# Earth is rotating on its own axis



- Earth is rotating counterclockwise *if you are looking at its North pole from other space.*
- Earth is rotating clockwise *if you are looking at its South pole from other space.*



To the lion, celestial object A is rising at East from the horizon.

Α



To the lion, celestial object A is high in the middle of the sky.

Α

Α



To the lion, celestial object A is setting at the West.

- Celestial objects rise (roughly) at East and set (roughly) at West.
- More precisely, all celestial objects are rotating about the line joining you and the star Polaris.



- The motion of all celestial objects in the sky is dominated by the Earth's rotation.
- There is no exception, including the Sun.



When the Sun is above horizon: Day time When the Sun is below horizon: Night time





To the lion, the Sun is rising at the East from the horizon. Beginning of a day: approximately 6:00 a.m.

When the Sun is above horizon: Day time When the Sun is below horizon: Night time





To the lion, the Sun is rising high in the middle of the sky.

Approximately Noon, 12:00 p.m (*closer to 12:30 p.m. EST in Lexington, because of our location in the Eastern time zone*).

When the Sun is above horizon: Day time When the Sun is below horizon: Night time





To the lion, the Sun is setting at the West. It will below the horizon after a while.

Beginning of evening: approximately 6:00 p.m.

When the Sun is above horizon: Day time When the Sun is below horizon: Night time





To the lion, the Sun is at the other side of the Earth. It cannot see the Sun at all.

Midnight: 12:00 a.m.

## In summary

The local time of every place on Earth is determined by the Sun position.

6 p.m.



# But the Moon is revolving around the Earth – once every ~ 30 days.

- The Moon will move in the manner similar to all other celestial objects over one day time, because of Earth's rotation.
- However, over several days, the Moon's motion in the sky will deviate from that of other stars because of the Moon's revolution around the Earth.

# Earth is rotating and Moon is revolving around Earth

The Moon is revolving around the Earth. One revolution in about 30 days (~ 1month).

### Both the Earth and Moon are lit by the Sun



# Do not worry whether the Moon and the Earth will bock sunlight from each other

- Earth and Moon are very small compare with Moon's orbit. Earth: Basket ball; Moon: Tennis Ball. These two balls are separated by a distance of 30 basket balls.
- Moon orbit is tilted at an angle of 5° with the Earth's orbit, so they usually don't get exactly between each other.
- Eclipses occur when the Earth and Moon are aligned with the sun rays.



When the Moon and the Earth kind of align with the sun ray, the Moon is actually way "high above" the Earth's shadow.

Eclipses rarely occur. The dark part of the Moon we see commonly is **NOT** a result of Earth's shadow or lunar eclipse.

# A Myth

- If that is the Earth's shadow, then this is a lunar eclipse and we will have a lunar eclipse every month!
- Earth's shadow cannot produce the "Gibbous" appearance of the Moon:

















### Phases of Moon - Don't forget about time!



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### Phases of Moon - Another example



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The Earth and Moon are revolving around the Sun at the same time - once every 365.25 days (1 year)



#### Size

• Earth: basketball; Moon: tennis ball; Sun diameter: length of 110 basketballs, larger then the space between Earth and Moon.



Size

• Distance between Sun and Earth: length of 11900 basketballs (~2.3 miles)



# Myth

- Summer and Winter cannot be a result of changing distance between Sun and Earth!
- If that is the case, then how can Australia be in Summer when we are in Winter?

# Real reason for seasons



Not to scale

# The Earth is lit by the Sun



Not to scale

# Different time in a year



Not to scale



#### Where are we on the globe?











But everything is rotating about the line joining between you and the Polaris.



### Now in the beginning of Summer









But everything is rotating about the line joining between you and the Polaris.



Path of Sun on June 21

# In summary

	Sunrise	Noon	Sunset
June 21	Northeast	South	Northwest
September 21	East	South	West
December 21	Southeast	South	Southwest
March 21	East	South	West





The shadow of a gnomon is pointing in the opposite direction to the position of the Sun in the sky



# In summary (for Lexington)

