

The Young Astronomer's Briefcase

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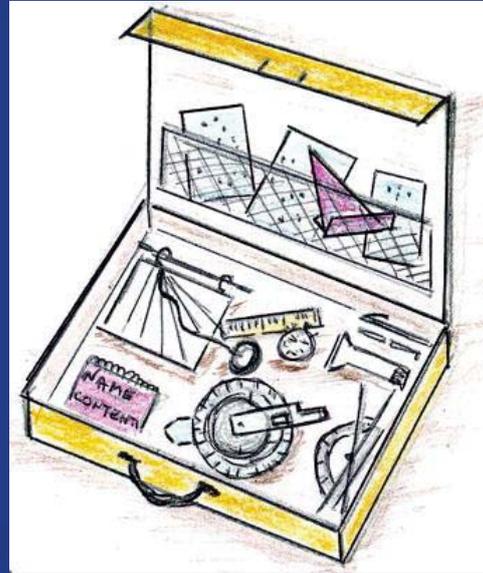
Goals

- Understand the importance of careful observations
- Understand the use of various instruments through student construction of the instruments



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- All instruments built and organized in a box



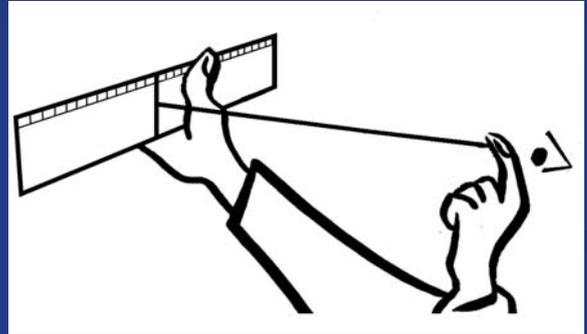
Components of the kit

- "Ruler to measure angles"
- Simplified quadrant
- Simple horizontal goniometer
- Planisphere
- Map of the Moon
- Spectroscope
- Equatorial Clock
- Red Light Flashlight
- Compass
- Wristwatch
- Paper, pencil, camera ...



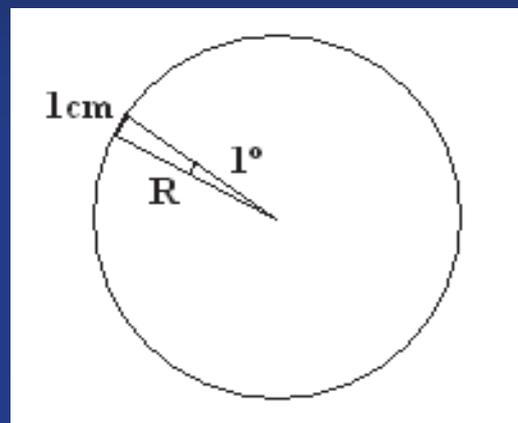
1- “Ruler to measure angles”

- To provide the angular distance between two stars
- Simple to use if we do not want to use coordinates.



1-“Ruler to measure angles”

- “What is the distance (radius R) needed to obtain a device which is equivalent to 1° to 1 cm?”



$$\frac{2\pi R \text{ cm}}{360^\circ} = \frac{1 \text{ cm}}{1^\circ}$$



$$R = 180 / \pi = 57 \text{ cm}$$



1-“Ruler to measure angles”

- To build: We set a string length of 57 cm to a non-flexible ruler



1-“Ruler to measure angles”

- How to use: We observe with the end of the string almost touching our eye (on the cheek below the eye)
- With string stretched: $1\text{cm} = 1\text{ degree}$



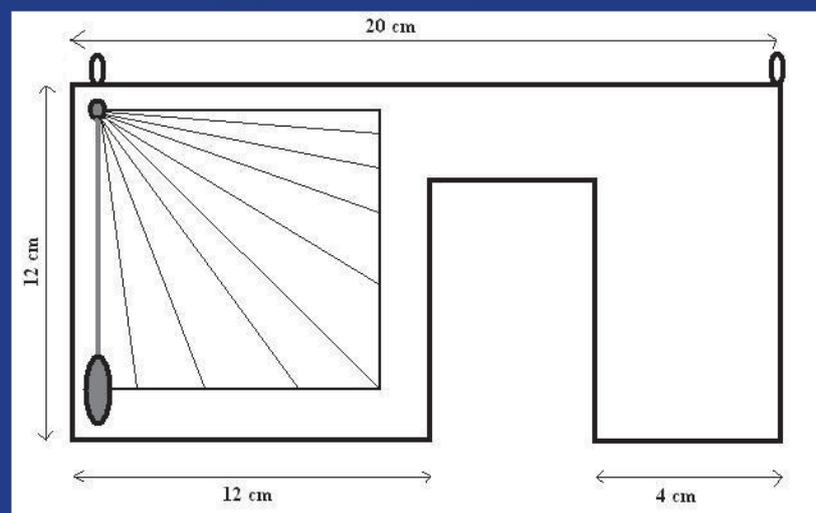
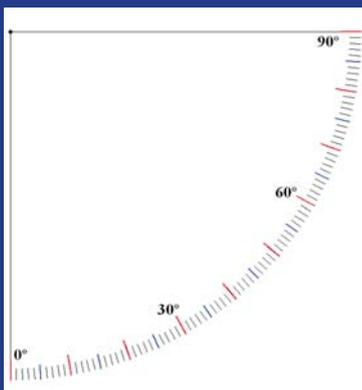
2- Simplified quadrant

