

Daily Coding Problem #1

Problem

This problem was recently asked by Google.

Given a list of numbers and a number k , return whether any two numbers from the list add up to k .

For example, given $[10, 15, 3, 7]$ and k of 17, return true since $10 + 7$ is 17.

Bonus: Can you do this in one pass?

Solution

This problem can be solved in several different ways.

Brute force way would involve a nested iteration to check for every pair of numbers:

```
def two_sum(lst, k):
    for i in range(len(lst)):
        for j in range(len(lst)):
            if i != j and lst[i] + lst[j] == k:
                return True
    return False
```

This would take $O(N^2)$. Another way is to use a set to remember the numbers we've seen so far. Then for a given number, we can check if there is another number that, if added, would sum to k . This would be $O(N)$ since lookups of sets are $O(1)$ each.

```
def two_sum(lst, k):
```

```

seen = set()
for num in lst:
    if k - num in seen:
        return True
    seen.add(num)
return False

```

Yet another solution involves sorting the list. We can then iterate through the list and run a binary search on $K - \text{lst}[i]$. Since we run binary search on N elements, this would take $O(N \log N)$ with $O(1)$ space.

```

from bisect import bisect_left

def two_sum(lst, K):
    lst.sort()

    for i in range(len(lst)):
        target = K - lst[i]
        j = binary_search(lst, target)

        # Check that binary search found the target and that it's not in the same
index      # as i. If it is in the same index, we can check lst[i + 1] and lst[i - 1] to
see        # if there's another number that's the same value as lst[i].
        if j == -1:
            continue
        elif j != i:
            return True
        elif j + 1 < len(lst) and lst[j + 1] == target:
            return True
        elif j - 1 >= 0 and lst[j - 1] == target:
            return True
    return False

def binary_search(lst, target):
    lo = 0
    hi = len(lst)
    ind = bisect_left(lst, target, lo, hi)

    if 0 <= ind < hi and lst[ind] == target:

```

```
return ind  
return -1
```

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