

# Star Position Calculations

The Big Dipper

Version 1.0

2007-03-26

<http://hethrael.com/big-dipper/>

Email me with any questions or comments. (See the web page for my email address)

This spreadsheet calculates the position of stars on a scale to fit them inside a room.

Notes for using this spreadsheet:

In OpenOffice.org, choose View | Value Highlighting (or press Ctrl+F8) to turn user-entered numbers blue.

For the bearing entry, 0 is North, 90 is East, 180 is South, and 270 is West.

An orange background means the object falls outside of the room, i.e. it has a negative in a "From Corner" column or a positive in a "From Opposite Corner" or "From Ceiling" column.

If your ceiling is flat, all values in the ceiling height column will be the same. Otherwise, ceiling height is the height of the ceiling at that X, Y coordinate.

The charts do not automatically match the size of the room. Their widths, heights, and axes maximum scales must be manually changed if you change the size of the room.

If you want to use units other than light years and inches, enter the units on the parameters sheet.

Notes unnecessary for using this spreadsheet:

The RA and Dec of the Earth are meaningless; the equally meaningless azimuthal values simply look nicer with the values of RA and Dec given.

There are hidden columns that show intermediate calculations.

The azimuthal and bearing coordinate systems are left-handed. All other coordinate systems are right-handed. (Right-handed:  $7^\circ$  is  $1^\circ$  to the left of  $6^\circ$ ; the X and Y axes are as you would see a standard graph lying on the floor, X pointing to the right and Y forward. Left-handed:  $7^\circ$  is  $1^\circ$  to the right of  $6^\circ$ ; the X and Y axes are swapped. The Z axis points up in both systems.)

The positive X axis of the azimuthal Cartesian coordinate system points North. The azimuthal rotated Cartesian coordinate system points toward the bearing entered. They will match if the bearing is 0.

The azimuthal Cartesian coordinate system is calculated from the polar equatorial coordinates using trigonometry. The azimuthal rotated Cartesian coordinate system uses matrix multiplication and Euler angles to convert the Cartesian equatorial coordinates. The transformation matrix is hidden on the parameters sheet.

Parameters

<b>LST</b>	<b>h</b>	<b>m</b>	<b>s</b>	<b>rad</b>
	22	57	8	6.0089
	°	'	"	<b>rad</b>
<b>Latitude</b>	46	46	55	0.8165
	<b>h</b>	<b>m</b>	<b>s</b>	<b>rad</b>
<b>Time Zone Offset</b>	-6	0	0	-1.5708
	°	'	"	<b>rad</b>
<b>Bearing</b>	325	0	0	5.6723

	<b>Euler's Angles Transformation Matrix</b>			
$\psi$	1.2965	-0.1805	0.9018	0.3928
$\theta$	0.7543	-0.7300	-0.3904	0.5609
$\phi$	-5.6723	0.6592	-0.1855	0.7288

<b>Units</b>	ly	:	in	
<b>Scale</b>	86.03	:	106	0.81

	<b>X (W)</b>	<b>Y (L)</b>
<b>Room Dimensions</b>	116	234

Coordinates

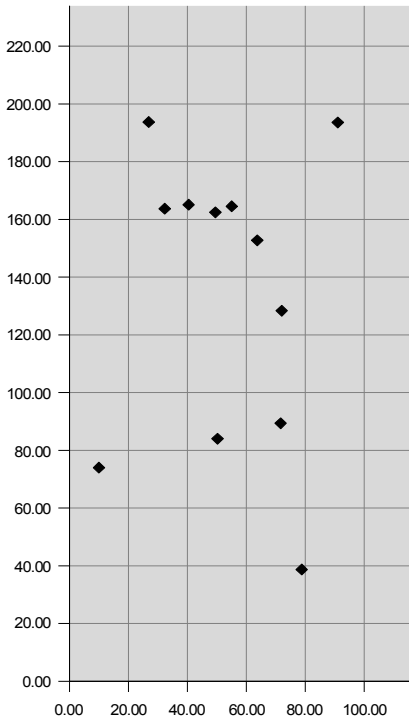
Object	Equatorial										Geocentric							
	Dist.	RA			Dec			Cartesian			Alt							
	ly	h	m	s	rad	°	'	"	rad	X ly	Y ly	Z ly	°	'	"	rad	°	'
Alkaid	100.70	13	47	50	3.6121	49	16	43	0.8601	-58.56	-29.78	76.32	12	56	11	0.2258	333	1
Mizar	78.16	13	24	13	3.5091	54	53	22	0.9580	-41.95	-16.15	63.94	16	17	58	0.2845	338	58
Alioth	80.94	12	54	21	3.3787	55	55	21	0.9760	-44.08	-10.65	67.04	15	36	21	0.2724	343	27
Megrez	81.44	12	15	47	3.2105	56	59	39	0.9947	-44.26	-3.05	68.30	15	3	46	0.2629	349	3
Phecda	83.69	11	54	12	3.1163	53	39	22	0.9365	-49.58	1.25	67.41	11	10	5	0.1949	351	26
Merak	79.42	11	2	16	2.8897	56	20	42	0.9834	-42.62	10.97	66.11	13	7	57	0.2292	359	16
Dubhe	123.64	11	4	10	2.8980	61	42	49	1.0771	-56.86	14.13	108.88	18	30	17	0.3230	359	7
Earth	0.00	0	0	0	0.0000	90	0	0	1.5708	0.00	0.00	0.00	46	46	55	0.8165	0	0
Castor	51.55	7	35	2	1.9855	31	52	25	0.5563	-17.64	40.07	27.22	0	51	58	0.0151	40	57
Pollux	33.72	7	45	44	2.0321	28	0	35	0.4889	-13.25	26.66	15.84	-3	-38	-20	-0.0635	40	59
Regulus	77.49	10	8	44	2.6561	11	56	4	0.2083	-67.05	35.38	16.02	-30	-17	-27	-0.5287	13	44
Vega	25.30	18	37	10	4.8746	38	47	20	0.6770	3.18	-19.46	15.85	43	0	49	0.7507	284	58
Aldebaran	65.11	4	36	18	1.2056	16	31	23	0.2884	22.29	58.30	18.52	15	28	37	0.2701	82	10
Fomalhaut	25.07	22	58	1	6.0127	-29	35	10	-0.4959	21.25	-5.89	-11.93	14	48	14	0.2584	359	47