- To get the altitude of the stars.
- Work in groups of two students: one looking through the viewfinder and another making readings.



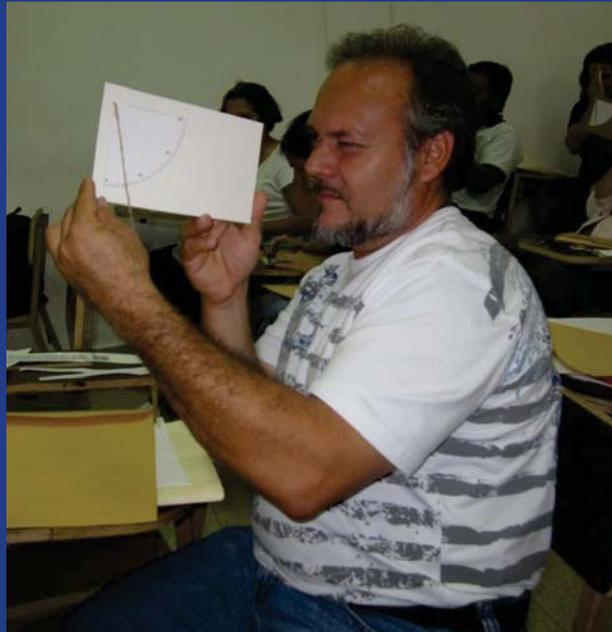
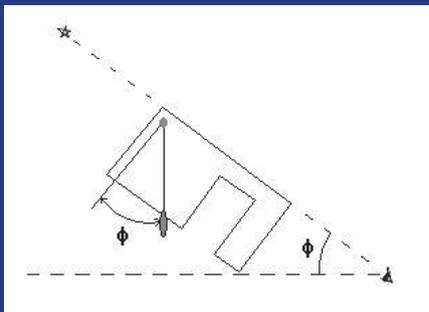
2 - Simplified quadrant (gun type)

- Rectangular piece of cardboard (approx. 12x20 cm).
- Two round hooks on the upper side



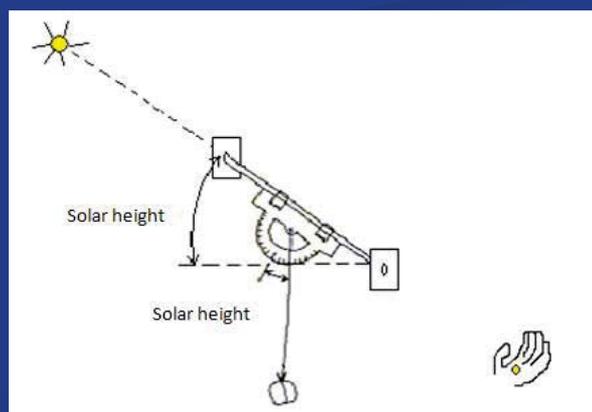
2 - Simplified quadrant (gun type)

- If you see the object through the two hooks, the string indicates the altitude above the horizon.



2 - Simplified quadrant (gun type)

- a straw with a carton located across the hooks is an excellent viewfinder for measuring the altitude of the sun by projecting the image onto a piece of white cardboard.
- **ATTENTION:
NEVER LOOK
DIRECTLY AT
THE SUN!**



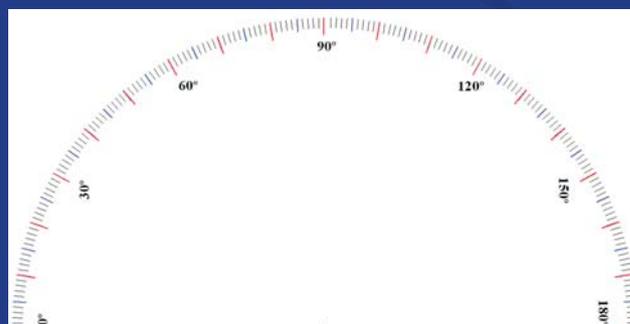
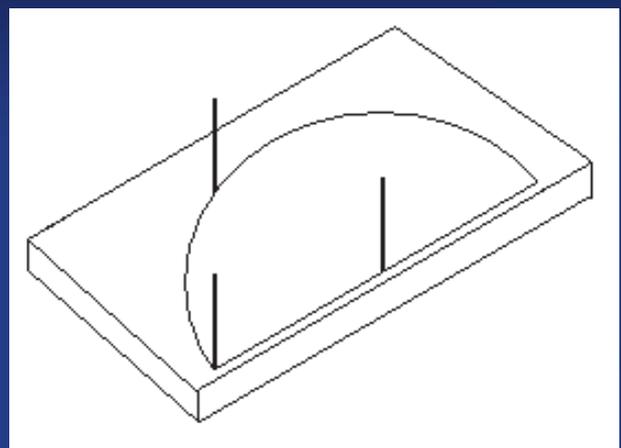
3- Simple horizontal goniometer

