

Lambert conformal conic projection with two standard parallels  
Plane coordinate projection tables

Ellipsoidal constants

a = 6378137 m  
f = 1/298.257222101

Defining constants

$\phi_b = 37^\circ 50'$  (latitude of grid origin)  
 $\lambda_o = 105\ 30$  (longitude of origin and Central Meridian, CM)  
 $\phi_s = 38\ 27$  (southern standard parallel)  
 $\phi_n = 39\ 45$  (northern standard parallel)  
 $E_o = 914401.8289$  m (easting coordinate of origin)  
 $N_b = 304800.6096$  m (northing coordinate of origin)

Derived constants

$l = 0.630689555224 = \sin(\phi_o)$   
 $K = 12518269.8410$  m (mapping radius at the equator)  
 $R_b = 7998699.7391$  m (mapping radius at grid origin)

Lambert coordinates (N,E) from geodetic positions ( $\phi, \lambda$ )

$\gamma = (\lambda_{CM} - \lambda) \sin(\phi_o)$  ( $\gamma$  is the meridional convergence)  
 $E = R \sin(\gamma) + E_o$  (R from table)  
 $N = R_b - R \cos(\gamma) + N_b$

Station	Latitude Longitude	R $\gamma$	Sin( $\gamma$ ) Cos( $\gamma$ )	E N
Sample 1	39 06 00.00000	7858090.608 m	-0.0055037769	871152.652 m
	106 00 00.00000	-0 18 55.24120	0.9999848541	445528.758 m

Geodetic positions from Lambert coordinates

$\tan(\gamma) = (E - E_o) / ((R_b - (N - N_b)))$   
 $R = (R_b - (N - N_b)) / \cos(\gamma)$   
 $\lambda = \lambda_{CM} - \gamma/l$   
 $\phi$  from table using R

Station	E N	E - E <sub>o</sub> R <sub>b</sub> - (N - N <sub>b</sub> )	R $\gamma$	Latitude Longitude
Sample 2	964401.829 m	50000.000 m	7848858.9996 m	39 10 59.3736
	454800.610 m	7848699.739 m	0 21 53.98845	104 55 16.5844

**WARNING:** Use sufficient significant digits for trig.functions

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<u>Lat</u>	<u>R (meters)</u>	<u>tab diff.</u>	<u>k</u>
37° 50'	7998699.739	30.83692	1.00017825
37 51	7996849.524	30.83682	1.00017194
37 52	7994999.315	30.83671	1.00016571
37 53	7993149.112	30.83661	1.00015956
37 54	7991298.916	30.83651	1.00015350
37 55	7989448.725	30.83642	1.00014751
37 56	7987598.540	30.83632	1.00014162
37 57	7985748.360	30.83623	1.00013580
37 58	7983898.186	30.83615	1.00013007
37 59	7982048.017	30.83606	1.00012442
38 0	7980197.854	30.83598	1.00011885
38 1	7978347.695	30.83590	1.00011337
38 2	7976497.541	30.83582	1.00010797
38 3	7974647.392	30.83575	1.00010265
38 4	7972797.247	30.83567	1.00009742
38 5	7970947.107	30.83560	1.00009226
38 6	7969096.971	30.83554	1.00008720
38 7	7967246.839	30.83547	1.00008221
38 8	7965396.710	30.83541	1.00007731
38 9	7963546.586	30.83535	1.00007249
38 10	7961696.465	30.83529	1.00006776
38 11	7959846.347	30.83524	1.00006310
38 12	7957996.233	30.83519	1.00005854
38 13	7956146.122	30.83514	1.00005405
38 14	7954296.014	30.83509	1.00004965
38 15	7952445.908	30.83505	1.00004533
38 16	7950595.805	30.83500	1.00004109
38 17	7948745.705	30.83497	1.00003694
38 18	7946895.607	30.83493	1.00003287
38 19	7945045.511	30.83490	1.00002888
38 20	7943195.418	30.83486	1.00002498
38 21	7941345.326	30.83484	1.00002116
38 22	7939495.236	30.83481	1.00001743
38 23	7937645.147	30.83479	1.00001377
38 24	7935795.060	30.83477	1.00001021
38 25	7933944.974	30.83475	1.00000672
38 26	7932094.889	30.83473	1.00000332
38 27	7930244.805	30.83472	1.00000000
38 28	7928394.722	30.83471	0.99999677
38 29	7926544.640	30.83470	0.99999361

