CECS 174 - Project 3
"Vending Machine Change Maker"
Due date: 10/31/2022

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Project Report: Programming Project 3 - "Vending Machine Change Make"

1. **Goal:** The goal of this project is to create a program that applies iteration to create more opportunities for experiencing the use of integers, floats, strings, and other conditional statements in order to simulate a change-maker for a vending machine.

2. **Problem Description:** Given a starting amount of coins and dollars, the user will then request to purchase an item or quit which then will either update the stock of coins in the machine or refund the amount of change deposited up until the full payment has been deposited.

3. **Program Description:**
    a. **Solution of the problem**: we will validate the price of the item asked from the user until they give us a valid price which is positive and a multiple of .05. Then we will keep the process of asking for payments until the user enter q for quit. We will also have a menu which they can enter coins as strings in order to pay for the item they previously said its price. If they input c, it means that they want to cancel and we will break out of the for loop. The most important part is to calculate the change we should give back or if there is no change due every time they give us a coin. Because we want to calculate the least amount of coins for change we will start counting the most quarters we can give back that is in the range of our stock and check these conditions for dimes and nickels. After this we will decrement our stocks number of coins.

b. **Test cases**: In order to check that our code works for all types of input scenarios, we imputed a series of different characters, positive, negative, and numbers. We chose these test cases because they are the possible inputs that may be imputed in the program.

- inputs ⇒ outputs

  1.96 for purchase price=> Illegal price: Must be a non-negative multiple of 5 cents.
  -1.96 for purchase price=> Illegal price: Must be a non-negative multiple of 5 cents.
  1 for menu for deposits => Illegal selection : 1
  q => quitting
  c => canceling the deposit and printing the amount of coins they have deposited until then to give it back to them with coins.

c. **Pseudocode:**

- **Start**
- Define vending machine stock (25 : Dimes, Nickels, and Quarters & 0 : One and Five dollar bills)
- Validate that the price is a + number, user input a price that is a multiple of 0.5 and will return an error message and ask user to input again
- Have program print a menu to "deposit" coin(s)/bill(s) or cancel the purchase
- Validate the menu & deposits that returns the price from the user input form the menu
- Have program print out the remaining change each time
- **End**

d. **IPO:**

Input:

Price
Menus
Fnum

Process:

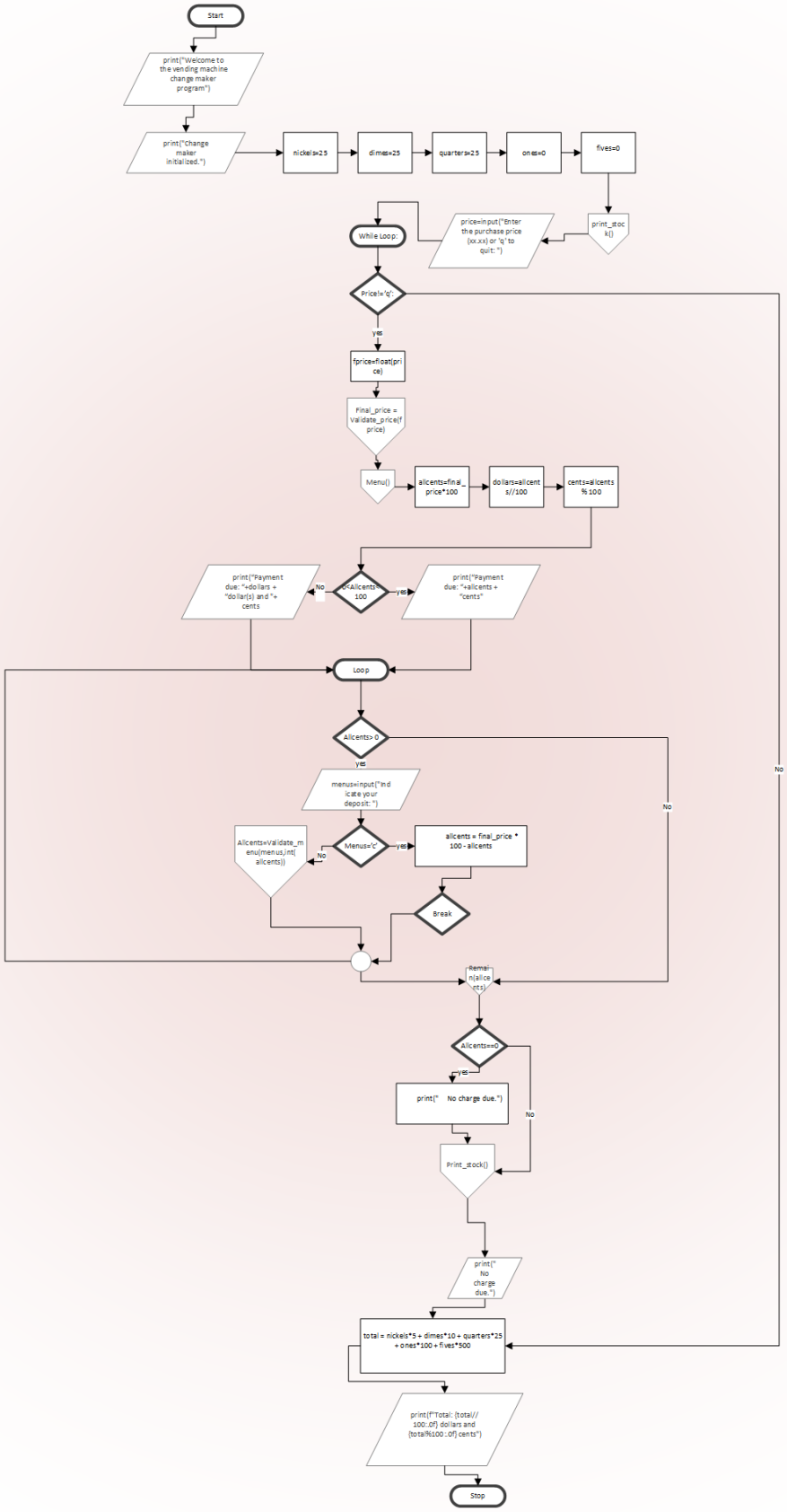
Validate price
Validate menu

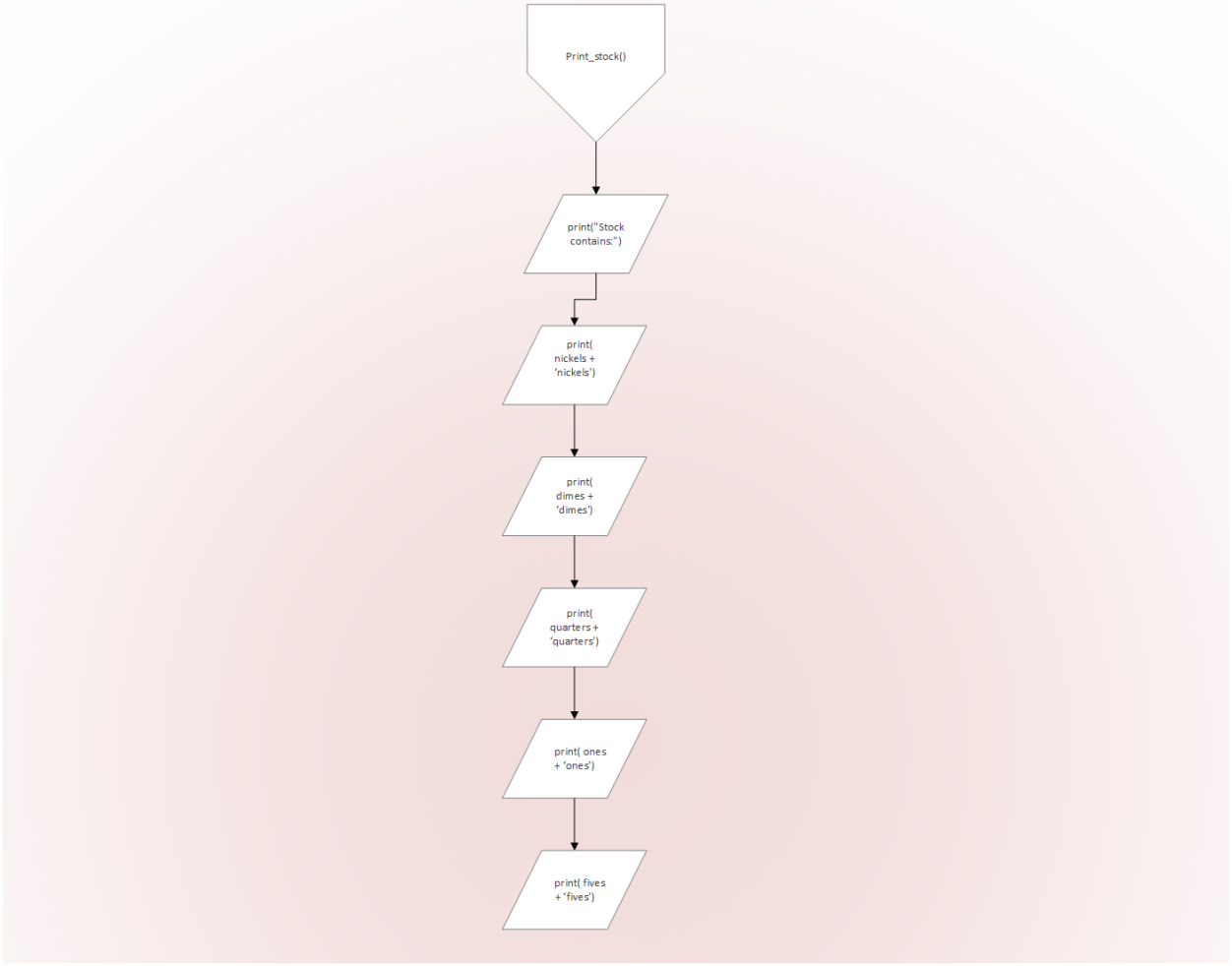
Output:

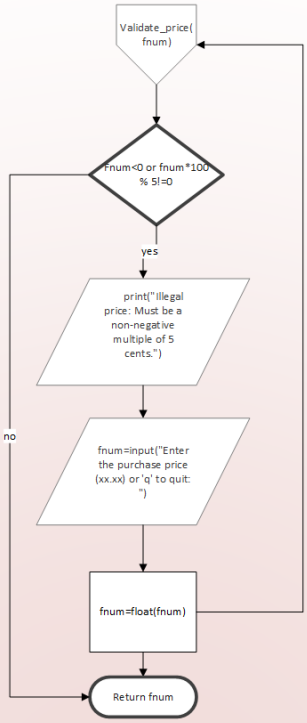
Stocks
Menus

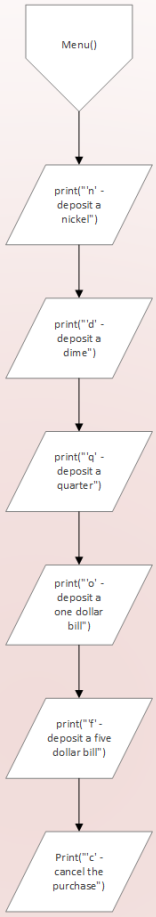
And change

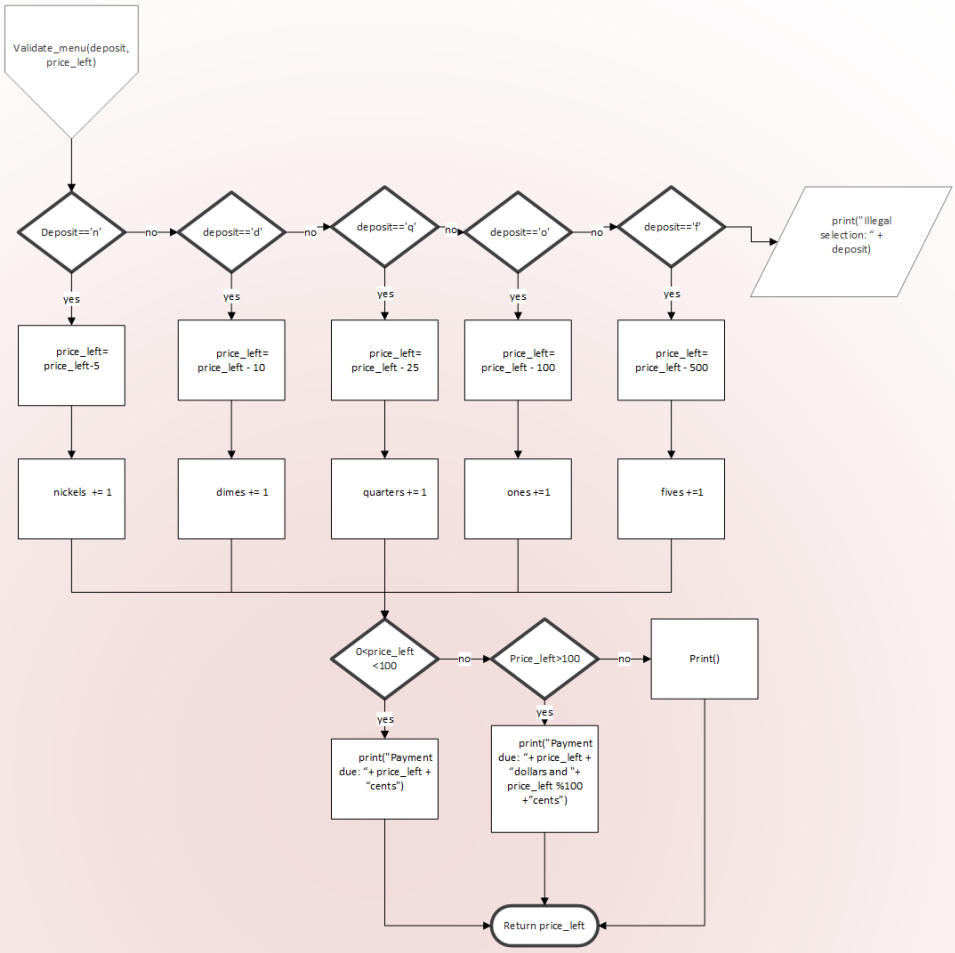
e. The **flowchart**
VisioFileFlowchart_Project03
PDF_file_flowchartProject03

