Vifaa vya kufundishia Mwendo wa Nyota, Jua na Mwezi

Stellar, solar and lunar demonstrators

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Malengo
Goals

- Kujifunza mwendo wa nyota jinsi unavyoonekana katika anga za latitudo tofauti
- Kujifunza mwendo wa Jua insi unavyoonekana katika anga za latitudo tofauti
- Kujifunza mwendo na umbile la Mwezi jinsi unavyoonekana katika anga za latitudo tofauti

- Understand the apparent motions of stars as seen from different latitudes
- Understand the apparent motions of the Sun as seen from different latitudes
- Understand the Moon's movement and shapes as seen from different latitudes

Zoezi 1: Aridhio la nyota kuonesha:

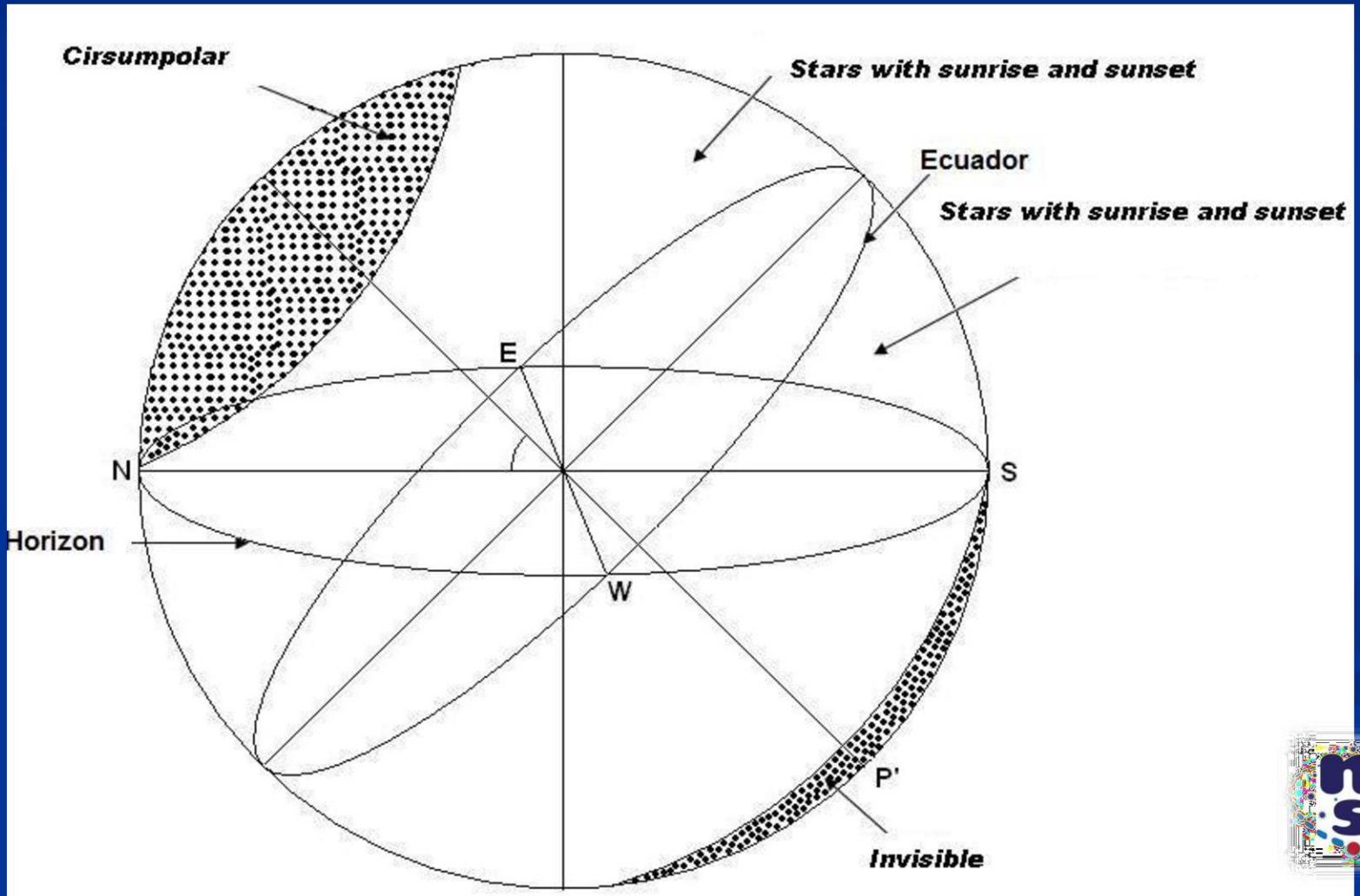
Activity 1: Stellar demonstrator for showing:

- Njia za nyota katika anga yetu
- Nyota za kuzunguka Ncha, nyota zinazochomoza na kuzama, na nyota ambazo hazichomozi wala kuzama
- Safiri mahali popote mradi unafahamu latitudo (Unaweza kutengeza kiigizio kwa kila mahali)

- The paths of the stars in the sky
- Circumpolar stars, stars that rise and set and stars that don't rise or set
- Travel anywhere if you know the latitude
  (You can build a simulator for each location)

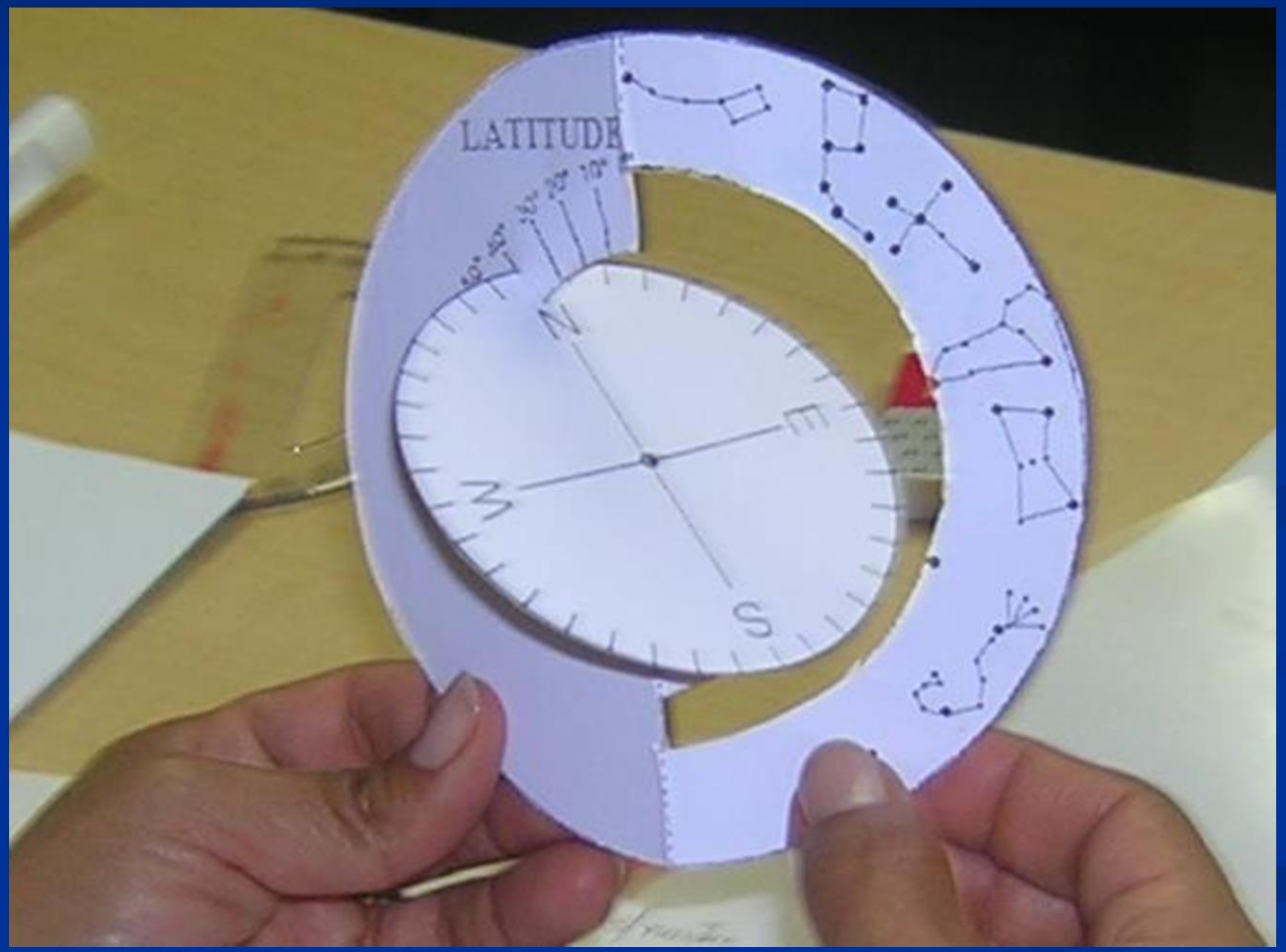
Nyota zakkuzunguka Ncha / nyota zinachomoza na kuzama / nyota ambazo hazichomozi wala kuzama

