In [1]:
```
import string
import random
import matplotlib.pyplot as plt
import csv
import os
```

Generating input of size n

In [2]:
```
def generate_input(n, k):
    res = []
    for i in range(n):
        N = 7

        fname = ''.join(random.choices(string.ascii_lowercase , k=N))
        lname = ''.join(random.choices(string.ascii_lowercase , k=N))



        dd = "{:02d}".format(random.randint(1,28))
        mm = "{:02d}".format(random.randint(1,12))
        yyyy = "{:04d}".format(random.randint(1980,2022))

        row = dd + mm + yyyy + ' ' + fname + ' ' + lname + '\n'
        row = [str(row)]
        res += row

    return res
```

Running the Algo a for inputs from 100 to 1000

In [3]:
```
fp = open("plottime.csv", "w")
fp.write("n,k,Algo,time\n")
fp.close()

for n in range(100, 1000, 10):
    k = n//2
    fp = open("randominput.txt", "w")
    fp.write(str(str(n) + ' ' + str(k) + '\n'))
    res = generate_input(n, k)
    fp.writelines(res)
    fp.close()

    os.system("./app a randominput.txt")
```

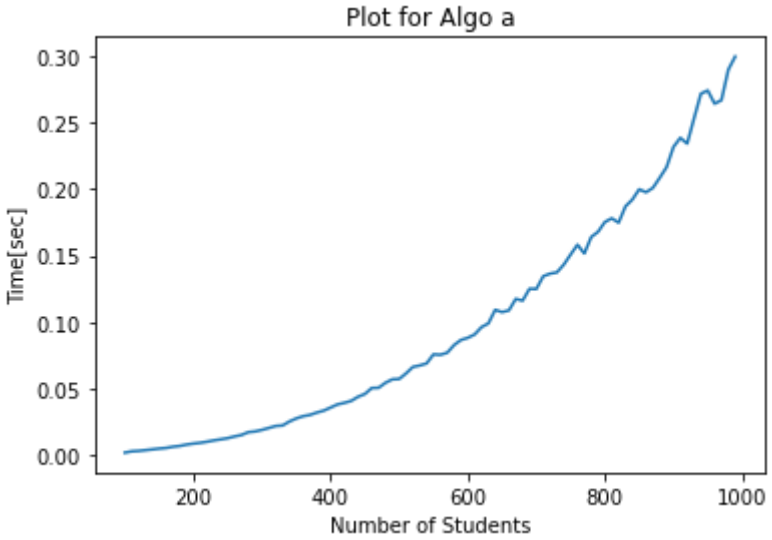
```
output1.txt file written successfully!
Clock time taken by the program: 0.001576
output1.txt file written successfully!
Clock time taken by the program: 0.002581
output1.txt file written successfully!
Clock time taken by the program: 0.002887
output1.txt file written successfully!
Clock time taken by the program: 0.003447
output1.txt file written successfully!
Clock time taken by the program: 0.004020
output1.txt file written successfully!
Clock time taken by the program: 0.004623
output1.txt file written successfully!
Clock time taken by the program: 0.005094
output1.txt file written successfully!
Clock time taken by the program: 0.006021
output1.txt file written successfully!
Clock time taken by the program: 0.006613
output1.txt file written successfully!
```

Ploting input size VS time for algo a, O(n^2log(n))

In [4]:
```
x = []
y = []

with open('plottime.csv','r') as csvfile:
    plots = csv.reader(csvfile, delimiter = ',')
    plots = list(plots)
    for row in plots[1:]:
        x.append(int(row[0]))
        y.append(float(row[3]))


plt.plot(x, y)
plt.title("Plot for Algo a")
plt.xlabel("Number of Students")
plt.ylabel("Time[sec]")
plt.savefig('plot_a.jpg', bbox_inches='tight')
plt.show()
```



Running the Algo b for inputs from 100 to 1000

In [5]:
```
fp = open("plottime.csv", "w")
fp.write("n,k,Algo,time\n")
fp.close()

for n in range(100, 1000, 10):
    k = n//2
    fp = open("randominput.txt", "w")
    fp.write(str(str(n) + ' ' + str(k) + '\n'))
    res = generate_input(n, k)
    fp.writelines(res)
    fp.close()

    os.system("./app b randominput.txt")
```

