

THE SALAH SUNDIAL

Manual



The SALAH Sundial

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Foreword

How do you tell time?

For most of us, the obvious answer is that we tell time by looking at the numbers on our wristwatch, or wall clock, or on our phones.

But is that 'real' time? Or abstract time?

What does 6am, or 1 pm, or 8pm mean? If you think about it — not much. It's just a number that tells you when to wake up, when to eat, when to go to work or school, and too often, when to pray.

But is there a different way to tell time?

A way that is aligned with God's time and God's creation?

Yes, there is — and the product you have in your hand gives you that.

Before the mechanical clock that plagues our modern world, we used to wake up with the athan of Fajr (dawn prayer), determined by the muezzin looking at the sky and discerning when the 'white thread becomes clear from the black thread' (Quran 2:187).

In the courtyard of our mosques, there used to be a sundial that told you exactly when the sun reached its peak and passed its zenith — the sign that Dhuhr (midday prayer) has entered.

When the shadow of the gnomon—the raised stick that casts the shadow—is longer than at noon by the length of the gnomon (or, in some schools of thought, by twice as long), the time for the 'Asr prayer (afternoon prayer) has entered.

The day was not measured or organized by abstract numbers on a wall, but by looking at the signs of Allah's creation.

That is the world this SALAH Sundial aims to return to you.

A sundial makes you connected to the sun. As the earth turns, a shadow lengthens and shifts, tracing the same rhythm that has ordered a Muslim's day for fourteen centuries: dawn, zenith, the lengthening of shadows, sunset, and the fall of darkness.

'Indeed, prayer has been decreed upon the believers at appointed times' (Quran 4:103). We often quote this verse to tell believers that they should be 'on time' according to the mechanical clock. But this verse was revealed to remind us that our prayers should be timed not by a factory owner, but by the One who created the sun in the heavens and set it in orbit.

So let this sundial sit somewhere you'll see it each day — near a window or a balcony. Pause your busy schedule and watch as the shadow becomes shortest at the time of solar noon (when the sun is at its highest point) and then grows longer again, marking that the time for Dhuhr has entered.

Get your children to observe and measure the length of shadows that usher in the time for 'Asr.

It might seem like a 'waste of time' to watch shadows, but nothing is more powerful to remind us that time is a gift to be honoured, not a currency to be consumed or wasted, than observing celestial movements of Allah's creation.

I pray this invention becomes a daily reminder to connect with God's creation and to be better worshippers of Him, according to His time.

My sincere appreciation and thanks to the inventor of this SALAH Sundial, Dr. Carlo Heller, who — although not a Muslim (yet) — took on this challenge and delivered a beautiful device for the Ummah. Thank you!

Sincerely,

Mohammed Faris

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Founder, The Productive Muslim Company