- To determine the azimuth of the stars
- You need to use a compass to align the instrument in the North-South direction.



3- Simple horizontal goniometer

- Cardboard 12x20 cm
- Using 3 "needles" can make two directions
- Read the angle between them



3- Simple horizontal goniometer

- To measure the azimuth of a star must place the origin of the semicircle in the North-South direction.
- Azimuth is the angle from the North-South line through the center of the circle and the direction of the star



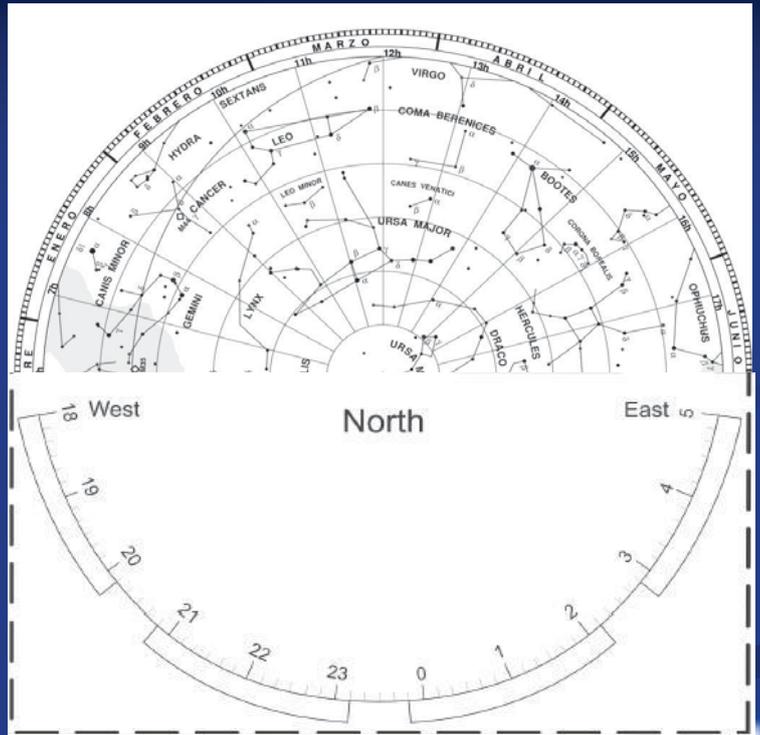
4- Planisphere

- To learn what are the **constellations visible in our latitude known the date and time of observation**



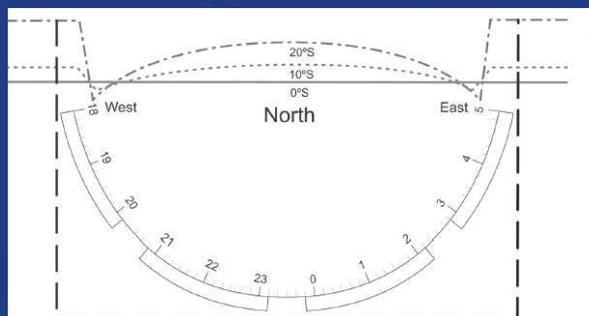
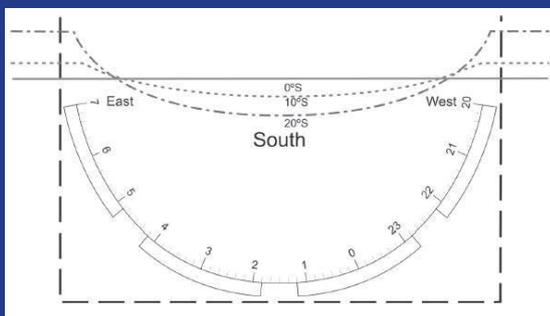
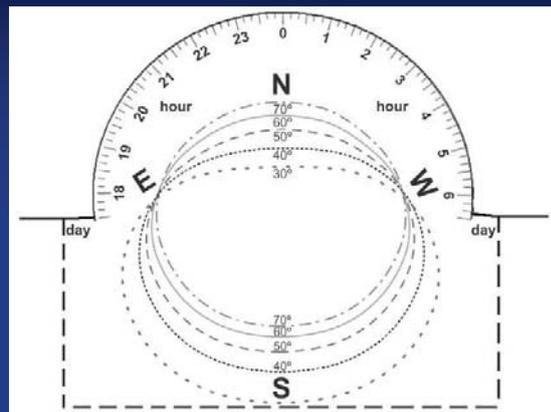
4- Planisphere