Circumpolar / stars that rise & set / stars that don't rise or set



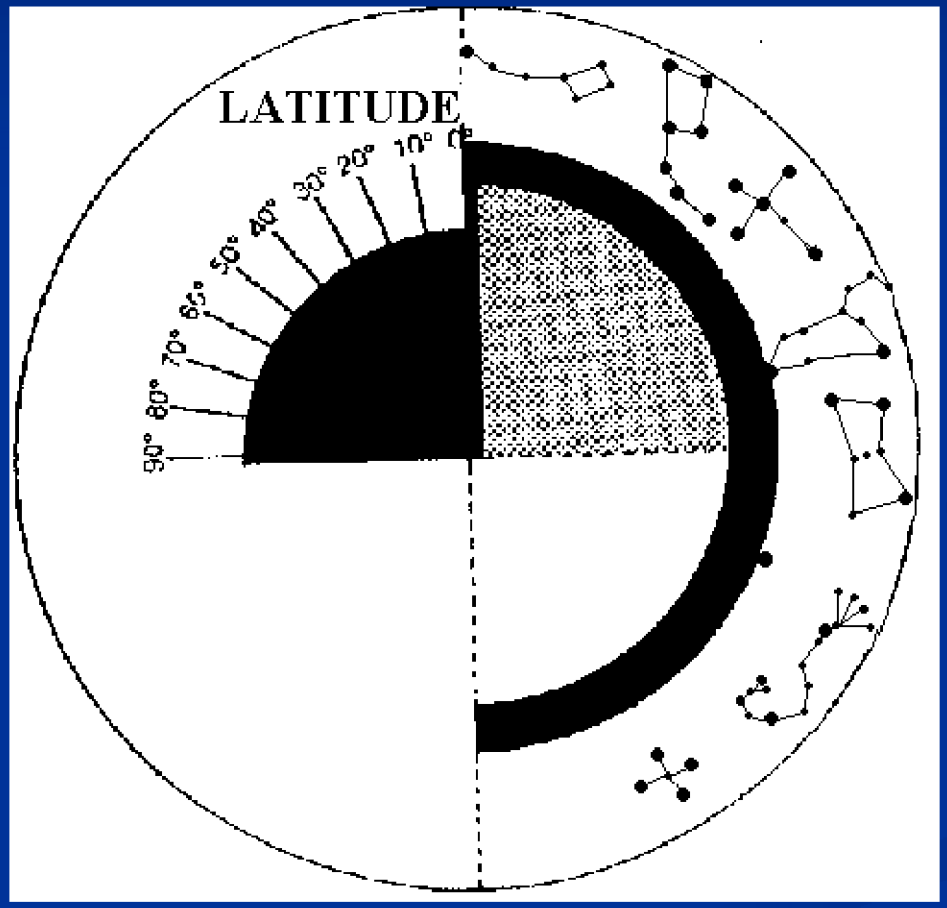
Kifaa cha Kuonesha Mwendo wa Nyota

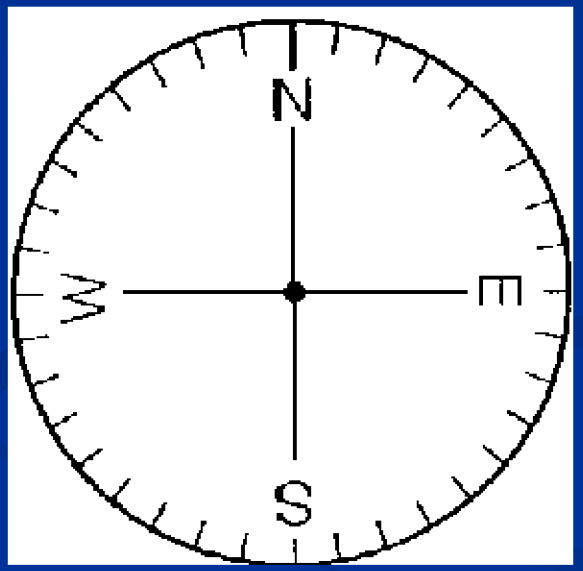
Stellar Demonstrator



Kifaa cha kuonesha mwendo wa nyota kwa Nusutufe ya Kaskazini

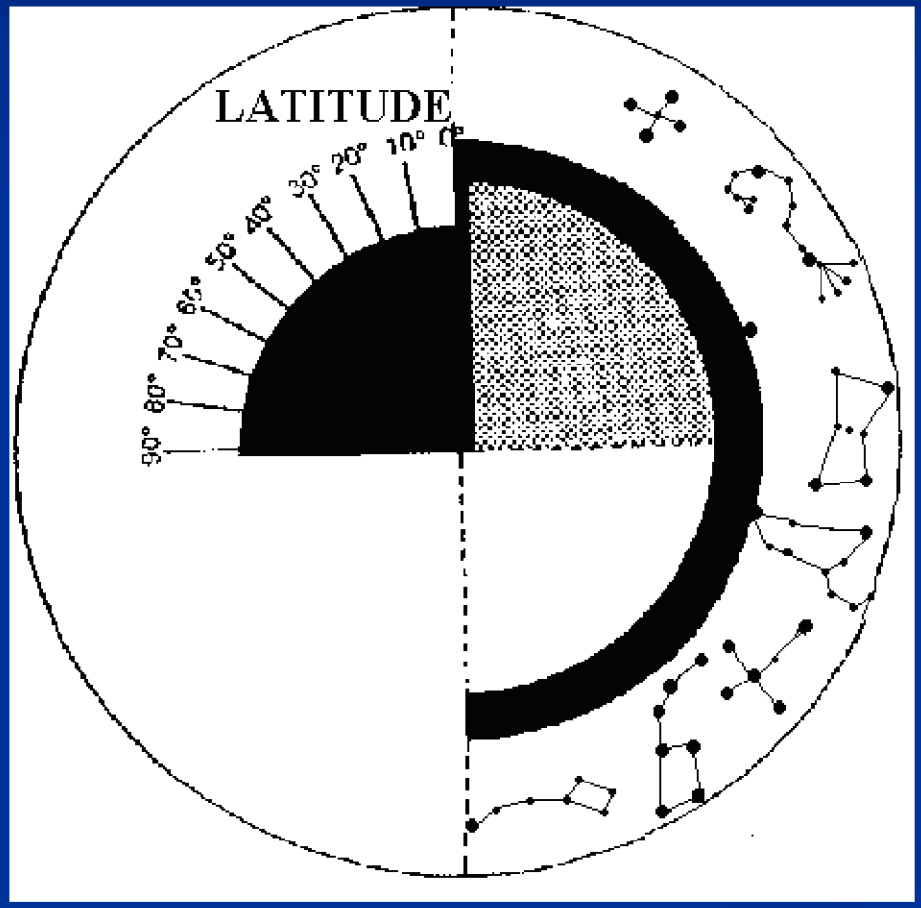
Stellar demonstrator for the Northern Hemisphere

