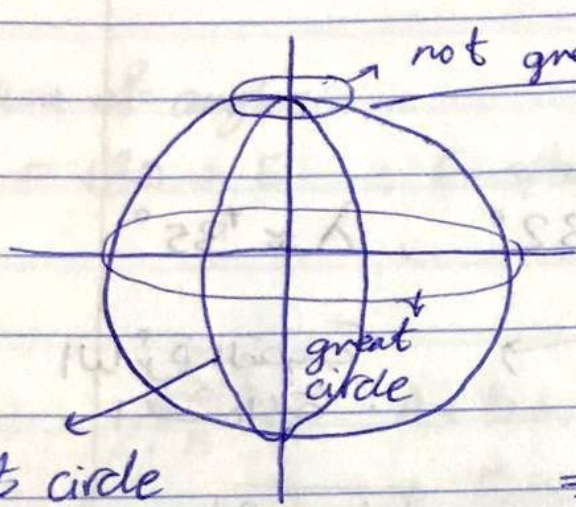




center is the same
as the center of
the sphere on which
surface is drawn.



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

great circle

⇒ just one great circle
from latitudes (equator)

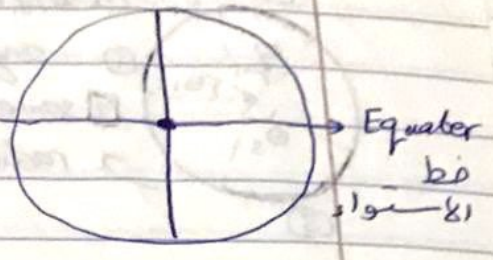
$\sqrt{1 - (b/c)^2} = 1 = 14.50034 \times 10^6 \text{ m d.}$

energy wh-

introduction

spherical Geometry

⇒ Great circle



* Latitude: دوائر العرض

* Longitude: دوائر الطول

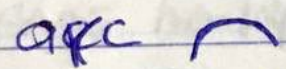

⇒ Telescopes

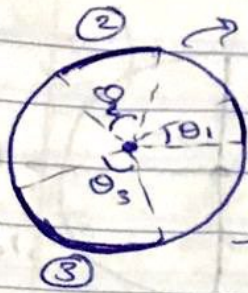
⇒ Kepler's laws

⇒ Solar system.

CH 1: self-reading

CH 2: spherical Geometry

spherical Geometry	plane Geometry
<p><u>3 arcs</u>  spherical triangle (greater than 180°)</p>	<p><u>3 lines</u> straight line plane triangle $\Delta 180^\circ$</p>
<p> length of arc</p>	<p>* Area = $\frac{1}{2} \cdot \text{length} \cdot \text{height}$ of triangle plane</p>
<p>$l = r\theta$, θ in rad.</p>	<p>* Area of spherical = \Rightarrow</p>



② → Different angles

① angles

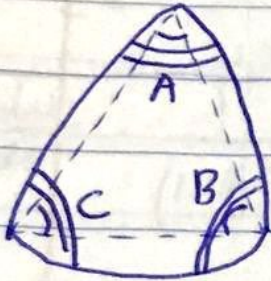
② same

→ radius

Cannot decide the angles of the spherical triangle.

sum of angles

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



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

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

* 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

$$= mc^2(\gamma - 1) = m(3 \times 10^8)^2 \left(\frac{1}{\sqrt{1 - (0.1)^2}} - 1 \right) = \boxed{4.50034 \times 10^{12} \text{ m J}}$$

Android:- أندرويد (Samsung)

