MUSLIM PRAYER TIMES
Argel, Argelia, Africa
2021

Rosa M. Ros, Jamal Mimouni

International Astronomical Union
Polytechnical University of Catalonia, Spain,
Frères Mentouri Constantin University, Alger

The Muslim pray every day during five intervals that were defined by Muslim authorities in the decades after the death of Muhammad in 632, based on the hadith (the reported sayings and actions) of the Islamic prophet.

The timing of the five prayers are fixed intervals defined by daily astronomical phenomena, normally fixed the time to begin the interval and finish before the following pray.

Great Mosque of Kairouan, Tunisia. Author: Keith Roper

In a mosque, the muezzin broadcasts the call to prayer at the beginning of each interval. Because the start and end times for prayers are related to the solar diurnal motion, they vary throughout the year and depend on the local latitude and longitude when expressed in local time. In the past, some mosques employed astronomers called the muwaqqits who were responsible for regulating the prayer time using mathematical astronomy.

Currently, religious or scientific agencies in Muslim countries produce annual prayer timetables for each locality, and electronic clocks capable of calculating local prayer times have been created, but we will give a simple approach by means of the demonstrators introduced during NASE courses.

The five daily muslim prayers include:

1- Fajr (dawn) Sun's height= -18° to 0°
2- Dhuhr (noon): Sun's height= colatitude + Sun's declination
3- Asr (afternoon): when the length of any object's shadow equals the length of the object itself plus the length of that object's shadow at noon. Solar height : *Not a simple computation**
4- Maghrib (sunset): Solar height = 0°
5- Isha (night) : at the start of astronomical dusk, when we begins to see magnitude 6 stars. Solar height = -18°.

*Computation uses spherical trigonometry and is not simple. Here's a good reference: http://praytimes.org/calculation/#Calculating_Prayer_Times

In order to obtain the prayers time it is necessary to consider **latitude, longitude and solar time +ajustements** (civil time, longitude and time equation)

Notice that the prayer times are varying for each city and from one day to another. In particular we presented here the situation on Algiers on August 27th 2021

For Instance Algiers

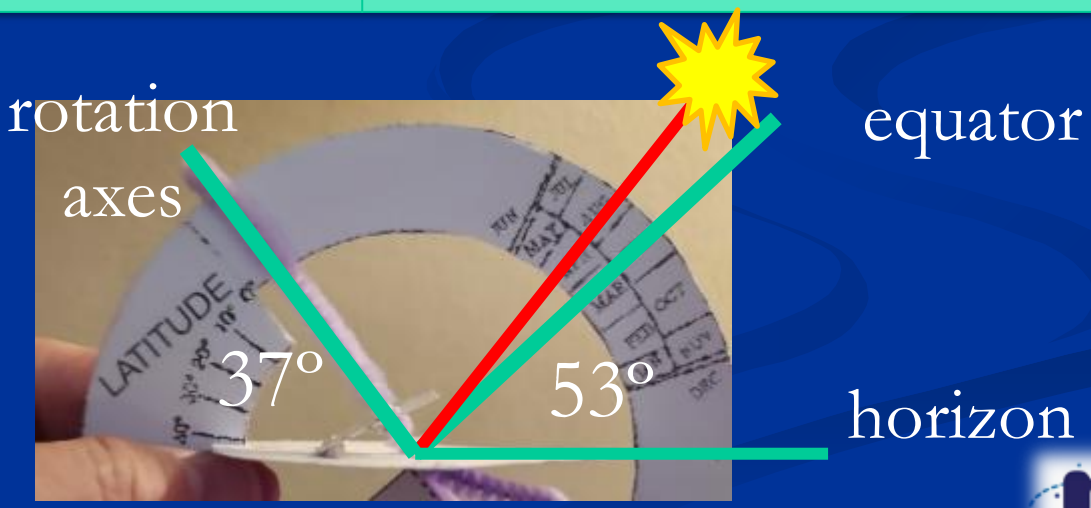
Prayers		Sun Height
Fajr	Dawn to Sunrise	-18º to 0º
Dhuhr	Noon	Colatitude +Declination
Asr	Afternoon	*See note
Maghrib	Sunset	0º
Isha	night	- 18º