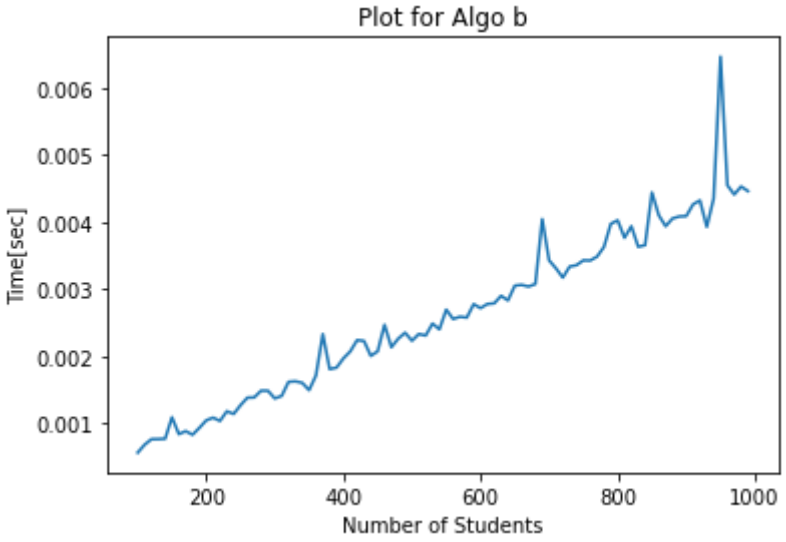
```
output2.txt file written successfully!
Clock time taken by the program: 0.000564
output2.txt file written successfully!
Clock time taken by the program: 0.000681
output2.txt file written successfully!
Clock time taken by the program: 0.000764
output2.txt file written successfully!
Clock time taken by the program: 0.000766
output2.txt file written successfully!
Clock time taken by the program: 0.000771
output2.txt file written successfully!
Clock time taken by the program: 0.001091
output2.txt file written successfully!
Clock time taken by the program: 0.000840
output2.txt file written successfully!
Clock time taken by the program: 0.000884
output2.txt file written successfully!
Clock time taken by the program: 0.000831
output2.txt file written successfully!
```

Ploting input size VS time for algo b, O(nlog(n))

In [6]:
```
x = []
y = []

with open('plottime.csv','r') as csvfile:
    plots = csv.reader(csvfile, delimiter = ',')
    plots = list(plots)
    for row in plots[1:]:
        x.append(int(row[0]))
        y.append(float(row[3]))


plt.plot(x, y)
plt.title("Plot for Algo b")
plt.xlabel("Number of Students")
plt.ylabel("Time[sec]")
plt.savefig('plot_b.jpg', bbox_inches='tight')
plt.show()
```



Running the Algo c for inputs from 100 to 1000

In [7]:
```
fp = open("plottime.csv", "w")
fp.write("n,k,Algo,time\n")
fp.close()

for n in range(100, 1000, 10):
    k = n//2
    fp = open("randominput.txt", "w")
    fp.write(str(str(n) + ' ' + str(k) + '\n'))
    res = generate_input(n, k)
    fp.writelines(res)
    fp.close()

    os.system("./app c randominput.txt")
```

```
output3.txt file written successfully!
Clock time taken by the program: 0.000603
output3.txt file written successfully!
Clock time taken by the program: 0.000629
output3.txt file written successfully!
Clock time taken by the program: 0.000647
output3.txt file written successfully!
Clock time taken by the program: 0.000733
output3.txt file written successfully!
Clock time taken by the program: 0.000852
output3.txt file written successfully!
Clock time taken by the program: 0.001006
output3.txt file written successfully!
Clock time taken by the program: 0.001040
output3.txt file written successfully!
Clock time taken by the program: 0.000944
output3.txt file written successfully!
Clock time taken by the program: 0.001114
output3.txt file written successfully!
```

Ploting input size VS time for algo b, O(nlog(n))

In [8]:
```
x = []
y = []

with open('plottime.csv','r') as csvfile:
    plots = csv.reader(csvfile, delimiter = ',')
    plots = list(plots)
    for row in plots[1:]:
        x.append(int(row[0]))
        y.append(float(row[3]))


plt.plot(x, y)
plt.title("Plot for Algo c")
plt.xlabel("Number of Students")
plt.ylabel("Time[sec]")
plt.savefig('plot_c.jpg', bbox_inches='tight')
plt.show()
```