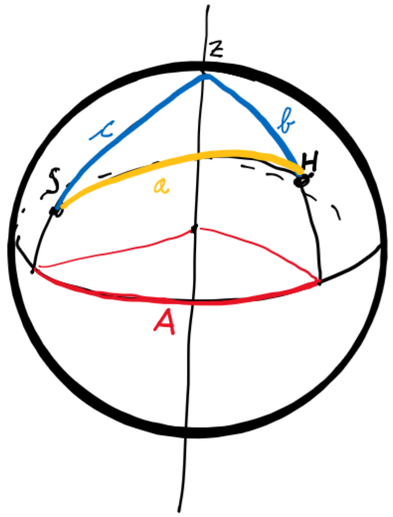
UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Esercizi astronomia sferica

Settimana 1

Esercizio 2.1

Trova la distanza tra Helsinki ($\lambda_1 = 25°$ E; $\Phi_1 = 60°$ N) e Seattle ($\lambda_2 = 122°$ W; $\Phi_2 = 48°$ N),



$\lambda_1 = 25° E \qquad \phi_1 = 60° N$

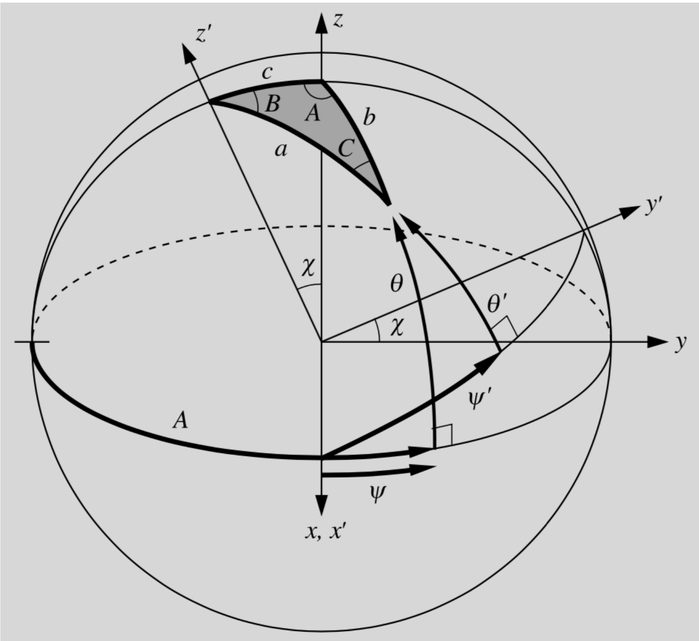
$\lambda_2 = 122° W \qquad \phi_2 = 48° N$

$R = 6370$

$$\cos d = \cos(25+122)\sin(90-60)\sin(90-48) + \cos(90-60)\cdot\cos(90-48) =$$

$$= -0.28 + 0.6436 = 0.3635$$

$$d = 68.679° = 1.198 \text{ rad} \qquad D = d \cdot R = 7635 \text{ Km}$$



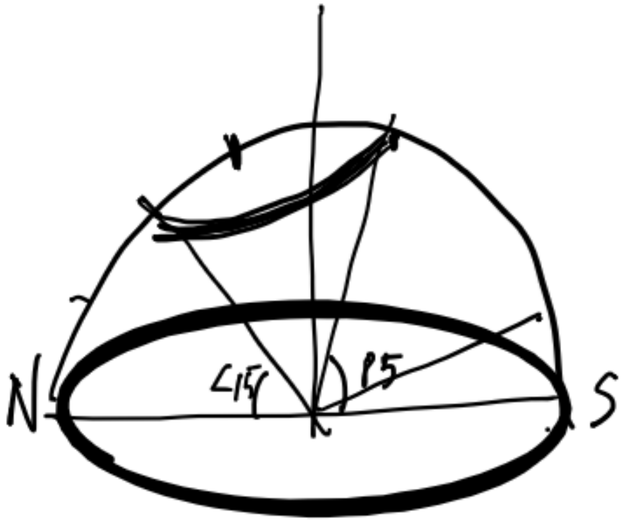
$$\cos a = \cos A \sin b \sin c + \cos b \cos c.$$

Esercizio 2.2

Una stella attraversa il meridiano sud ad un'altezza a=85° e quello nord ad un'altezza a=45°. Determinare la declinazione della stella e la latitudine dell'osservatore

