# Teaching with astronomy exhibits

A collection of Astronomy teaching aids

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# Teaching with astronomy exhibits

I will be presenting my collection of Astronomy teaching aids. All these are actual hands-on models, not computer apps and can be easily assembled by students. We regularly conduct workshops where students are sent kits in advance and they assemble and learn how to use  them. These, and similar models in science and maths, have proved to be very popular with students.

As an example, the sunrise locator and timer shows you the location and time of sunrise/set at any latitude on any day of the year! Almost invariably, viewers are amazed to learn that at high latitudes, the sun rises closer to north than to east and that it rises very early in the morning!

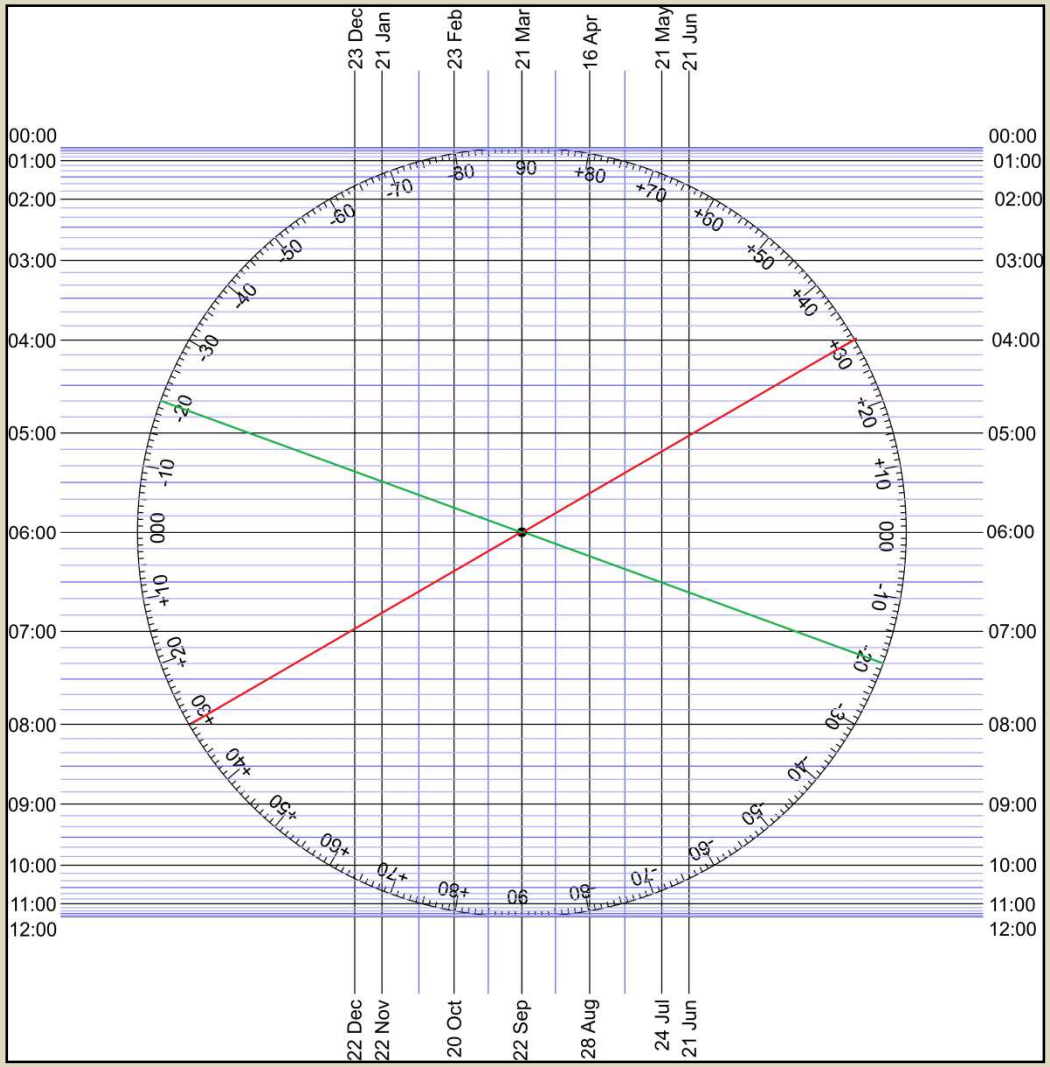
# Sunrise Timer

When will the sunrise tomorrow? When will it rise on June 1 in London? On April 10 in Sydney?