Algiers

Latitude = 37º

Colatitude = 53º

-23º< Sun's Dec<+23°



*Asr time: when the length of any object's shadow equals the length of the object itself plus the length of that object's shadow at noon

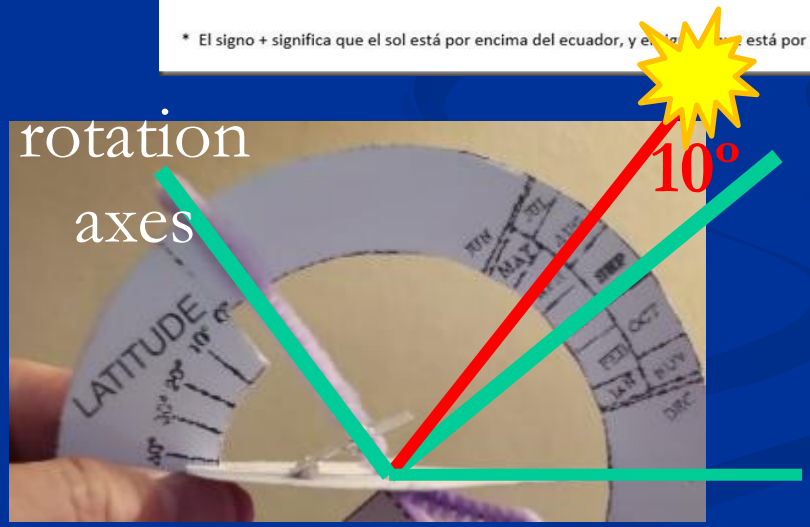
Sun Declination August 27th 2021

	Enero	Agosto	Septiem
1	-23 03 09	+18 10 51	+08 31 15
2	-22 58 17	+17 55 49	+08 09 31
3	-22 52 58	+17 40 28	+07 47 40
4	-22 47 11	+17 24 51	+07 25 41
5	-22 40 57	+17 08 56	+07 03 34
6	-22 34 16	+16 52 45	+06 41 21
7	-22 27 08	+16 36 17	+06 19 01
8	-22 19 34	+16 19 33	+05 56 34
9	-22 11 33	+16 02 34	+05 34 02
10	-22 03 06	+15 45 19	+05 11 24
11	-21 54 14	+15 27 48	+04 48 40
12	-21 44 55	+15 10 03	+04 25 52
13	-21 35 12	+14 52 04	+04 02 59
14	-21 25 03	+14 33 50	+03 40 02
15	-21 14 29	+14 15 22	+03 17 01
16	-21 03 31	+13 56 41	+02 53 57
17	-20 52 09	+13 37 46	+02 30 49
18	-20 40 23	+13 18 39	+02 07 38
19	-20 28 13	+12 59 19	+01 44 25
20	-20 15 41	+12 39 46	+01 21 09
21	-20 02 45	+12 20 02	+00 57 52
22	-19 49 27	+12 00 06	+00 34 33
23	-19 35 47	+11 39 -59	+00 11 13
24	-19 21 45	+11 19 40	-00 12 08
25	-19 07 21	+10 59 11	-00 35 30
26	-18 52 37	[illegible]	-00 58 51
27	-18 37 32	+10 17 43	-01 22 13
28	-18 22 06	[illegible]	-01 45 34
29	-18 06 21	+09 35 35	-02 08 55
30	-17 50 16	+09 14 17	-02 32 14
31	-17 33 52	+08 52 50	

Tabla de declinación solar anual en grados, minutos y segundos.