$a_S = 85°$ $a_N = 45°$

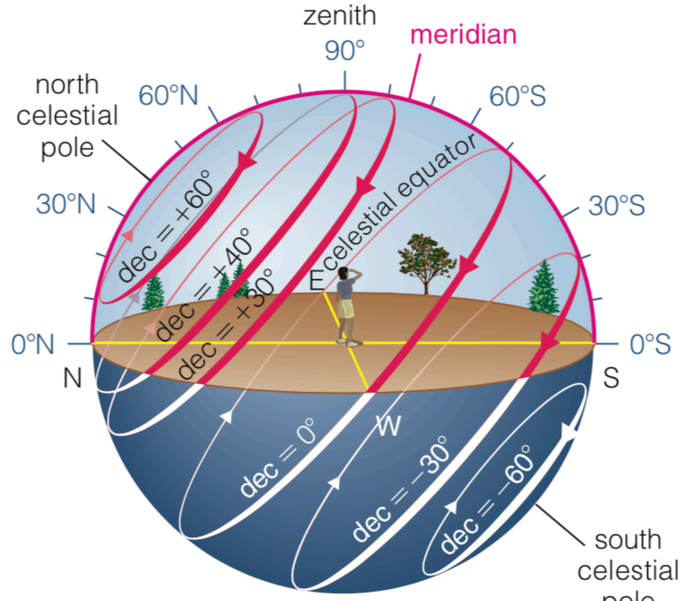
$\phi = ?$ $\delta = ?$



CULMINA A S DI Z:

$$\Rightarrow \delta = \frac{1}{2}(a_{min} + a_{max}) = 65°$$

$$a_{max} = 90 - \phi + \delta \qquad \phi = 90 - a_S + \delta = 90 - 85 + 65 = 70°$$



$$\delta = \frac{1}{2}(a_{min} + a_{max})$$ **culmina a S**

$$\delta = \frac{1}{2}(a_{min} - a_{max}) + 90°$$ culmina a N

Esercizio 2.3

Dove sono valide queste affermazioni:

a) Castor (α_{Gem}, declinazione δ=31°53') è circumpolare

b) Betelgeuse (α_{Ori}, declinazione δ=7°24') culmina allo zenith

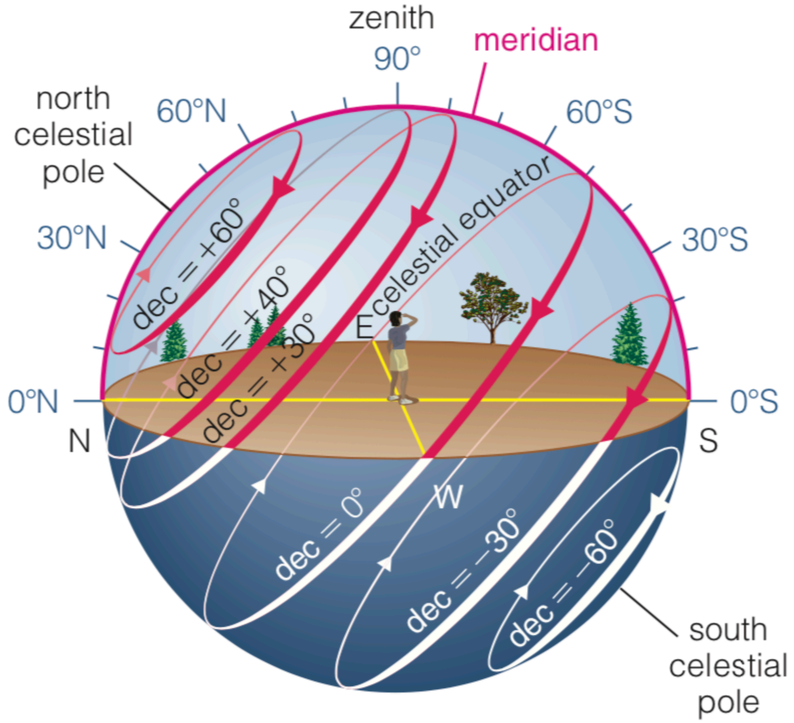
a) α_{Gem} $\delta = 31°53' = 31.8833°$

$\delta + \phi > 90°$ circumpolare

$\phi > 90 - \delta > 58.11°$

b) α_{Ori} $\delta = 7°24'$

$\phi \simeq 7°24'$



a_{min}>0 se $\delta+\phi$>90°; corpi con $\delta+\phi$>90° circumpolari

Esempio 2.4

Consideriamo 2 stelle di coordinate celesti α_1=10h δ_1=70° e α_2=11h δ_2=80°. Qual'è la loro distanza in cielo?

