In the following lab we used CO2 monitors to assess CO2 exposure and used the collected data to calculate building ventilation efficiency. The following spreadsheet is a CO2 Analysis of a room located in the dorms on campus. It contains the ppm for the Hobo CO2 as well as the ppm for the actual Co2 in the room. After recording raw data and analyzing the concentration in the room we then plotted the concentration to identify any trends with indoor air quality. Next we identified the exchange rate and plotted it as well using an equation that can be seen in the following sheets.

Jocelyn Barber
ENGR 115
Friday 8am-10:50 am
10/28/2016

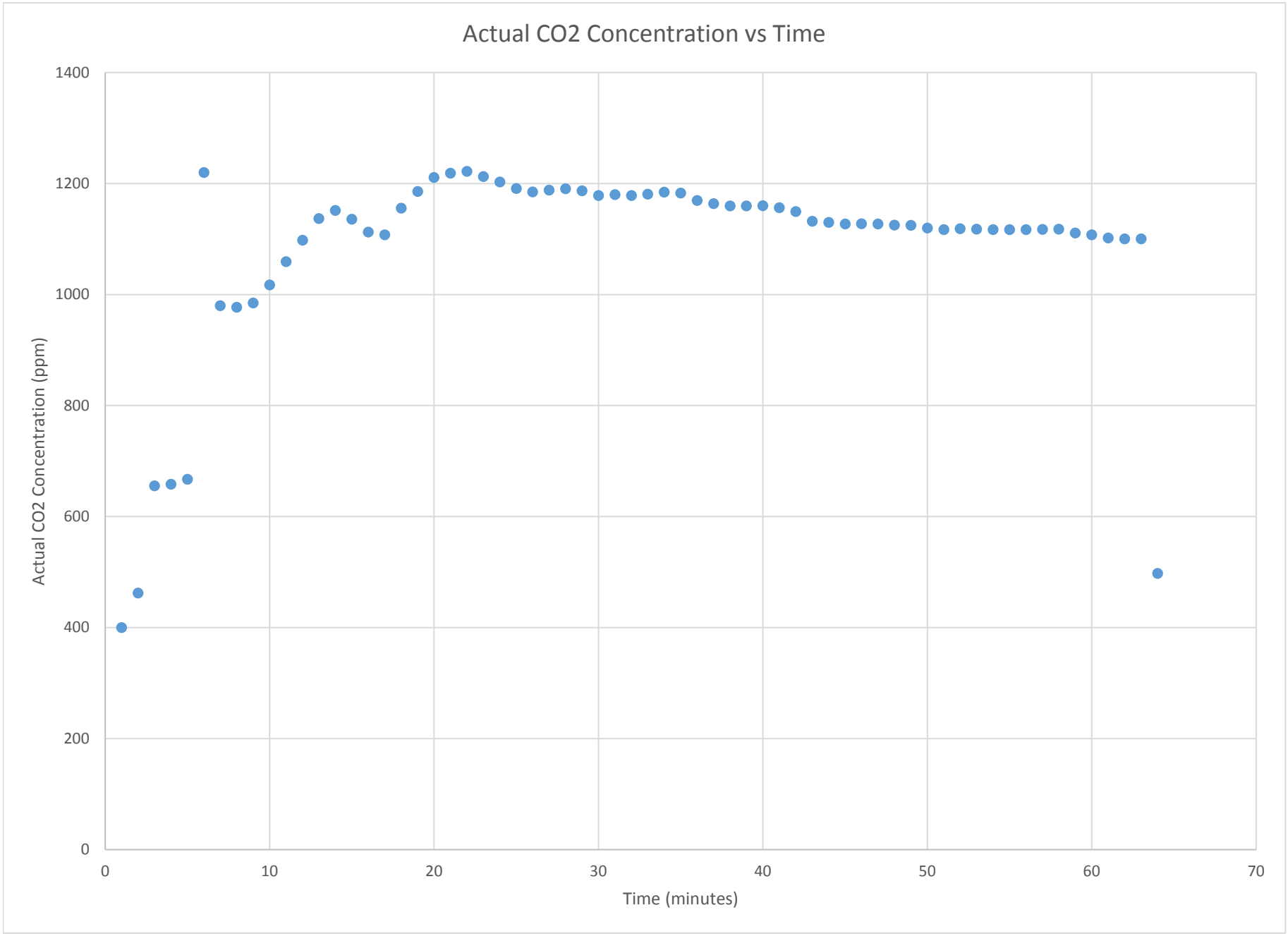
Inptut Parameters

Measured C outdoor	804
Assumed C outdoor	400
Correction Factor	404

Analysis

Measurement	Date & Time	Hobo CO2 Concentration (ppm)	Actual CO2 concentration (ppm)
1	10/21/2016 8:59	804	400
2	10/21/2016 9:00	866.3	462.3
3	10/21/2016 9:01	1059.2	655.2
4	10/21/2016 9:02	1062.3	658.3
5	10/21/2016 9:03	1071.4	667.4
6	10/21/2016 9:04	1623.9	1219.9
7	10/21/2016 9:05	1384	980
8	10/21/2016 9:06	1381	977
9	10/21/2016 9:07	1388.9	984.9
10	10/21/2016 9:08	1421.2	1017.2
11	10/21/2016 9:09	1463.4	1059.4
12	10/21/2016 9:10	1501.8	1097.8
13	10/21/2016 9:11	1540.9	1136.9
14	10/21/2016 9:12	1555.6	1151.6
15	10/21/2016 9:13	1539.7	1135.7
16	10/21/2016 9:14	1516.5	1112.5
17	10/21/2016 9:15	1511.6	1107.6
18	10/21/2016 9:16	1559.8	1155.8
19	10/21/2016 9:17	1589.7	1185.7
20	10/21/2016 9:18	1614.8	1210.8
21	10/21/2016 9:19	1622.7	1218.7
22	10/21/2016 9:20	1625.8	1221.8