The Sunrise timer provides an instant answer to all these questions!

And it is easy to use: just find out the latitude of the place and the date!

# Sunrise Timer




**How to use:**

Place a scale on the figure so that it passes through the latitude marks on the circle (red line for 40 N and green line for 20 S)

For any date, note the time at which the date line intersects the scale.

**Examples:**

The 16 April line intersects the red line at 05:35

The 22 November line intersects the red line at 06:48

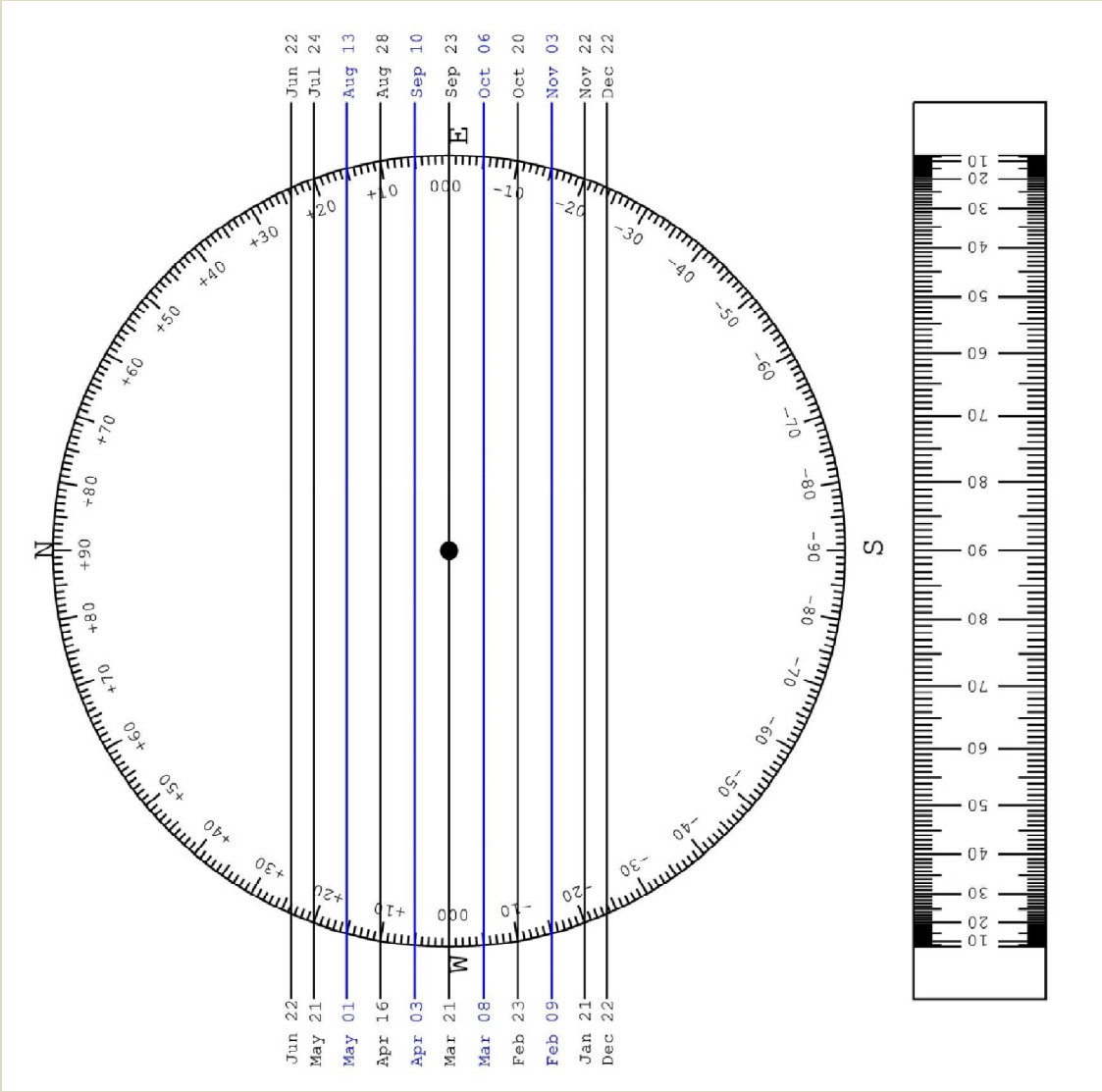
The 28 August line intersects the green line at 06:15