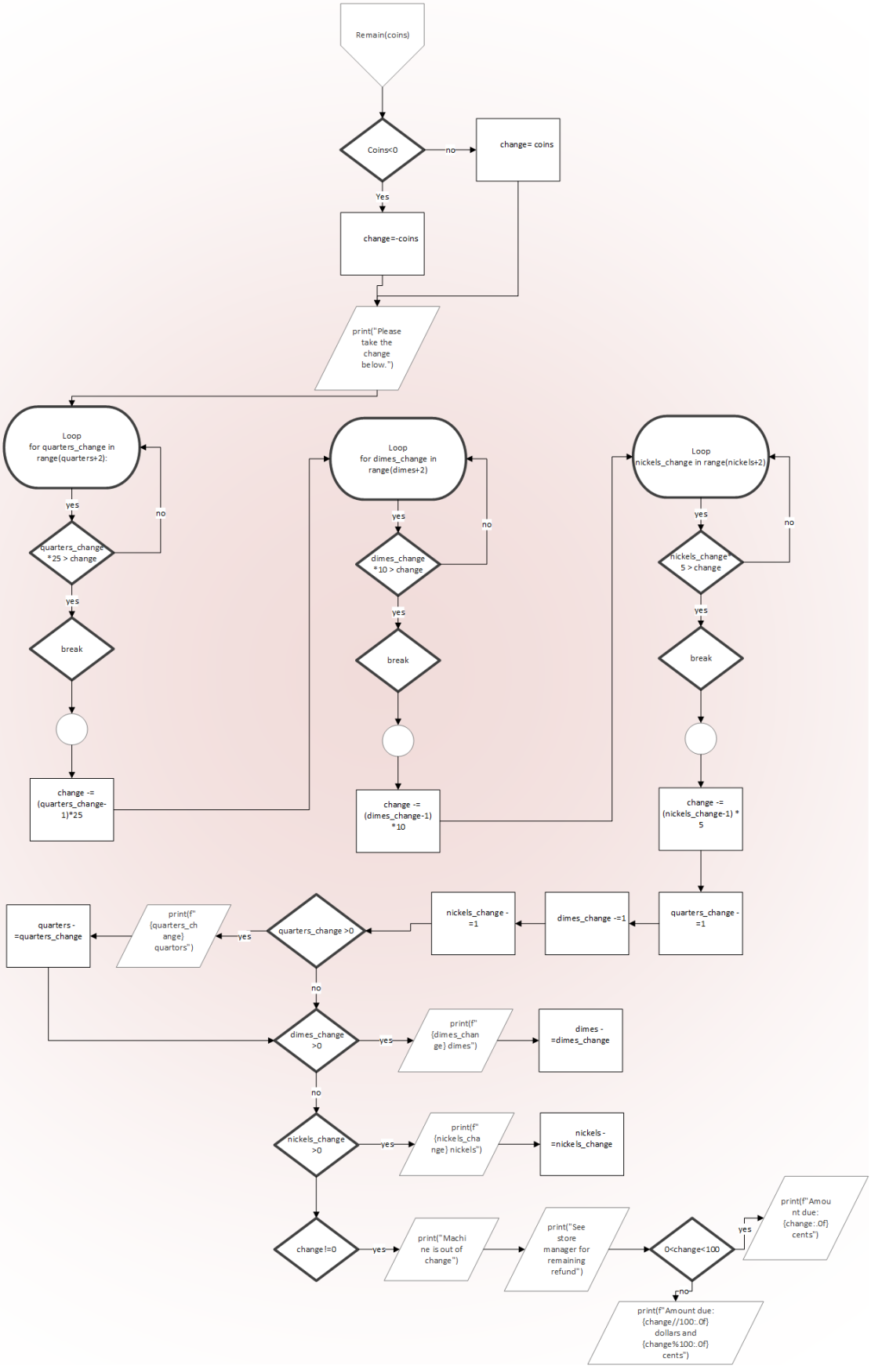

Start
print("Welcome to the vending machine change maker program")
print("Change maker initialized.")
nickels=25
dimes=25
quarters=25
ones=0
fives=0
print_stock()
While Loop:
price=input("Enter the purchase price (xx.xx) or 'q' to quit: ")
Price!='q'
yes
No
fprice=float(price)
Final_price = validate_price(fprice)
Menu()
allcents=final_price*100
dollars=allcents//100
cents=allcents % 100
print("Payment due: "+dollars + "dollar(s) and"+ cents
<<Allcents>100
print("Payment due: "+allcents + "cents"
Loop
Allcents> 0
menus=input("Indicate your deposit: ")
Allcents=Validate_menu(menus,int(allcents))
Menus='c'
allcents = final_price * 100 - allcents
Break
Remain(allcents)
Allcents==0
print(" No charge due.")
Print_stock()
print(" No charge due.")
total = nickels*5 + dimes*10 + quarters*25 + ones*100 + fives*500
print(f"Total: {total// 100:.0f} dollars and {total%100 :.0f} cents")
Stop


Print_stock()
print("Stock contains:")
print(nickels + 'nickels')
print(dimes + 'dimes')
print(quarters + 'quarters')
print(ones + 'ones')
print(fives + 'fives')


Validate_price(fnum)
fnum<0 or fnum*100 % 5!=0
yes
print("Illegal price: Must be a non-negative multiple of 5 cents.")
fnum=input("Enter the purchase price (xx.xx) or 'q' to quit: ")
fnum=float(fnum)
Return fnum
no


Menu()
print("'n' - deposit a nickel")
print("'d' - deposit a dime")
print("'q' - deposit a quarter")
print("'o' - deposit a one dollar bill")
print("'f' - deposit a five dollar bill")
Print("'c' - cancel the purchase")


Validate_menu(deposit, price_left)
Deposit=='n'
no
deposit=='d'
no
deposit=='q'
no
deposit=='o'
no
deposit=='f'
print("Illegal selection: " + deposit)
yes
price_left= price_left-5
price_left= price_left - 10
price_left= price_left - 25
price_left= price_left - 100
price_left= price_left - 500
nickels += 1
dimes += 1
quarters += 1
ones +=1
fives +=1