$$\phi = 32.0808^\circ$$

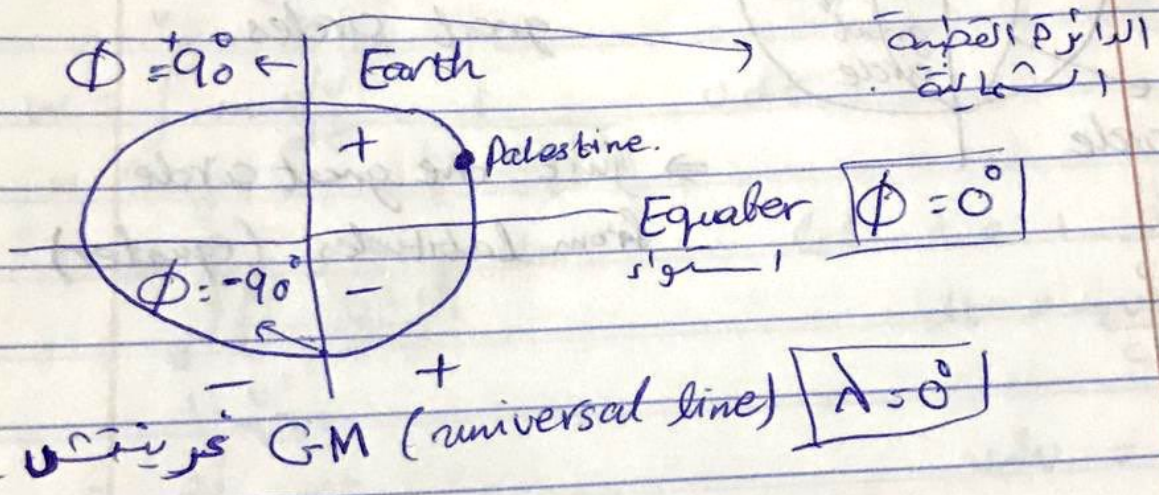
$$\lambda = 35.1761^\circ$$

MI: (Android)

$$\phi = 31.9583645^\circ$$

$$\lambda = 35.1813202^\circ$$

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



⇒ Northern hemisphere نصف الكرة الشمالي

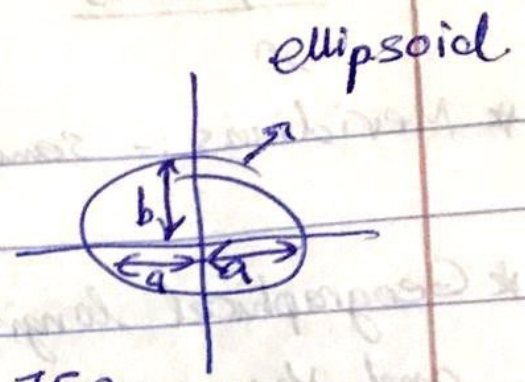
$$\phi \in [-90^\circ, +90^\circ]$$

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

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

ellipsoid

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

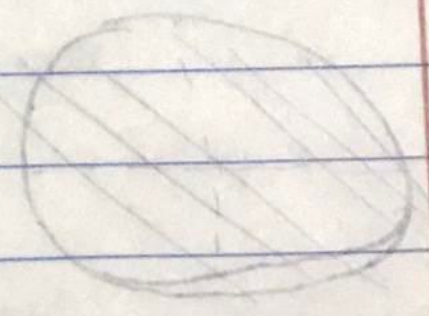
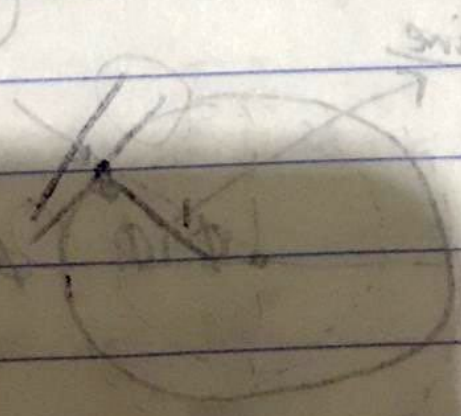


* $a = 6378137 \text{ m}$, $b = 63567520 \text{ m}$.

① $a - b = ?$ ② $\frac{b}{a} = ?$

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

8.8 pg



$\phi = 31.9632^\circ$
 $\lambda = 32.1843^\circ$

* $1^\circ = 60''$

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

② converge to radians.

