

Computing GCSE Coursework

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OCR A453 Programming Project

Made with L^AT_EX

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Summary

1 Objectives

1.1 Task 1

1. Take an input and verify that it is 8 or 7 numerical digits
2. Calculate the 8th check digit:
 - a Multiply the first 7 numbers alternately by 3,1
 - b Total these results
 - c Subtract this sum from its nearest highest multiple of 10
3. Compare this to the given 8th number, or complete the 7-digit number

1.2 Task 2

1. Take an input and validate that it is 8 numerical digits
2. Connect to a SQL database and run a query
3. Collect and display the results
4. Update the database with the customer's order
5. Print a receipt
6. Cope with SQL errors

1.3 Task 3

1. Scan a database and find stock to order
2. Create a receipt of the order
3. Update the database with the updated stock level
4. Cope with any SQL errors

2 Test Plan

2.1 Task 1

1. Input strings of incorrect length. If rejected, it passes.

Test data: 12345

Test data: 1234567890

2. Input strings of letters. If rejected, it passes.

Test data: abcdefg

3. Get program to run a valid input. Print out totals at each stage, and check them manually. If they are the same, it passes.

Test data: 13245627

- i. Manually add the totals of a valid input. If they are the same, it passes.
 - ii. Manually round the total to the highest 10. If it is the same, it passes.
 - iii. Manually collect the distance rounded. If it is the same, it passes.
4. Run the program with a GTIN number taken from a product. If it correctly calculated and verified, it passes.

2.2 Task 2

1. Input strings of incorrect length. If rejected, it passes.

Test data: 12345.

Test data: 1234567890.

2. Input strings of letters. If rejected, it passes.

Test data: abcdefg.

3. Input a valid string to search. If product found, it passes.

Test data: 11440529.

4. Manually check that the program has displayed the correct stock level and information. If it does, it passes.

Stock info: 50 in stock for #11440529 (red paint 100ml).

5. Order a quantity of the product. If the program updates the stock levels, it passes.

Test data: order 5 x QTY of #11440529 (red paint 100ml).

6. Complete a full order. If the program displays a receipt with the correct values, it passes.

Test data: order 5 x QTY of #11440529 (red paint 100ml) AND

6 x QTY of #11509493 (blue paint 100ml).

Expected result: 5 x #11509493 = £9.95 AND 6x #11509493 = £11.94, total: £21.90 .

7. Provide the program with invalid values (such as ordering negative values). If the program rejects these, it passes.

Test data: -3 x QTY #11509493.

Expected result: error and re-input.

Test data 0 x QTY #11509493.

Expected result: error and re-input.

Test data: 100 x QTY #11509493.

Expected result: not enough stock, re-input.

2.3 Task 3

1. Edit database for reduced stock. If reduced stock is identified, it passes.

Test data: Edit a stock level to -10 of stock level.

Print receipt.

2. Edit database for reduced stock. If a human-readable receipt is produced, it passes.

Test data: Edit two stock levels to -10 of stock level.

Print receipt.

3. Complete order for reduced stock. If the database updated, it passes.

Continue from test area 2, and update database.

Check database manually.

4. If the program handles SQL errors, it passes.

Attempt to update from more than stock level.

3 Pseudocode

3.1 Task 1

START

User INPUT choice for calculate or verify

IF Calculate:

Number Length is 7

INPUT GTIN

CALL Verify function

ELSE IF Verify:

Number Length is 8

INPUT GTIN

CALL verify Function

ENDIF

ENDIF

Verify Function:

IF GTIN length = Length AND is all numeric:

For a loop of 7 by step of 2:

total = total+(GTIN [counter]*3)

IF counter =6:

Round total UP to nearest multiple of 10

result = roundedNumber - total

If Length = 7:

Print result

ELSE

If GTIN at position Length = result:

Print GTIN is a valid number

ELSE:

Print GTIN is an invalid number

ENDIF

ELSE

Multiply GTIN at position of counter+1 by 1 and add to total

ENDIF

ELSE

Print error and return to GTIN input

ENDIF

END

3.2 Task 2

```
START
User INPUT GTIN number
IF GTIN is numerical AND GTIN = 8 characters:
    Search Database for GTIN number
    IF result found:
        User INPUT quantity to order
        IF quantity > 0 AND quantity <= stock available
            PRINT receipt with total cost (cost per item * quantity ordered)
            Update Database with new stock (stock available a quantity ordered)
            User INPUT choice to order more items
            IF choice = yes:
                Add to order list and return to GTIN INPUT
            ELSE
                PRINT final receipt (order list) and end program
            ENDIF
        ELSE
            Return to Quantity INPUT
        ENDIF
    ELSE
        Return to GTIN INPUT
    ENDIF
ELSE
    Return to GTIN INPUT
ENDIF
END
```

3.3 Task 3

```
START
Connect to SQL Database
Search database:
    IF stock level < target stock level:
        RETURN results
PRINT results
APPEND results to order list
IF order complete:
    UPDATE database:
        stock level = target stock level
ELSE
    END
ENDIF
END
```

4 Data Structure

4.1 Task 1

Variable Name	Variable Description
ask	The choice wether the user wants to verify or calculate
gtin	The GTIN number used
length	The length the GTIN should be
total	The running total of all the multipli-cations
checkdig	The 8th digit in a verification
rounded	total Rounded up to the nearest 10
result	The 8th digit as the program calcu-lates it
again	The choice of wether the user wants to run the program again

4.2 Task 2

Variable Name	Variable Description	Value
con and cur	Connections to SQL database	N/A
var	User Input GTIN number	User Defined
results	Fetchall results from SQL query	N/A (list)
product	Equal to results , reformatted	Equal to results
sizeName and sizeNameRaw	Variables used to format the name of the product	Name of product selected
QtyToOrder	User Input quantity ordered	User Defined
NewStockAvab	Variable used to update the SQL database with the new stock levels	Stock Available minus QtyToOrder
costOfOrder	Total cost of order	Price of product* QtyToOrder
currentOrderAddRaw and currentOrderAdd and currentOrder	Variables used to format and append the order to the entire list of order (to print receipt)	N/A

4.3 Task 3

Variable Name	Variable Description	Value
con and cur	Connections to SQL database	N/A
sql1	SQL command for finding reduced stock levels	SELECT* FROM Inventory WHERE StockAvab != Target Stock
results	Fetchall results from SQL query	N/A, List
toOrder	Value of how much stock needs to be ordered for each product	targetStock - stockAvab
sizeName and sizeNameRaw	Used to correctly format the product name	N/A
stockOrderAddRaw and stockOrderAdd and stockOrder	Used to format the list of the stock update order	N/A
orderList	Final order list	N/A

5 Development

5.1 Task 1

Objective 1: Take an input and verify that it is 8 or 7 numerical digits

start() Function

```
def start():    ## Main process
    ask = input('Press [c] to calculate the 8th GTIN Number from 7 numbers. \nPress [v] to verify an 8 digit GTIN')
    if ask == 'c' or ask == 'C':
        gtin = 0
        length = 7
        check(length)
    elif ask == 'v' or ask == 'V':
        gtin = 0
        length = 8
        check(length)
    else: print('Error: Please enter either \'c\' or \'v\' ')
    start()
```

This function takes a user input of 'ask' to decide if the user wants to either calculate the 8th GTIN digit from 7 digits (choice c), or verify the 8th GTIN digit from 8 digits (choice v). If the choice is c, the program creates the variables `gtin` and `length`, and sets `length` to 7. It then calls the `check()` function carrying `length` with it.

If the choice is v, the program creates the variables `gtin` and `length`, and sets `length` to 8. It then calls the `check()` function carrying `length` with it.

check() Function

```
def check(length):
    print('Enter the', length, 'digit GTIN number')
    gtin = input(': ')
    if len(gtin) == length and gtin.isnumeric() == True:
        total = 0
    else:
        print('Error: Only', length, 'numbers are allowed. Try again ')
        check(length)
```

This function prints a statement asking the user for the `length` length GTIN. It then takes the user input of `gtin`.

If the length of `gtin` is equal to `length` and `gtin.isnumeric` function is True (the variable is numerical) then it creates the variable `total`. Else, it prints an error message, and returns to the `check()` function.