	Enero	Febrero	Marzo	Abril	Mayo	Junio	Julio	Agosto	Septiem	Octubr	Noviem	Diciemb
1	-23 03 09	-17 17 10	-07 50 19	+04 16 57	+14 52 25	+21 57 37	+23 08 56	+18 10 51	+08 31 15	-02 55 32	-14 12 39	-21 41 35
2	-22 58 17	-17 00 09	-07 27 33	+04 40 07	+15 10 36	+22 05 50	+23 04 58	+17 55 49	+08 09 31	-03 18 49	-14 31 54	-21 50 59
3	-22 52 58	-16 42 51	-07 04 40	+05 03 11	+15 28 32	+22 13 39	+23 00 36	+17 40 28	+07 47 40	-03 42 03	-14 50 56	- 21 59 58
4	-22 47 11	-16 25 14	-06 41 41	+05 26 11	+15 46 13	+22 21 05	+22 55 50	+17 24 51	+07 25 41	-04 05 15	-15 09 43	-22 08 32
5	-22 40 57	-16 07 21	-06 18 37	+05 49 04	+16 03 38	+22 28 08	+22 50 39	+17 08 56	+07 03 34	-04 28 24	-15 28 15	-22 16 40
6	-22 34 16	-15 49 11	-05 55 27	+06 11 52	+16 20 48	+22 34 47	+22 45 05	+16 52 45	+06 41 21	-04 51 30	-15 46 32	-22 24 23
7	-22 27 08	-15 30 44	-05 32 13	+06 34 33	+16 37 41	+22 41 02	+22 39 08	+16 36 17	+06 19 01	-05 14 33	-16 04 34	-22 31 39
8	-22 19 34	-15 12 02	-05 08 53	+06 57 08	+16 54 17	+22 46 54	+22 32 46	+16 19 33	+05 56 34	-05 37 31	-16 22 19	-22 38 28
9	-22 11 33	-14 53 04	-04 45 30	+07 19 35	+17 10 37	+22 52 21	+22 26 01	+16 02 34	+05 34 02	-06 00 25	-16 39 48	-22 44 52
10	-22 03 06	-14 33 51	-04 22 03	+07 41 55	+17 26 39	+22 57 25	+22 18 53	+15 45 19	+05 11 24	-06 23 15	-16 56 60	-22 50 48
11	-21 54 14	-14 14 23	-03 58 33	+08 04 08	+17 42 24	+23 02 04	+22 11 22	+15 27 48	+04 48 40	-06 45 59	-17 13 55	-22 56 17
12	-21 44 55	-13 54 42	-03 34 59	+08 26 12	+17 57 51	+23 06 19	+22 03 28	+15 10 03	+04 25 52	-07 08 38	-17 30 32	-23 01 19
13	-21 35 12	-13 34 46	-03 11 23	+08 48 08	+18 13 01	+23 10 09	+21 55 11	+14 52 04	+04 02 59	-07 31 12	-17 46 51	-23 05 54
14	-21 25 03	-13 14 37	-02 47 45	+09 09 56	+18 27 51	+23 13 35	+21 46 32	+14 33 50	+03 40 02	-07 53 39	-18 02 51	-23 10 02
15	-21 14 29	-12 54 14	-02 24 05	+09 31 34	+18 42 24	+23 16 37	+21 37 30	+14 15 22	+03 17 01	-08 15 59	-18 18 32	-23 13 41