23	10/21/2016 9:21	1616.6	1212.6
24	10/21/2016 9:22	1606.8	1202.8
25	10/21/2016 9:23	1595.2	1191.2
26	10/21/2016 9:24	1589.1	1185.1
27	10/21/2016 9:25	1592.2	1188.2
28	10/21/2016 9:26	1594.6	1190.6
29	10/21/2016 9:27	1591	1187
30	10/21/2016 9:28	1582.4	1178.4
31	10/21/2016 9:29	1584.2	1180.2
32	10/21/2016 9:30	1582.4	1178.4
33	10/21/2016 9:31	1584.9	1180.9
34	10/21/2016 9:32	1588.5	1184.5
35	10/21/2016 9:33	1586.7	1182.7
36	10/21/2016 9:34	1573.3	1169.3
37	10/21/2016 9:35	1567.8	1163.8
38	10/21/2016 9:36	1563.5	1159.5
39	10/21/2016 9:37	1563.5	1159.5

40	10/21/2016 9:38	1564.1	1160.1
41	10/21/2016 9:39	1560.4	1156.4
42	10/21/2016 9:40	1553.7	1149.7
43	10/21/2016 9:41	1536	1132
44	10/21/2016 9:42	1534.2	1130.2
45	10/21/2016 9:43	1531.1	1127.1
46	10/21/2016 9:44	1531.7	1127.7
47	10/21/2016 9:45	1531.1	1127.1
48	10/21/2016 9:46	1529.3	1125.3
49	10/21/2016 9:47	1528.7	1124.7
50	10/21/2016 9:48	1523.8	1119.8
51	10/21/2016 9:49	1520.8	1116.8
52	10/21/2016 9:50	1522.6	1118.6
53	10/21/2016 9:51	1522	1118
54	10/21/2016 9:52	1520.8	1116.8
55	10/21/2016 9:53	1520.8	1116.8
56	10/21/2016 9:54	1520.8	1116.8
57	10/21/2016 9:55	1521.4	1117.4
58	10/21/2016 9:56	1522	1118
59	10/21/2016 9:57	1514.7	1110.7
60	10/21/2016 9:58	1511.6	1107.6
61	10/21/2016 9:59	1506.1	1102.1
62	10/21/2016 10:00	1504.3	1100.3
63	10/21/2016 10:01	1504.3	1100.3
64	10/21/2016 10:02	901.7	497.7


Actual CO2 Concentration vs Time
Actual CO2 Concentration (ppm)
1400
1200
1000
800
600
400
200
0
0
10
20
30
40
50
60
70
Time (minutes)

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Inptut Parameters:

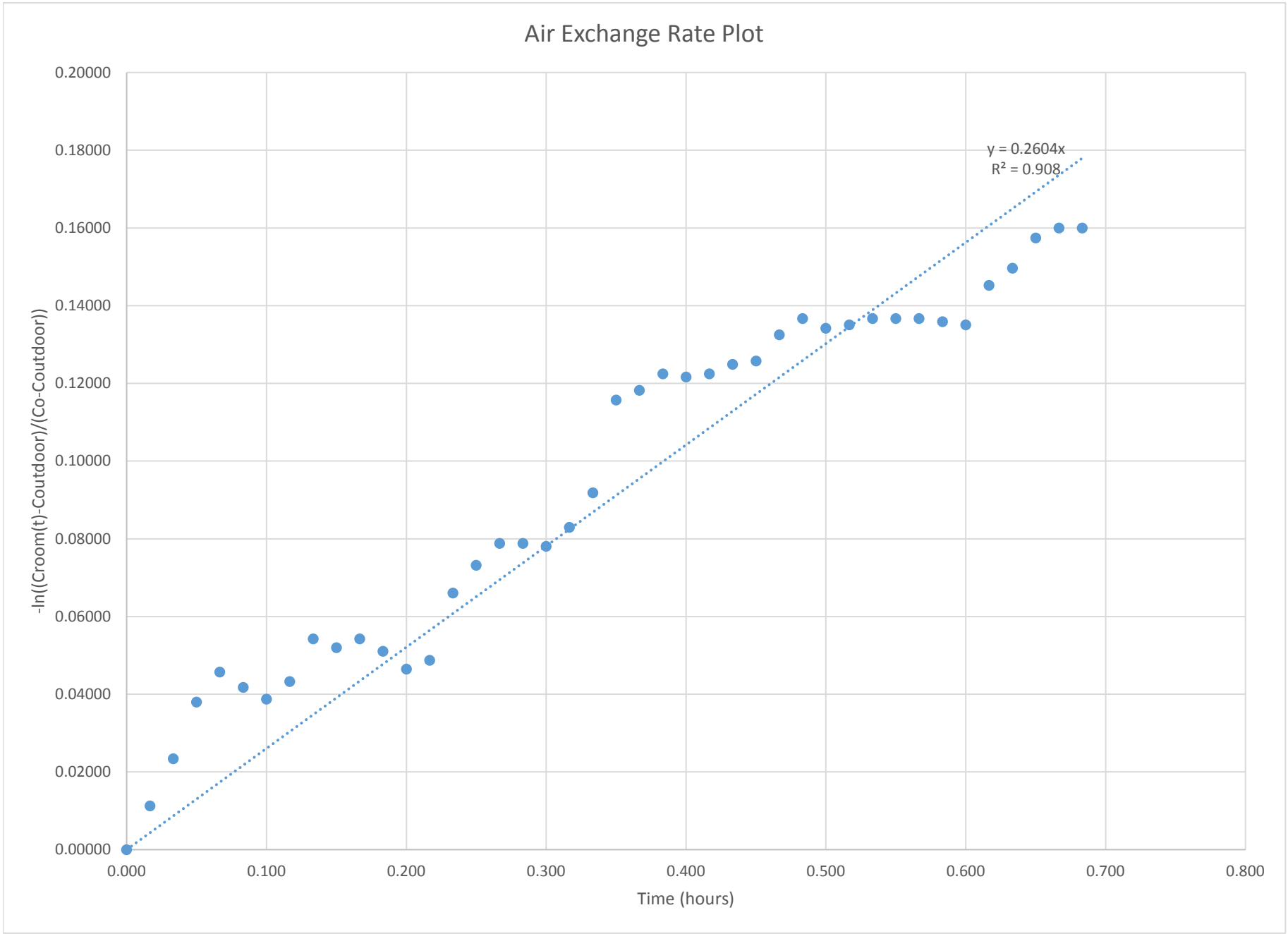
Measured C outdoor	804
Assumed C outdoor	400
Correction Factor	404
Room Value (ft3)	1287
Room Capacity (people)	2

Calculations:

Air Exchange Rate (1/hr)	0.2604
Time to remove non-reactive chemical (hr)	3.84
Ventilation Rate (ft3/min/person)	2.79