A: $\alpha_1 = 10h \quad \delta_1 = 70^\circ$

B: $\alpha_2 = 11h \quad \delta_2 = 80^\circ$

$d_{AB} = ?$

$\alpha_1 = 150^\circ \quad \alpha_2 = 165^\circ$

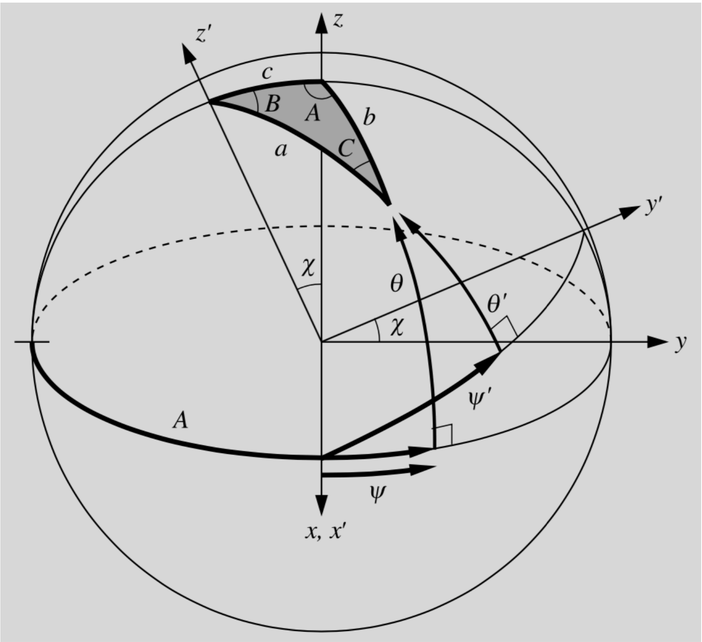
~~$d_{AB} = \sqrt{15^2 + 10^2} = 18^\circ$~~

$\cos d = \cos(\alpha_2 - \alpha_1)\sin(90 - \delta_1)\sin(90 - \delta_2) + \cos(90 - \delta_1)\cos(90 - \delta_2)$

$= \cos(\alpha_2 - \alpha_1)\cos\delta_1\cos\delta_2 + \sin\delta_1\sin\delta_2 =$

$= 0.05736 + 0.3254 = 0.383$

$d_{AB} = 10.65^\circ$



$$\cos a = \cos A \sin b \sin c + \cos b \cos c.$$

Esempio 2.7

Le coordinate di Arcturus sono α_1=14h15.7min δ_1=19°11'. Trovare il tempo siderale in cui Arcturus sorge e tramonta a Boston (Φ=42°19')

$\alpha = 14h\ 15.7min = 14.262\,h$ $\quad \delta = 19^\circ 11' = 19.18^\circ$

$LST_{R,S} = ?$ $\quad \phi = 42^\circ 19' = 42.32^\circ$

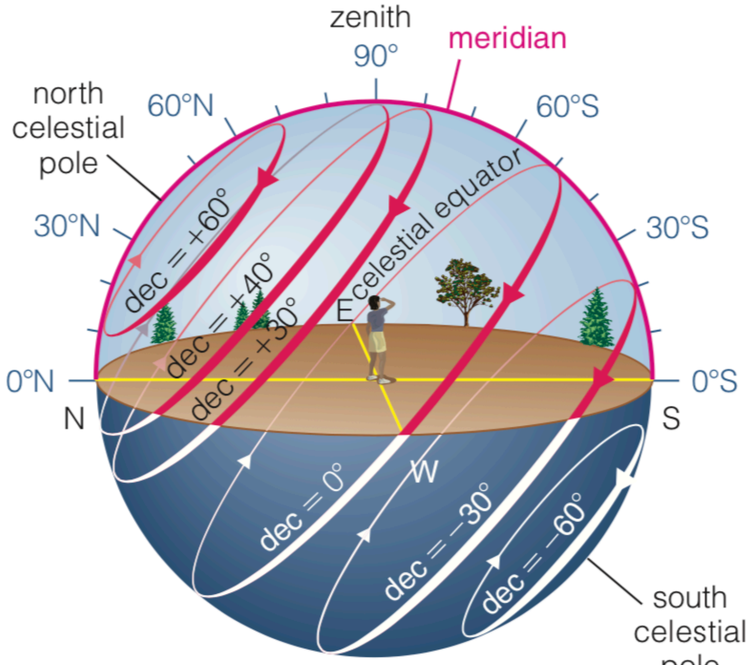
$\cos h_{R,S} = -\tan\phi \tan\delta = -\tan 19.18^\circ \tan 42.32 = -0.3167$

$h_{R,S} = \pm 108.465^\circ = \pm 7.23$

$LST = h + \alpha$

$LST_R = 14.262 - 7.23 = 7.032\,h = 7h\,2m$

$LST_S = 14.262 + 7.23 = 21.492\,h = 21h\,29m\,30s$



$$\cos h_{s,t} = -\tan\delta \tan\phi \qquad \Theta_{s,t} = h_{s,t} + \alpha$$