Coordinates

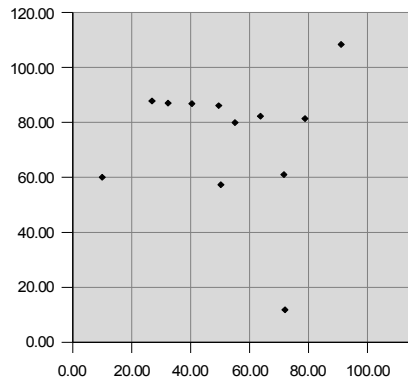
Az "	Azimuthal			Cartesian				Cartesian Rotated			From Corner			From Opposite Corner		Ceiling Height	From Ceiling
	rad	x ly	y ly	z ly	x' ly	y' ly	z' ly	x' in	y' in	z' in	x'' in	y'' in	in	z'' in			
1	5.8122	87.46	-44.53	22.54	97.18	13.69	22.54	26.86	193.74	87.78	-89.14	-40.26	99.31	-11.54			
43	5.9163	70.03	-26.91	21.94	72.80	18.12	21.94	32.33	163.69	87.03	-83.67	-70.31	102.02	-14.99			
23	5.9944	74.73	-22.20	21.77	73.94	24.68	21.77	40.41	165.10	86.83	-75.59	-68.90	106.02	-19.20			
29	6.0922	77.21	-14.93	21.17	71.81	32.06	21.17	49.50	162.48	86.08	-66.50	-71.52	110.53	-24.45			
20	6.1338	81.19	-12.22	16.21	73.51	36.56	16.21	55.04	164.58	79.97	-60.96	-69.42	113.28	-33.31			
11	6.2704	77.34	-0.99	18.04	63.92	43.55	18.04	63.66	152.75	82.23	-52.34	-81.25	120.00	-37.77			
17	6.2679	117.23	-1.80	39.24	97.06	65.77	39.24	91.03	193.59	108.35	-24.97	-40.41	120.00	-11.65			
0	0.0000	0.00	0.00	0.00	0.00	0.00	0.00	10.00	74.00	60.00	-106.00	-160.00	90.96	-30.96			
50	0.7150	38.92	33.79	0.78	12.50	50.01	0.78	71.61	89.40	60.96	-44.39	-144.60	120.00	-59.04			
8	0.7153	25.40	22.07	-2.14	8.15	32.65	-2.14	50.23	84.04	57.36	-65.77	-149.96	110.89	-53.53			
23	0.2398	65.00	15.89	-39.09	44.13	50.30	-39.09	71.97	128.37	11.84	-44.03	-105.63	120.00	-108.16			
2	4.9736	4.78	-17.87	17.26	14.16	-11.90	17.26	-4.66	91.45	81.26	-120.66	-142.55	83.69	-2.43			
4	1.4341	8.55	62.16	17.37	-28.65	55.83	17.37	78.78	38.70	81.41	-37.22	-195.30	120.00	-38.59			
56	6.2797	24.24	-0.08	6.41	-19.90	-13.83	6.41	-7.04	49.48	67.89	-123.04	-184.52	82.51	-14.62			

# Charts

## Top View



## Front View



## Right Side View

