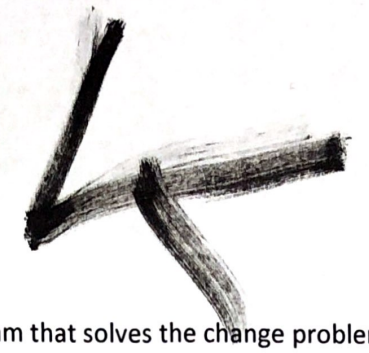
Quick Quiz 1 CS 5050

Name:

A number:



Here is the simple recursive program that solves the change problem

Definition: Given an integer that is the amount of money to be paid out (the change) determine the minimum number of coins needed. In this case, there are only three coins, of value 1, 7 and 27.

Let **C** be the amount of change needed. The first call to the function will be **change(C)**

```
def change(c): #c is an integer, the function returns an int
      If c == 0: #simple problem, simple solution
            return 0
      if c < 0: # clean up case to deal with negative change events
            return +infinity #to prevent option being picked
      # make the problem smaller by using a coin
      # solution is the min of the three choices, plus the coin we used
      return 1 + min(change(c-1), change(c-7), change(c - 27))
```

Convert the recursive algorithm to a dynamic programming algorithm:

a) Define the cache

```
S = array((C+1))
```

b) Fill in the base case(s) into the cache

```
S[0] = 0
```

c) Write the *for loop*(s) that fills in all the solutions in the correct order (deal with out of bounds cases)

```
for i in range(0, C+1):
    x = S[i-1]
    if i-7 >= 0:
        x = min(S[i-7], x)
    if i-27 >= 0:
        x = min(S[i-27], x)
    S[i] = x + 1
```

d) Return the last solution

```
return S[C]
```