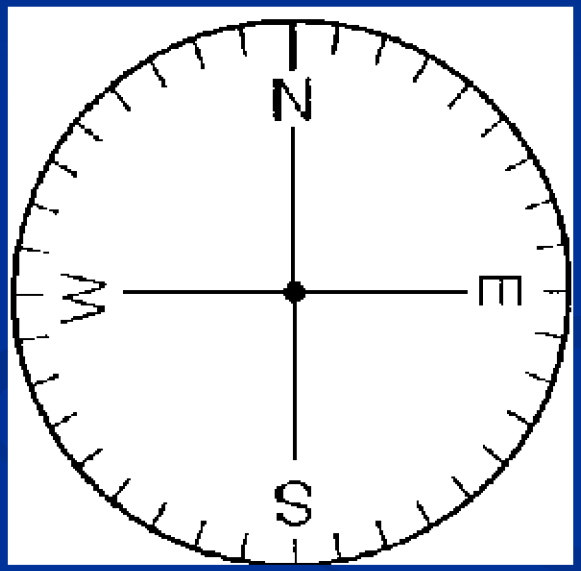




Kifaa cha kuonesha mwendo wa nyota kwa Nusutufe ya Kusini

Stellar demonstrator for the Southern Hemisphere

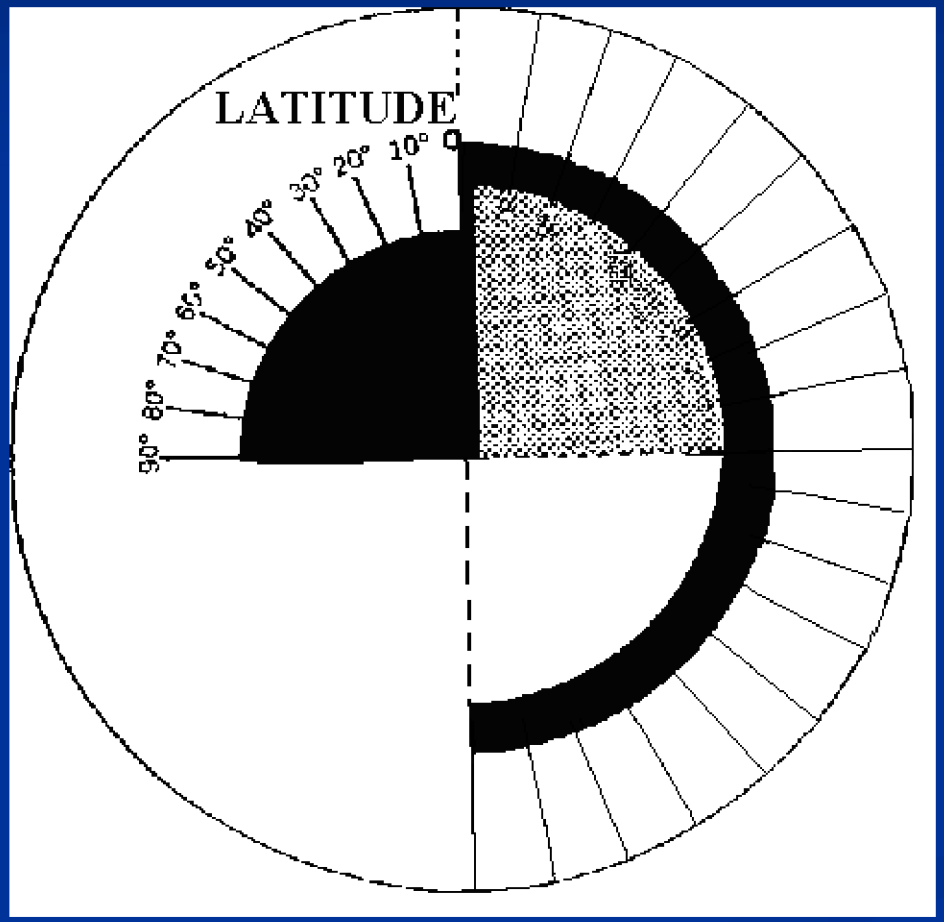


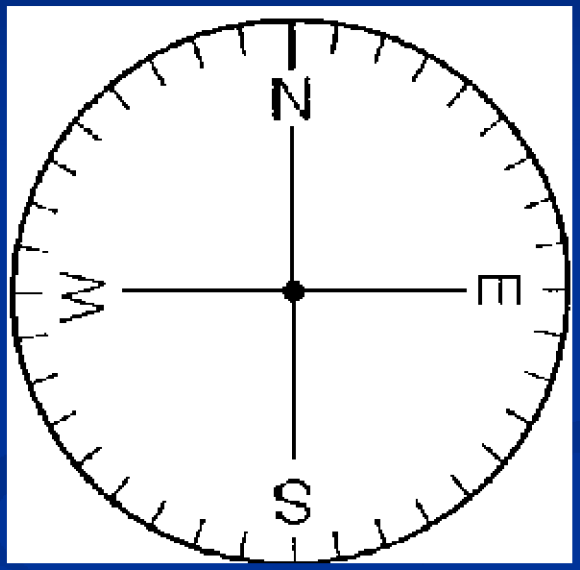


Kifaa tupu cha mwendo wa nyota

Blank stellar demonstrator

(add desired constellations)



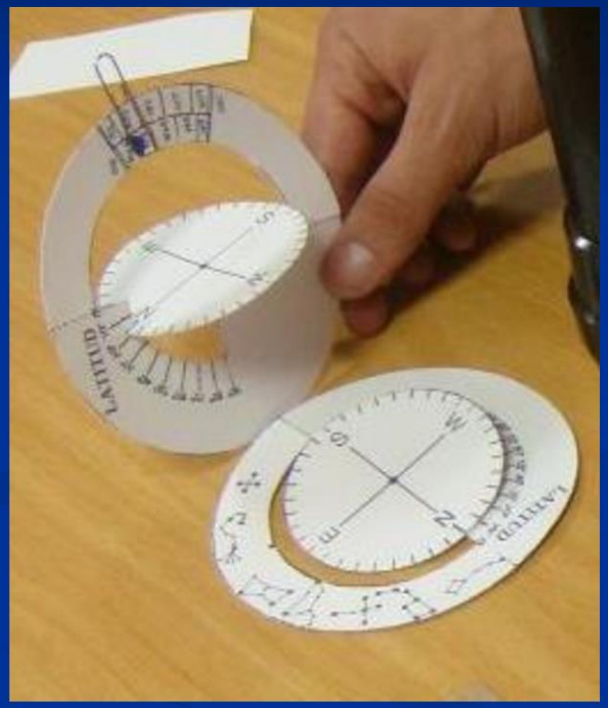


- Msimu wa baridi
- Msimu wa mvua
- Msimu wa joto
- au kwa kila mwezi

Spring, Summer, Autumn, Winter or each month

Kutengeneza kifaa
Construction

- **Maelezo ya namna ya kutengeneza kifaa yanategemea eneo lako:**
- **Nusutufe ya Kaskazini**
- ***Nusutufe ya Kusini***



- **The explanations given for construction depend on your location:**
- **Northern hemisphere**
- ***Southern hemisphere***

Maelekezo ya Utengenezaji-Hatua 1
Building instructions - Step 1

- Toa fotokopi kwenye karatasi ya manila ngumu na nzito
- Kata vipande vyote viwili (kikubwa na kidogo) kwenye mistarti kamili
- Ondoa maeneo meusi
- Pinda kipande kikubwa kwenye mstari nukta

- Make a photocopy on heavy-weight paper
- Cut both pieces (the big one and the small one) along the continuous lines
- Remove the black areas
- Fold the main piece along the straight dotted line

Maelekezo ya Utengenezaji-Hatua 2

Building instructions - Step 2

- Kata pengo dogo juu ya "N" (Nusutufe ya Kaskazini) kwenye diski ya upeo *au "S" (Nusutufe ya Kusini) kwenye diski ya upeo*
- Bandika roboduara ya Kaskazini-Mashariki (Nusutufe ya Kaskazini) kwenye diski la upeo juu ya roboduara ya rangi kijivu la diski kuu. Herufi"W" inatakiwa iowane na latitudo nyuzi 90º
- *au roboduara ya Kusini-Magharibi (Nusutufe ya Kusini) kwenye diski la upeo juu ya roboduara ya rangi kijivu la diski kuu. Herufi "E" inatakiwa iowane na latitudo 90º.*
- Kuwa makini katika zoezi hili, kwa sababu usahihi wa kifaa unategemea uowanishi kamili wa sehemu hizo mbili

- Cut a small notch above the "N" (Northern hemisphere) in the horizon disk *or the "S" (Southern hemisphere) in the horizon disk*
- Glue the North-East quadrant (Northern hemisphere) of the horizon disk onto the grey quadrant of the main piece. The "W" point must match up with latitude 90º

or the South-West quadrant (Southern hemisphere) of the horizon disk onto the grey quadrant of the main piece. The "E" point must match up with latitude 90º.

Try to be careful in this operation because the accuracy of model depends on the correct alignment of the two parts.

Maelekezo ya Utengenezaji-Hatua 3

Building instructions - Step 3

- Ingiza pengo la "N" (Nusutufe ya Kaskazini) kwenye roboduara juu ya vipimo vya nyuzi za latitudo

au ingiza sehemu "S" (Nusutufe ya Kusini) kwenye roboduara juu ya vipimo vya nyuzi za latitudo.

- Shika diski ya upeo iwe wima kwa diski ya digree za latitudo
- Anza kutumia kifaa chako kwa kuiweka kwenye latitudo yoyote unayoitaka…

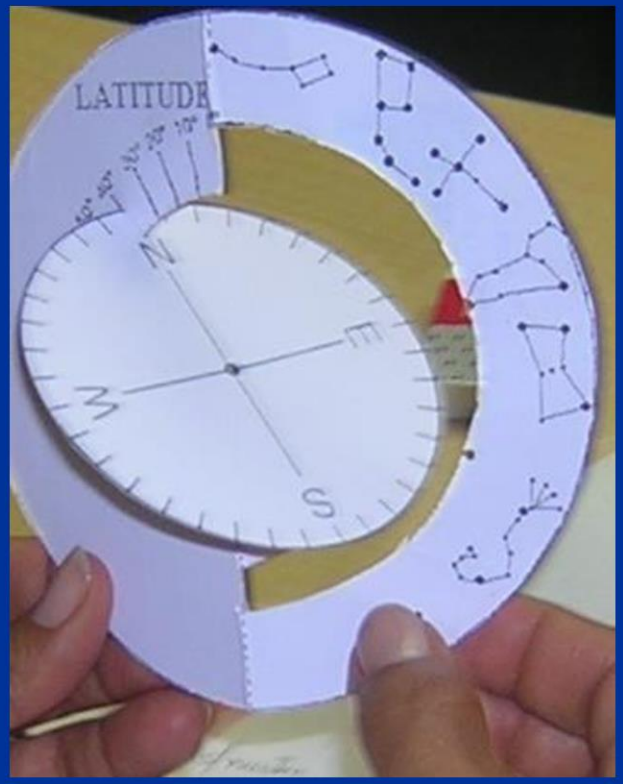
- Fit the incision “N” (Northern hemisphere) into the quadrant over the degrees of latitude

or the incision “S” (Southern hemisphere) in the quadrant over the degrees of latitude

- Hold the horizon disk perpendicular to the latitude degree disk
- Begin to use by setting it for any desired latitude…

