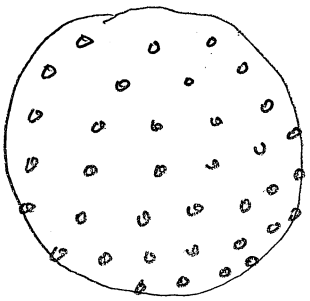
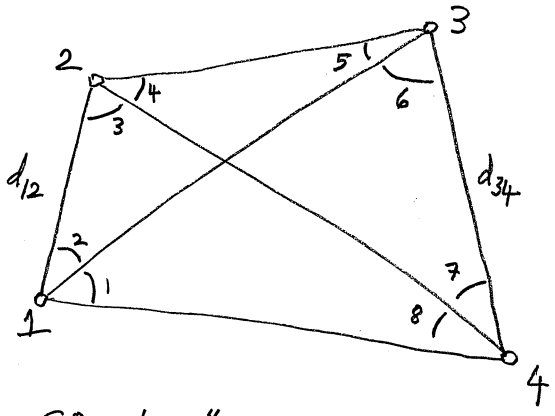
Homework 5, Data 1 Fall 2017

assigned 23 oct., due 1 week

1. 

156 points observed in X, Y, and Z on the surface of a sphere: $\sigma_X = \sigma_Y = \sigma_Z = 2.5$ mm. Estimate by LS (using mixed model) R, X_c, Y_c, Z_c. Make global test on reference variance @ $\alpha = .05$. What are $\sigma_{X_c}, \sigma_{Y_c}, \sigma_{Z_c}$?

2. 

horizontal angles and horizontal distances are observed on the survey network. Estimate the station coordinates by LS (indirect obs.). Fix $X_1, Y_1 = (100, 100)$ and $Y_4 = 90$. (m)

1	52° 42′ 19.″0	
2	34° 52′ 25.″4	
3	56° 29′ 59.″3	
4	46° 23′ 42.″9	
5	42° 12′ 34.″1	
6	62° 28′ 08.″0	
7	28° 56′ 30.″0	
8	35° 55′ 32.″6	
d_{12}	70.731 m	
d_{34}	90.119 m	

$\sigma_{angle} = 35''$

$\sigma_{dist} = .02$ m

make global test on ref. var. @ $\alpha = .05$. what is $\Sigma_{\begin{pmatrix} X_3 \\ Y_3 \end{pmatrix}}$?

X	Y	Z
0.0898	0.0520	-0.3372
0.0576	0.0959	-0.3377
-0.0006	0.1133	-0.3397
-0.0589	0.0942	-0.3351
-0.0934	0.0569	-0.3398
-0.1090	-0.0028	-0.3409
-0.0965	-0.0542	-0.3362
-0.0579	-0.0977	-0.3374
-0.0040	-0.1130	-0.3355
0.0518	-0.0960	-0.3396
0.0881	-0.0568	-0.3407
0.1117	0.0011	-0.3415
0.1529	0.0887	-0.3098
0.0872	0.1553	-0.3116
0.0006	0.1788	-0.3071
-0.0908	0.1553	-0.3091
-0.1511	0.0870	-0.3066
-0.1812	0.0007	-0.3075
-0.1558	-0.0913	-0.3098
-0.0881	-0.1545	-0.3080
-0.0028	-0.1803	-0.3028
0.0870	-0.1485	-0.3076
0.1524	-0.0909	-0.3127
0.1760	-0.0035	-0.3084
0.2053	0.1161	-0.2637
0.1215	0.1996	-0.2634
-0.0003	0.2372	-0.2615
-0.1223	0.2031	-0.2614
-0.2043	0.1186	-0.2655
-0.2371	-0.0001	-0.2639
-0.2120	-0.1213	-0.2681
-0.1218	-0.2098	-0.2637
0.0014	-0.2378	-0.2630
0.1185	-0.2059	-0.2671
0.2092	-0.1211	-0.2618
0.2386	-0.0003	-0.2688
0.2449	0.1413	-0.2047
0.1451	0.2502	-0.2058
-0.0013	0.2832	-0.2114
-0.1385	0.2495	-0.2072
-0.2450	0.1452	-0.2077
-0.2899	0.0009	-0.2085
-0.2517	-0.1461	-0.2097
-0.1467	-0.2490	-0.2063
0.0003	-0.2907	-0.2102
0.1455	-0.2503	-0.2069
0.2488	-0.1454	-0.2077
0.2882	-0.0011	-0.2080
0.2841	0.1633	-0.1421
0.1597	0.2795	-0.1439
0.0020	0.3253	-0.1480
-0.1642	0.2772	-0.1404
-0.2828	0.1651	-0.1445
-0.3248	0.0004	-0.1431
-0.2832	-0.1635	-0.1456
-0.1642	-0.2825	-0.1425
-0.0013	-0.3222	-0.1474
0.1654	-0.2824	-0.1466
0.2821	-0.1591	-0.1473
0.3213	-0.0023	-0.1451
0.3003	0.1687	-0.0792
0.1760	0.3006	-0.0737
-0.0013	0.3505	-0.0740
-0.1710	0.3011	-0.0740
-0.3033	0.1790	-0.0712
-0.3509	0.0027	-0.0767
-0.2944	-0.1760	-0.0777
-0.1715	-0.3050	-0.0710
0.0025	-0.3488	-0.0706
0.1715	-0.2972	-0.0770
0.3014	-0.1713	-0.0780
0.3498	-0.0014	-0.0802
0.3050	0.1755	0.0004
0.1772	0.3086	-0.0001
-0.0032	0.3573	-0.0009
-0.1765	0.3093	-0.0027
-0.3083	0.1753	-0.0047