16	-21 03 31	-12 33 40	-02 00 23	+09 53 03	+18 56 37	+23 19 14	+21 28 07	+13 56 41	+02 53 57	-08 38 13	-18 33 55	-23 16 53
17	-20 52 09	-12 12 53	-01 36 40	+10 14 22	+19 10 31	+23 21 26	+21 18 21	+13 37 46	+02 30 49	-09 00 19	-18 48 57	-23 19 37
18	-20 40 23	-11 51 54	-01 12 56	+10 35 31	+19 24 06	+23 23 13	+21 08 14	+13 18 39	+02 07 38	-09 22 17	-19 03 39	-23 21 53
19	-20 28 13	-11 30 45	-00 49 13	+10 56 29	+19 37 21	+23 24 36	+20 57 45	+12 59 19	+01 44 25	-09 44 07	-19 18 01	-23 23 40
20	-20 15 41	-11 09 24	-00 25 29	+11 17 17	+19 50 16	+23 25 34	+20 46 55	+12 39 46	+01 21 09	-10 05 48	-19 32 02	-23 24 60
21	-20 02 45	-10 47 53	-00 01 45	+11 37 53	+20 02 50	+23 26 07	+20 35 44	+12 20 02	+00 57 52	-10 27 21	-19 45 41	-23 25 51
22	-19 49 27	-10 26 12	+00 21 57	+11 58 18	+20 15 04	+23 26 15	+20 24 12	+12 00 06	+00 34 33	-10 48 44	-19 58 59	-23 26 14
23	-19 35 47	-10 04 21	+00 45 39	+12 18 31	+20 26 57	+23 25 58	+20 12 20	+11 39 -59	+00 11 13	-11 09 58	-20 11 55	-23 26 09
24	-19 21 45	-09 42 21	+01 09 19	+12 38 31	+20 38 29	+23 25 17	+20 00 08	+11 19 40	-00 12 08	-11 31 01	-20 24 29	-23 25 36
25	-19 07 21	-09 20 13	+01 32 57	+12 58 19	+20 49 39	+23 24 11	+19 47 35	+10 59 11	-00 35 30	-11 51 54	-20 36 40	-23 24 34
26	-18 52 37	-08 57 56	+01 56 32	+13 17 54	+21 00 28	+23 22 40	+19 34 43	+10 38 32	-00 58 51	-12 12 36	-20 48 28	-23 23 04
27	-18 37 32	-08 35 31	+02 20 05	+13 37 16	+21 10 55	+23 20 44	+19 21 32	+10 17 43	-01 22 13	-12 33 06	-20 59 54	-23 21 06
28	-18 22 06	-08 12 58	+02 43 35	+13 56 24	+21 21 01	+23 18 24	+19 08 01	+09 56 44	-01 45 34	-12 53 26	-21 10 55	-23 18 40
29	-18 06 21		+03 07 01	+14 15 19	+21 30 43	+23 15 39	+18 54 11	+09 35 35	-02 08 55	-13 13 33	-21 21 33	-23 15 46
30	-17 50 16		+03 30 24	+14 33 59	+21 40 04	+23 12 30	+18 40 03	+09 14 17	-02 32 14	-13 33 28	-21 31 46	-23 12 24
31	-17 33 52		+03 53 43		+21 49 02		+18 25 36	+08 52 50		-13 53 10		-23 08 34