Mwinamo wa njia za nyota

The tilts of stellar paths



Lat 70º
Enontekiö
(Ufini)
Finland

Lat 41º
Montseny
(Hispania)
Spain

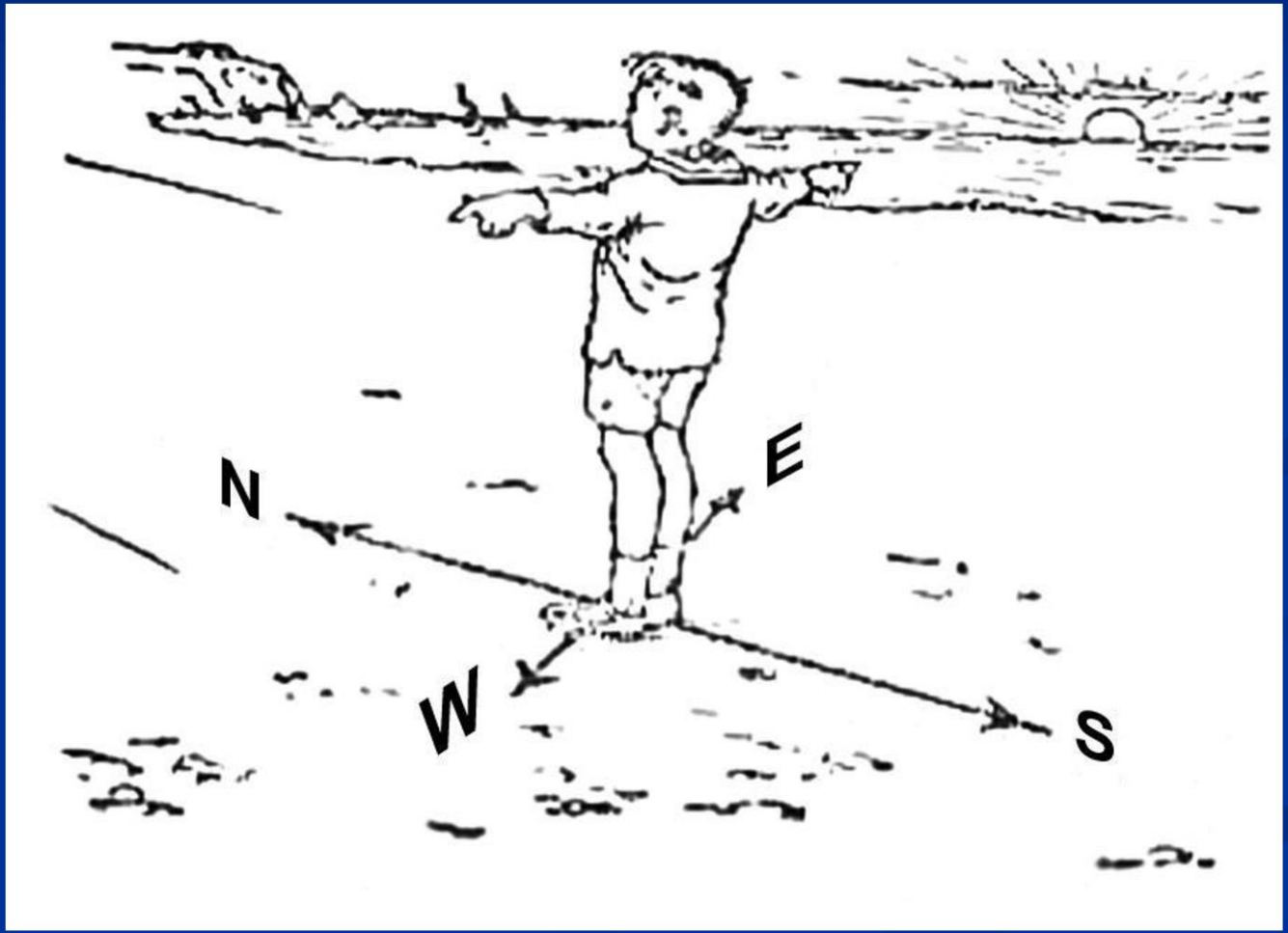
Lat 23º
Matehuala
(Meksico)
Mexico

Jua huchomoza wapi?

Where is the sunrise?

Je, picha hii ni sahihi?

Is this picture correct?

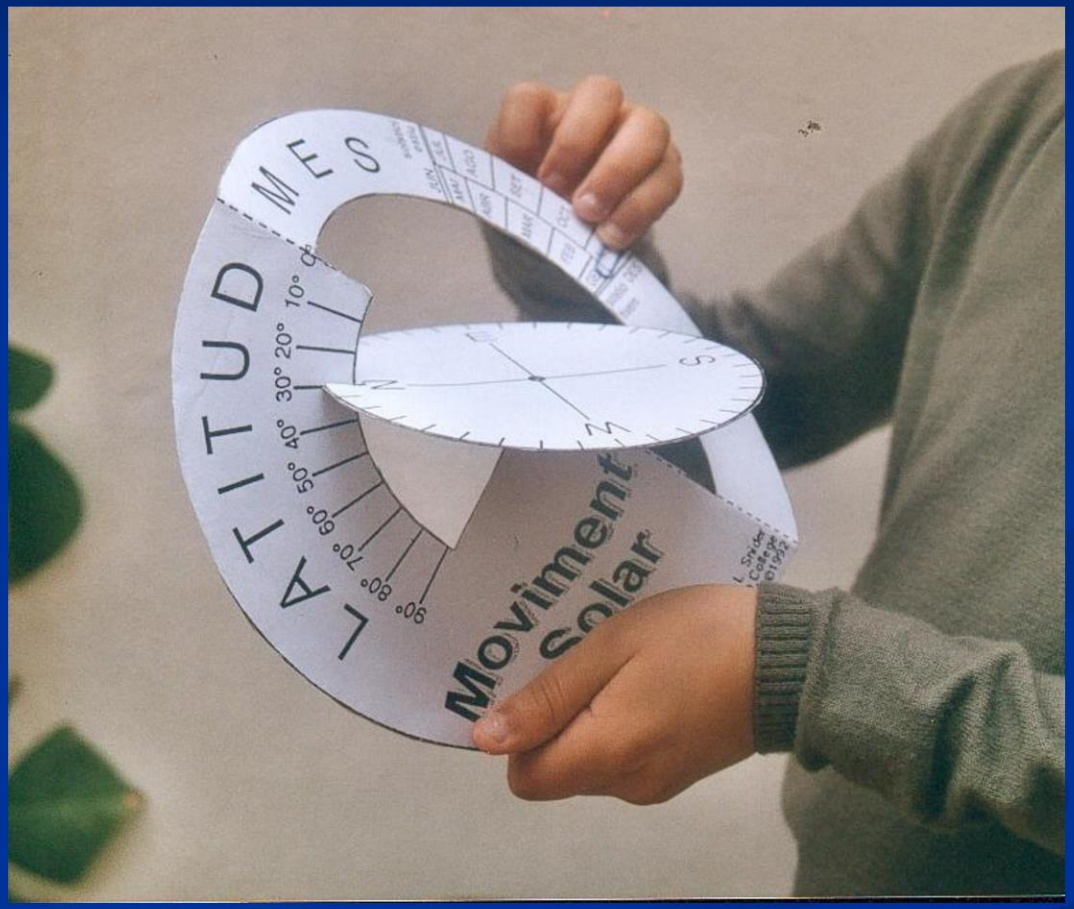


“Jua huchomoza upeo wa Mashariki na huzama upeo wa Magharibi”
Je, hii ni sahihi?

The sunrise is always due East and the sunset is always due West.
Is this correct?

...tutumie kifaa kingine

…with another demonstrator



Shughuli 2: Kifaa cha Mwendo wa Jua kwa ajili ya kuonesha:

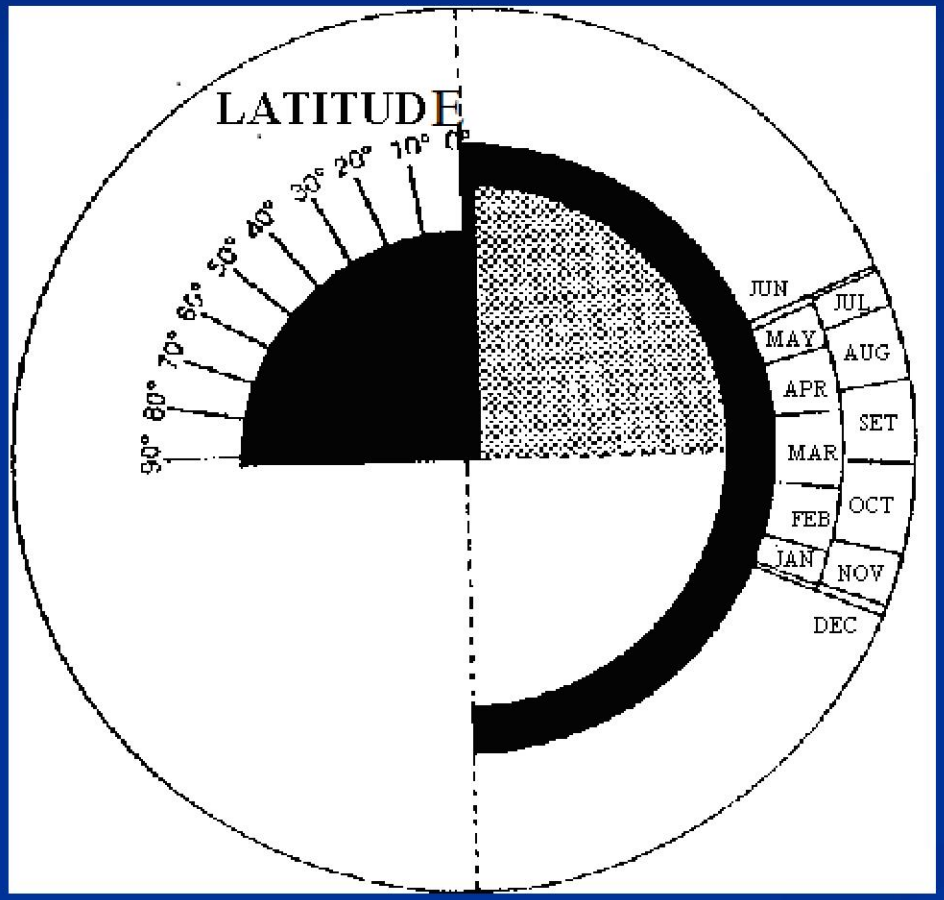
Activity 2: Solar demonstrator for showing:

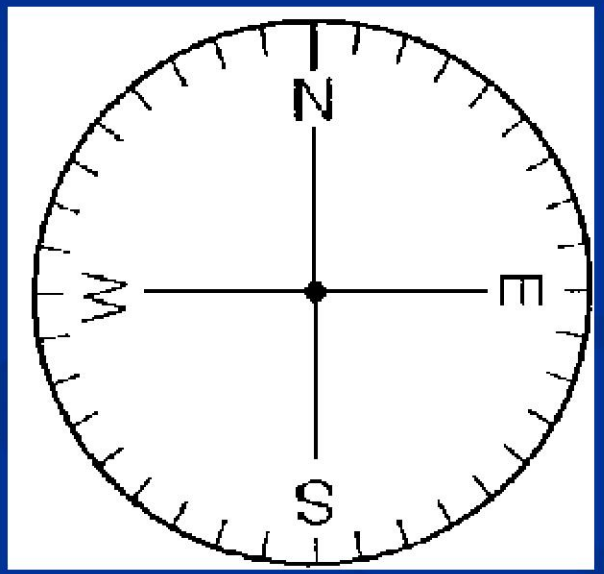
- Njia ya jua wakati wa mchana
- Mwendo wa Jua kwa mwaka
- Kutafiti namna Jua linachomoza na kuzama
- Jua la usiku wa manane
- Kusafiri mahali popote ikiwa unajua latitudo

- Daytime solar path
- Annual motion of the Sun
- Study risings and settings
- Midnight Sun
- Travel anywhere if you know the latitude

Kifaa cha Mwendo wa Jua- Nusutufe ya Kaskazini

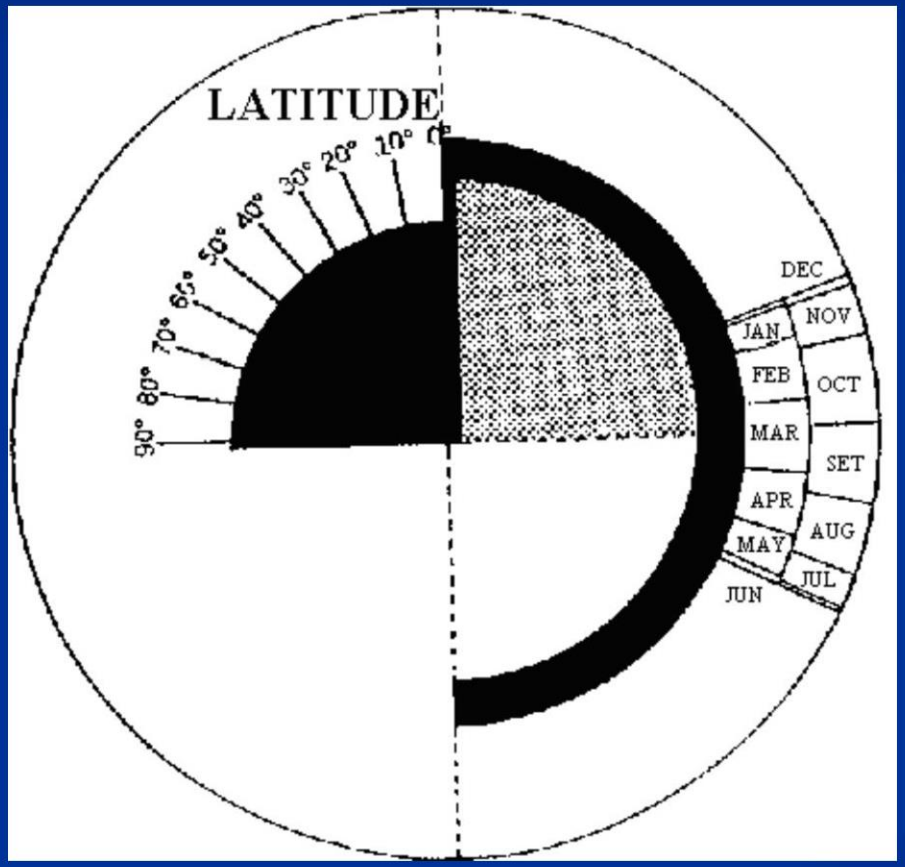
Solar demonstrator - Northern hemisphere

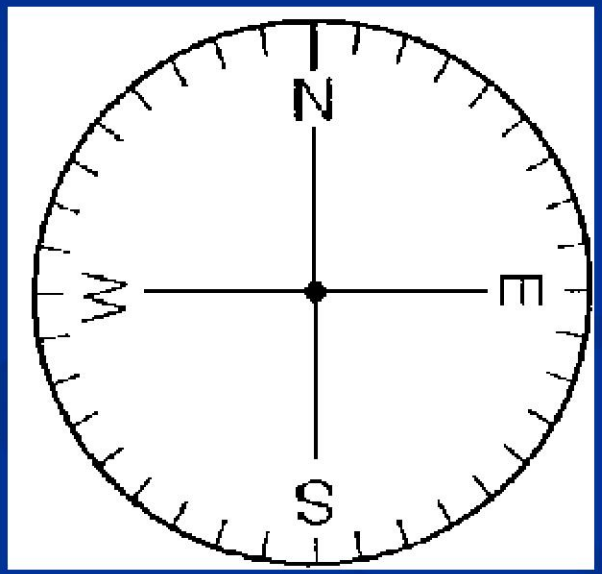




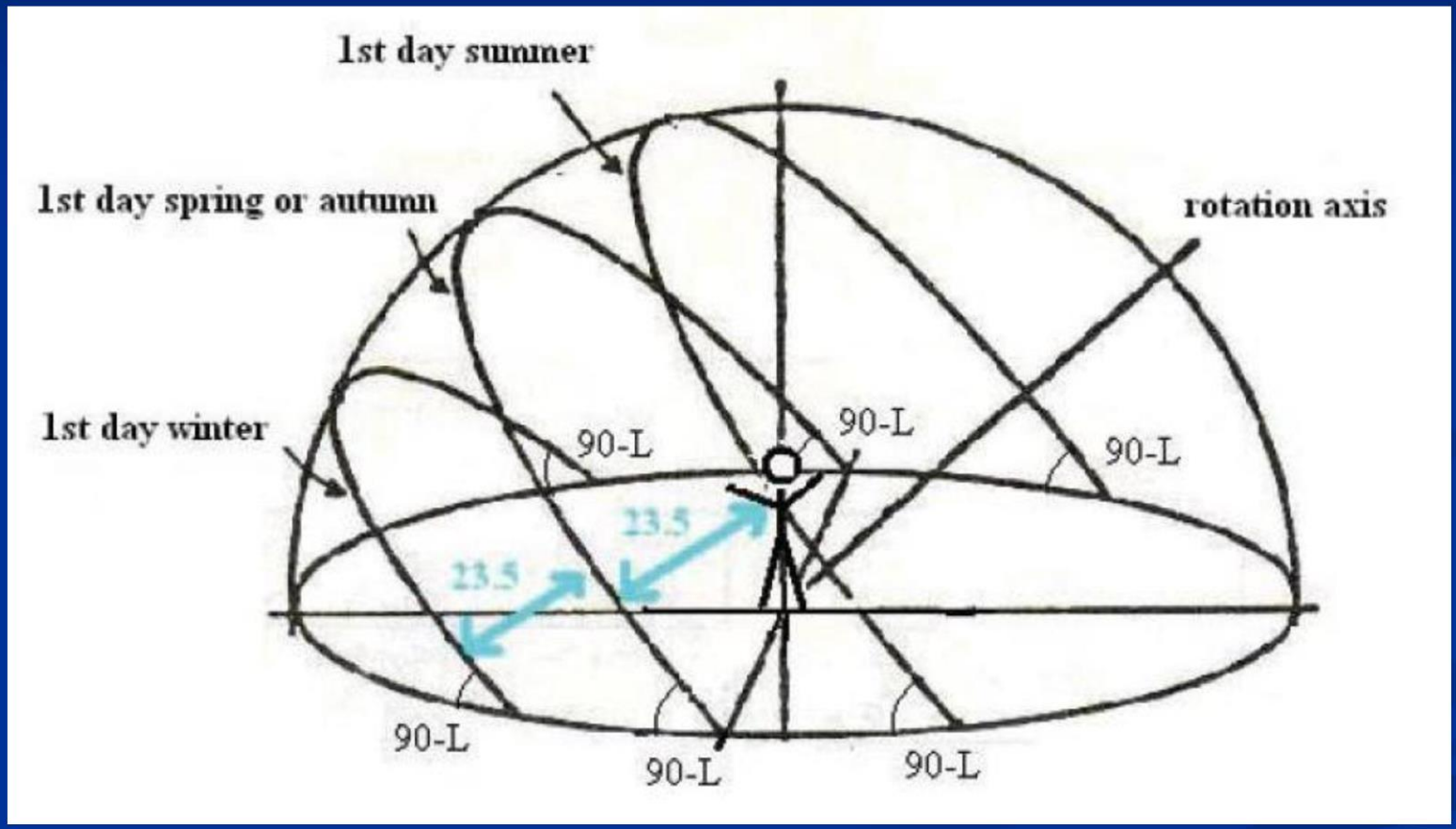
Kifaa cha Mwendo wa Jua- Nusutufe ya Kusini

