1. Second (inverse) geodetic problem

Given two points, determine the azimuth and length of the line (straight line, arc or geodesic) that connects them.

In the case of plane geometry (valid for small areas on the Earth's surface) the solutions to both problems reduce to simple trigonometry. On the sphere, the solution is significantly more complex, e.g., in the inverse problem the azimuths will differ between the two end points of the connecting great circle, arc, i.e. the geodesic.

On the ellipsoid of revolution, geodesics may be written in terms of elliptic integrals, which are usually evaluated in terms of a series expansion; for example, see Vincenty's formulae.

In the general case, the solution is called the geodesic for the surface considered. The differential equations for the geodesic can be solved numerically.

Input data

x0=500

y0=600

x=301

y=705

$$s = \sqrt{(x0 - x)^2 + (y0 - y)^2}$$

$$alpha = \tan^{-1}\left((y0 - y)/(x0 - x)\right)$$

Help:

Function name to get the square root: sqrt()

Archus tangent: atan()

2. task:

First read the Introduction of the spherical law of cosines

https://en.wikipedia.org/wiki/Spherical_law_of_cosines

First geodetic problem on sphere, please read this part of the lecture note:

*****The principal problems of geodesy - transformation between geographical coordinates and polar coordinates on surface of revolution**

First (direct) geodetic problem***

http://mercator.elte.hu/~gyorffy/jegyzete/Coord_sys/coordinate_2__.htm

Input data:

fi0=47.474795

la0=19.0620286

s=85000 meter

r=6372797 meter

alpha0=60°

Use this equation to calculate **fip and la**

$$\varphi_P = \arcsin\left[\sin\varphi_0 \cdot \cos\left(\frac{s}{R}\right) + \cos\varphi_0 \cdot \sin\left(\frac{s}{R}\right) \cdot \cos\alpha_0\right]$$

$$\Delta\lambda = \arccos\left[\frac{\cos\left(\frac{s}{R}\right) - \sin\varphi_0 \cdot \sin\varphi_P}{\cos\varphi_0 \cdot \cos\varphi_P}\right] \cdot \frac{\sin\Delta\lambda}{\left|\sin\Delta\lambda\right|}$$

la=la0+Δla

Help: archus cosine in Python: acos(), and archus sine is asin()