0<price_left <100
no
Price_left>100
no
Print()
print("Payment due: "+ price_left + "cents")
print("Payment due: "+ price_left + "dollars and "+ price_left %100 +"cents")
Return price_left


Remain(coins)
Coins<0
no
change= coins
Yes
change=-coins
print("Please take the change below.")
Loop for quarters_change in range(quarters+2):
yes
quarters_change *25 > change
no
yes
break
change -= (quarters_change-1)*25
Loop for dimes_change in range(dimes+2)
yes
dimes_change *10 > change
no
yes
break
change -= (dimes_change-1) *10
Loop nickels_change in range(nickels+2)
yes
nickels_change 5 > change
no
yes
break
change -= (nickels_change-1) * 5
quarters_change -=1
dimes_change -=1
nickels_change -=1
quarters_change >0
yes
print(f"{quarters_change} quartors")
quarters -=quarters_change
no
dimes_change >0
yes
print(f"{dimes_change} dimes")
dimes -=dimes_change
no
nickels_change >0
yes
print(f"{nickels_change} nickels")
nickels -=nickels_change
change!=0
yes
print("Machine is out of change")
print("See store manager for remaining refund")
0<change<100
yes
print(f"Amount due: {change:.0f} cents")
no
print(f"Amount due: {change//100:.0f} dollars and {change%100:.0f} cents")

1. **Program Implementation:** Describe the implementation

    a. What did you use: floats, integers and strings, we used built in functions such as input, float, for and while loops, if statements, we laso defined functions for better readability in our code.

    b. What was challenging while you were implementing your program? The algorithm to calculate the change was challenging. In the end we used for loops to iterate within the range of our stock and check if it is the most number of coin for that particular coin to use.

    c. What was interesting/straightforward/fun to implement? Using if statements was easy to use.

    d. Did you add any more tests after you implemented the code? If so, which ones and why?