Analysis

Measurement	Date & Time	Hobo CO2 Concentration (ppm)	Actual CO2 concentration (ppm)	Experiment Time (hr)	-ln((Croom(t)-Coutdoor)/(Co-Coutdoor))
0	10/21/2016 9:20	1625.8	1221.8	0.000	0.00000
1	10/21/2016 9:21	1616.6	1212.6	0.017	0.01126
2	10/21/2016 9:22	1606.8	1202.8	0.033	0.02339
3	10/21/2016 9:23	1595.2	1191.2	0.050	0.03795
4	10/21/2016 9:24	1589.1	1185.1	0.067	0.04569
5	10/21/2016 9:25	1592.2	1188.2	0.083	0.04175
6	10/21/2016 9:26	1594.6	1190.6	0.100	0.03870
7	10/21/2016 9:27	1591.0	1187.0	0.117	0.04327
8	10/21/2016 9:28	1582.4	1178.4	0.133	0.05426
9	10/21/2016 9:29	1584.2	1180.2	0.150	0.05195
10	10/21/2016 9:30	1582.4	1178.4	0.167	0.05426
11	10/21/2016 9:31	1584.9	1180.9	0.183	0.05105
12	10/21/2016 9:32	1588.5	1184.5	0.200	0.04645
13	10/21/2016 9:33	1586.7	1182.7	0.217	0.04875
14	10/21/2016 9:34	1573.3	1169.3	0.233	0.06602
15	10/21/2016 9:35	1567.8	1163.8	0.250	0.07319
16	10/21/2016 9:36	1563.5	1159.5	0.267	0.07884
17	10/21/2016 9:37	1563.5	1159.5	0.283	0.07884
18	10/21/2016 9:38	1564.1	1160.1	0.300	0.07805
19	10/21/2016 9:39	1560.4	1156.4	0.317	0.08293
20	10/21/2016 9:40	1553.7	1149.7	0.333	0.09182
21	10/21/2016 9:41	1536.0	1132.0	0.350	0.11572
22	10/21/2016 9:42	1534.2	1130.2	0.367	0.11818
23	10/21/2016 9:43	1531.1	1127.1	0.383	0.12243
24	10/21/2016 9:44	1531.7	1127.7	0.400	0.12161
25	10/21/2016 9:45	1531.1	1127.1	0.417	0.12243
26	10/21/2016 9:46	1529.3	1125.3	0.433	0.12491
27	10/21/2016 9:47	1528.7	1124.7	0.450	0.12574
28	10/21/2016 9:48	1523.8	1119.8	0.467	0.13252
29	10/21/2016 9:49	1520.8	1116.8	0.483	0.13670
30	10/21/2016 9:50	1522.6	1118.6	0.500	0.13419
31	10/21/2016 9:51	1522.0	1118.0	0.517	0.13503
32	10/21/2016 9:52	1520.8	1116.8	0.533	0.13670
33	10/21/2016 9:53	1520.8	1116.8	0.550	0.13670
34	10/21/2016 9:54	1520.8	1116.8	0.567	0.13670
35	10/21/2016 9:55	1521.4	1117.4	0.583	0.13586
36	10/21/2016 9:56	1522.0	1118.0	0.600	0.13503
37	10/21/2016 9:57	1514.7	1110.7	0.617	0.14525
38	10/21/2016 9:58	1511.6	1107.6	0.633	0.14962
39	10/21/2016 9:59	1506.1	1102.1	0.650	0.15742
40	10/21/2016 10:00	1504.3	1100.3	0.667	0.15999
41	10/21/2016 10:01	1504.3	1100.3	0.683	0.15999


Air Exchange Rate Plot
y = 0.2604x
R² = 0.908
-ln((Croom(t)-Coutdoor)/(Co-Coutdoor))
Time (hours)
0.20000
0.18000
0.16000
0.14000
0.12000
0.10000
0.08000
0.06000
0.04000
0.02000
0.00000
0.000
0.100
0.200
0.300
0.400
0.500
0.600
0.700
0.800

1.What is the air exchange rate (λ) of the room you tested? Be sure to include the units for the air exchange rate in your answer.	The air exchange rate in the room we tested was λ=.2604/hr. This means that it will take approximately 4 hours for the room to completely cycle out the air.
2. In general it takes 3/λ hours to remove a non-reactive chemical from indoor air. Based on this time, what recommendations would you make to the occupants of the room?	If it takes approximately 3/λ hours to remove a non-reactive chemical form indoor air it would take about 11 and a half hours for it to clear out completely. I would recommend the resident to leave for this amount of time and let circulation clear out the room in case there was a contaminant that was harmful that they could possibly breathe in.
3. Compare your ventilation rate for a typical number of occupants to the ASHRAE recommended ventilation rate. Based on this comparison, are the occupants wasting energy heating and cooling the air or are the occupants being too cheap and not supplying enough air? Justify your answer.	The ASHRAE recommended ventilation rate is 15 scfm/person as opposed to a calculated 2.79 scfm/person in the dorm rooms on HSU campus. I don't think that the occupants are necessarily being too cheap rather they are not letting enough circulation run through their room and all of the air is settling leading to a lower standard of living.
4. Given the ASHRAE standard ventilation standard, what is the maximum number of people you would recommend having in this room at one time? Use your model to determine this number.	The maximum number of people that should be occupying this room is zero because even if you doubled the value giving 5.6 scfm/person it would still be significantly lower than the standard. The ventilation rate would double because the number of occupants in the equation is in the denominator therefor replacing 2 residents with 1 would double the value of the rate.