* El signo + significa que el sol está por encima del ecuador, y el [illegible] está por debajo.



For Instance Algiers August 27th 2021

Prayers		Sun Height	Wristwatch time
Fajr	Dawn to Sunrise	-18º to 0º	4:42
Dhuhr	Noon	53º + 10º	12:50
Asr	Afternoon	*See note	16:31
Maghrib	Sunset (dusk)	0º	19:27
Isha	Astronomical twilight	-18º	20:50

*Asr time: when the length of any object's shadow equals the length of the object itself plus the length of that object's shadow at noon.

Twilights

Civil twilight is when the center of the sun is -6° . When enough natural light remains that artificial light is not needed.

Nautical twilight is when the center of the sun is -12°. Sailors can take reliable star sightings of well-known stars, constellations, and they can distinguish a visible horizon for reference.

Astronomical twilight is when the center of the sun is -18°. Astronomers can begins to observe and can work with stars of magnitude 6. The night begins.

For Instance Argel August 27th 2021

We see the time of last column by means of a solar demonstrators with an equatorial sundial, for instance in the photo we can see that **the position of the sun/light shows 10:30 in the sundial**

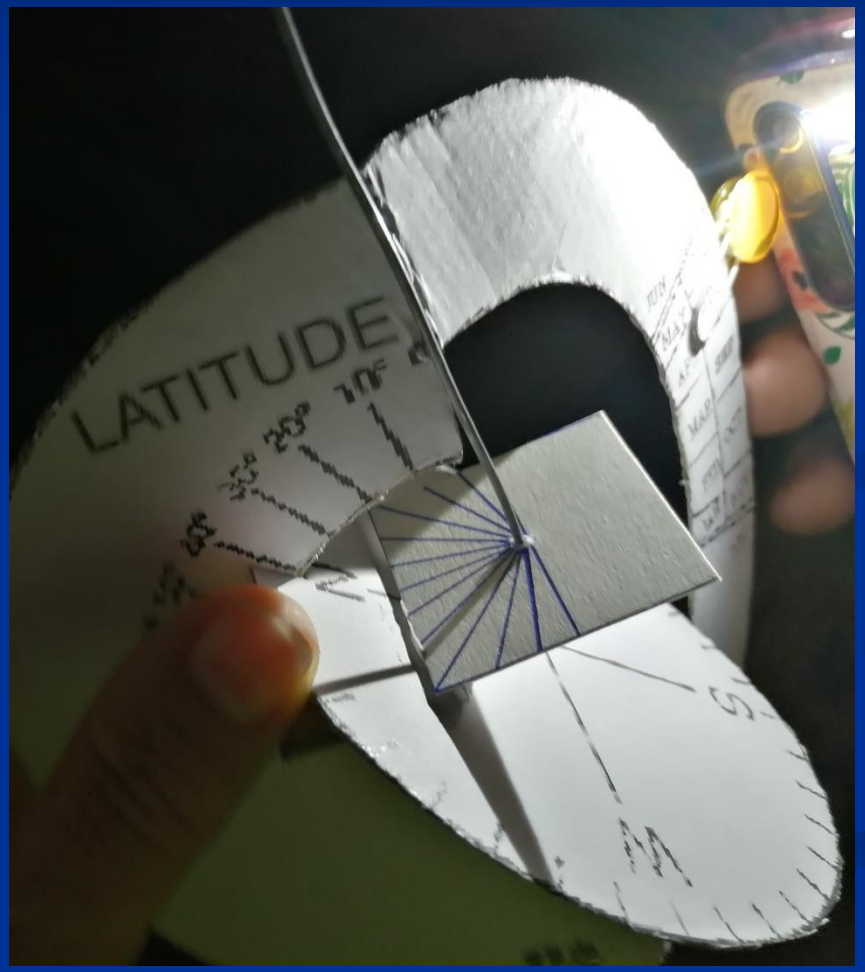


Photo of **Fajr** Algiers August 27th 2021

Begins at 4:42 h (in the sundial) and finish at Sunrise

Photo of **Dhuhr** Algiers August 27th 2021

Noon 12:50 h in the sundial

Photo of **Asr** Algiers August 27th 2021

Asr time: when the length of any object's shadow equals the length of the object itself plus the length of that object's shadow at noon.