The 21 January line intersects the green line at 05:30

# Sunrise locator

Where does the sunrise? Exactly in the east? Not at all! It rises due East only on two days in the year, the equinoxes. On other days, it rises north of east (March equinox to September equinox) or south of east (September equinox to March equinox) (Northern hemisphere). Find out the exact direction of sunrise using this card model!

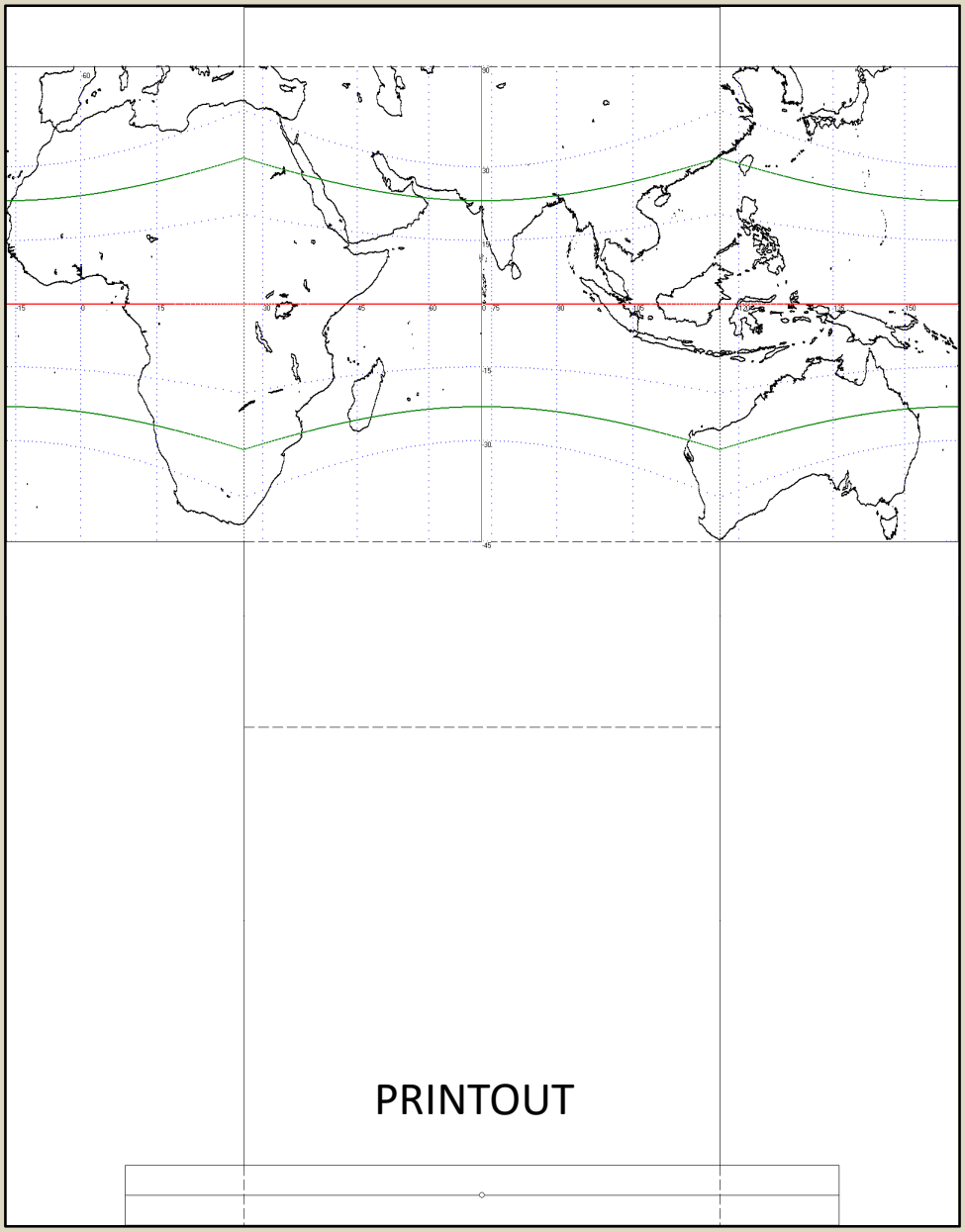
# Sunrise locator



# Sub-solar point model

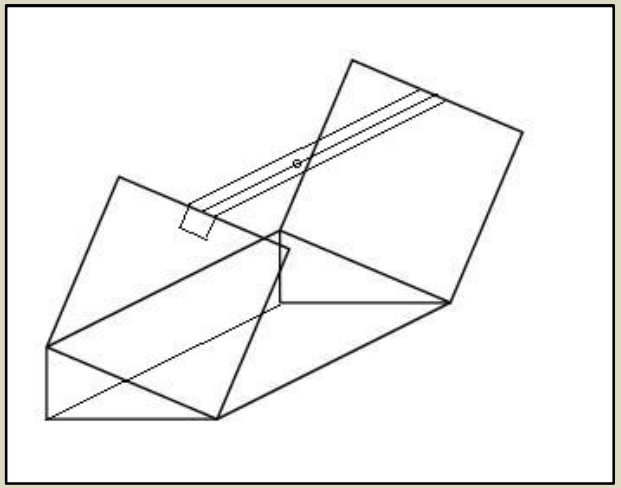
At any instant of time, there is a point on the surface of the earth where the sun is at the zenith. This point is called the sub-solar point. The sub-solar point moves from east to west daily and from north to south and back to north annually.
The daily motion is easy to observe, but the north-south-north motion is far more difficult to observe.
The sub-solar point model is designed to show this motion.
The model consists of a map centred at the equator and the observer's longitude and mounted appropriately. An image of the sun is cast on the map indicating the position of the sub-solar point. The model is designed separately for each latitude-longitude pair.
An application for a patent has been made under Indian Patent Law.

