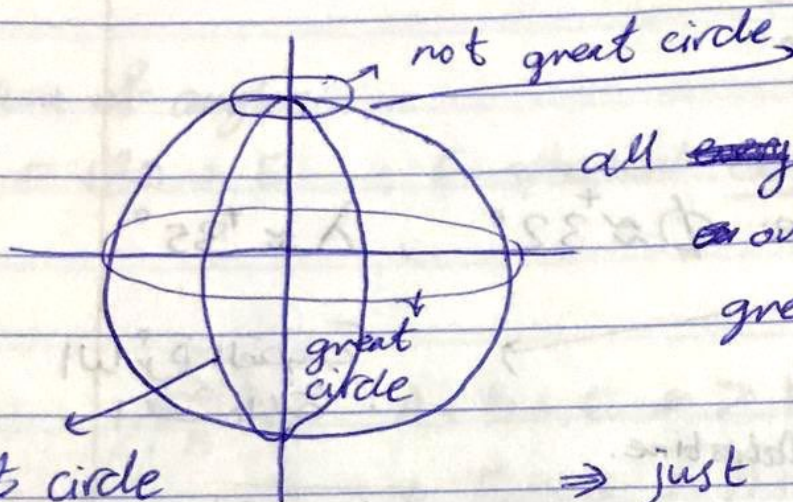




center is the same
as the center of
the sphere on which
surface is drawn.



all ~~every~~ Longitudes
on earth are
great circles.

⇒ just one great circle
from latitudes (equator).

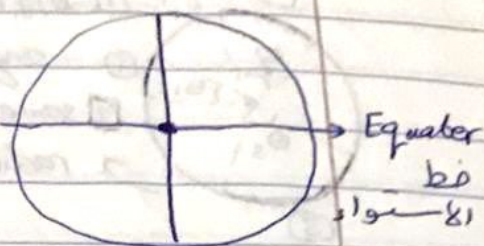
$$\sqrt{1 - 6.1012} = 1 = 14.50034 \times 10^6 \text{ m d.}$$

energy wh-

introduction

spherical Geometry

⇒ Great circle



* Latitude: دوائر العرض

* Longitude: دوائر الطول

⇒ ~~Telescop~~ Telescopes

⇒ Kepler's laws

⇒ Solar system.

CH 1: self-reading

CH 2: spherical Geometry

spherical Geometry

plane Geometry

3 arcs

arc

spherical triangle (greater than 180°)

length of arc

$$l = r\theta, \theta \text{ in rad.}$$

straight line

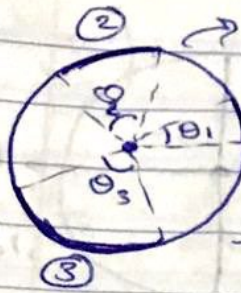
plane triangle

3 lines

$\triangle 180^\circ$

$$* \text{Area} = \frac{1}{2} \cdot \text{length} \cdot \text{height of triangle plane}$$

* Area of spherical = ⇒



② different angles

① angles

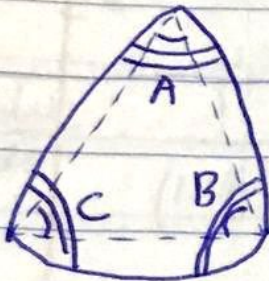
② same

radius

⇒ Cannot decide the angles of the spherical triangle.

sum of angles

$$= 180 + E \quad ; \quad E: \text{spherical excess} \cdot \frac{\pi}{180}; \quad (\text{rad.})$$



$$A + B + C > 180^\circ$$

$$\Rightarrow \text{Excess} = A + B + C - 180^\circ$$

* Area of spherical triangle = $E r^2$ ^{radius of the sphere}

* Position on ~~the~~ Earth surface

two coordinates

① Latitude " ϕ "

② Longitude " λ "

⇒ My location: $\phi = 31.9582^\circ$

$\lambda = 35.1814^\circ$

→ IOS

$$E = mc^2(\gamma - 1) = m(3 \times 10^8)^2 \left(\frac{1}{\sqrt{1 - (v/c)^2}} - 1 \right) = 4.50034 \times 10^{12} \text{ J}$$

