1.Write a socket program in python using TCP :Client shouldsend anumberto the server. Server should find the reverse of that number and return the reversed number to the client.

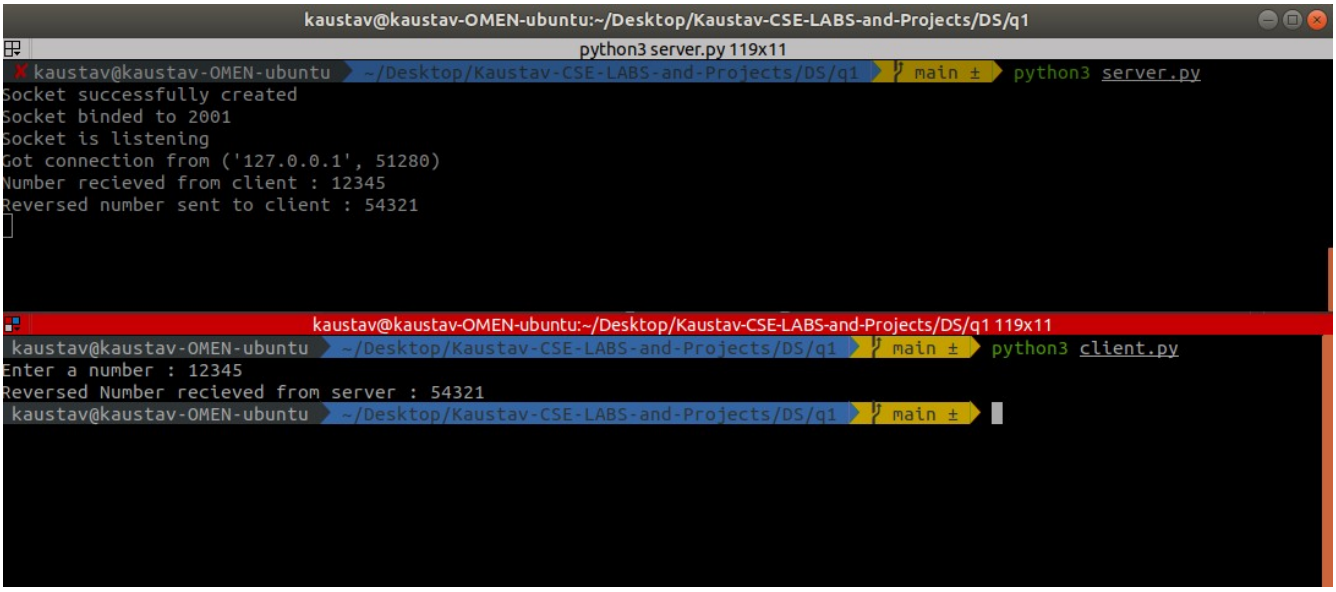
./q1/client.py

```
import socket
host = socket.gethostname()
port = 2001
with socket.socket(socket.AF_INET, socket.SOCK_STREAM) as s:
    s.connect((host, port))
    n = int(input("Enter a number : "))
    s.sendall(bytes(str(n), 'utf-8'))
    print("Reversed Number recieved from server : "+str(s.recv(1024).decode()))
    s.close()
```

