

Zach Kirchman
ENGR 115
Friday 8-11
10/21/2016

Input Parameters:

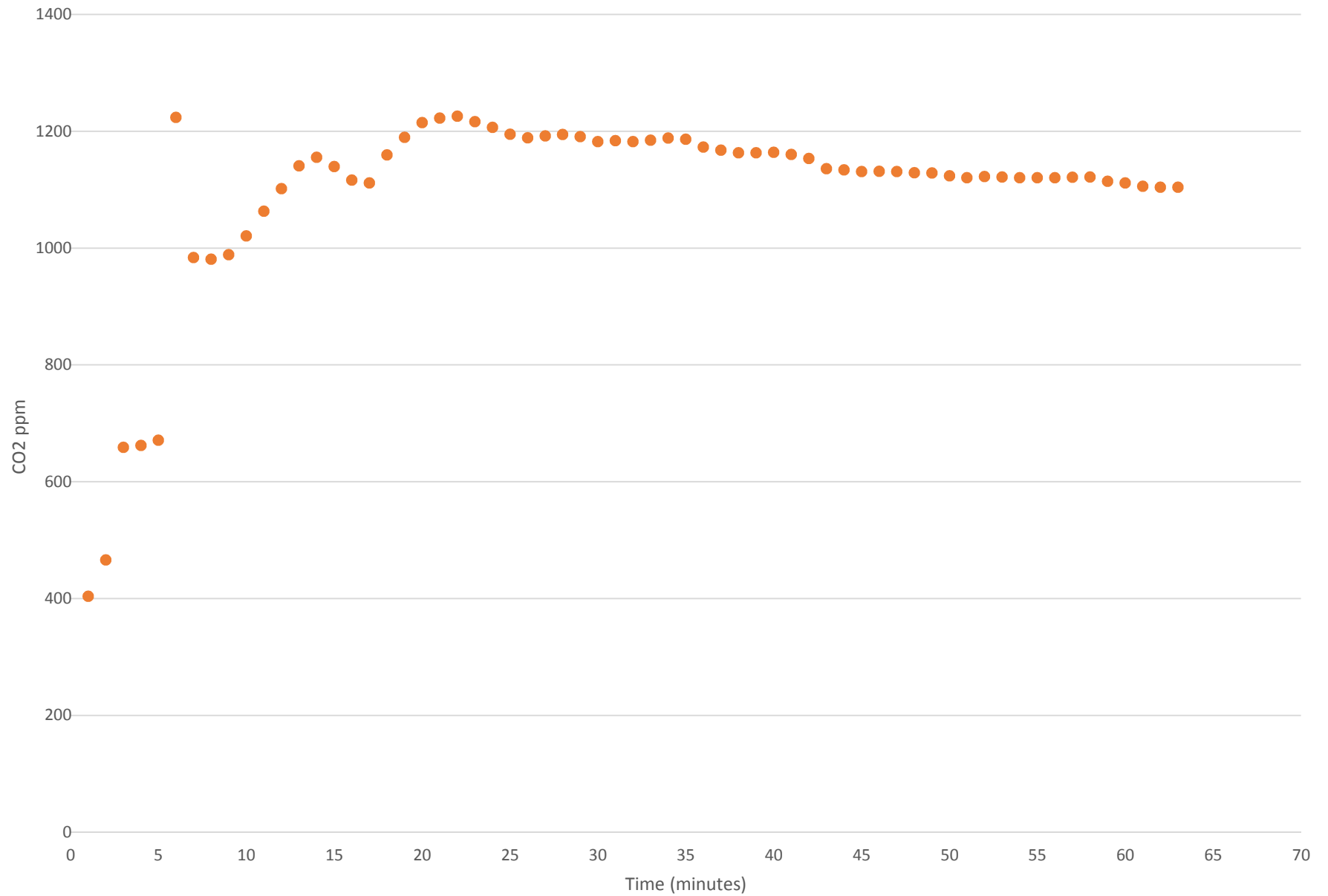
Measured Coutdoor(ppm CO2):	800
Assumed Coutdoor(ppm CO2):	400
Correction Factor:	400