    If the code will stop when our stock is empty and has no coins because it is not an error of validating the input but an error to see if everything is checked.

    e. How does your program handle bad input? It validates the inputs from the user in the functions validate_price and menu for validating price and menu respectively.

2. **Conclusion:** Lessons Learned:

    a. What went well in this project? Figuring out what happens in the stock and outputting results and formatting.

    b. What you would do differently given another opportunity (about writing a code, about your study skills, and time management)? I would have not used functions because at some points it might have been unbenificed.

    c. What are the improvements that might have made the project better or clearer? Using another algorithm such as module to calculate the amount of coins we must use to give back the change.

Appendix:
#here is a link to the py file

Project03_code

Project 3 Source Code:

```
'''This program will request the user to purchase and item or quit, It is a vending machine change maker'''
#program starts with a stock 25 nickles, 25 dimes, 25 quarters
print("Welcome to the vending machine change maker program")
print("Change maker initialized.")
nickels=25
dimes=25
quarters=25
ones=0
fives=0


def print_stock():
    '''This function prints what stock contains'''
    print("Stock contains:")
    print(f'    {nickels} nickles')
    print(f'    {dimes} dimes')
    print(f'    {quarters} quarters')
    print(f'    {ones} ones')
    print(f'    {fives} fives')
    print()

def validate_price(fnum):
    '''This function gets the parameter parameter fnum and validates it if is a positive number multiple of .05,
then returns a fnum which is validated'''
    #validate the price (non-negative multiple of .05)
    while fnum<0 or fnum*100 % 5 !=0:
        #print error message and ask again
        print("Illegal price: Must be a non-negative multiple of 5 cents.")
        print()
        fnum=input("Enter the purchase price (xx.xx) or 'q' to quit: ")
    fnum=float(fnum)
    return fnum
```

```
#print a menu for coin/bill or cancel by c
def menu():
    '''This function prints the menu'''
    print("Menu for deposits:")

    print('{:>5}'. format("'n' - deposit a nickel"))
    print('{:>5}'. format("'d' - deposit a dime"))
    print('{:>5}'. format("'q' - deposit a quarter"))
    print('{:>5}'. format("'o' - deposit a one dollar bill"))
    print('{:>5}'. format("'f' - deposit a five dollar bill"))
    print('{:>5}'. format("'c' - cancel the purchase"))
    print()


#validate the menu
def validate_menu(deposit,price_left):
    '''This function gets the parameters deposit and price_left as a string and integer respectively, returns
price_left
    deposit : 'n' => price_left -5 and adds to nickels stock by one
    deposit : 'd' => price_left -10 and adds to dimes stock by one
    deposit : 'q' => price_left -25 and adds to quartors stock by one
    deposit : 'o' => price_left -100 and adds to one dollar bills stock by one
    deposit : 'f' => price_left -500 and adds to five dollar bills stock by one
    deposit : 'c' => process is canceled and the money deposited until then must be given back
    if anything else => wrong entry


    '''
    #validate the deposit
    global nickels
    global dimes
    global quarters
    global ones
    global fives

    if deposit=='n':
        price_left= price_left-5
        nickels  += 1
```

```
    elif deposit=='d':
        price_left= price_left-10
        dimes +=1

    elif deposit=='q':
        price_left= price_left-25
        quarters +=1

    elif deposit=='o':
        price_left= price_left-100
        ones +=1

    elif deposit=='f':
        price_left= price_left-500
        fives +=1

    else:
        print(f"Illegal selection: {deposit}")

    #print payment due
    if 0<price_left<100:
        print(f"Payment due: {price_left:.0f} cents")
    elif price_left>100:
        print(f"Payment due: {price_left//100:.0f} dollars and {price_left%100:.0f} cents")
    else:
        print()

    return price_left

#print the remaining amount each time
def remain(coins):
    if coins<0:
        change=-coins
    else:
        change=coins
    global nickels
    global dimes
    global quarters
```

```
print("Please take the change below.")

for quarters_change in range(quarters+2):
    if quarters_change *25 > change:
        break

change -= (quarters_change-1)*25

for dimes_change in range(dimes+2):
    if dimes_change *10 > change:
        break
change -=  (dimes_change-1) *10

for nickels_change in range(nickels+2):
    if nickels_change*5 > change:
        break
change -= (nickels_change-1) * 5

quarters_change -=1
dimes_change -=1
nickels_change -=1

if quarters_change >0 :
    print(f"     {quarters_change} quartors")
    quarters -=quarters_change
if dimes_change >0 :
    print(f"     {dimes_change} dimes")
    dimes -=dimes_change
if nickels_change >0 :
    print(f"     {nickels_change} nickels")
    nickels -=nickels_change


if change!=0:
    print("Machine is out of change")
    print("See store manager for remaining refund")
    if 0<change<100:
        print(f"Amount due: {change:.0f} cents")
```

```
        else:
            print(f"Amount due: {change//100:.0f} dollars and {change%100:.0f} cents")

#main program

print_stock()
price=input("Enter the purchase price (xx.xx) or 'q' to quit: ")
#ask the user input repeatedly until q
while price!='q':

    fprice=float(price)
    final_price=validate_price(fprice)
    print()
    menu()

    allcents=final_price*100
    dollars=allcents//100
    cents=allcents % 100
    if 0<allcents<100:
        print(f"Payment due: {allcents:.0f} cents")
    else:
        print(f"Payment due: {dollars:.0f} dollar(s) and {cents:.0f} cents")

    while allcents>0:
        menus=input("Indicate your deposit: ")
        if menus=='c':
            allcents = final_price * 100 - allcents
            print()
            break
        allcents=validate_menu(menus, int(allcents))


    remain(allcents)
    if allcents==0:
        print("     No charge due.")
    print()
    print_stock()
    price=input("Enter the purchase price (xx.xx) or 'q' to quit: ")
```

```
total = nickels*5 + dimes*10 + quarters*25 + ones*100 + fives*500
print()
print(f"Total: {total//100:.0f} dollars and {total%100:.0f} cents")
```