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<u>Lat</u>	<u>R (meters)</u>	<u>tab diff.</u>	<u>k</u>
38° 30'	7924694.558	30.83469	0.99999055
38 31	7922844.476	30.83469	0.99998756
38 32	7920994.394	30.83469	0.99998466
38 33	7919144.313	30.83469	0.99998184
38 34	7917294.231	30.83470	0.99997911
38 35	7915444.149	30.83471	0.99997646
38 36	7913594.067	30.83472	0.99997389
38 37	7911743.984	30.83473	0.99997141
38 38	7909893.900	30.83475	0.99996901
38 39	7908043.815	30.83476	0.99996670
38 40	7906193.729	30.83478	0.99996447
38 41	7904343.642	30.83481	0.99996232
38 42	7902493.554	30.83483	0.99996026
38 43	7900643.464	30.83486	0.99995828
38 44	7898793.372	30.83489	0.99995638
38 45	7896943.279	30.83493	0.99995457
38 46	7895093.183	30.83496	0.99995284
38 47	7893243.085	30.83500	0.99995119
38 48	7891392.985	30.83504	0.99994963
38 49	7889542.883	30.83509	0.99994816
38 50	7887692.778	30.83513	0.99994676
38 51	7885842.670	30.83518	0.99994546
38 52	7883992.559	30.83523	0.99994423
38 53	7882142.445	30.83529	0.99994309
38 54	7880292.327	30.83535	0.99994203
38 55	7878442.207	30.83540	0.99994106
38 56	7876592.082	30.83547	0.99994017
38 57	7874741.954	30.83553	0.99993937
38 58	7872891.822	30.83560	0.99993865
38 59	7871041.686	30.83567	0.99993801
39 0	7869191.546	30.83574	0.99993746
39 1	7867341.402	30.83582	0.99993699
39 2	7865491.253	30.83589	0.99993660
39 3	7863641.099	30.83598	0.99993630
39 4	7861790.941	30.83606	0.99993609
39 5	7859940.777	30.83614	0.99993596
39 6	7858090.608	30.83623	0.99993591
39 7	7856240.435	30.83632	0.99993595
39 8	7854390.255	30.83642	0.99993607
39 9	7852540.070	30.83651	0.99993627

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39°10'	7850689.879	30.83661	0.99993656
39 11	7848839.683	30.83671	0.99993694
39 12	7846989.480	30.83682	0.99993740
39 13	7845139.271	30.83692	0.99993794
39 14	7843289.056	30.83703	0.99993857
39 15	7841438.834	30.83714	0.99993928
39 16	7839588.605	30.83726	0.99994008
39 17	7837738.370	30.83738	0.99994096
39 18	7835888.127	30.83749	0.99994192
39 19	7834037.877	30.83762	0.99994297
39 20	7832187.620	30.83774	0.99994411
39 21	7830337.356	30.83787	0.99994532
39 22	7828487.084	30.83800	0.99994663
39 23	7826636.804	30.83813	0.99994802
39 24	7824786.516	30.83827	0.99994949
39 25	7822936.220	30.83841	0.99995105
39 26	7821085.916	30.83855	0.99995269
39 27	7819235.603	30.83869	0.99995441
39 28	7817385.281	30.83883	0.99995623
39 29	7815534.951	30.83898	0.99995812
39 30	7813684.612	30.83913	0.99996010
39 31	7811834.264	30.83929	0.99996217
39 32	7809983.907	30.83944	0.99996432
39 33	7808133.540	30.83960	0.99996655
39 34	7806283.164	30.83976	0.99996887
39 35	7804432.778	30.83993	0.99997128
39 36	7802582.382	30.84010	0.99997377
39 37	7800731.977	30.84027	0.99997634
39 38	7798881.561	30.84044	0.99997900
39 39	7797031.135	30.84061	0.99998175
39 40	7795180.698	30.84079	0.99998458
39 41	7793330.250	30.84097	0.99998749
39 42	7791479.792	30.84115	0.99999049
39 43	7789629.323	30.84134	0.99999358
39 44	7787778.843	30.84153	0.99999675
39 45	7785928.351	30.84172	1.00000000
39 46	7784077.848	30.84191	1.00000334
39 47	7782227.334	30.84210	1.00000676
39 48	7780376.808	30.84230	1.00001027
39 49	7778526.269	30.84250	1.00001387

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39° 50'	7776675.719	30.84271	1.00001755
39 51	7774825.157	30.84291	1.00002132
39 52	7772974.582	30.84312	1.00002517
39 53	7771123.994	30.84333	1.00002910
39 54	7769273.394	30.84355	1.00003312
39 55	7767422.781	30.84377	1.00003723
39 56	7765572.156	30.84399	1.00004142
39 57	7763721.516	30.84421	1.00004570
39 58	7761870.864	30.84443	1.00005006
39 59	7760020.198	30.84466	1.00005451
40 0	7758169.518	30.84489	1.00005904
40 1	7756318.825	30.84512	1.00006366
40 2	7754468.118	30.84536	1.00006837
40 3	7752617.396	30.84560	1.00007316
40 4	7750766.660	30.84584	1.00007803
40 5	7748915.910	30.84608	1.00008299
40 6	7747065.145	30.84633	1.00008804
40 7	7745214.366	30.84658	1.00009317
40 8	7743363.571	30.84683	1.00009839
40 9	7741512.762	30.84708	1.00010369
40 10	7739661.937	30.84734	1.00010908
40 11	7737811.097	30.84760	1.00011455
40 12	7735960.241	30.84786	1.00012012
40 13	7734109.369	30.84812	1.00012576
40 14	7732258.482	30.84839	1.00013149
40 15	7730407.579	30.84866	1.00013731
40 16	7728556.659	30.84893	1.00014321
40 17	7726705.723	30.84921	1.00014920
40 18	7724854.771	30.84949	1.00015528
40 19	7723003.802	30.84977	1.00016144
40 20	7721152.816	30.85005	1.00016768