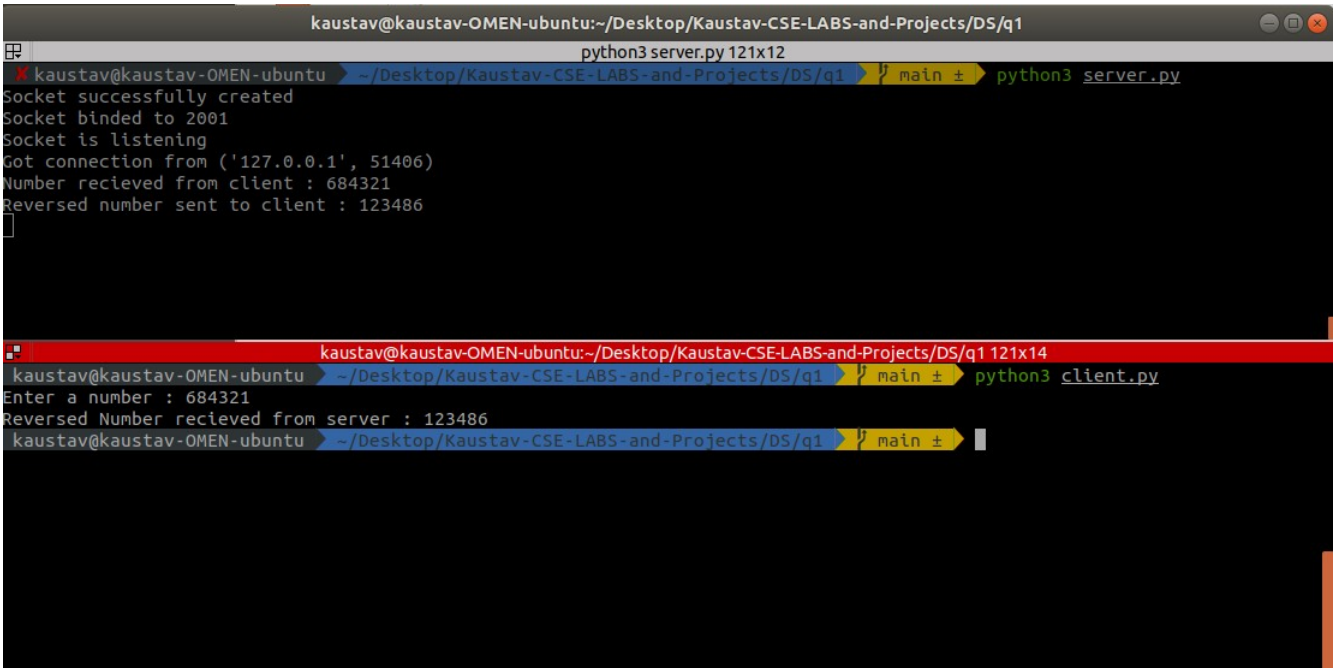
./q1/server.py

```
import socket


def revNumber(number):
    rev = 0
    while (number > 0):
        remainder = number % 10
        rev = (rev * 10) + remainder
        number = number // 10
    return rev


s = socket.socket(socket.AF_INET, socket.SOCK_STREAM)
print("Socket successfully created")
port = 2001
host = socket.gethostname()
s.bind((host, port))
print("Socket binded to", port)
s.listen(5)
print("Socket is listening")
while True:
    conn, addr = s.accept()
    print('Got connection from', addr)
    data = int(conn.recv(1024).decode())
    print("Number recieved from client : "+str(data))
    data = revNumber(data)
    if not data:
        break
    conn.sendall(bytes(str(data), 'utf-8'))
    print("Reversed number sent to client : "+str(data))
    conn.close()
```

Test case 1



Test Case 2



2.Write a map reduce program that returns the highest number of population, for each countryin the dataset countries.csv

./q2/mapper.py

```
import fileinput

for line in fileinput.input():
    data = line.strip().split(",")
    if len(data) == 6:
        country, continent, year, lifeExpectancy, population, gdpPerCapita = data
        if country != "country":
            print("{0}\t{1}".format(country, int(population)))
```

