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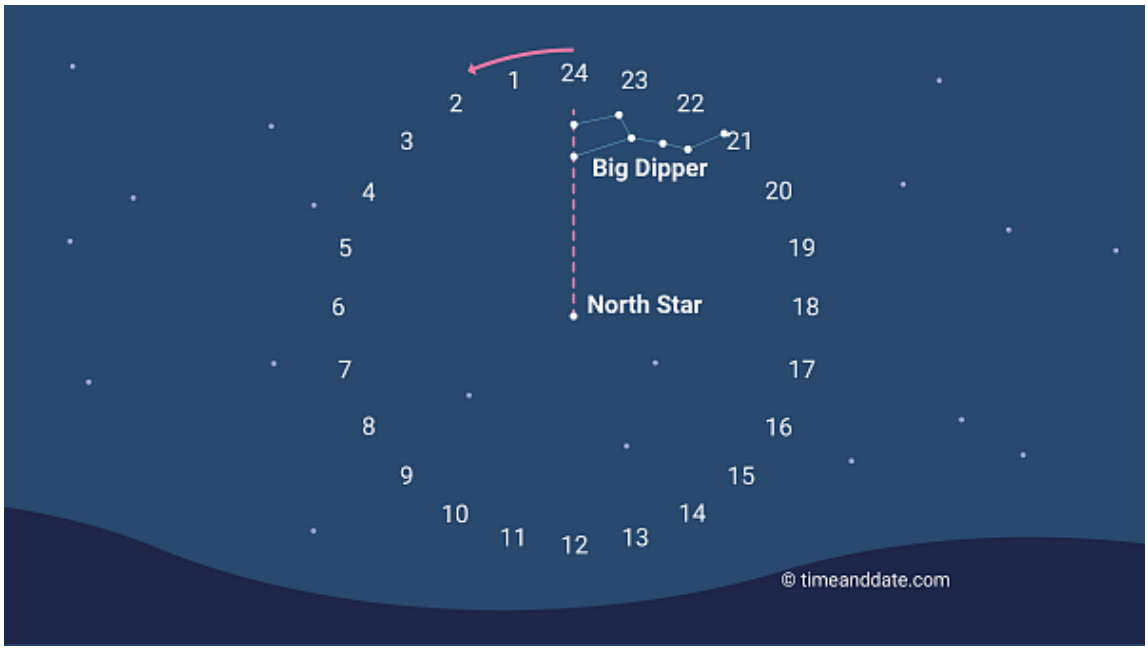
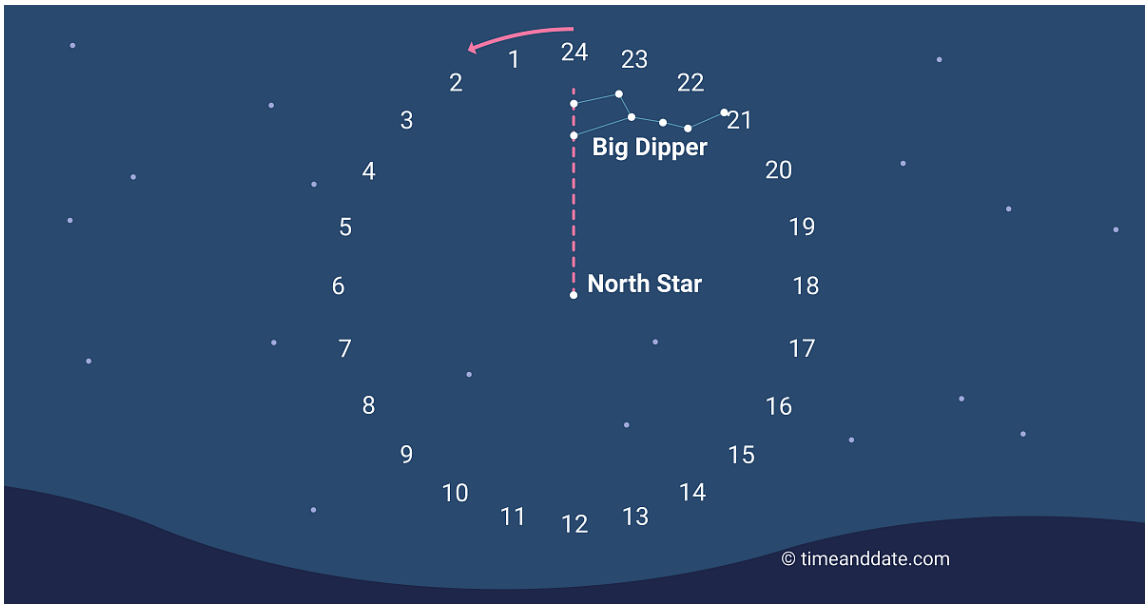
Tell Time With the Stars?

By Aparna Kher ⋮ 6-7 minutes

Did you know that you can tell time at night without a watch or a clock? All you need to do is to step out, look up at the sky, and locate the Big Dipper and the North Star.