# Sub-solar point model



PRINTOUT

ASSEMBLED MODEL

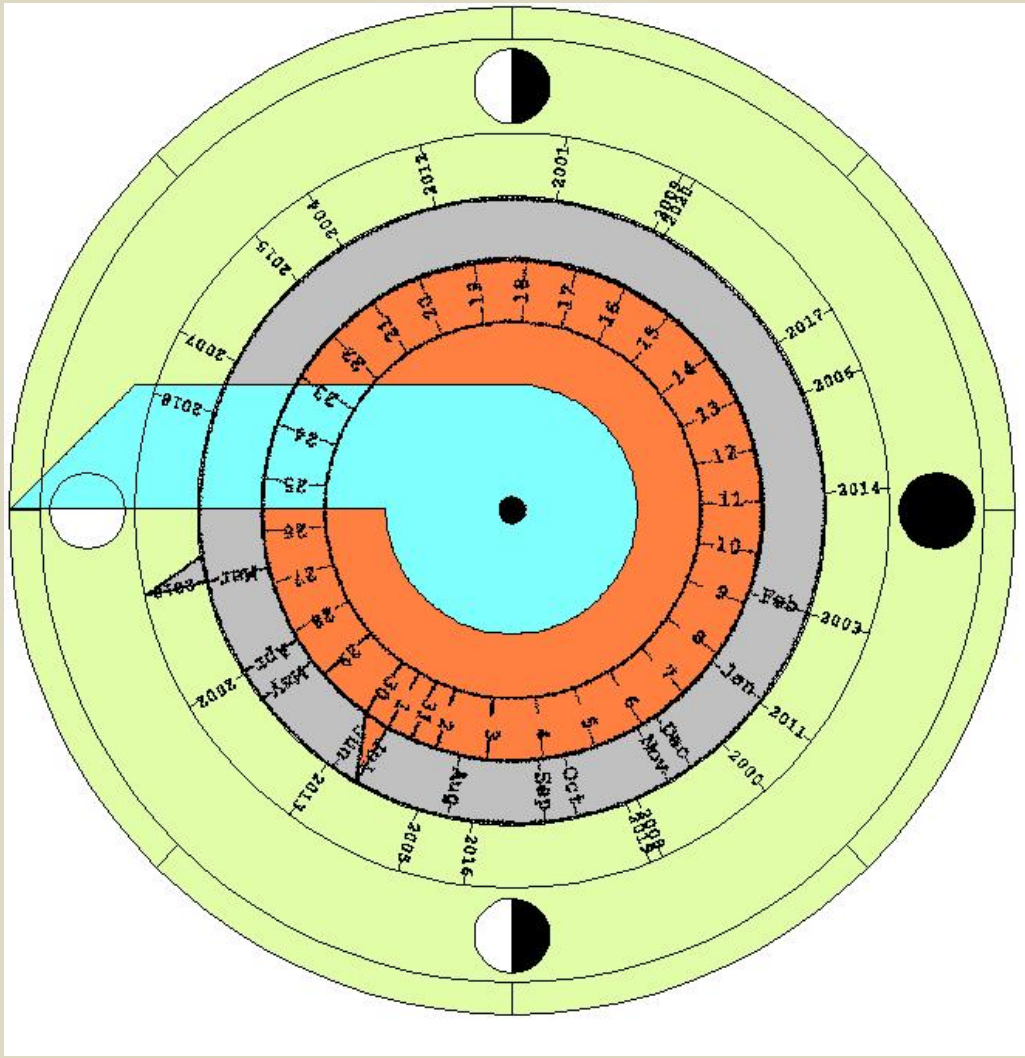


# Moon phase calculator

Finding the phase of the moon on a specific date is important for several reasons:

- The phase of the moon is related to the time of moonrise and moonset; knowing the phase of the moon helps to plan observations and astronomical night-outs!
- Eclipses take place only on new and full moon days.
- The phase of the moon is related to the time of high and low tides, although local geography may delay these times.
- Many Indian festivals, and the Hindu calendar, are associated with the phase of the moon. A moon phase calculator in essence becomes a lunar calendar, which can be used for checking the dates of festivals!