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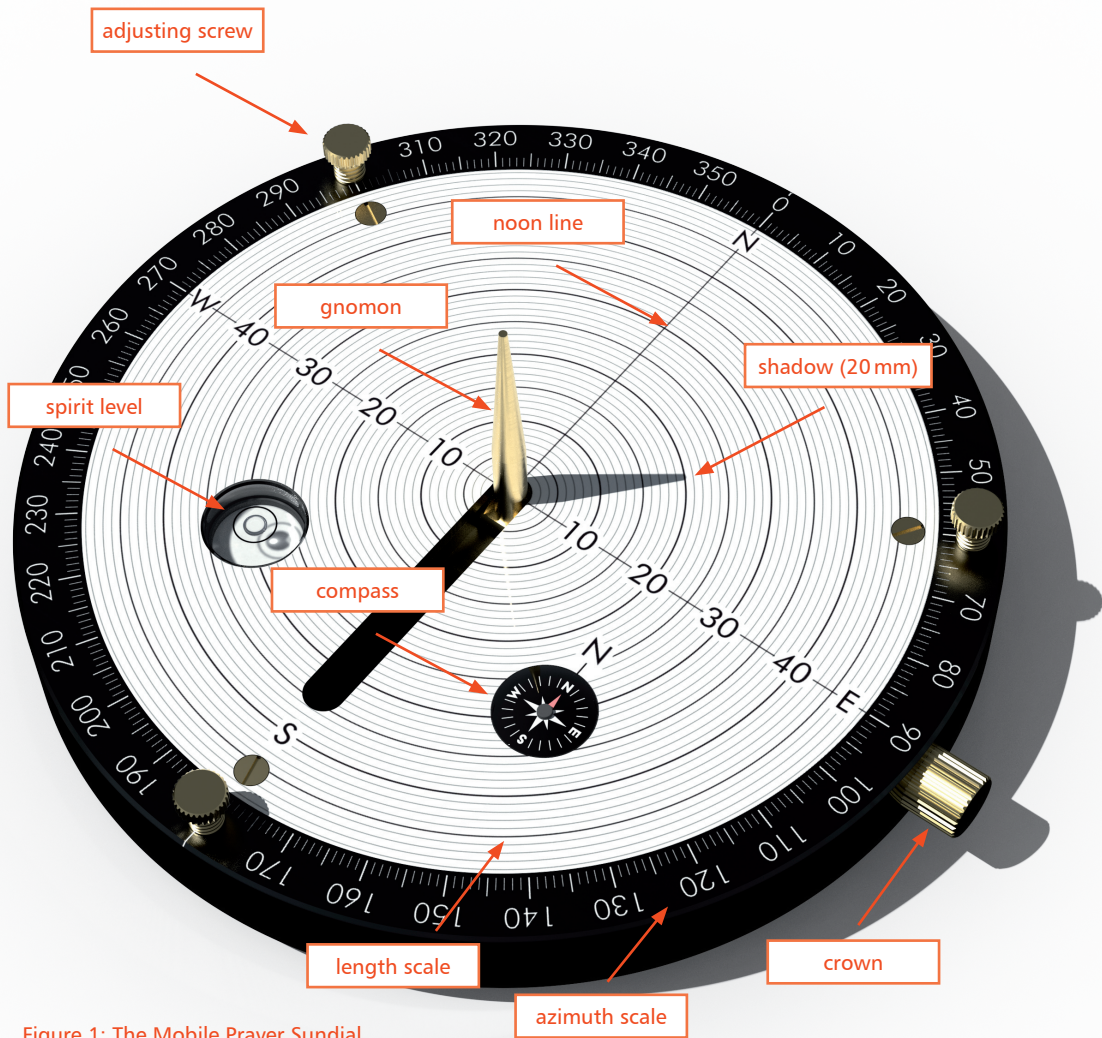


Figure 1: The Mobile Prayer Sundial

The SALAH Sundial

The Mobile Prayer Sundial is used to determine the important prayer times in Islam based on the sun's path.

Salah is the ritual prayer of Islam. It must be performed five times a day at set times, facing the Kaaba in Mecca, the Qibla. The times for the five prayers are directly determined by the sun's path at a given location. For this reason, sundials were originally used to determine prayer times. In particular, the times for the two prayers that take place in broad daylight, Dhuhr and 'Asr, can be ideally determined using a sundial.

The portable SALAH sundial is very well suited for this purpose. It can be used anywhere in the world to measure the length of the shadow.

Dhuhr - the Midday Prayer

The time for the Dhuhr prayer (midday prayer) begins when the sun has passed the middle of the sky – its highest point of the day at solar noon – or when it visibly begins to descend again.

On the SALAH Sundial, you can track both of these events by observing the shadow cast by the tip of the gnomon. The sun reaches its highest point when the shadow is shortest and points north. After that, it continues to move clockwise and becomes longer again as the sun loses altitude, that is, as it descends. This is the moment when the Dhuhr prayer begins. Another spelling for Dhuhr is Zuhr.

'Asr - the Afternoon Prayer

The time for the 'Asr prayer (afternoon prayer) begins when the gnomon's shadow reaches a certain length, calculated as the sum of the gnomon's height and the shadow's length at solar noon. The time for the 'Asr prayer ends at sunset.

Other Prayers

Next come the prayers whose start and end are determined not by the sundial but by direct observation of the sun on the horizon. The time for the Maghrib prayer (evening prayer) begins shortly after sunset (when the sun's disk disappears below the horizon) and ends with the onset of the 'Ishā' time, the disappearance of the evening glow. This, in turn, ends with the onset of true dawn, the beginning of the Subh prayer time (morning prayer time), which lasts until sunrise. It should also be noted that, depending on the school of thought, there are sometimes differing definitions regarding the start, end, and naming of prayer times.

The following guide describes step by step how you can determine the prayer times.

In addition, it also shows how you can align the sundial more accurately than with a compass. This allows you to precisely determine the direction of the Kaaba in Mecca, the Qibla.

Step-by-step Instructions

First, select the ideal height of the gnomon for the latitude and season so that both the start of the Dhuhr prayer and the start of the 'Asr prayer can be determined.