- Constellations disc photocopied on white



4- Planisphere

- Inside a pocket whose cut-out area depends on the local latitude



6- Spectroscope

- To display the spectrum of sunlight



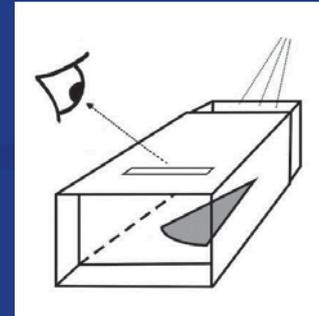
6- Spectroscope

- Paint inside the box black
- Cut longitudinally to look at the spectrum within the box



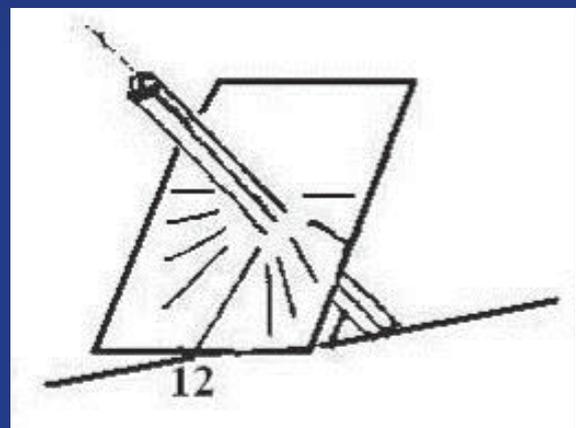
6- Spectroscope

- Paste a piece of CD on the bottom inside the box (with the recorded area facing up)
- Close the box leaving only a slit open in the area opposite the viewer.



7- Equatorial clock

- **To determine the time**
 - You need to use a compass to align the instrument in the North-South direction.
- HORIZON AND
SUNDIAL
WORKSHOP**



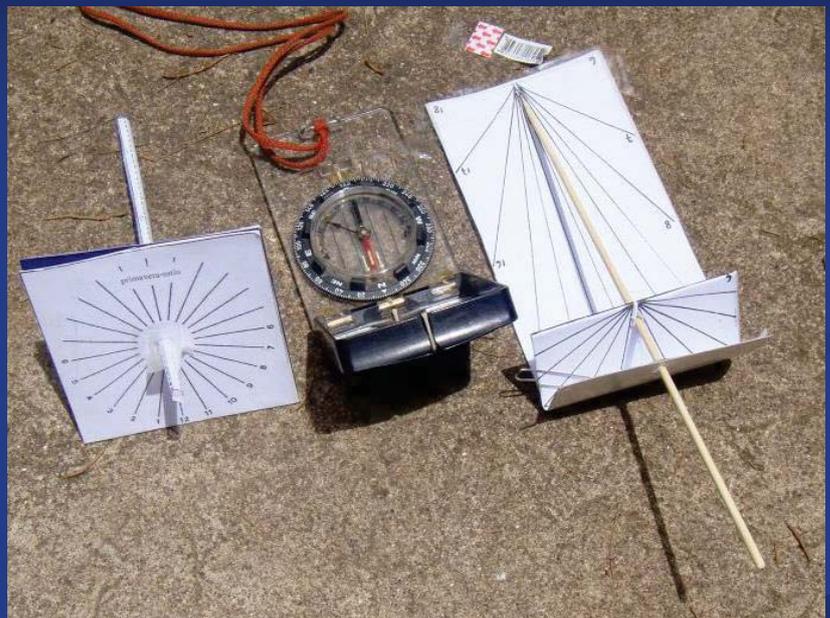
8 Flashlight (red light)

- To illuminate the maps before looking at real sky at night
- Light can annoy observations
- You can attach "cellophane" red to the light with adhesive



9- Compass

- to align different tools



10- Wristwatch and...

■ everything else ...

- notebook
- pencil or pen
- camera
- ...



Conclusions

- Is appropriate that students make their own instruments, and use them in their organized briefcase
- With this activity, students:
 - gain confidence in the measures;
 - take responsibility for their own instruments;
 - develop their creativity and manual skills;
 - understand the importance of systematic data collection;
 - facilitate their understanding of more sophisticated instruments;
 - recognize the importance of observation with the unaided eye, both in history and now.



**Thank you very
much
for your attention!**