Use the Big Dipper to find the North Star.

And then, with just a little bit of imagination and math you can do what explorers, adventurers, and astronomers have been doing for centuries – tell time using the stars!

Northern Hemisphere Stars

Before you begin learning how to tell time using the Big Dipper and the North Star, keep in mind that because these are mostly Northern Hemisphere stars. Those residing in mid-Northern Hemisphere latitudes – 40 degrees North and above – are best positioned to use them to tell time.

A Counter-Clockwise Star Clock

- To begin, step outdoors on a clear night, away from any light pollution. Make sure you check the weather.
- Find the Big Dipper and the North Star using the steps detailed below.
- Now, picture a clock with the North Star at its center, and draw an imaginary line starting from the North Star through the 2 pointer stars of the Big Dipper – Dubhe and Merak. Assume that this is the hour hand of your imaginary star clock.
- The clock you just created in the sky is a 24-hour clock. Unlike on a regular analog clock face where an hour takes up 30 degrees of a full circle, the imaginary hour hand on the star clock moves only 15 degrees per hour. What's more, this hour hand moves counter-clockwise.
- Before you go on to learn how to tell the time, you have one last thing to do. Draw another imaginary line straight up from the North Star. This line will mark midnight or the passing of 24 hours.

Calculating Time

Once you have figured out how to create an imaginary clock in the sky, you need to do some calendrical calculations and very basic math.

- To tell time, look at where the hour hand points to in relation to the reference line. Remember, each 15-degree movement corresponds with the passing of 1 hour.
- Now, look at the calendar for the date. If it is March 6, you do not need to do any calculations. The time on your imaginary clock will be the actual time. For example, if the pointer hour hand points straight to the top of the imaginary clock, the time will be midnight. If it points 30 degrees to the right of the reference line, the time would be 22:00 or 10 pm.
- To calculate times for different months, you will need to do the following calculation: `Time = Dipper Time – 2 X the number of months since March 6.`
- The time you get will be a rough estimate and may be off by about 30 minutes as compared to a clock.
- To account for Daylight Saving Time (DST), add 1 hour to the calculation in the months that DST is in place at your location.

Does your location have DST changes?

Finding the North Star

- **Use a compass** to locate the North. The position of the North Star above the horizon corresponds to the latitude of your location. For example, if you are 38 degrees North, then the North Star will be 38 degrees from the horizon. At the North Pole, the North Star is 90 degrees from the horizon (overhead). At the Equator, it is 0 degrees from the horizon (touching it).

- **Use the Big Dipper** to find the North Star or Polaris. The 2 outer stars of the Big Dipper – Dubhe and Merak – point towards the North Star. To find it, draw an imaginary line connecting the 2 stars, which are also known as **Pointer Stars** or **Pointers**, and extend it into the sky. This line will pass through the North Star.

Why Big Dipper and North Star?

The Big Dipper is a **circumpolar** object. Circumpolar objects are celestial objects that are always visible throughout the day and the year as seen from a specific latitude because they are close to the celestial pole of the observer's hemisphere.

The celestial poles are imaginary lines that trace the Earth's rotation axis in space. The Earth has 2 celestial poles – the Northern Celestial Pole and the Southern Celestial Pole. These poles correspond to the North and the South Pole and therefore are inclined at an angle – around 23.4 degrees.

Because neither the celestial poles nor the direction of the Earth's rotation axis change, any stars and constellations close to one of the celestial poles will be observable from some latitudes throughout the year all day long.

In addition, the Earth's daily rotation around its axis makes it seem like that the stars close to the celestial poles revolve around the pole once each day. Because of this, constellations and stars close to the celestial poles, such as the Big Dipper, can be used to estimate time during the night.

The North Star

The North Star, sometimes also called the *Lodestar* or *Guiding Star*, belongs to the constellation *Ursa Minor*. The North Star is the brightest star closest to the geographical and celestial North Pole. Because of this, it is visible from the Northern Hemisphere throughout the year. To a northern observer, the North Star appears motionless in the sky, with other stars in the sky revolving around it. It is this unique property of the pole star that makes it very helpful to navigators and for those who use the stars to tell time.

Not a Constellation, but an Asterism

Contrary to popular belief, the Big Dipper is not a constellation but asterism – which is a pattern of stars recognizable to observers from Earth. Asterisms may or may not be part of a constellation. Some asterisms like the *Diamond of Virgo*, also known as the *Great Diamond*, are made up of stars from different constellations.

The stars in the Big Dipper are also part of the constellation Ursa Major. The Big Dipper is also known as the *Plough*, *Saptarishi (Seven Sages)*, or *Butcher's Cleaver*. It is one of the most well-known asterisms in history. It has been used by explorers, stargazers, and astronomers to locate the **North Star**.

Topics: Astronomy, Stars, Timekeeping