LAT. [°]	JAN			FEB			MAR			APR			MAY			JUN		
30	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30
31	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30
32	10	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30
33	10	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30
34	10	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30
35	10	10	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30
36	10	10	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30

Figure 2: Selection of the gnomon from Table 2 for a latitude of 33° on April 10

You can find the correct gnomon using Table 1 on pages 14–15 for latitudes from 0° (the equator) to 30°N and Table 2 on pages 16–17 for latitudes from 30° to 60°N. Gnomons with heights of 5, 10, 20, and 30 mm are included.



Figure 3: Four gnomon lengths are available

As an example, let's choose the town of Allen in Texas, USA. Allen is located at a latitude of 33°N. Let's say today is April 10. In Table 2, select the row for 33° and look in the middle column for April – which covers the 10th through the 19th of the month – to find the

gnomon height of 30 mm (Figure 2).

To replace it, use the crown to rotate the gnomon to the vertical position. Now unscrew the current gnomon by turning it to the left and screw in the 30 mm gnomon by turning it to the right.

Using a compass, align the SALAH Sundial with the north by rotating the dial until the red arrow points to the north mark. Then level the sundial by using the three adjustment screws to center the bubble in the spirit level within the black circle (Figure 1).

When the sun is shining, you can begin the measurement. In Figure 4a, you can see that the shadow is still far from the noon line. The shadow's length can be read on the circular scale and measures right now 25 mm.

Now observe the length of the shadow, and you will notice that it grows shorter and shorter until the sun reaches its highest point in the sky and the shadow is at its shortest. This moment is called solar noon or midday. Literally, it divides the daylight hours exactly into two equal halves. It is difficult to determine the exact time of midday by measuring the shadow



Figure 4a: The shadow length can be read on the circular scale and is currently 25 mm.



Figure 4b: At solar noon, the sun reaches its highest point. The shadow is at its shortest and measures 14 mm.



Figure 4c: The time for the Dhuhr prayer (midday prayer) does not begin until the sun has begun to descend and the shadow has increased again.

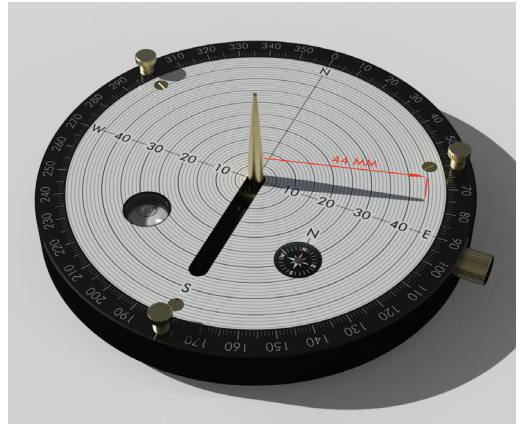


Figure 4d: When the shadow reaches 14 mm (noon length) + 30 mm (gnomon height) = 44 mm, the 'Asr prayer time begins.

because the shadow hardly changes near the sun's highest point. This is why the time period for the midday prayer Dhuhr does not begin until the shadow has visibly lengthened again (Figure 4c).

The midday prayer Dhuhr is followed by the afternoon prayer 'Asr. The starting time is determined by the gnomon height plus the shadow length at solar noon.:

$$\text{Shadow}_{\text{'Asr}} = \text{Gnomon height} + \text{Shadow}_{\text{noon}}$$

When the shadow reaches this length, the afternoon prayer time 'Asr begins.

In our example in Allen on April 10, the gnomon height is 30mm and the shadow length at solar noon is 14mm. This gives us the following calculation:

$$\text{Shadow}_{\text{'Asr}} = 30\text{mm} + 14\text{mm} = 44\text{mm}$$

When the shadow length reaches 44mm, the 'Asr prayer begins (Figure 4d).

The time for the afternoon prayer ends when the sun has set.

Another Method for Calculating 'Asr

According to some schools of thought, the 'Asr prayer does not begin until the shadow cast by the gnomon exceeds the shadow at noon by twice the height of the gnomon. At that point, the length of the shadow calculated as:

$$\text{Shadow}_{\text{'Asr}} = 2 \times \text{Gnomon height} + \text{Shadow}_{\text{noon}}$$

This time can also be determined in the same way using the SALAH sundial. However, you should use a shorter gnomon so that the shadow can still be measured in the afternoon.

Use in the Southern Hemisphere

Measuring shadows and determining prayer times in the Southern Hemisphere is done exactly the same way as in the Northern Hemisphere. The sun also moves from east to west, but in a counterclockwise direction, and is in the north at noon.