Project 3 Output Screenshot:

```
Welcome to the vending machine change maker program
Change maker initialized.
Stock contains:
     25 nickles
     25 dimes
     25 quarters
     0 ones
     0 fives

Enter the purchase price (xx.xx) or 'q' to quit: 1.96
Illegal price: Must be a non-negative multiple of 5 cents.

Enter the purchase price (xx.xx) or 'q' to quit: 1.95

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 1 dollar(s) and 95 cents
Indicate your deposit: 1
Illegal selection: 1
Payment due: 1 dollars and 95 cents
Indicate your deposit: o
Payment due: 95 cents
Indicate your deposit: o

Please take the change below.
     1 nickels

Stock contains:
     24 nickles
     25 dimes
     25 quarters
     2 ones
     0 fives
```

```
Enter the purchase price (xx.xx) or 'q' to quit: 3.25

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 3 dollar(s) and 25 cents
Indicate your deposit: o
Payment due: 2 dollars and 25 cents
Indicate your deposit: d
Payment due: 2 dollars and 15 cents
Indicate your deposit: d
Payment due: 2 dollars and 5 cents
Indicate your deposit: o
Payment due: 1 dollars and 5 cents
Indicate your deposit: d
Payment due: 95 cents
Indicate your deposit: c

Please take the change below.
     9 quartors
     1 nickels

Stock contains:
     23 nickles
     28 dimes
     16 quarters
     4 ones
     0 fives
```

```
Enter the purchase price (xx.xx) or 'q' to quit: .05

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 5 cents
Indicate your deposit: f

Please take the change below.
     16 quartors
     9 dimes
     1 nickels

Stock contains:
     22 nickles
     19 dimes
     0 quarters
     4 ones
     1 fives

Enter the purchase price (xx.xx) or 'q' to quit: 25

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 25 dollar(s) and 0 cents
Indicate your deposit: f
Payment due: 20 dollars and 0 cents
Indicate your deposit: f
Payment due: 15 dollars and 0 cents
Indicate your deposit: f
Payment due: 10 dollars and 0 cents
Indicate your deposit: f
Payment due: 5 dollars and 0 cents
Indicate your deposit:
```

```
Payment due: 10 dollars and 0 cents
Indicate your deposit: f
Payment due: 5 dollars and 0 cents
Indicate your deposit: c

Please take the change below.
     19 dimes
     22 nickels
Machine is out of change
See store manager for remaining refund
Amount due: 17 dollars and 0 cents

Stock contains:
     0 nickles
     0 dimes
     0 quarters
     4 ones
     5 fives

Enter the purchase price (xx.xx) or 'q' to quit: .35

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 35 cents
Indicate your deposit: q
Payment due: 10 cents
Indicate your deposit: d

Please take the change below.
     No charge due.

Stock contains:
     0 nickles
     1 dimes
     1 quarters
     4 ones
     5 fives

Enter the purchase price (xx.xx) or 'q' to quit:
```

```
Enter the purchase price (xx.xx) or 'q' to quit: .35

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 35 cents
Indicate your deposit: q
Payment due: 10 cents
Indicate your deposit: q

Please take the change below.
     1 dimes
Machine is out of change
See store manager for remaining refund
Amount due: 5 cents

Stock contains:
     0 nickles
     0 dimes
     3 quarters
     4 ones
     5 fives

Enter the purchase price (xx.xx) or 'q' to quit: q

Total: 29 dollars and 75 cents
PS C:\Users\SONY\Desktop\Uni\CECS 174\Projects\project03>
```