./q2/reducer.py

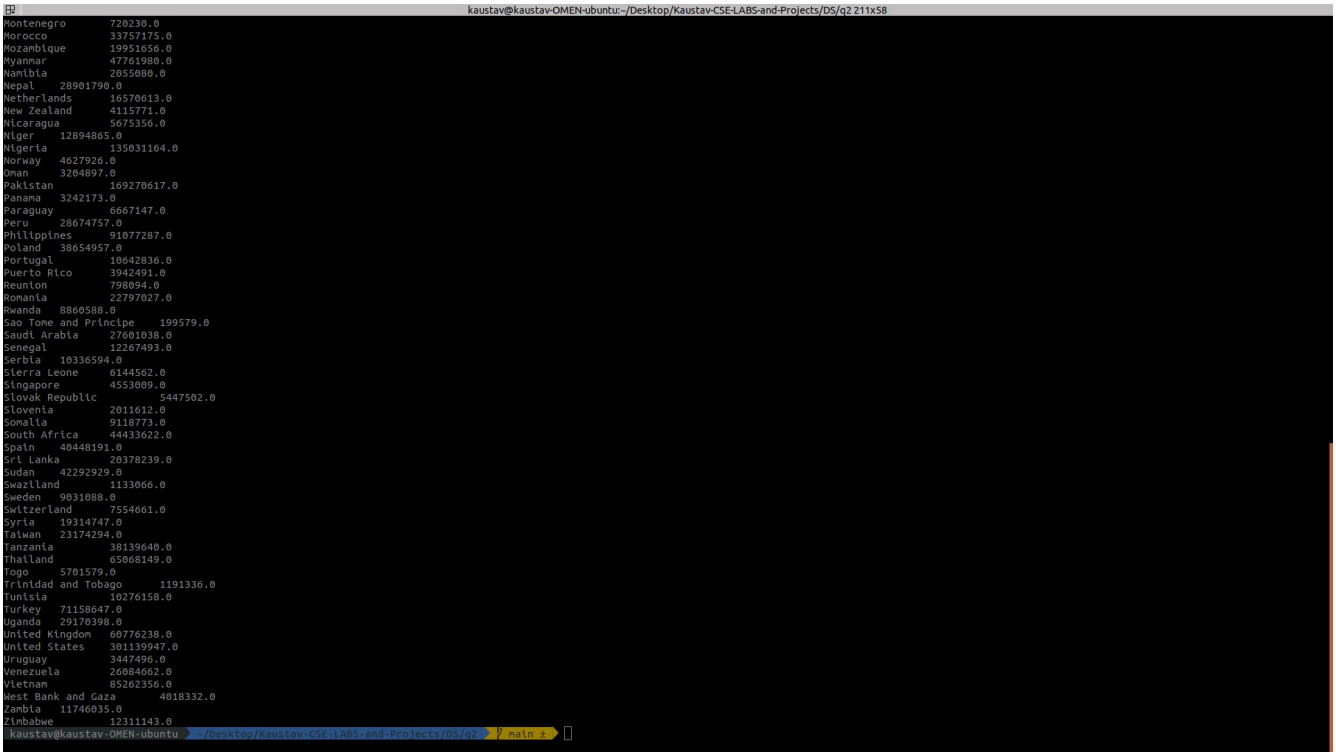
```
import fileinput

maximum = 0
old_key = None

for line in fileinput.input():

    data = line.strip().split("\t")

    if len(data) != 2:
        # Something has gone wrong. Skip this line.
        continue

    current_key, current_value = data

    # Refresh for new keys (i.e. locations in the example context)
    if old_key and old_key != current_key:
        print(old_key, "\t", maximum)
        old_key = current_key
        maximum = 0

    old_key = current_key
    if float(current_value) > float(maximum):
        maximum = float(current_value)

if old_key != None:
    print(old_key, "\t", maximum)
```

kaustav@kaustav-OMEN-ubuntu:~/Desktop/Kaustav-CSE-LABS-and-Projects/DS/q2 211x58

```
kaustav@kaustav-OMEN-ubuntu ~/Desktop/Kaustav-CSE-LABS-and-Projects/DS/q2  main ± cat countries.csv | sort | python3 mapper.py  | sort |python3 reducer.py
Afghanistan      31889923.0
Albania          3600523.0
Algeria          33333216.0
Angola   12420476.0
Argentina        40301927.0
Australia        20434176.0
Austria          8199783.0
Bahrain          708573.0
Bangladesh       150448339.0
Belgium          10392226.0
Benin    8078314.0
Bolivia          9119152.0
Bosnia and Herzegovina   4552198.0
Botswana         1639131.0
Brazil   190010647.0
Bulgaria         8971958.0
Burkina Faso     14326203.0
Burundi          8390505.0
Cambodia         14131858.0
Cameroon         17696293.0
Canada   33390141.0
Central African Republic         4369038.0
Chad     10238807.0
Chile    16284741.0
China    1318683096.0
Colombia         44227550.0
Comoros          710960.0
Costa Rica       4133884.0
Cote d'Ivoire    18013409.0
Croatia          4494013.0
Cuba     11416987.0
Czech Republic   10315702.0
Denmark          5468120.0
Djibouti         496374.0
Dominican Republic       9319622.0
Ecuador          13755680.0
Egypt    80264543.0
El Salvador      6939688.0
Equatorial Guinea        551201.0
Eritrea          4906585.0
Ethiopia         76511887.0
Finland          5238460.0
France   61083916.0
Gabon    1454867.0
Gambia   1688359.0
Germany          82400996.0
Ghana    22873338.0
Greece   10706290.0
Guatemala        12572928.0
Guinea   9947814.0
Guinea-Bissau    1472041.0
Haiti    8502814.0
Honduras         7483763.0
Hungary          10705535.0
Iceland          301931.0
India    1110396331.0
Indonesia        223547000.0
Iran     69453570.0
```

