Change 2 DP

Wednesday, April 4, 2018 6:30 PM

$c_i \in \mathbb{Z}^+$

Give a set of coins $\{c_1, c_2, \dots, c_n\}$

find the number of ways we can give

coins that sum to exactly $D \in \mathbb{Z}$

1, 5, 10, 25

35 ← maybe doable in 40 minutes

35 pennies

1 nickel 30 pennies

2 nickels 25 pennies

$1,000,000.00 ← not possible today sorry

```
f(int x)
```

f(x-1) + f(x-5) + f(x-10) + f(x-25)

```
if(memo[x] != sent)
    return memo[x];
otherwise
memo[x] += f(x-1);
memo[x] += f(x-5);
memo[x] += f(x-10);
memo[x] += f(x-25);
return memo[x];
```

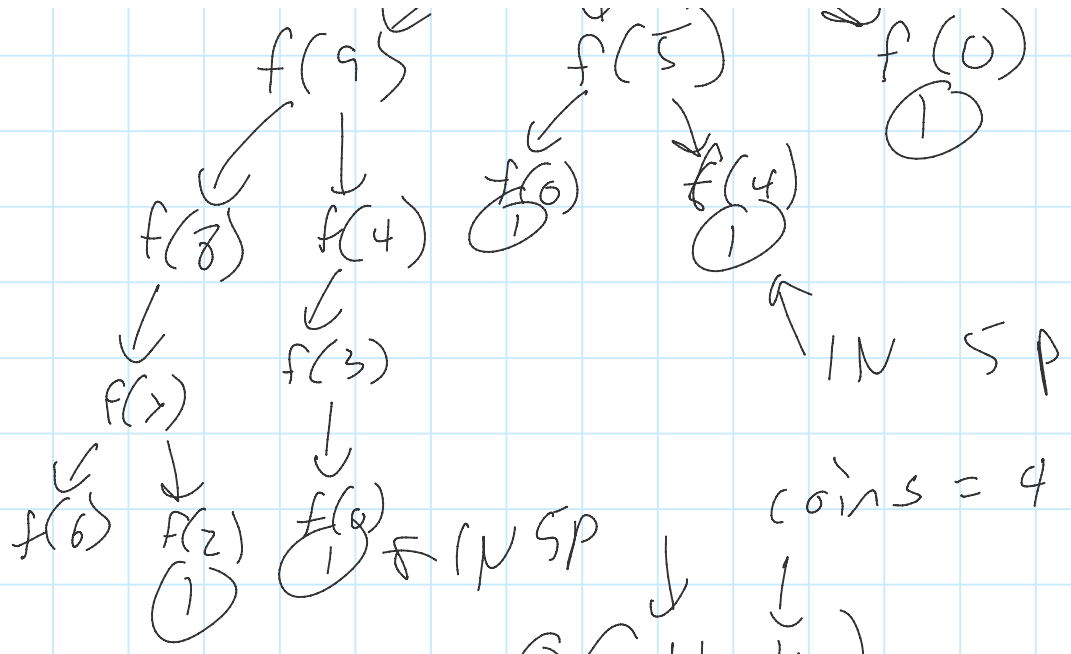
f(x) = 0; x < 0

f(0) = 1;

10?

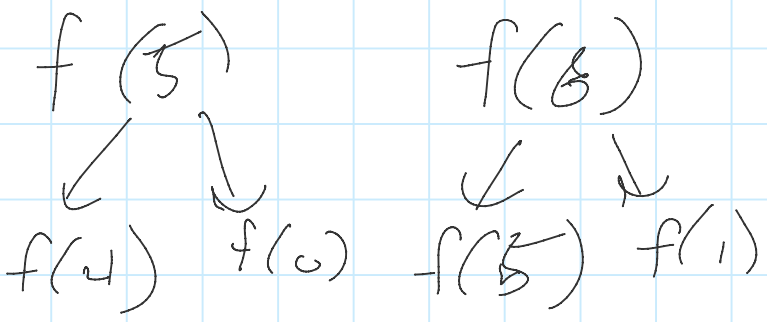
f(10)

f(9) f(5) f(0) f(-15)



10	P
5	P
2	N
1	D

IN



Memo table

	10	9	8	7	6	5	4	3	2	1	0	-1	-2
pennies	1	1	1	1	1	1	1	1	1	1	1	0	0
Nickels	3	2	2	2	2	2	1	1	1	1	1	0	0
dimes	4	2	2	2	2	2	1	1	1	1	1	0	0
quarters													

```
f(int target, int smallest)

if(memo[target][smallest] != set)
    return memo[target][smallest];

for(coin <= smallest)
    memo[target][smallest] +=
        f(target - coin, coin);

return memo[target][smallest];
```