Mid Latitude Formula

This is used to determine the Spherical Coordinates of any point. This can be applied, when the distance is less than 40km from the reference point.

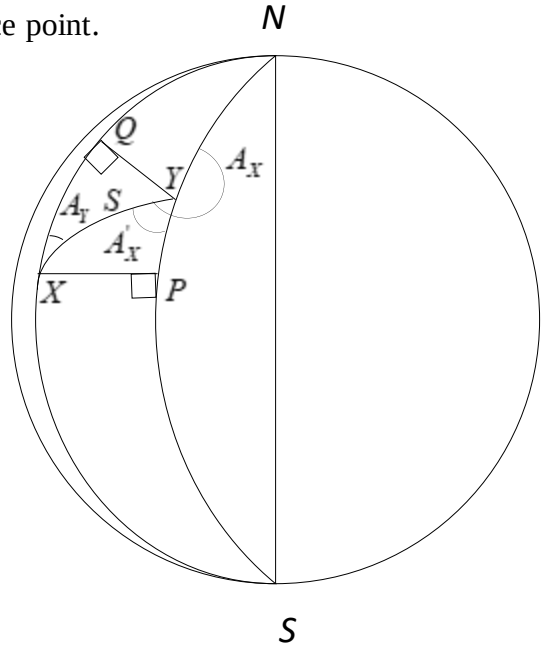

Figure 3.8: Mid Latitude Formula.

Where.

φ_X, λ_X - Spherical co-ordinates of the known point

A_Y - Azimuth of unknown point from the known point

S - The distance between known point and unknown point

φ_Y, λ_Y - Spherical co-ordinates of unknown point

M_X - Meridian radius of curvature of point X;

M_Y - Meridian radius of curvature of point Y;

N_Y - Prime vertical of curvature of point Y;

N_X - Prime vertical of curvature of point X;

From the above figure we can obtain following equations.

$$\Delta\varphi^{''} = \frac{S.Cos(A_X^{'} + A_Y)/2}{M_M Sin1^{''}}$$

$$\Delta\lambda^{''} = \frac{S.Sin\left(A_Y + A_X^{'}\right)/2}{N_M.Cos\varphi_M.Sin1^{''}}$$

$$A_x' = A_y + \Delta A$$

$$\Delta A'' = \Delta\lambda \ Sin\ \varphi_m$$

The Inverse of mid latitude formula

The reverse method $\lambda_X, \varphi_X, \lambda_Y, \varphi_Y$ are our known data's S, Ay and $A^{'}x$ should be found.

$$A_Y + A_X^{'} = 2Tan^{-1}\left[\frac{\Delta\lambda^{''}.N_M Cos\varphi_M}{\Delta\varphi^{''}M_M}\right]$$

$$\Delta A = \Delta\lambda\,.Sin\ \varphi_m$$

$$S*Sin\ (\alpha_{12} + \Delta\alpha/2) = N_m Cos\ \varphi_m \Delta\lambda$$

Hence, can calculate the $A_X^{'}, A_Y$, by using above answer; Now we can calculate the S by using above equations

(References : Erakiwsky E.J. , Thomson D.B. (1974) Geodetic position computations)