Objective 2: Calculate the 8th check digit

Multiply the first 7 numbers alternately by 3,1

```
for counter in range(0, 7, 2):  
    total = total + ((int(gtin[counter]))*3)  
    total = total + ((int(gtin[counter+1]))*1)
```

This snippet starts a loop for the value of `counter`, which goes from 0 to 7, stepping by 2 each time. The counter could have gone 0 to 3 stepping by 1, but this would make it more complicated. The program then adds the following to `total` : integer of: `gtin` at position of `counter` multiplied by 3. It then adds to following to `total` : integer of `gtin` at position of `counter+1` multiplied by 1.

Total these results

The program simply adds all of these calculations to `total`

Subtract this sum from its nearest highest multiple of 10

```
if counter == 6:  
    checkdig = int(gtin[length-1])  
    rounded = (int(math.ceil(total / 10.0)) * 10)  
    result = (rounded - total)
```

This snippet checks to see if the loop is on its final iteration (`counter = 6`). It then sets `checkdig` to the penultimate digit of `gtin`. It then creates the variable `rounded` and sets it to to the nearest highest multiple of 10 of `total`. It then creates the variable `result` and sets it to the result of `rounded - total`.

Objective 3: Compare this to the given 8th number, or complete the 7-digit number

```
if length == 7:  
    print('Final Check Digit = ', result)  
    print('Whole GTIN-8 Number = ', gtin,result)  
    park()  
else:  
    if checkdig == result: print(gtin, 'is a Valid Number')  
    else: print(gtin, 'is an Invalid Number')  
    park()
```

In this section of code, if `length` equals 7, the program prints the final check digit (`result`), and also prints the whole calculated GTIN (`gtin` and `result`). It then calls the `park()` function. Else, if `checkdig` is equal to `result`, it prints that `gtin` is a valid number. Else, it prints that `gtin` is an invalid number.

5.2 Task 2

Objective 1: Take an input and validate that it is 8 numerical digits

```
def verify(con, cur, currentOrder):
    var = input('Enter GTIN for the product you wish to purchase:\n> ')
    if len(var) == 8 and var.isnumeric() == True:
        findStock(con, cur, currentOrder, var)
    else:
        print('Enter a 8 digit number')
        verify(con, cur, currentOrder)
```

This function takes the user input `var`. If it is 8 digits long and `var.isnumeric` function is True (the variable is numerical) , it calls `findStock` function, carrying `con` and `cur` (variables for SQL database connection), `currentOrder`, and `var`. Else, it prints an error message and returns to `verify()` function.

Objective 2: Connect to a SQL database and run a query

```
con = lite.connect('dbuse.db')
cur = con.cursor()
```

This snippet uses the `sqlite3` library to connect to the database file `dbuse.db`.

```
def findStock(con, cur, currentOrder, var):
    cur.execute('SELECT * FROM Inventory WHERE GTIN = ?', (var,))
    results = cur.fetchall()      ## collects results from SQL
    con.commit()
```

The `findStock()` function executes the SQL query to find the record in `Inventory` where GTIN is equal to `var`. It then sets the variable `results` to the results of this query.

Objective 3: Collect and display the results

```
for product in results:
    if product[2] == "":
        sizeName = ""
    elif product[2] == 'Small' or product[2] == 'Medium' or product[2] == 'Large':
        sizeName = product[2]
    else:
        sizeNameRaw = product[2], 'ml'
        sizeName = "".join(sizeNameRaw)
    print(' Name: ', sizeName, product[1], '\n Price: ', product[3], '\n Stock Available: ', product[4])
```

This section of code formats the product name: If the product has no size, it displays the name. If it has a small/medium/large quantity, it appends that to the end. If it has a ml volume, it appends that to the front. It then prints the name of the product as product name, volume, price, stock available.