kaustav@kaustav-OMEN-ubuntu:~/Desktop/Kaustav-CSE-LABS-and-Projects/DS/q2 211x58

```
Indonesia        223547000.0
Iran     69453570.0
Iraq     27499638.0
Ireland          4109086.0
Israel   6426679.0
Italy    58147733.0
Jamaica          2780132.0
Japan    127467972.0
Jordan   6053193.0
Kenya    35610177.0
Kuwait   2505559.0
Lebanon          3921278.0
Lesotho          2046772.0
Liberia          3193942.0
Libya    6036914.0
Madagascar       19167654.0
Malawi   13327079.0
Malaysia         24821286.0
Mali     12031795.0
Mauritania       3270065.0
Mauritius        1250882.0
Mexico   108700891.0
Mongolia         2874127.0
Montenegro       720230.0
Morocco          33757175.0
Mozambique       19951656.0
Myanmar          47761980.0
Namibia          2055080.0
Nepal    28901790.0
Netherlands      16570613.0
New Zealand      4115771.0
Nicaragua        5675356.0
Niger    12894865.0
Nigeria          135031164.0
Norway   4627926.0
Oman     3204897.0
Pakistan         169270617.0
Panama   3242173.0
Paraguay         6667147.0
Peru     28674757.0
Philippines      91077287.0
Poland   38654957.0
Portugal         10642836.0
Puerto Rico      3942491.0
Reunion          798094.0
Romania          22797027.0
Rwanda   8860588.0
Sao Tome and Principe    199579.0
Saudi Arabia     27601038.0
Senegal          12267493.0
Serbia   10336594.0
Sierra Leone     6144562.0
Singapore        4553009.0
Slovak Republic          5447502.0
Slovenia         2011612.0
Somalia          9118773.0
South Africa     44433622.0
Spain    40448191.0
Sri Lanka        20378239.0
```


kaustav@kaustav-OMEN-ubuntu:~/Desktop/Kaustav-CSE-LABS-and-Projects/DS/q2 211x58
Montenegro 720230.0
Morocco 33757175.0
Mozambique 19951656.0
Myanmar 47761980.0
Namibia 2055080.0
Nepal 28901790.0
Netherlands 16570613.0
New Zealand 4115771.0
Nicaragua 5675356.0
Niger 12894865.0
Nigeria 135031164.0
Norway 4627926.0
Oman 3204897.0
Pakistan 169270617.0
Panama 3242173.0
Paraguay 6667147.0
Peru 28674757.0
Philippines 91077287.0
Poland 38654957.0
Portugal 10642836.0
Puerto Rico 3942491.0
Reunion 798094.0
Romania 22797027.0
Rwanda 8860588.0
Sao Tome and Principe 199579.0
Saudi Arabia 27601038.0
Senegal 12267493.0
Serbia 10336594.0
Sierra Leone 6144562.0
Singapore 4553009.0
Slovak Republic 5447502.0
Slovenia 2011612.0
Somalia 9118773.0
South Africa 44433622.0
Spain 40448191.0
Sri Lanka 20378239.0
Sudan 42292929.0
Swaziland 1133066.0
Sweden 9031088.0
Switzerland 7554661.0
Syria 19314747.0
Taiwan 23174294.0
Tanzania 38139640.0
Thailand 65068149.0
Togo 5701579.0
Trinidad and Tobago 1191336.0
Tunisia 10276158.0
Turkey 71158647.0
Uganda 29178398.0
United Kingdom 60776238.0
United States 301139947.0
Uruguay 3447496.0
Venezuela 26084662.0
Vietnam 85262356.0
West Bank and Gaza 4018332.0
Zambia 11746035.0
Zimbabwe 12311143.0
kaustav@kaustav-OMEN-ubuntu ~/Desktop/Kaustav-CSE-LABS-and-Projects/DS/q2 main ±