Android: جوال (Samsung)

$$\phi = 32.0808^\circ$$

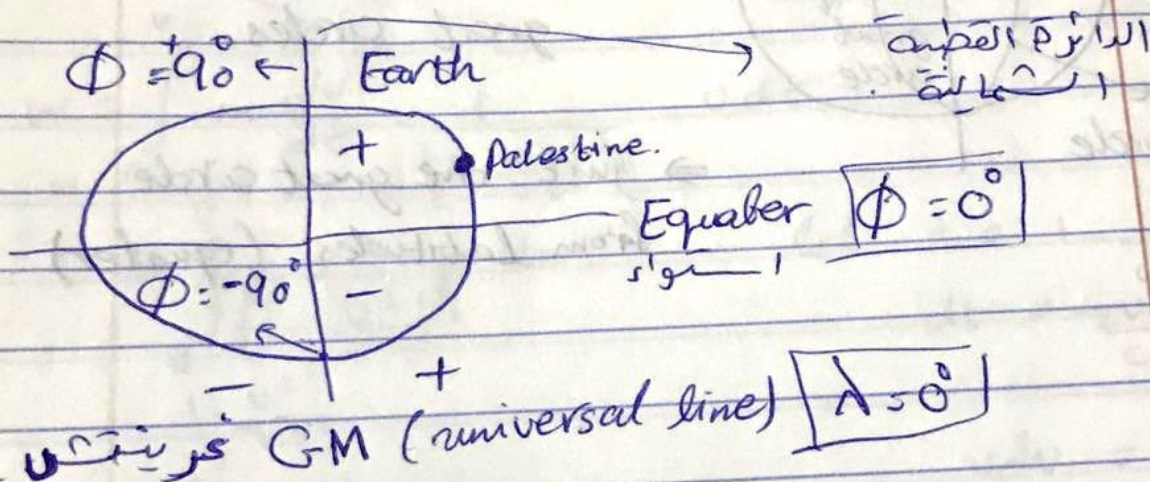
$$\lambda = 35.1761^\circ$$

MI: (Android)

$$\phi = 31.9583645^\circ$$

$$\lambda = 35.1813202^\circ$$

Question: palestine: $\phi \approx +32^\circ$, $\lambda \approx +35^\circ$



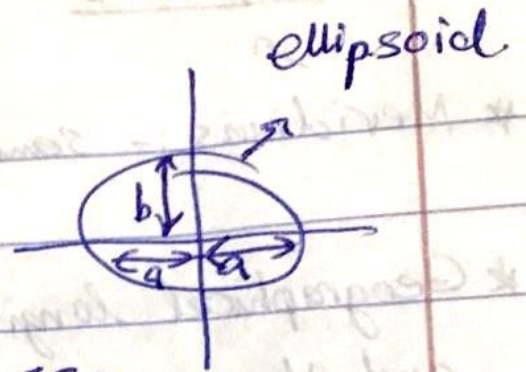
⇒ Northern hemisphere النصف الشمالي

$$\phi \in [-90^\circ, +90^\circ]$$

$$\lambda \in [-180^\circ, +180^\circ]$$

$$K_{tr} = K_{total} - K_e$$

$$\Rightarrow \tan \phi' = \frac{b^2}{a^2} \tan \phi$$

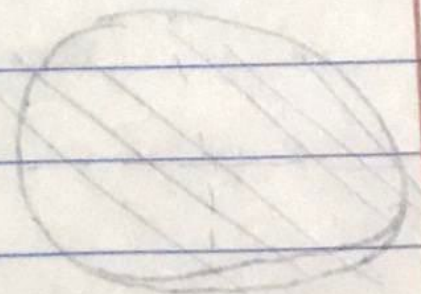
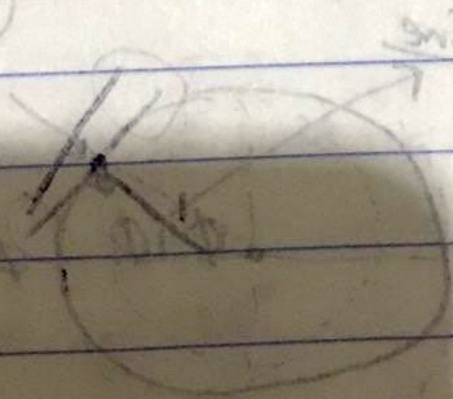


