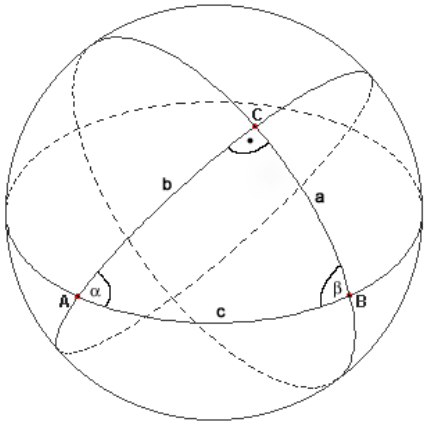
Properties of spherical triangle :



1. If a circle is drawn on a sphere so that the radius of the circle is the same as the radius of the sphere it is called a *great circle* . Any other circle is a *small circle* .
2. An infinit number of great circle can pass through one point , but only one great circle can pass through tow points , unless they are diametrically opposite .
3. A spherical triangle is a triangle each of whose sides is a great circle .
4. The length of the arc of a circle can be measured by the angle which the arc subtends at the center of the circle . The sides of a spherical triangle are measured in degree , minutes , and seconds .
5. No sides of a spherical triangle can therefore exceed 180° .
6. The three angles of a spherical triangle must together be more than 180° and less than 540° .
7. The greater side is opposite the greater angle , if tow sides are equal their opposite angles are equal .
8. If one angle of the triangle is 90° it is called a right-angle triangle , and if one side of the triangle 90° it is called a quadrantal triangle .

Solving right angle spherical triangle :

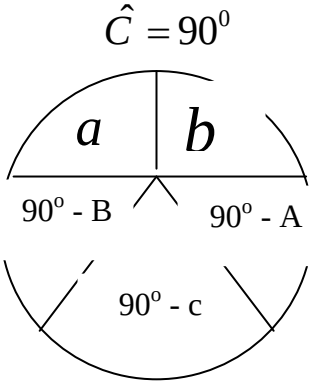
In case giving a spherical triangle in which one angle is 90° , we use the following fundamental rules ,

$$\sin middle = \tan(adj.) \times \tan(adj.)$$
$$\sin middle = \cos(opp.) \times \cos(opp.)$$

Example :

1. Solve the following right angle spherical triangle ABC given that : a = 87° 16' , B = 38° 45' , C = 90°

Solution :



In the first

$$\sin a = \tan b \,.\tan (90 - B)$$

$$\therefore \quad \sin a = \tan b \,.\cot B$$

$$\therefore \quad \tan b = \frac{\sin a}{\cot B} = \sin a.\tan B = 0.801671751$$

$$\therefore \quad b = \tan^{-1} 0.801671751 = 38.718657 = 38° 43' 5''$$

In the second

$$\sin (90 - A) = \cos a \,.\cos (90 - B)$$

$$\therefore \quad \cos A = \cos a \,.\sin B$$

$$\therefore \quad \cos A = 0.029848771$$

$$\therefore \quad A = \cos^{-1} 0.02984877145 = 88^\circ\ 17' 22.33''$$

In the third

$$\sin (90 - B) = \tan a \,.\tan (90 - c)$$

$$\therefore \quad \cos B = \tan a \,.\cot c$$

$$\therefore \quad \tan c = \frac{\tan a}{\cos B} = 26.85778049$$

$$\therefore \quad c = \tan^{-1} 26.85778049 = 87^\circ\ 52' 3''$$

Sheet (3)

Solving right angle spherical triangle :

1) Solve the following right angle spherical triangle ABC given that :

$$\sin middle = \tan(adj.) \times \tan(adj.)$$

$$\sin middle = \cos(opp.) \times \cos(opp.)$$

Lecture

1. A = 90° , c = 46° 18' 30" , B = 34° 27' 30"
2. C = 90° , c = 69° 25' 11" , B = 63° 25' 03"
3. a = 85° 17' , b = 102° 26' 15" , B = 90°
4. C = 90° , a = 120° 18' 45' , b = 101° 9'
5. A = 90° , B = 100° , C = 87° 10'

Section

1. c = 61°4' 56" , a = 40° 31' 20" , C = 90°
2. b = 70° 23' 42" , B = 90° , c = 48° 39' 16"
3. A = 90° , b = 100° , c = 98° 20'
4. A = 90° , c = 100° 42' , B = 78° 10'

Home work

1. C = 90° , A = 66° 07' 20" , a = 59° 28' 27"
2. A = 90° , B = 72° 19' , b = 50° 50'
3. B = 90° , a = 25° 12' 48" , c = 52° 0' 45"
4. A = 90° , c = 46° 12' , a = 70° 49'
5. c = 78° 53' 20" , A = 83° 56' 40" , C = 90°