

# Converting from Celestial to Galactic Coordinates

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[http://www.geocities.com/alt\\_comos/index.html](http://www.geocities.com/alt_comos/index.html)

<b>Galactic North Pole</b>		<u>Epoch 2000.0</u>	<u>Given by</u>
Right Ascension:	g	192.85°	12 hours 51.4 mins
Declination:	g	27.128 333 333°	27 + (77/600) degrees
<b>Galactic Centre</b>			
Right Ascension:	c	266.4°	17 hours 45.6 mins
Declination:	c	-28.929 656 275°	calculation
<b>Celestial Coordinates</b>			
Right Ascension:	x		
Declination:	x		

Calculating the Galactic Centre Declination,  $c_c$

$$c_c = \text{Tan}^{-1} [ -1 * \text{Cos}(c - g) / \text{Tan}(g) ]$$

Calculating the Galactic Latitude,  $B$

$$B = \text{Sin}^{-1} [ \text{Sin}(x) \text{Sin}(g) + \text{Cos}(x) \text{Cos}(g) \text{Cos}(x - g) ]$$

Calculating the intermediate,  $J$

$$J = (\text{Sin}(x) \text{Cos}(g) - \text{Cos}(x) \text{Sin}(g) \text{Cos}(x - g)) / \text{Cos}(B)$$

Calculating the intermediate,  $K$

$$K = \text{Sin}^{-1} [ \text{Cos}(x) \text{Sin}(x - g) / \text{Cos}(B) ]$$

Calculating the intermediate,  $Q$

$$Q = \text{Cos}^{-1} [ \text{Sin}(c) / \text{Cos}(g) ]$$

Calculating the Galactic Longitude,  $L$

if  $J < 0$  then,  $L = Q + K - 180^\circ$

otherwise,  $L = Q - K$

if  $L < 0$  then,  $L = L + 360^\circ$

# Converting to 3D Galactic Coordinates

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**L** = Galactic Longitude

**B** = Galactic Latitude

**D** = Distance from the Sun (Light-years)

## Calculating the 3D Galactic Coordinates, **X, Y, Z**

**X** =  $D \cdot \cos(B) \cdot \sin(L)$

**Y** =  $D \cdot \cos(B) \cdot \cos(L)$

**Z** =  $D \cdot \sin(B)$

$$D^2 = X^2 + Y^2 + Z^2$$

Where

**X** > **0** is to the right-side of the galaxy, looking towards the centre.

**Y** > **0** is towards the centre of the galaxy,

**Z** > **0** is above the galactic plane (as is the North Galactic Pole).

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