# Moon phase calculator



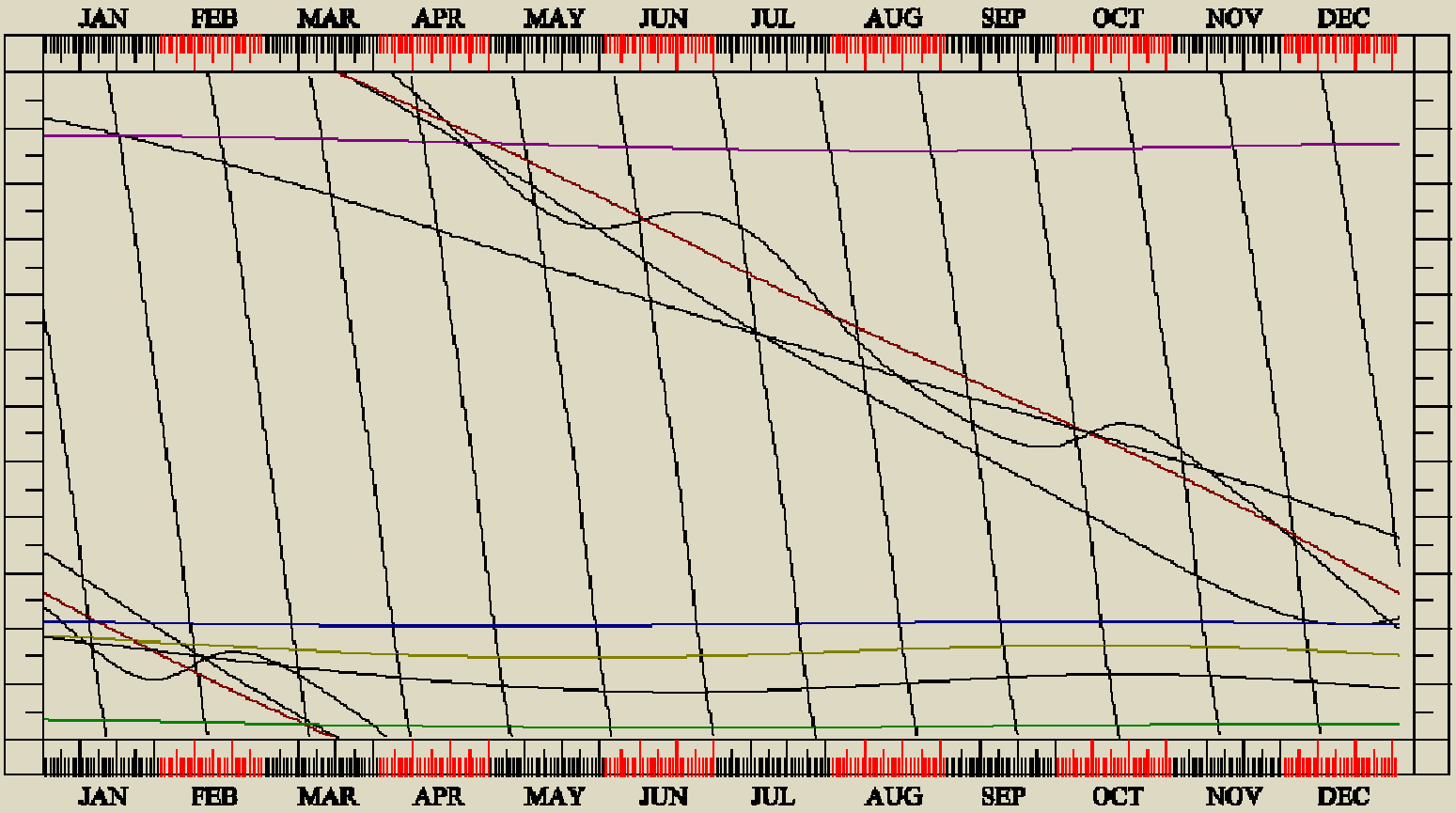
# Ephemeris

The Astronomical Ephemeris is a novel model that shows the celestial longitudes of the Sun, the Moon and the planets over a calendar year. Some of the major features are:

1. You can see how the longitudes of some bodies change very rapidly, while others remain essentially constant.
2. You can check whether a planet will be visible in the night sky on a particular day and estimate it's time of rise/set and crossing the zenith.
3. You can determine the phase of the moon on any day of the year, useful for instantly determining the dates of lunar festivals.
4. You can clearly distinguish between retrograde and prograde motions.