$$* a = 6378137 \text{ m}, b = 6356752 \text{ m}$$

$$\textcircled{1} a - b = ? \quad \textcircled{2} \frac{b}{a} = ?$$

$$\textcircled{3} \text{avg. of } a, b = \text{radius of Earth}$$

8.8 pt



$$* 1^{\circ} = 60''$$

$$0.792 = ? \Rightarrow ? = 47.52 \approx 48''$$

② converge to radians.

$$180^{\circ} = \pi \text{ rad.}$$

$$31.9632 = ? \Rightarrow ? = 0.5579 \text{ rad.}$$

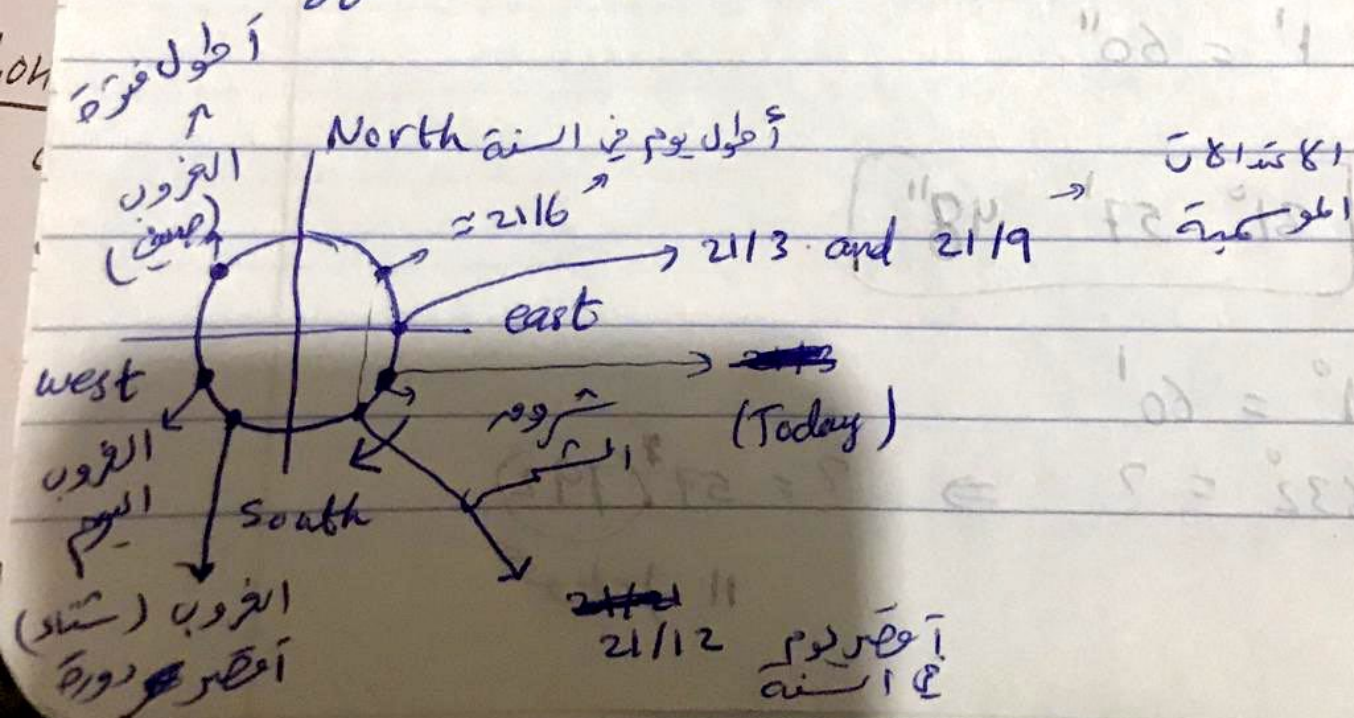
Time: 24 hours = 360°

$$1 \text{ hour} = \frac{360^{\circ}}{24} = 15^{\circ}$$

$$1 \text{ minute of time} = \frac{15^{\circ}}{60} = 0.25^{\circ}$$

$$* 24 \text{ hour} = 360^{\circ}$$

$$\frac{1}{60} = ?? \Rightarrow ? = 0.25^{\circ} = 00^{\circ} 15' 00''$$



$$\frac{1}{\sqrt{1 - (v/c)^2}} - 1 = 4.50034 \times 10^{12} \text{ m J.}$$

longitudes

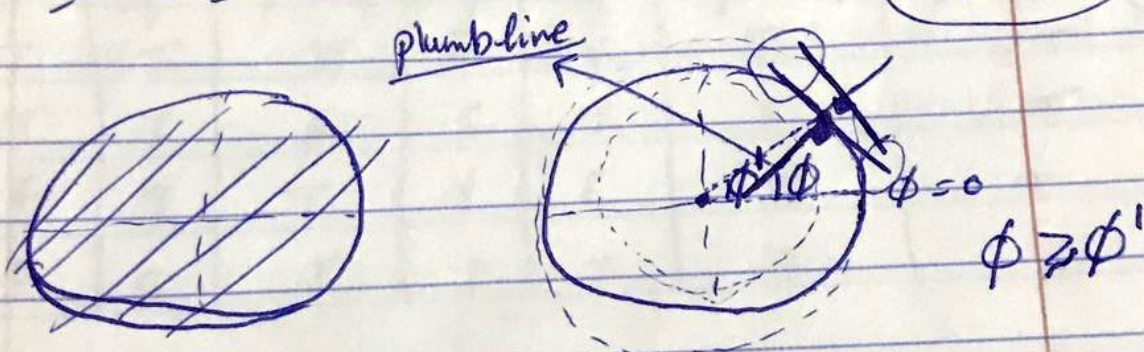
* Meridians :- semicircles from pole to pole.

* Geographical longitude: " λ " : angle between meridian and the zero meridian passing through Greenwich observatory