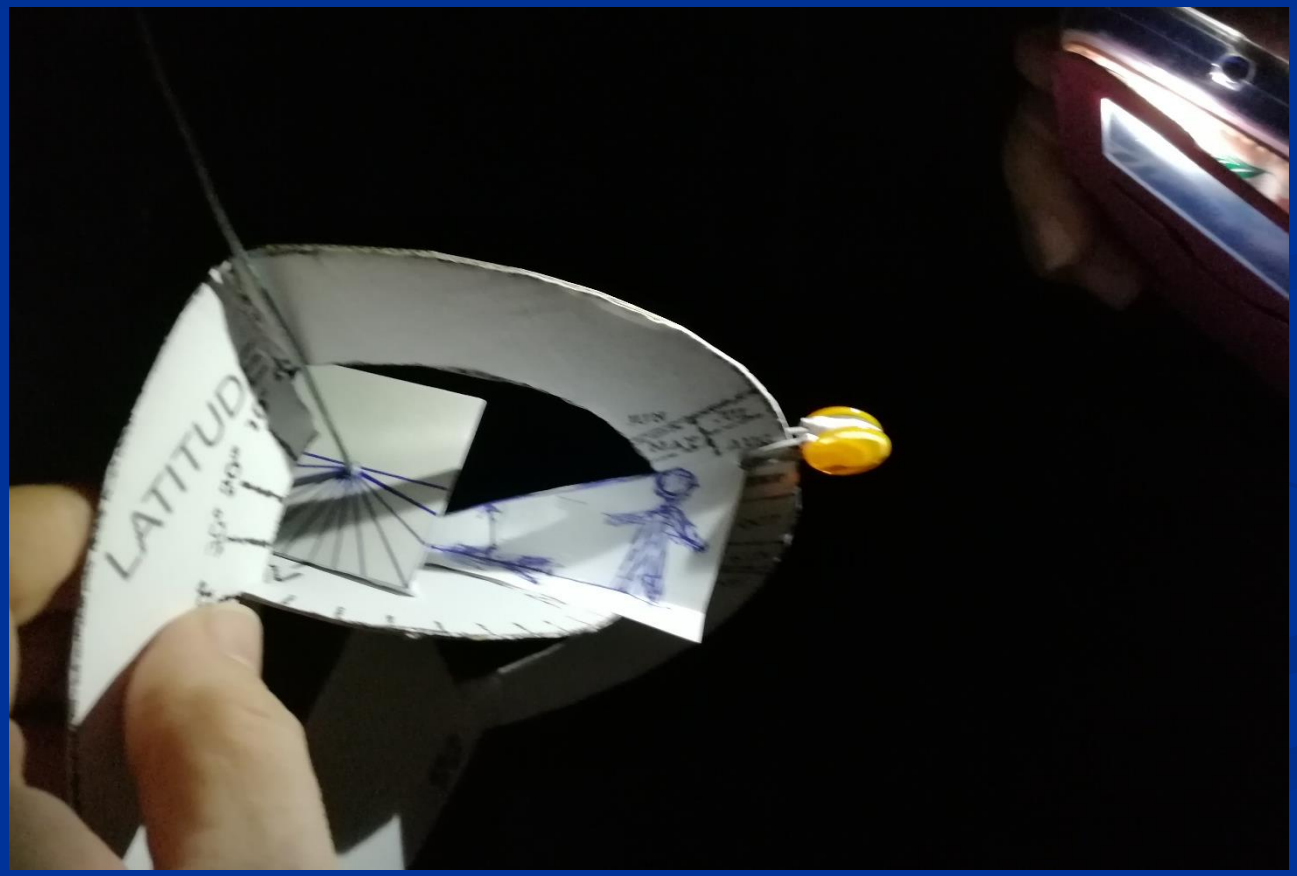
$\tan(\text{colatitude}+\text{declination}) = h/h_{noon}$