# Ephemeris

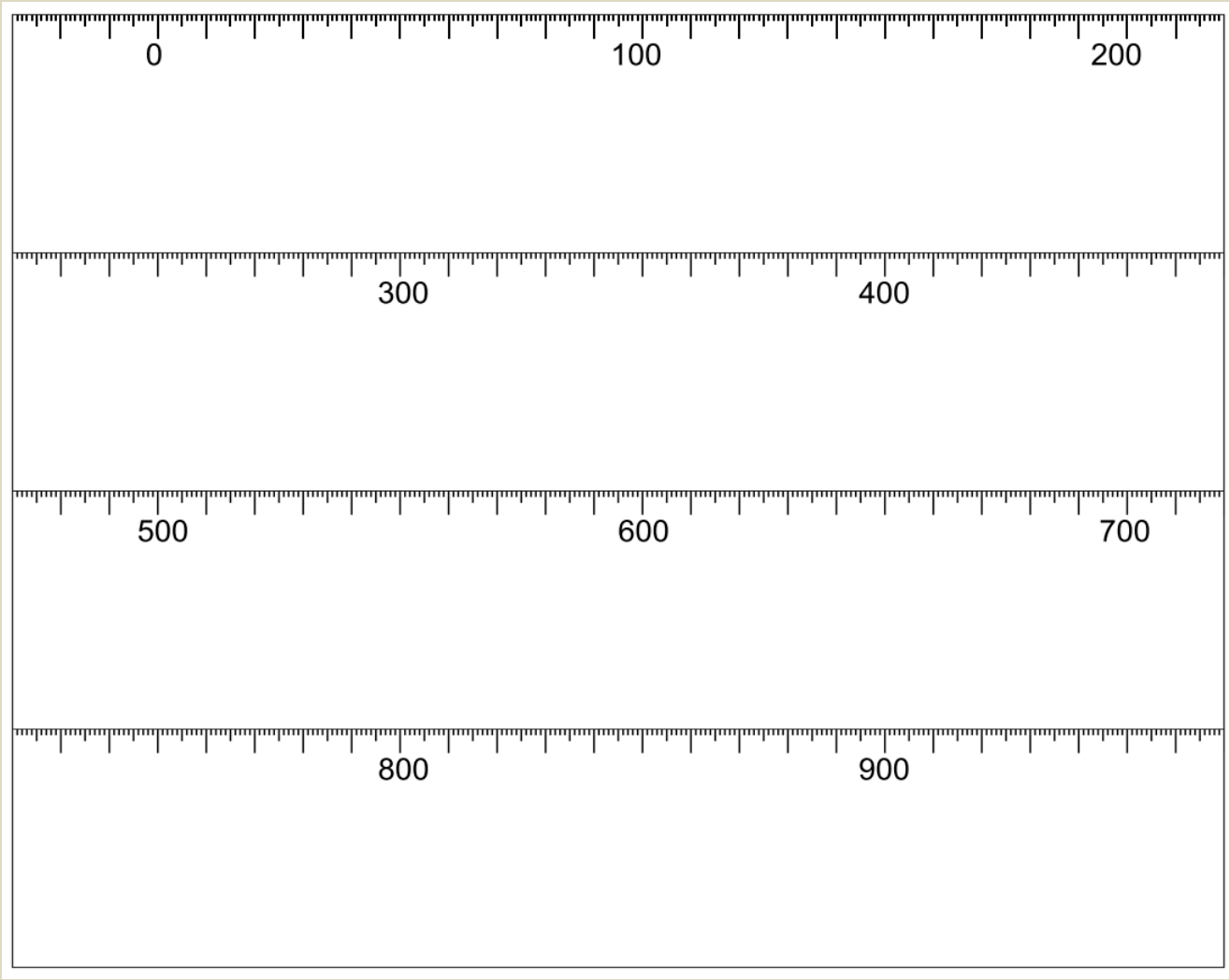
## 2021



# Solar System Distances Strip

As is well known, it is impossible to make a scale model of the solar system, preserving both size and distance. Our Distances Strip is a long strip (about 5 m long) (scale: 1 mm => 1 million km) that can be concertina folded to fit in a pocket! Students mark the planets at the relevant distances from the Sun and also mark a small dot (about 1.5 mm diameter) to show the Sun. They then realize that since the planets are very small compared to the Sun, it would be impossible to mark them!