Project 3 Output:

Welcome to the vending machine change maker program
Change maker initialized.
Stock contains:
- 25 nickles
- 25 dimes
- 25 quarters
- 0 ones

0 fives

Enter the purchase price (xx.xx) or 'q' to quit: 1.96
Illegal price: Must be a non-negative multiple of 5 cents.

Enter the purchase price (xx.xx) or 'q' to quit: 1.95

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 1 dollar(s) and 95 cents
Indicate your deposit: 1
Illegal selection: 1
Payment due: 1 dollars and 95 cents
Indicate your deposit: o
Payment due: 95 cents
Indicate your deposit: o

Please take the change below.
1 nickels

Stock contains:
24 nickles
25 dimes
25 quarters
2 ones
0 fives

Enter the purchase price (xx.xx) or 'q' to quit: 3.25

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 3 dollar(s) and 25 cents

Indicate your deposit: o
Payment due: 2 dollars and 25 cents
Indicate your deposit: d
Payment due: 2 dollars and 15 cents
Indicate your deposit: d
Payment due: 2 dollars and 5 cents
Indicate your deposit: o
Payment due: 1 dollars and 5 cents
Indicate your deposit: d
Payment due: 95 cents
Indicate your deposit: c

Please take the change below.
    9 quartors
    1 nickels

Stock contains:
    23 nickles
    28 dimes
    16 quarters
    4 ones
    0 fives

Enter the purchase price (xx.xx) or 'q' to quit: .05

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 5 cents
Indicate your deposit: f

Please take the change below.
    16 quartors
    9 dimes
    1 nickels

Stock contains:
    22 nickles
    19 dimes

0 quarters
4 ones
1 fives

Enter the purchase price (xx.xx) or 'q' to quit: 25

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 25 dollar(s) and 0 cents
Indicate your deposit: f
Payment due: 20 dollars and 0 cents
Indicate your deposit: f
Payment due: 15 dollars and 0 cents
Indicate your deposit: f
Payment due: 10 dollars and 0 cents
Indicate your deposit: f
Payment due: 5 dollars and 0 cents
Indicate your deposit: c

Please take the change below.
19 dimes
22 nickels
Machine is out of change
See store manager for remaining refund
Amount due: 17 dollars and 0 cents

Stock contains:
0 nickles
0 dimes
0 quarters
4 ones
5 fives

Enter the purchase price (xx.xx) or 'q' to quit: .35

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime

'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 35 cents
Indicate your deposit: q
Payment due: 10 cents
Indicate your deposit: d

Please take the change below.
    No charge due.

Stock contains:
    0 nickles
    1 dimes
    1 quarters
    4 ones
    5 fives

Enter the purchase price (xx.xx) or 'q' to quit: .35

Menu for deposits:
'n' - deposit a nickel
'd' - deposit a dime
'q' - deposit a quarter
'o' - deposit a one dollar bill
'f' - deposit a five dollar bill
'c' - cancel the purchase

Payment due: 35 cents
Indicate your deposit: q
Payment due: 10 cents
Indicate your deposit: q

Please take the change below.
    1 dimes
Machine is out of change
See store manager for remaining refund
Amount due: 5 cents

Stock contains:
    0 nickles
    0 dimes

3 quarters
4 ones
5 fives

Enter the purchase price (xx.xx) or 'q' to quit: q

Total: 29 dollars and 75 cents