

**Law of Cosines for Sides:**

$$\cos(a) = \cos(b) \cdot \cos(c) + \sin(b) \cdot \sin(c) \cdot \cos(A)$$

**For the problem to the right:**

$$N := \left( 23 \cdot \text{deg} + \frac{43}{60} \cdot \text{deg} \right) + \left( 46 \cdot \text{deg} + \frac{31}{60} \cdot \text{deg} \right)$$

$$N = 70.233 \text{ deg}$$

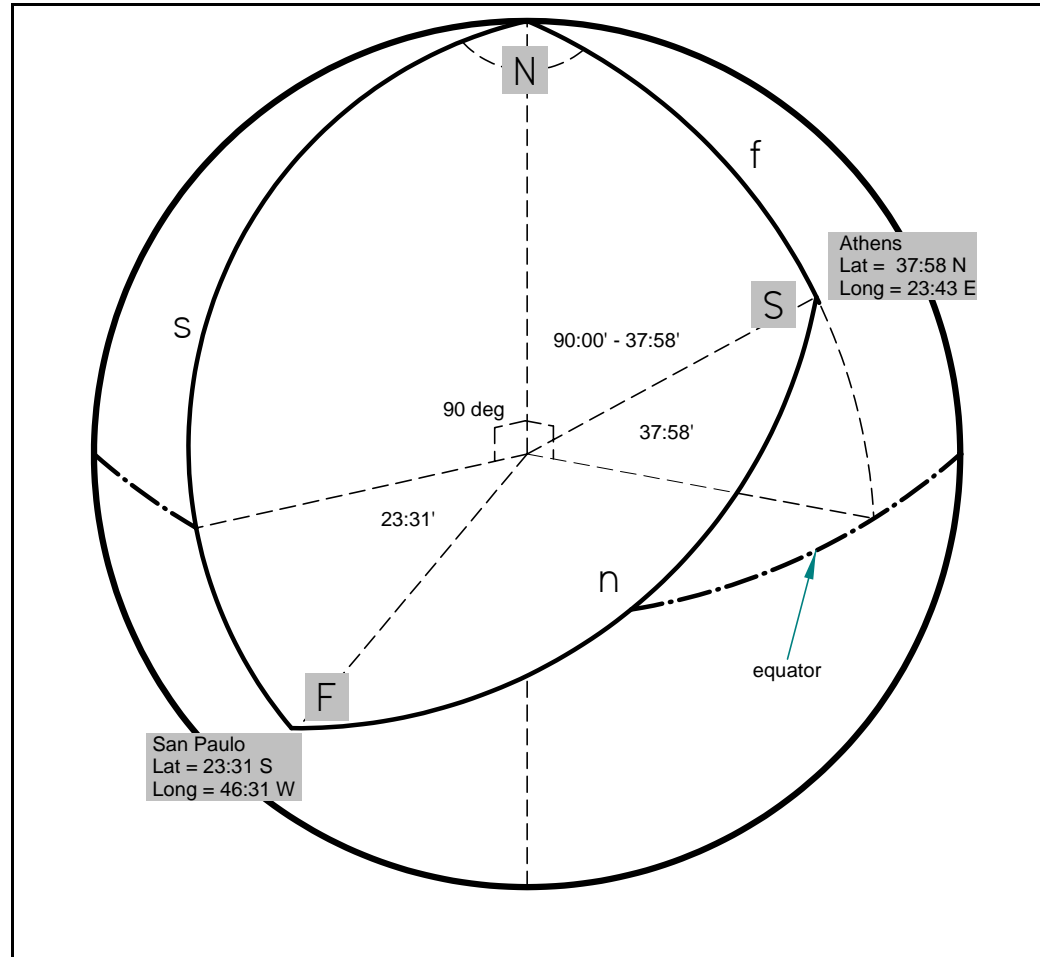
$$s := 90 \text{ deg} + \left( 23 \cdot \text{deg} + \frac{31}{60} \cdot \text{deg} \right) \quad s = 113.517 \text{ deg}$$

$$f := 90 \cdot \text{deg} - \left( 37 \cdot \text{deg} + \frac{58}{60} \cdot \text{deg} \right) \quad f = 52.033 \text{ deg}$$

**Using law of cosines for sides:**

$$\cos(n) = \cos(s) \cdot \cos(f) + \sin(s) \cdot \sin(f) \cdot \cos(N)$$

**Solving for n:**  $n := \text{acos}(\cos(s) \cdot \cos(f) + \sin(s) \cdot \sin(f) \cdot \cos(N))$      $n = 1.572$      $n = 90.057 \text{ deg}$      $n = 5403.442 \text{ NMi}$



Since 1 Nautical Mile = 1/60 degree of arc (1 minute), we define:

$$\text{NMi} := \frac{1}{60} \cdot \text{deg}$$

Solution from Sphere.exe

The screenshot shows the 'Sphere' application window with the following data:

Input Latitude / Longitude Data			
Location	deg	min	direction
Start: Athens	37	58	N
Greece	23	43	E
End: São Paulo	23	31	S
Brazil	46	31	W

Output Data			
Great Circle Distance =	5403.44	nautical miles	N = 70.23
	6213.96	stauter miles	n = 90.06
Initial Course =	239.65	degrees	direction EW = West
Course of Arrival =	227.89	degrees	direction NS =
			s = 52.03
			e = 113.52

Buttons: Done with Inputs, Compute Outputs, Clear All, Math Example, Exit

**Javascript Great Circle Calculator. - Microsoft Internet Explorer**

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## Great Circle Calculator.

By Ed Williams

You need Javascript enabled if you want this page to do anything useful! For Netscape, it's under Options/Network Preferences/Languages.

**Compute true course and distance between points.**

Enter lat/lon of points, select distance units and earth model and click "compute". Lat/lons may be entered in DD.DD, DD:MM.MM or DD:MM:SS.SS formats.

Note that if either point is very close to a pole, the course may be inaccurate, because of its extreme sensitivity to position and inevitable rounding error.

Input Data

Lat1		Lon1	
37:58.00	N	23:43.00	E
Lat2		Lon2	
23:31.00	S	46:31.00	W

Output

Course 1-2	Course 2-1	Distance
239.645585	47.8949417	5403.441716

Distance Units: nm Earth model: Spherical (1'=1nm)

Done Internet