Solar demonstrator - Southern hemisphere



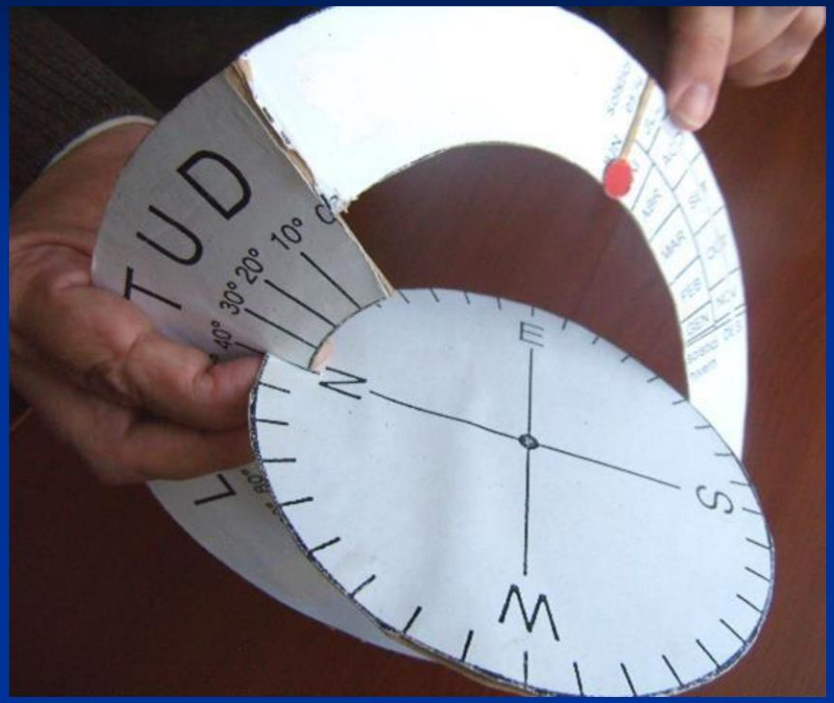


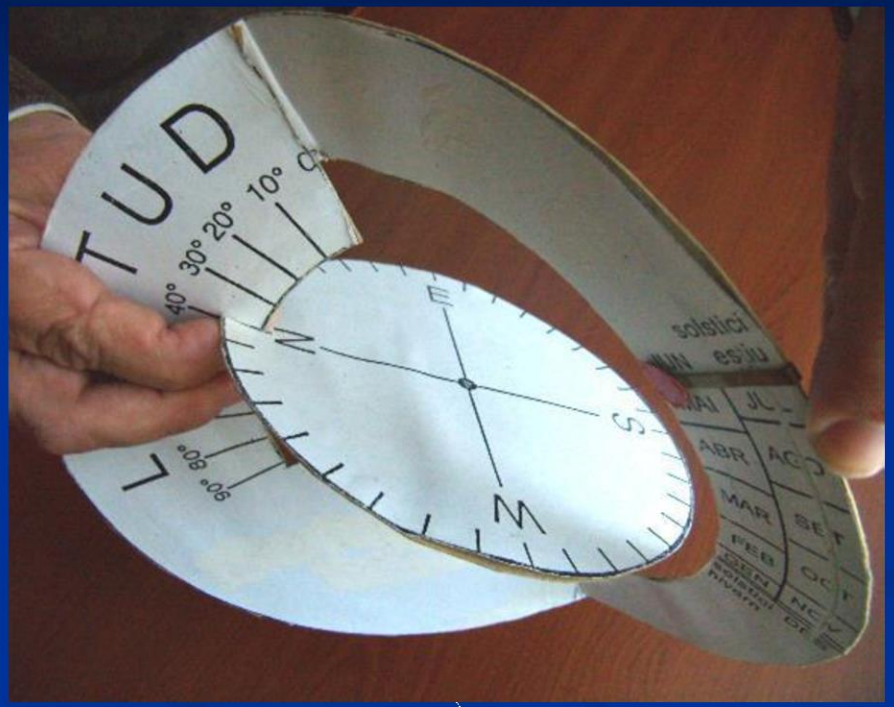
Njia za Jua
Sehemu za Kusini au Kaskazini



Njia ya Jua

The Sun's path



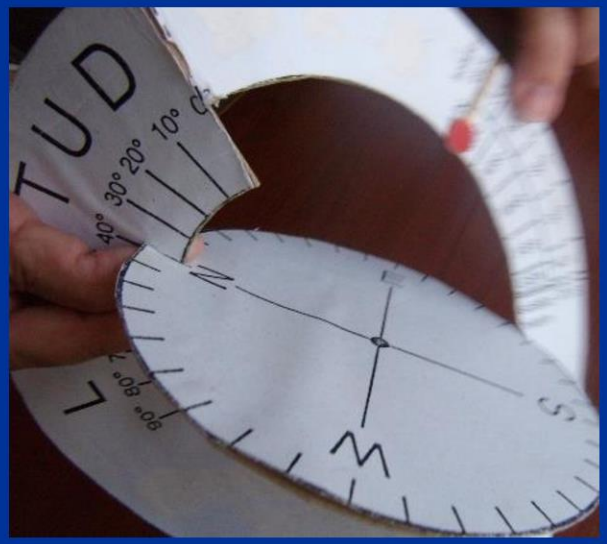


- Weka "N" iowane na latitude sahihi
- Weka alama kwa tarehe inayohitajika
- Tembeza 'mkono' wa tarehe kuonyesha njia ya Jua kwa mchana mzima
- Kumbuka mahali ambako Jua linachomoza na kuzama

- Place "N" at proper latitude
- Place the marker at required date
- Move date "arm" to show Sun's path through a day
- Note the positions of Sunrise and Sunset