in Argel $\tan(63^\circ) = h/\ h_{noon}$ then $h_{noon} = h\ 0.51$

Photo of **Asr** Algiers August 27th 2021

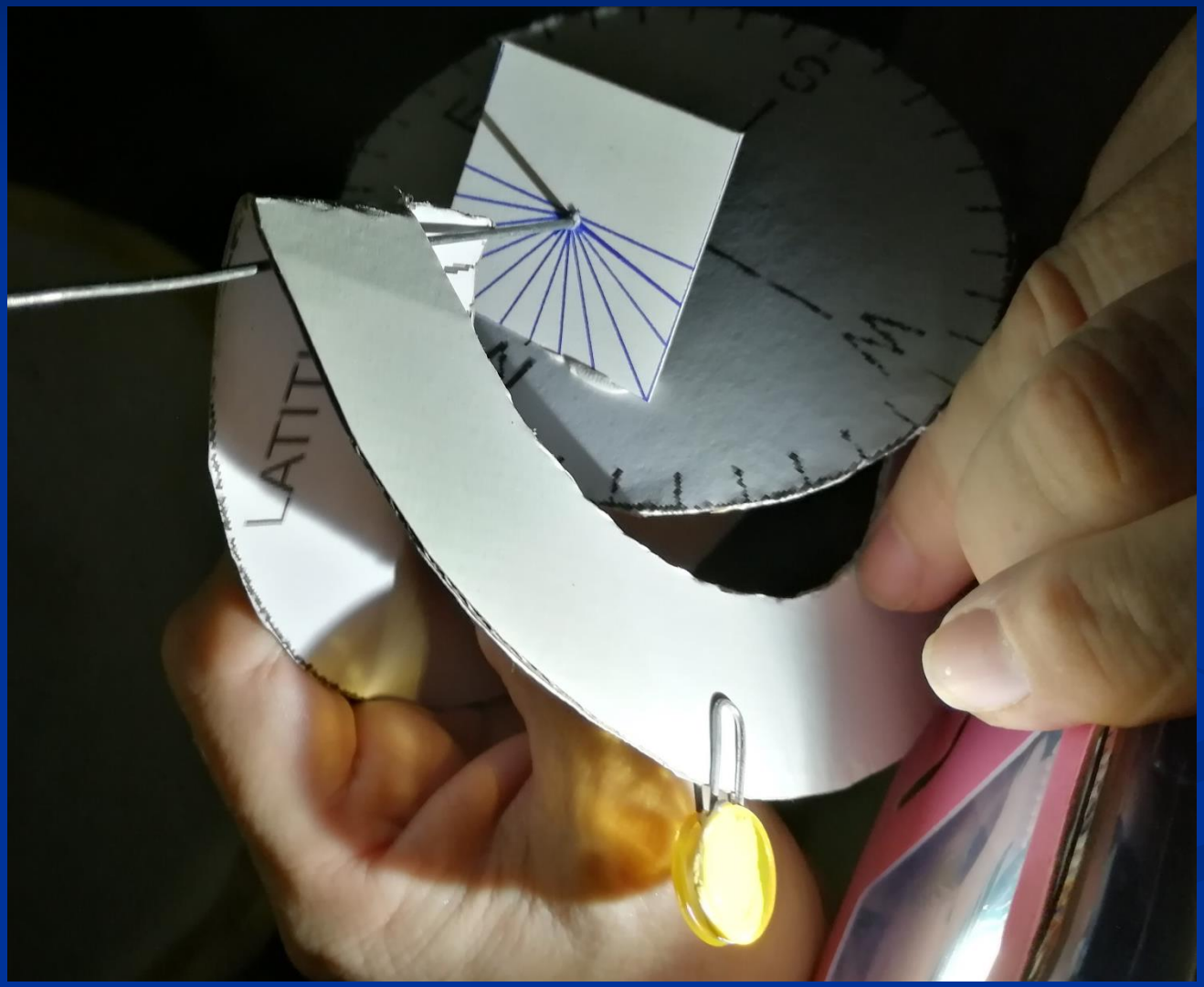
Asr time:

when the length of any object's shadow equals the length of the object itself plus ½ the length of that object's shadow.



