum, and if the next sum already in hash, then their exist m,s,p,k in A that satisfy m^2+s = p^2+k, otherwise add new sum as a new key into the hash.

Its complexity = calculate every possible m^2+s * hash find

= **O(n^2)*O(1) = O(n^2)**