Objective 4: Update the database with the customer's order

```
def enterOrder(sizeName, product, var, results, currentOrder, cur, con):
    QtyToOrder = input('-----\nEnter Quantity to order:\n>')
    if QtyToOrder.isnumeric() == False:
        print('Enter a valid Number')
        enterOrder(sizeName, product, var, results, currentOrder, cur, con)
    elif int(QtyToOrder) > int(product[4]):
        print('Error: Not enough stock. Please order', product[4], 'or less')
        enterOrder(sizeName, product, var, results, currentOrder, con, cur)
    elif int(QtyToOrder) < 1:
        print('You can't order less than 1. Try again')
        enterOrder(sizeName, product, var, results, currentOrder, con, cur)
```

This section of `enterOrder()` function ensures that the customer can only order more than 1, and less than or equal the number of stock available.

```
else:
    print('Adding to order...')
    NewStockAvab = 0
    costOfOrder = float(product[3])*int(QtyToOrder)
    currentOrderAddRaw = str(QtyToOrder), ' x ', str(sizeName), ' ', str(product[1]), ' (GTIN: ', str(product[0]), ') @ £', str(product[3]), ' = £', str(costOfOrder)
    currentOrderAdd = "" join(currentOrderAddRaw)
    print('Added to order!')
    print('Updating Stock Levels...')
    QtyInt = int(QtyToOrder)
    NewStockAvab = str((int(product[4])) - QtyInt)
    sql = ("UPDATE INVENTORY SET STOCKAVAB = "+NewStockAvab+" WHERE GTIN LIKE '"+product[0]+"")
```

This section creates a verbose receipt, and makes an SQL query to update the database with the new stock levels

Objective 5: Print a receipt

```
currentOrder.append(currentOrderAdd)
again = input('Order another item? [Y/N]:\n>')
if again == 'Y' or again == 'y':
    verify(con, cur, currentOrder)
if again == 'N' or again == 'n':
    print('Order finished!')
    print('Receipt:')
    for order in currentOrder:
        print(order)
```

Objective 6: Cope with SQL errors

```
except:
    print('Error: Inventory Update failed to commit.')
    currentOrder.append(currentOrderAdd+' [CANCELLED]')
    print("\n\nPLEASE ENTER \'I00\' TO ESCAPE ERROR\n\n")
    enterOrder(sizeName, product, var, results, currentOrder, cur, con)
```

If the user enters an invalid number, the `sqlite3` library may get confused, and may enter an error loop. To break this loop, the user has to force the library to send another invalid request to the database.

5.3 Task 3

Objective 1: Scan a database and find stock to order

```
def findStock(con, cur, stockOrder):  
    sql1 = 'SELECT * FROM Inventory WHERE StockAvab != TargetStock'  
    cur.execute(sql1)  
    results = cur.fetchall()  
    orderList = []
```

The `findStock()` function sends a SQL query to the database to find any record where the stock level does not equal the target stock level. It then sets the variable `results` to these results.

Objective 2: Create a receipt of the order

```
print('Low stock! Order', toOrder, 'x', product[1], 'more to fill stock')  
if product[2] == '':  
    sizeName = ''  
elif product[2] == 'Small' or product[2] == 'Medium' or product[2] == 'Large':  
    sizeName = product[2]  
else:  
    sizeNameRaw = product[2], 'ml'  
    sizeName = ''.join(sizeNameRaw)  
stockOrderAddRaw = str(toOrder), ' x ', str(sizeName), ' ', str(product[1]), ' (GTIN: ', str(product[0]), ' )'  
stockOrderAdd = ''.join(stockOrderAddRaw)  
stockOrder.append(stockOrderAdd)  
orderList.append(product[0])
```

This section is similar to Task 2 Objective 4, and formats a verbose name of the product, and adds it to the receipt list.

Objective 3: Update the database with the updated stock level

```
def updateStock(con, cur, stockOrder, toOrder, orderList):  
    ##print(orderList)  
    print('Updating Database...')  
    for productUpdate in orderList:  
        sql2 = "UPDATE INVENTORY SET STOCKAVAB = TARGETSTOCK WHERE GTIN LIKE '"+productUpdate+""  
        try:  
            cur.execute(sql2)  
            con.commit()  
            print('Complete #', productUpdate)  
        except:  
            print('An exception occurred.')
```

This function connects to the SQL database and updates the new stock levels. If it fails, it returns to the last function.

Objective 4: Cope with any SQL errors

```
except:  
    print('An exception occurred.')
```

There should not be any SQL errors, as the user does not input any information that is used directly in the SQL query. This also protects against SQL injection.

6 Testing

6.1 Task 1

Objective 1: Input strings of incorrect length. If rejected, it passes