Measurement	Date & Time	Hobo CO2 Concentration (ppm)	Actual CO2 concentration (ppm)
1	10/21/2016 8:59	804	404
2	10/21/2016 9:00	866.3	466.3
3	10/21/2016 9:01	1059.2	659.2
4	10/21/2016 9:02	1062.3	662.3
5	10/21/2016 9:03	1071.4	671.4
6	10/21/2016 9:04	1623.9	1223.9
7	10/21/2016 9:05	1384	984
8	10/21/2016 9:06	1381	981
9	10/21/2016 9:07	1388.9	988.9
10	10/21/2016 9:08	1421.2	1021.2
11	10/21/2016 9:09	1463.4	1063.4
12	10/21/2016 9:10	1501.8	1101.8
13	10/21/2016 9:11	1540.9	1140.9
14	10/21/2016 9:12	1555.6	1155.6
15	10/21/2016 9:13	1539.7	1139.7
16	10/21/2016 9:14	1516.5	1116.5
17	10/21/2016 9:15	1511.6	1111.6
18	10/21/2016 9:16	1559.8	1159.8
19	10/21/2016 9:17	1589.7	1189.7
20	10/21/2016 9:18	1614.8	1214.8
21	10/21/2016 9:19	1622.7	1222.7
22	10/21/2016 9:20	1625.8	1225.8

23	10/21/2016 9:21	1616.6	1216.6
24	10/21/2016 9:22	1606.8	1206.8
25	10/21/2016 9:23	1595.2	1195.2
26	10/21/2016 9:24	1589.1	1189.1
27	10/21/2016 9:25	1592.2	1192.2
28	10/21/2016 9:26	1594.6	1194.6
29	10/21/2016 9:27	1591	1191
30	10/21/2016 9:28	1582.4	1182.4
31	10/21/2016 9:29	1584.2	1184.2
32	10/21/2016 9:30	1582.4	1182.4
33	10/21/2016 9:31	1584.9	1184.9
34	10/21/2016 9:32	1588.5	1188.5
35	10/21/2016 9:33	1586.7	1186.7
36	10/21/2016 9:34	1573.3	1173.3
37	10/21/2016 9:35	1567.8	1167.8
38	10/21/2016 9:36	1563.5	1163.5
39	10/21/2016 9:37	1563.5	1163.5
40	10/21/2016 9:38	1564.1	1164.1
41	10/21/2016 9:39	1560.4	1160.4
42	10/21/2016 9:40	1553.7	1153.7
43	10/21/2016 9:41	1536	1136
44	10/21/2016 9:42	1534.2	1134.2
45	10/21/2016 9:43	1531.1	1131.1
46	10/21/2016 9:44	1531.7	1131.7
47	10/21/2016 9:45	1531.1	1131.1
48	10/21/2016 9:46	1529.3	1129.3
49	10/21/2016 9:47	1528.7	1128.7
50	10/21/2016 9:48	1523.8	1123.8
51	10/21/2016 9:49	1520.8	1120.8
52	10/21/2016 9:50	1522.6	1122.6
53	10/21/2016 9:51	1522	1122
54	10/21/2016 9:52	1520.8	1120.8
55	10/21/2016 9:53	1520.8	1120.8
56	10/21/2016 9:54	1520.8	1120.8

57	10/21/2016 9:55	1521.4	1121.4
58	10/21/2016 9:56	1522	1122
59	10/21/2016 9:57	1514.7	1114.7
60	10/21/2016 9:58	1511.6	1111.6
61	10/21/2016 9:59	1506.1	1106.1
62	10/21/2016 10:00	1504.3	1104.3
63	10/21/2016 10:01	1504.3	1104.3

CO2 Concentration Plot



Zach Kirchman
ENGR 115
Friday 8-11
10/21/16

Input Parameters:

Measured Coutdoor(ppm CO2):	800
Assumed Coutdoor(ppm CO2):	400
Correction Factor:	400
Room Volume(cubic feet):	1287
Room Capacity (people):	2