Mwinamo wa njia ya Jua

Slope of the Sun's path



Lat 70º
Enontekiö
Finland

Lat 40º
Gandía
Spain

Lat 5º
Ladrilleros
Colombia

Kimo cha Njia ya Jua

Height of the Solar path

Msimu wa Joto na Msimu wa Baridi huko Norway

Summer and Winter in Norway

Michomozo na Mizamo ya Jua katika maeneo tofauti

Sunrises and Sunsets in different places

winter

msimu wa baridi

spring autumn

msimu wa masika

msimu wa joto

summer

Michomozo na Mizamo ya Jua katika maeneo tofauti

Sunrises and Sunsets in different places

2 º Popayán, Colombia

- 19º La Paz, Bolivia

- 43º Esquel, Argentina

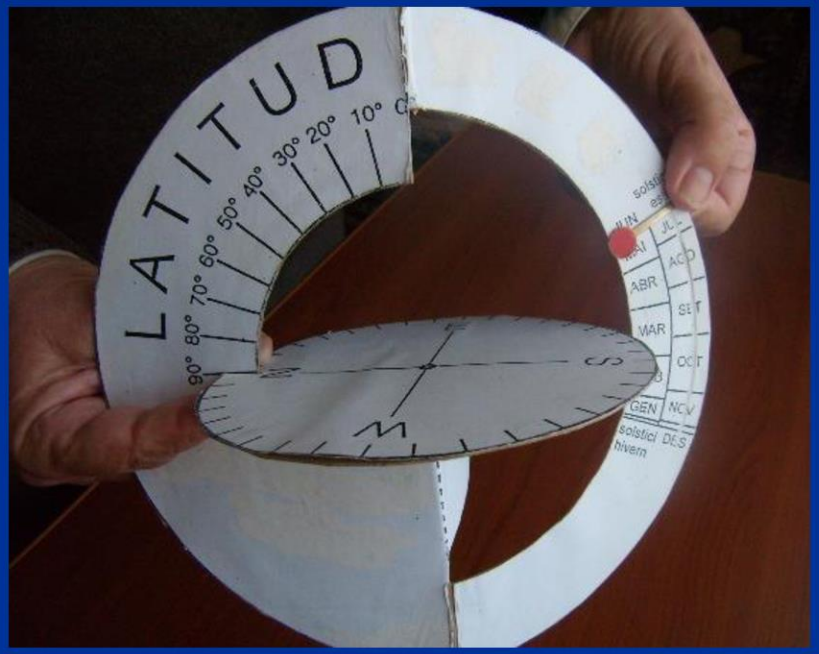
msimu wa baridi

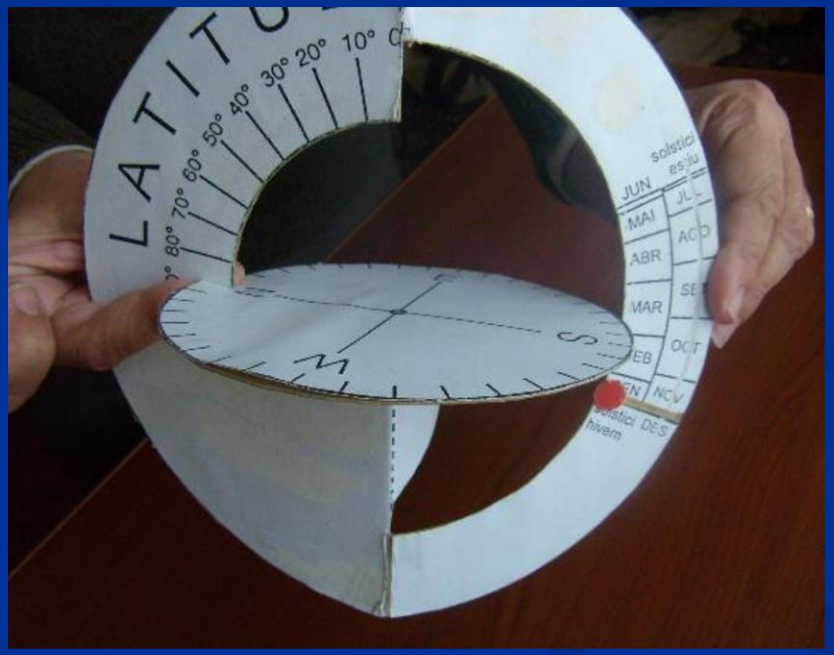
msimu wa masika

msimu wa joto

Misimu ya joto na baridi kwenye ncha za Dunia

Polar summer and winter





Kwenye Ncha za Dunia, Jua linakuwa juu ya upeo kwa nusu mwaka na chini ya upeo kwa nusu ya pili.

At the poles, the sun is above the horizon for half a year and below it for half a year.

Jua la Usiku wa Manane

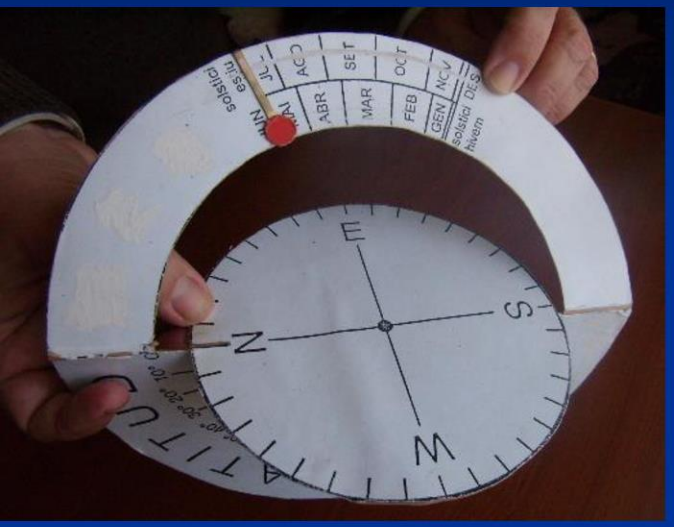
Midnight Sun

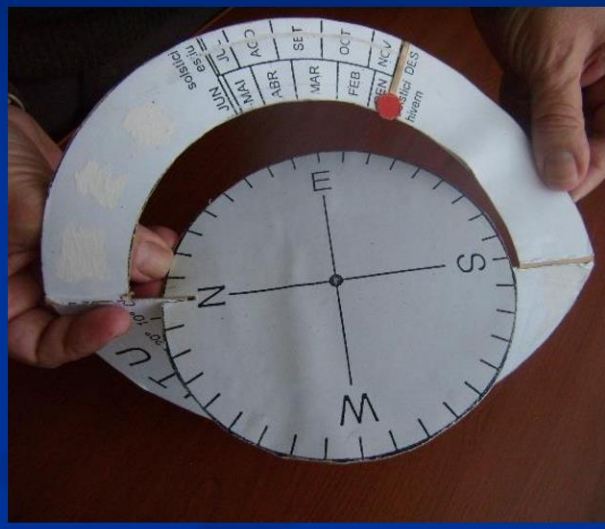
Jua huzama mpaka lipite meridi na halafu huanza kupanda tena badala ya kuzama chini ya upeo.

The Sun goes down until it passes the meridian and then begins to rise rather than set below the horizon.

“Misimu katika Ikwet”

“Seasons at the equator”



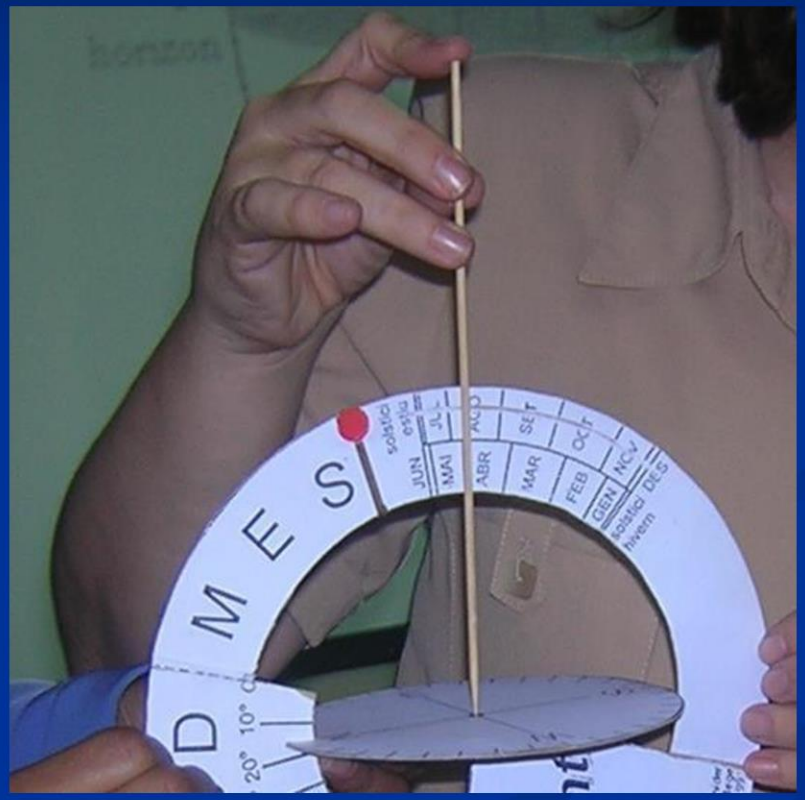


Njia ya jua inakaribia kuwa wima upeoni, na muda wake kuwa angani wakati wa mchana ni sawa mwaka mzima

The solar path is always almost perpendicular to the horizon and its length is almost the same throughout the year.

