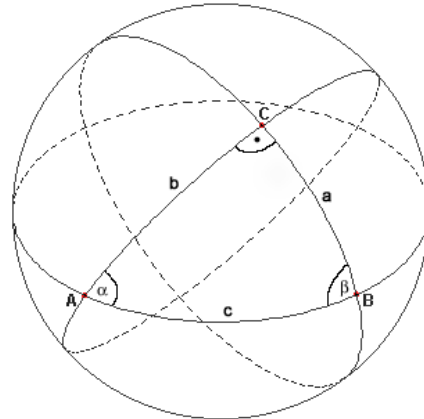


### Properties of spherical triangle :



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  $180^\circ$  .
6. The three angles of a spherical triangle must together be more than  $180^\circ$  and less than  $540^\circ$  .
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  $90^\circ$  it is called a right-angle triangle , and if one side of the triangle  $90^\circ$  it is called a quadrantal triangle .

### Solving right angle spherical triangle :

In case giving a spherical triangle in which one angle is  $90^\circ$  , we use the following fundamental rules ,

$$\begin{aligned}\sin \text{ middle} &= \tan(\text{adj.}) \times \tan (\text{adj.}) \\ \sin \text{ middle} &= \cos(\text{opp.}) \times \cos (\text{opp.})\end{aligned}$$

Example :

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

**Solution :**

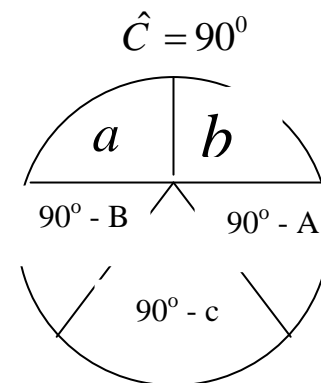
In the first

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

$$\therefore \sin a = \tan b \cdot \cot B$$

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

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



In the second

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

$$\therefore \cos A = \cos a \cdot \sin B$$

$$\therefore \cos A = 0.029848771$$

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

In the third

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

$$\therefore \cos B = \tan a \cdot \cot c$$

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

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

## Sheet (3)

### Solving right angle spherical triangle :

- 1) Solve the following right angle spherical triangle ABC given that :
- $$\sin \text{middle} = \tan(\text{adj.}) \times \tan(\text{adj.})$$
- $$\sin \text{middle} = \cos(\text{opp.}) \times \cos(\text{opp.})$$

#### Lecture

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

#### Section

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

#### Home work

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