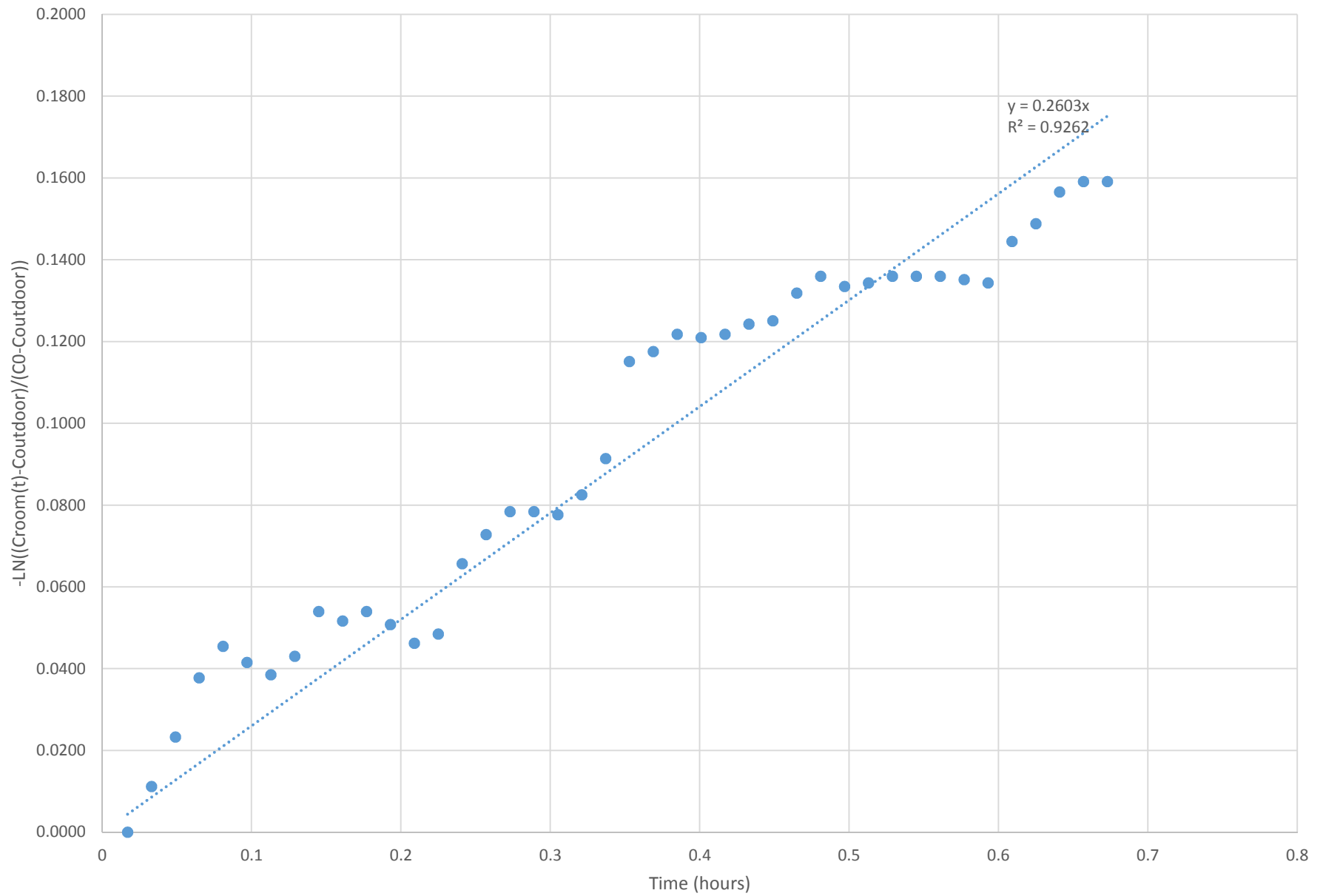
Calculations:

Air Exchange Rate (1/hr):	0.2603
Time to remove non-reactive chemical (hr):	3.84
Ventilation Rate (ft ³ /min/person):	2.79