You can align the SALAH Sundial with the compass as described above, except that after orienting it toward the north, you should rotate it half a turn. The degree scale now has a different meaning: it no longer indicates the direction of the shadow, but rather the direction of the sun (solar azimuth).

If you are in a location in the tropics, the sun is at its zenith at noon twice a year, and then changes its noon direction from north to south or from south to north the next day. You should align the sundial accordingly.

Determining the Noon Line

The method described here for determining prayer times works even if the Salah Sundial does not point exactly north, since the measurement of the shadow length is independent of this.

However, it is advantageous to determine the direction of the noon line more precisely.

Aligning the prayer sundial using a compass is a simple and quick method. The drawback is that the compass points to the magnetic North Pole rather than the geographic North Pole. Depending on the location, this can result in significant deviations.



Figure 5a: The shadow length is 20 mm at 310° in the morning.



Figure 5b: In the afternoon, the shadow reaches the 20 mm circle again at 44°.



Figure 5c: The middle is at 357°. Mark the determined north direction there.



Figure 5d: Turn the sundial toward the north. The direction of prayer is 83° from north in Allen.

If you always use the prayer sundial in the same location, it's worth determining the noon line, because the shortest shadow length will coincide with the shadow crossing the noon line. This makes it very easy to determine the exact time of solar noon.

To do this, first select a circle that the shadow reaches in the morning, at least one hour before solar noon. When the shadow reaches the circle, place the ruler exactly on the shadow and read the angle on the azimuth scale.

Now wait until the shadow reaches the same circle in the afternoon. Use the ruler to measure the angle again. The noon angle lies exactly between the two angles and can be calculated using the formula

$$\text{Angle}_{\text{noon}} = (\text{Angle}_1 + \text{Angle}_2 + 360) / 2$$

For example, the sundial in Figure 5a is not quite aligned correctly and needs to be oriented exactly toward the north.

The shadow has just reached the 20 mm circle; the ruler indicates an angle of 310°. In the afternoon, the shadow reaches the 20 mm circle at an angle of 44°. The calculation follows:

$$\text{Angle}_{\text{noon}} = (310^\circ + 44^\circ + 360^\circ) / 2 = 357^\circ$$

Now use a pencil to mark the table at 357° and rotate the sundial until N aligns with the mark. The noon line is now exactly north-south. As early as the next day, you can measure the shortest shadow when the tip of the shadow crosses the noon line. After that, the shadow begins to grow again, and the midday prayer Dhuhr begins.

By precisely aligning the noon line, it is also possible to determine the Qibla, the direction of the Kaaba in Mecca.

Qibla - the Direction of Prayer

The Qibla is the direction of prayer prescribed by the Quran for Muslims toward the Kaaba in Mecca, the holiest site in Islam, no matter where the believer may be on Earth.

If you know the angle from north (azimuth) for your location, you can determine the direction using the azimuth scale.

In Allen, Texas, the Qibla is in the direction of 83° from north (Figure 5d).

Frequently Asked Questions (FAQ)

This section answers questions designed to help you better understand the SALAH Sundial.

> Does the SALAH sundial always have to be oriented exactly north?

No, it doesn't, since the shadow length can be measured in any direction using the circular scale. However, it is easier to determine noon if the noon line is oriented exactly north-south.

> Why does a shadow become blurrier the longer it gets?

The sun is not a point-like light source, but appears as a disk in the sky. As a result, in addition to the umbra, a penumbra is formed that grows larger as the distance increases.

> Can I use a gnomon that is shorter than the one listed in the table?

Yes, this makes the shadow shorter and sharper, improving the accuracy of the length measurement. However, you should not use a gnomon that is larger than the one specified in the table.

> Why doesn't my watch show 12 noon at solar noon?

Solar noon is based on the longitude of your location. The standard time displayed on the watch is measured at the time zone meridian. In addition, standard time is a mean time and can be either ahead of or behind solar time.

> Is the method described for determining the noon line accurate?

Yes, it's actually more accurate than a magnetic compass or a cell phone.

> How is the Qibla defined?

The great circle is the shortest line on the globe between your location and the Kaaba in Mecca. The direction of prayer (Qibla) is the initial bearing (azimuth) of the great circle from your location.