-0.3592	-0.0035	0.0009
-0.3095	-0.1751	0.0012
-0.1848	-0.3078	0.0015
0.0041	-0.3571	-0.0002
0.1755	-0.3053	0.0019
0.3045	-0.1768	-0.0013
0.3576	0.0018	-0.0060
0.3042	0.1765	0.0728
0.1816	0.3014	0.0747
-0.0036	0.3457	0.0739
-0.1760	0.3078	0.0745
-0.3000	0.1761	0.0765
-0.3456	-0.0007	0.0726
-0.3030	-0.1752	0.0738
-0.1754	-0.3034	0.0740
-0.0012	-0.3473	0.0779
0.1754	-0.2991	0.0726
0.3035	-0.1737	0.0753
0.3492	-0.0029	0.0688
0.2837	0.1627	0.1495
0.1658	0.2843	0.1472
-0.0041	0.3267	0.1453
-0.1626	0.2849	0.1450
-0.2803	0.1592	0.1438
-0.3231	-0.0002	0.1451
-0.2817	-0.1591	0.1497
-0.1607	-0.2781	0.1454
0.0000	-0.3254	0.1503
0.1636	-0.2834	0.1447
0.2856	-0.1622	0.1459
0.3281	0.0010	0.1442
0.2473	0.1439	0.2101
0.1426	0.2472	0.2114
0.0022	0.2862	0.2065
-0.1411	0.2517	0.2092
-0.2521	0.1424	0.2110
-0.2865	-0.0030	0.2039
-0.2519	-0.1422	0.2118
-0.1417	-0.2494	0.2094
0.0010	-0.2865	0.2049
0.1472	-0.2471	0.2078
0.2481	-0.1429	0.2091
0.2860	0.0013	0.2092
0.2097	0.1230	0.2684
0.1228	0.2095	0.2671
-0.0006	0.2389	0.2636
-0.1219	0.2041	0.2626
-0.2075	0.1182	0.2659
-0.2364	-0.0017	0.2622
-0.2085	-0.1221	0.2622
-0.1149	-0.2088	0.2649
0.0014	-0.2382	0.2627
0.1167	-0.2069	0.2643
0.2054	-0.1203	0.2701
0.2380	-0.0034	0.2610
0.1577	0.0880	0.3110
0.0854	0.1498	0.3110
0.0007	0.1768	0.3097
-0.0882	0.1542	0.3080
-0.1536	0.0915	0.3059
-0.1769	0.0022	0.3085
-0.1501	-0.0949	0.3064
-0.0889	-0.1544	0.3056
-0.0002	-0.1705	0.3119
0.0868	-0.1539	0.3107
0.1537	-0.0914	0.3088
0.1751	-0.0028	0.3083
0.0917	0.0572	0.3376
0.0586	0.0951	0.3331
-0.0012	0.1067	0.3396
-0.0537	0.0973	0.3390
-0.0980	0.0504	0.3423
-0.1123	0.0015	0.3391
-0.0952	-0.0559	0.3405
-0.0556	-0.0956	0.3386
-0.0011	-0.1078	0.3433
0.0568	-0.0951	0.3407
0.0920	-0.0547	0.3349
0.1087	-0.0027	0.3399