Measurement	Date & Time	Hobo CO2 Concentration (ppm)	Actual CO2 concentration (ppm)	Experiment Time (hour)	-LN((Croom(t)-Coutdoor)/(CO-Coutdoor))
0	10/21/2016 9:20	1625.8	1225.8	0.017	0.0000
1	10/21/2016 9:21	1616.6	1216.6	0.033	0.0112
2	10/21/2016 9:22	1606.8	1206.8	0.049	0.0233
3	10/21/2016 9:23	1595.2	1195.2	0.065	0.0378
4	10/21/2016 9:24	1589.1	1189.1	0.081	0.0455
5	10/21/2016 9:25	1592.2	1192.2	0.097	0.0415
6	10/21/2016 9:26	1594.6	1194.6	0.113	0.0385
7	10/21/2016 9:27	1591	1191	0.129	0.0431
8	10/21/2016 9:28	1582.4	1182.4	0.145	0.0540
9	10/21/2016 9:29	1584.2	1184.2	0.161	0.0517
10	10/21/2016 9:30	1582.4	1182.4	0.177	0.0540

11	10/21/2016 9:31	1584.9	1184.9	0.193	0.0508
12	10/21/2016 9:32	1588.5	1188.5	0.209	0.0462
13	10/21/2016 9:33	1586.7	1186.7	0.225	0.0485
14	10/21/2016 9:34	1573.3	1173.3	0.241	0.0657
15	10/21/2016 9:35	1567.8	1167.8	0.257	0.0728
16	10/21/2016 9:36	1563.5	1163.5	0.273	0.0784
17	10/21/2016 9:37	1563.5	1163.5	0.289	0.0784
18	10/21/2016 9:38	1564.1	1164.1	0.305	0.0777
19	10/21/2016 9:39	1560.4	1160.4	0.321	0.0825
20	10/21/2016 9:40	1553.7	1153.7	0.337	0.0914
21	10/21/2016 9:41	1536	1136	0.353	0.1151
22	10/21/2016 9:42	1534.2	1134.2	0.369	0.1176
23	10/21/2016 9:43	1531.1	1131.1	0.385	0.1218
24	10/21/2016 9:44	1531.7	1131.7	0.401	0.1210
25	10/21/2016 9:45	1531.1	1131.1	0.417	0.1218
26	10/21/2016 9:46	1529.3	1129.3	0.433	0.1243
27	10/21/2016 9:47	1528.7	1128.7	0.449	0.1251
28	10/21/2016 9:48	1523.8	1123.8	0.465	0.1318
29	10/21/2016 9:49	1520.8	1120.8	0.481	0.1360
30	10/21/2016 9:50	1522.6	1122.6	0.497	0.1335
31	10/21/2016 9:51	1522	1122	0.513	0.1343
32	10/21/2016 9:52	1520.8	1120.8	0.529	0.1360
33	10/21/2016 9:53	1520.8	1120.8	0.545	0.1360
34	10/21/2016 9:54	1520.8	1120.8	0.561	0.1360
35	10/21/2016 9:55	1521.4	1121.4	0.577	0.1352
36	10/21/2016 9:56	1522	1122	0.593	0.1343
37	10/21/2016 9:57	1514.7	1114.7	0.609	0.1445
38	10/21/2016 9:58	1511.6	1111.6	0.625	0.1488
39	10/21/2016 9:59	1506.1	1106.1	0.641	0.1566
40	10/21/2016 10:00	1504.3	1104.3	0.657	0.1591
41	10/21/2016 10:01	1504.3	1104.3	0.673	0.1591

Air Exchange Plot



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.

A. The exchange rate of the room I tested is 0.2603hr^{-1} . This means that it takes about 4 hours to completely circulate the air in the room with the windows closed.

2. In general it takes $3/\lambda$ 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?

A. Since it takes about 11 1/2 hours to completely remove a non-reactive chemical from this room with the windows closed, I would recommend that the inhabitants in this room open any windows they can, grab any thing they would need all day, go to school, and study at the library all day.

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.

A. I would recommend the occupants invest in heating and cooling in order to circulate the air in the room. Since the room's current ventilation rate is 2.8 scfm there needs to be an additional input to meet ASHRAE's recommended 15scfm.

4. Given the ASHRAE standard ventilation, what is the maximum number of people you would recommend having in this room at one time? Use your model to determine this number.

A. The number of people occupying this room at one time depends on how long these people are staying. For example, 6 people could share this room for a 1 hour study session and be fine. However, the same 6 people should not stay the night in this room. Also, if the windows and doors stay open, then there most likely will not be a problem with ventilation.