# Solar System Distances Strip

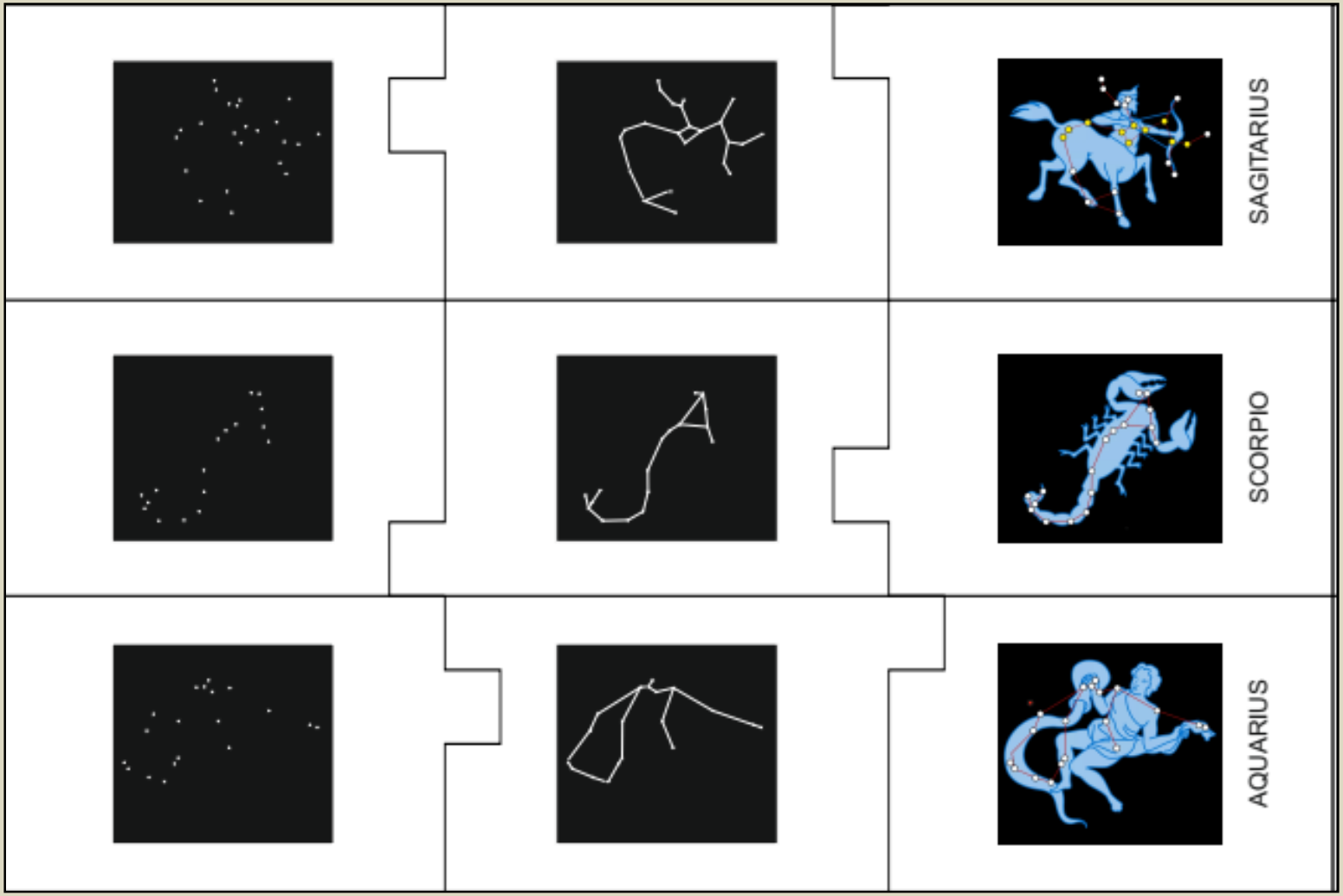


# Constellation Cards

School books often define constellations as shapes formed by stars in the sky. At home, students also hear about signs of the zodiac and may be exposed to astrology. As a consequence, students tend to think that Leo is actually a lion and Taurus is actually a bull!

We use constellation cards to show students how fertile an imagination is needed to see a lion or a bull in the sky! The cards are made in series of 3: only stars, stars with imaginary lines joining them and stars with imaginary figures drawn around them. They fit with each other like jig saw pieces and are given to students to arrange.

# Constellation Cards



# About Me

I am a PhD in Theoretical Physics (University of Delhi, 1983), who worked in Group Theory, Classical Mechanics and Mathematical Physics. Since 1996, I have been working with schools, working as a consultant in Science and Maths Education. Over the years, I have designed many models in these fields and in Astronomy. I have a shop where many of my models can be procured:

http://www.teacherspayteachers.com/Store/Sitaram-Bettadpur

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