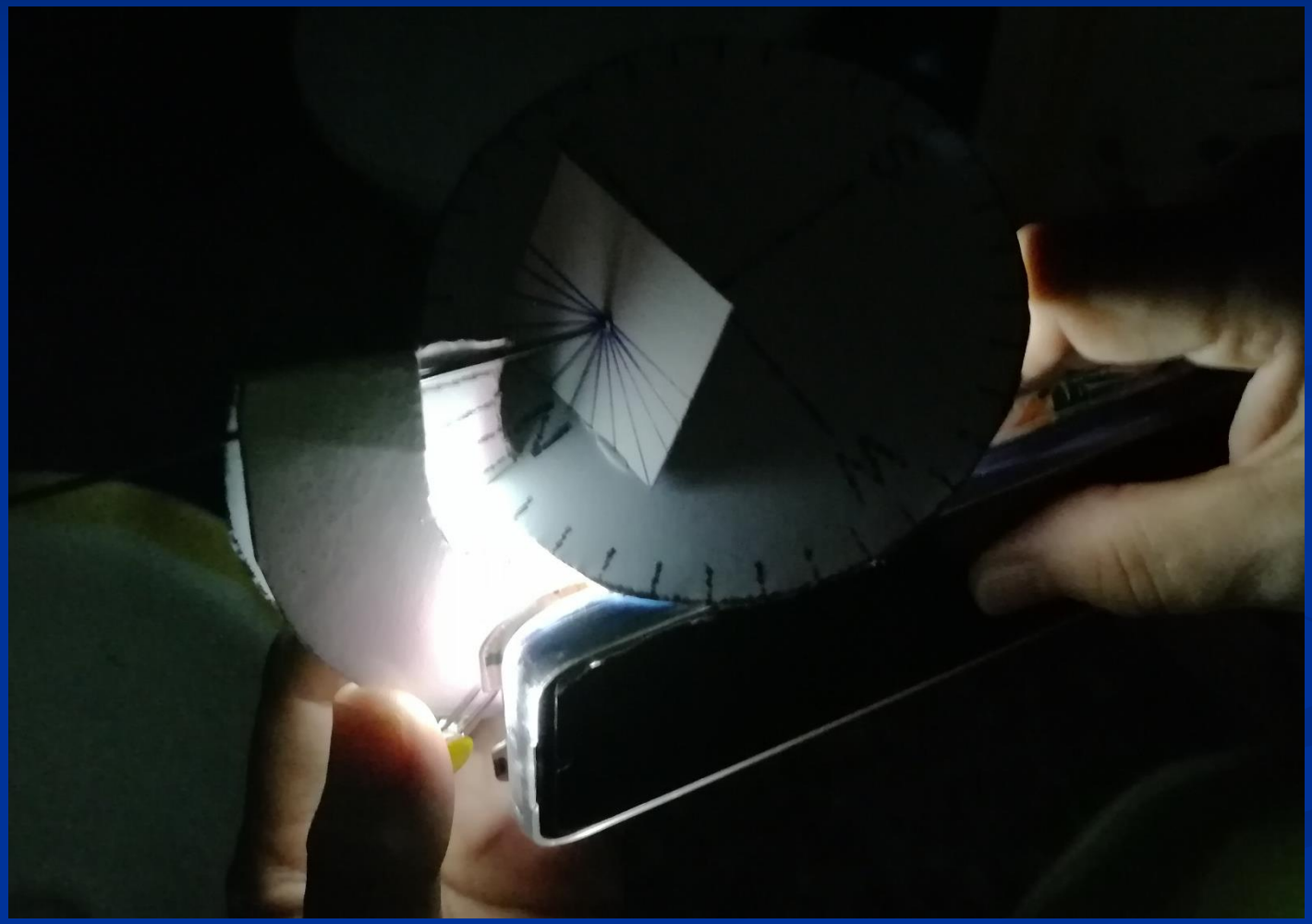
Afternoon 16:31 h in the sundial

Photo of **Maghrib** Algiers August 27th 2021



Sunset 19:27 h in the sundial

Photo of Isha Algiers August 27th 2021



Night
20:50 h
WE
CANNOT
SEE
in the
sundial

Many Thanks
for your attention !