* Geographical latitude " ϕ " : angle between the ~~plane~~ plumb line and the equator plane.

خط العرض

fig 2.8



والخط العرض نقطة وصلها الإنسان في الكفر في باطن الأرض ؟
 ← أرى نقطة فوق سطح الأرض وصلها الإنسان في القمر.

* Geocentric ~~latit~~ latitude " ϕ' " : angle between equator and the center of earth ~~and the~~ to the point on the surface
 line from the

$$\phi = 31.9617^\circ$$

$$\lambda = 35.1843^\circ$$

نسب

Astronomy

مختف بيرزيت

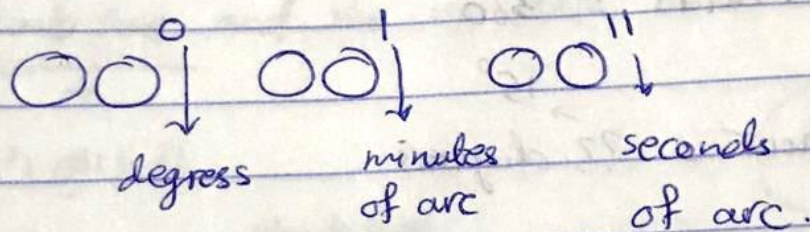
$$\phi = 31.9632^\circ \rightarrow \text{جهة السماء}$$

$$\lambda = 35.1843^\circ \rightarrow \text{جهة الشرق}$$

⇒ الكائن

$$\lambda = 35.1813202^\circ \rightarrow \text{جهة الغرب}$$

Form:-



① write: 31.9632° on the form $00^\circ 00' 00''$

Note: - $1^\circ = 60'$ (دقائق)

$$1' = 60''$$

$$31^\circ 57' 48''$$

$$* 1^\circ = 60'$$

$$0.9632^\circ = ?$$

$$\Rightarrow ? = 57' 792''$$

تحويل 11