Jua la Utosini

Sun at the Zenith

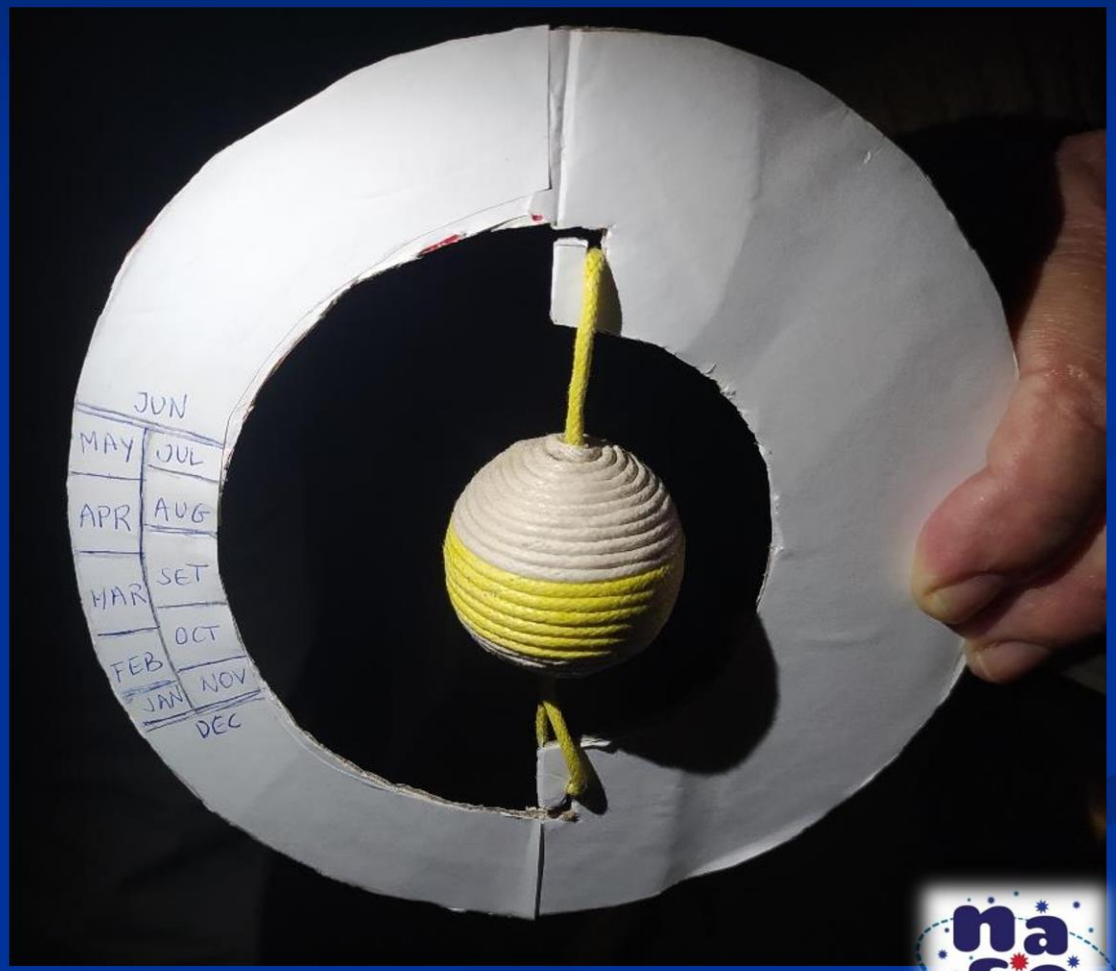


Kwa Jua la adhuhuri, kivuli chako kinakuwa miguuni

At Solar Noon, your shadow is on your feet.

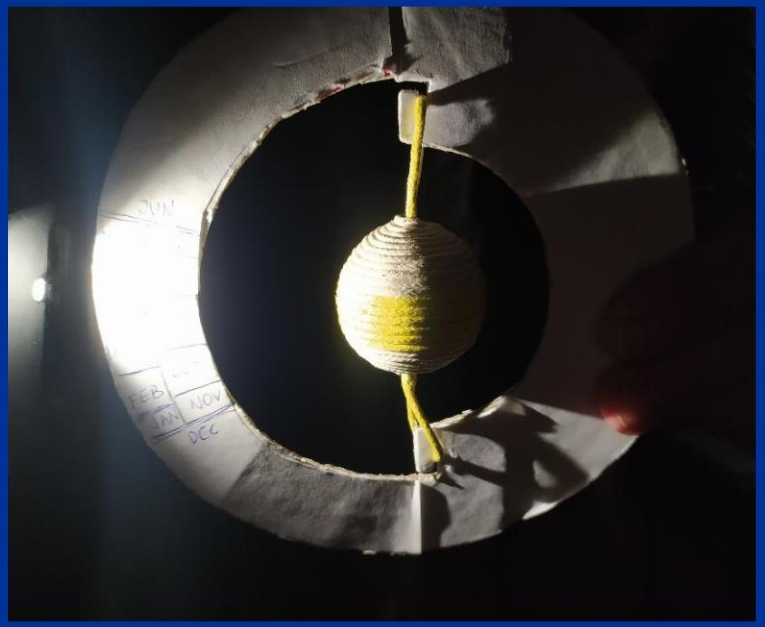
Zoezi 3: Muonyeshaji Sambamba wa Dunia
Activity 3: Parallel Earth Demonstrator

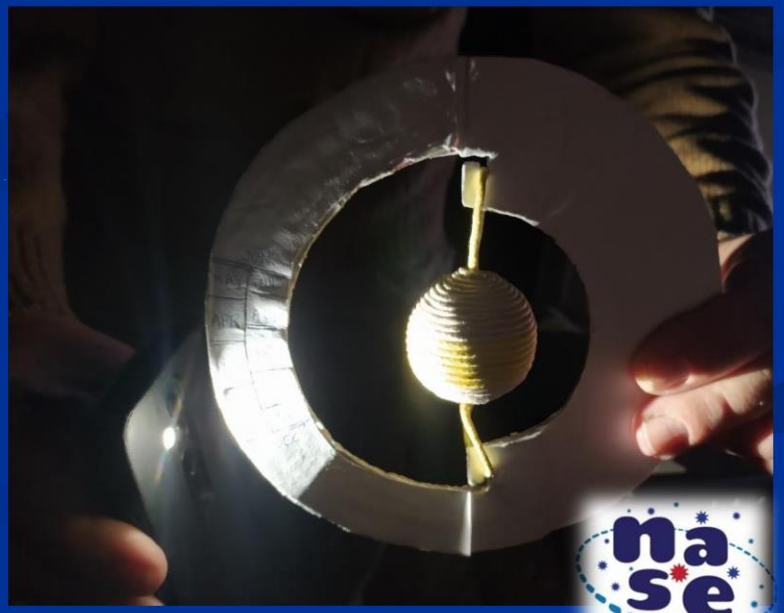
- Kuelezea nafasi ya Jua wakati wa kutumia Dunia Sambamba
- To explain the position of the Sun when using the Parallel Earth



Zoezi 3: Muonyeshaji Sambamba wa Dunia

Activity 3:
Parallel Earth Demonstrator





Zoezi 3: Kifaa cha kueleza Mwendo wa Mwezi

Activity 3: Lunar demonstrator

- **Kwa nini Mwezi huwa na sura ya katika maeneo fulani?**

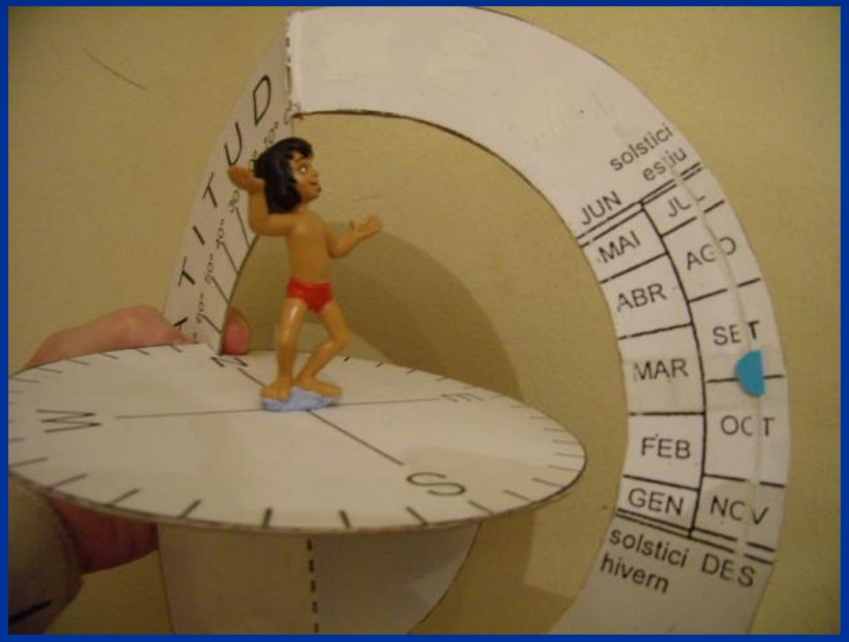
- **Why does the Moon smile in some places?**

Kwa nini? ... sawa au hapana….

Why - yes or no….

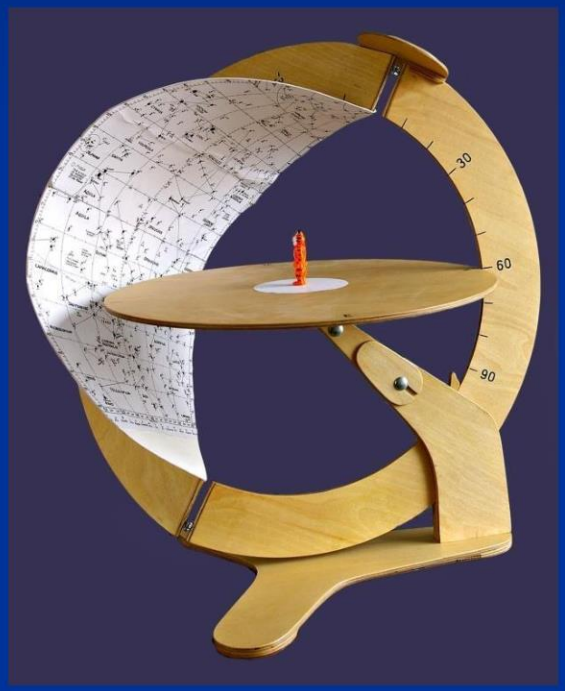
Zoezi 3: Kifaa cha kuelekeza Mwendo wa Mwezi

Activity 3: Lunar demonstrator



Vifaa vya saizi kubwa vya kuelekeza miendo

XXL demonstrators



Asanteni sana kwa usikivu wenu.

Thank you very much for your attention!