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

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

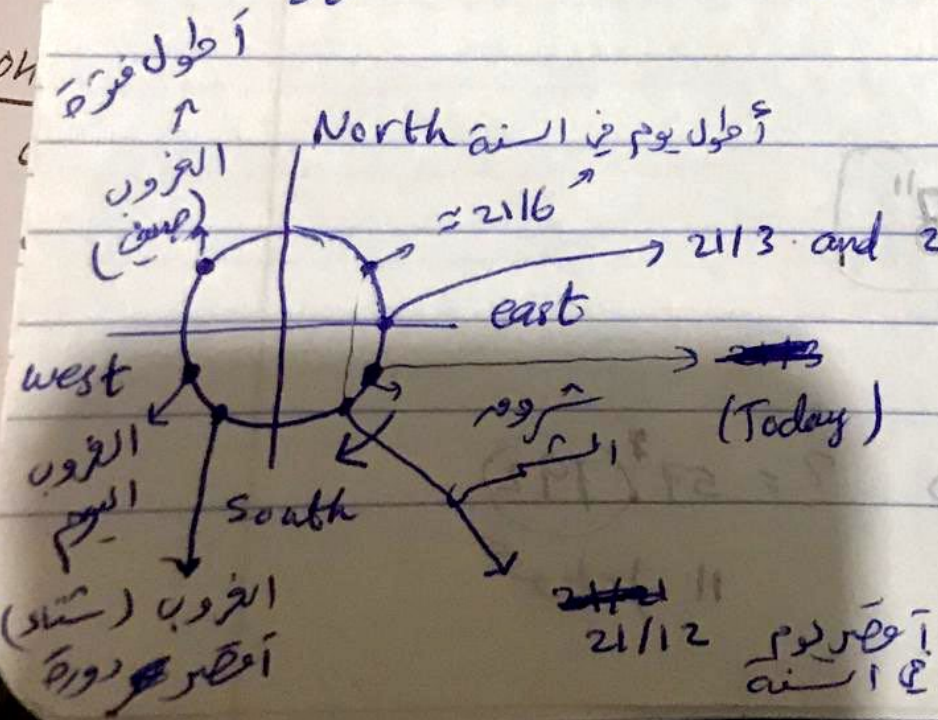
Time: 24 hours = 360°

1 hour = 15°
 $?? \text{ degrees}$

1 minute of time = $?? \text{ degrees.}$

* 24 hour = 360°

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



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

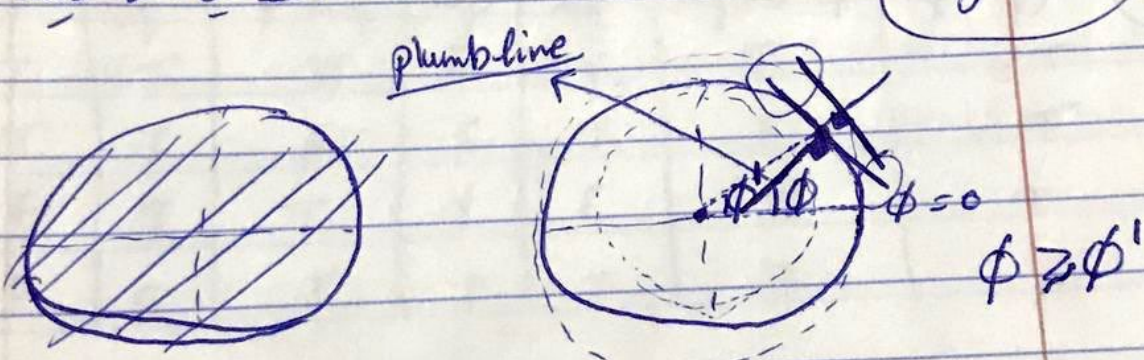
longitudes

- * 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 الارتفاع

fig 2.8



والارتفاع نقطة وصلها إلى مركز الأرض في الكفر في باطن الأرض ؟
 ← أرى نقطة فوق سطح الأرض وصلها إلى مركز الأرض هي القمر.

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

$$\phi = 31.9617^\circ$$

$$\lambda = 35.1843^\circ$$

مشرق
مغرب

Astronomy

صنعت سیرزیت

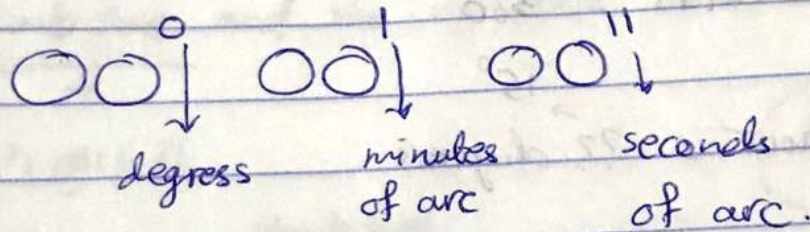
$$\phi = 31.9632^\circ \rightarrow \text{جهت الشمال (زادتا)}$$

$$\lambda = 35.1843^\circ \rightarrow \text{جهت الشرق (زادتا)}$$

⇒ اكدانته

$$\lambda = 35.1813202^\circ \rightarrow \text{جهت الغرب (نقتت)}$$

Form:-



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

Note: - $1^\circ = 60'$ (أربعون)

$$1' = 60''$$

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

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

$$0.9632^\circ = ?$$

$$\Rightarrow ? = 57' \text{ (792)}$$

تحويل 11