Support

If you have any further questions about using the SALAH sundial, please contact:

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LAT [°]	JAN			FEB			MAR			APR			MAY			JUN		
0	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
1	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
2	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
3	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
4	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
5	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
6	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
7	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
8	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
9	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
10	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30
11	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30
12	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30	30
13	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30
14	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30
15	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30	30
16	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30
17	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30
18	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30
19	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30	30
20	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30
21	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30
22	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30	30
23	20	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30
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25	20	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30
26	20	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30
27	20	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30
28	20	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30
29	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30
30	10	10	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30	30

Table 1: Selection of the gnomon for latitudes from 0 to 30° and a specific date. The first column of the month covers the 1st through the 9th, the second the 10th through the 19th, and the third the 20th through the end of the month.

JUL			AUG			SEP			OCT			NOV			DEC			LAT. [°]
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	0
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	1
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	2
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	3
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	4
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	5
30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	6
30	30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	7
30	30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	8
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30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	10
30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	11
30	30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	12
30	30	30	30	30	30	30	30	30	30	30	30	20	20	20	20	20	20	13
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30	30	30	30	30	30	30	30	20	20	20	20	20	20	20	20	20	10	28
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30	30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	30

LAT. [°]	JAN			FEB			MAR			APR			MAY			JUN		
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31	10	10	20	20	20	20	20	20	20	30	30	30	30	30	30	30	30	30
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38	10	10	10	10	10	20	20	20	20	20	20	30	30	30	30	30	30	30
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45	10	10	10	10	10	10	10	20	20	20	20	20	20	20	30	30	30	30
46	10	10	10	10	10	10	10	20	20	20	20	20	20	20	30	30	30	30
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48	10	10	10	10	10	10	10	10	20	20	20	20	20	20	20	30	30	30
49	10	10	10	10	10	10	10	10	20	20	20	20	20	20	20	20	30	30
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55	5	5	5	10	10	10	10	10	10	20	20	20	20	20	20	20	20	20
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59	5	5	5	5	10	10	10	10	10	10	20	20	20	20	20	20	20	20
60	5	5	5	5	5	10	10	10	10	10	10	20	20	20	20	20	20	20

Table 2: Selection of the gnomon for latitudes from 30 to 60° and a specific date. The first column of the month covers the 1st through the 9th, the second the 10th through the 19th, and the third the 20th through the end of the month.

JUL			AUG			SEP			OCT			NOV			DEC			LAT. [°]
30	30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	30
30	30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	31
30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	32
30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	33
30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	34
30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	35
30	30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	36
30	30	30	30	30	30	30	20	20	20	20	20	20	10	10	10	10	10	37
30	30	30	30	30	30	30	20	20	20	20	20	20	10	10	10	10	10	38
30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	10	39
30	30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	10	40
30	30	30	30	30	30	20	20	20	20	20	20	10	10	10	10	10	10	41
30	30	30	30	30	30	20	20	20	20	20	20	10	10	10	10	10	10	42
30	30	30	30	30	20	20	20	20	20	20	20	10	10	10	10	10	10	43
30	30	30	30	20	20	20	20	20	20	20	20	10	10	10	10	10	10	44
30	30	30	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	45
30	30	30	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	46
30	30	30	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	47
30	30	20	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	48
30	20	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	10	49
20	20	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	10	50
20	20	20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	5	51
20	20	20	20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	52
20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	5	5	5	53
20	20	20	20	20	20	20	20	10	10	10	10	10	10	10	5	5	5	54
20	20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	5	5	55
20	20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	5	5	56
20	20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	5	5	57
20	20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	5	5	58
20	20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	5	5	59
20	20	20	20	20	20	20	10	10	10	10	10	10	5	5	5	5	5	60

Step	Activity	Picture (example)
Selection of gnomons from Tables 1 and 2	Select and mount the gnomon based on latitude and date	
Orientation toward the north	Rotate the sundial until the compass is aligned with north	
Leveling	Use the three adjustment screws to level the spirit level until the bubble is centered.	
Measuring the length of the shadow at solar noon	Wait until the shadow is at its shortest, then measure the shadow's length	
Calculation of the start of 'Asr (Afternoon Prayer)	$\text{Shadow length}_{\text{Asr}} = \text{gnomon height} + \text{shadow length}_{\text{noon}}$	$\text{Shadow length}_{\text{Asr}} = 30 \text{ mm} + 14 \text{ mm} = 44 \text{ mm}$
Start of Dhuhr (midday prayer)	The shadow is growing again	
End of Dhuhr and beginning of 'Asr (afternoon prayer)	The shadow reaches the calculated shadow length $\text{Shadow length}_{\text{Asr}}$	
End of 'Asr	Sunset	

Table 3: Quick Guide to Using the SALAH Sundial

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