SHADOW STUDIES

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CAMELS OR SHADOWS

Source: https://www.ngssphenomena.com/camels-or-shadows/

1-ESS1 Earth's Place in the Universe

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Students who demonstrate understanding can:

1-ESS1-1. Use observations of the sun, moon, and stars to describe patterns that can be predicted. [Clarification Statement: Examples of patterns could include that the sun and moon appear to rise in one part of the sky, move across the sky, and set; and stars other than our sun are visible at night but not during the day.] [Assessment Boundary: Assessment of star patterns is limited to stars being seen at night and not during the day.]

1-ESS1-2. Make observations at different times of year to relate the amount of daylight to the time of year. [Clarification Statement: Emphasis is on relative comparisons of the amount of daylight in the winter to the amount in the spring or fall.] [Assessment Boundary: Assessment is limited to relative amounts of daylight, not quantifying the hours or time of daylight.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

Science and Engineering Practices

Planning and Carrying Out Investigations

Planning and carrying out investigations to answer questions or test solutions to problems in K–2 builds on prior experiences and progresses to simple investigations, based on fair tests, which provide data to support explanations or design solutions.

- Make observations (firsthand or from media) to collect data that can be used to make comparisons. (1-ESS1-2)

Analyzing and Interpreting Data

Analyzing data in K–2 builds on prior experiences and progresses to collecting, recording, and sharing observations.

- Use observations (firsthand or from media) to describe patterns in the natural world in order to answer scientific questions. (1-ESS1-1)

Disciplinary Core Ideas

ESS1.A: The Universe and its Stars

- Patterns of the motion of the sun, moon, and stars in the sky can be observed, described, and predicted. (1-ESS1-1)

ESS1.B: Earth and the Solar System

- Seasonal patterns of sunrise and sunset can be observed, described, and predicted. (1-ESS1-2)

Crosscutting Concepts

Patterns

- Patterns in the natural world can be observed, used to describe phenomena, and used as evidence. (1-ESS1-1),(1-ESS1-2)

Connections to Nature of Science

Scientific Knowledge Assumes an Order and Consistency in Natural Systems

- Science assumes natural events happen today as they happened in the past. (1-ESS1-1)
- Many events are repeated. (1-ESS1-1)

Source: http://www.nextgenscience.org/dci-arrangement/1-ess1-earths-place-universe

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ESS1.B: Earth and the Solar System

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Let students make discoveries!

Don’t ruin their “Aha Moments”

- Sidewalk Chalk Shadows
- Bear Shadow
- Moon Phases
- Sundials
- Misconceptions

SIDEWALK CHALK

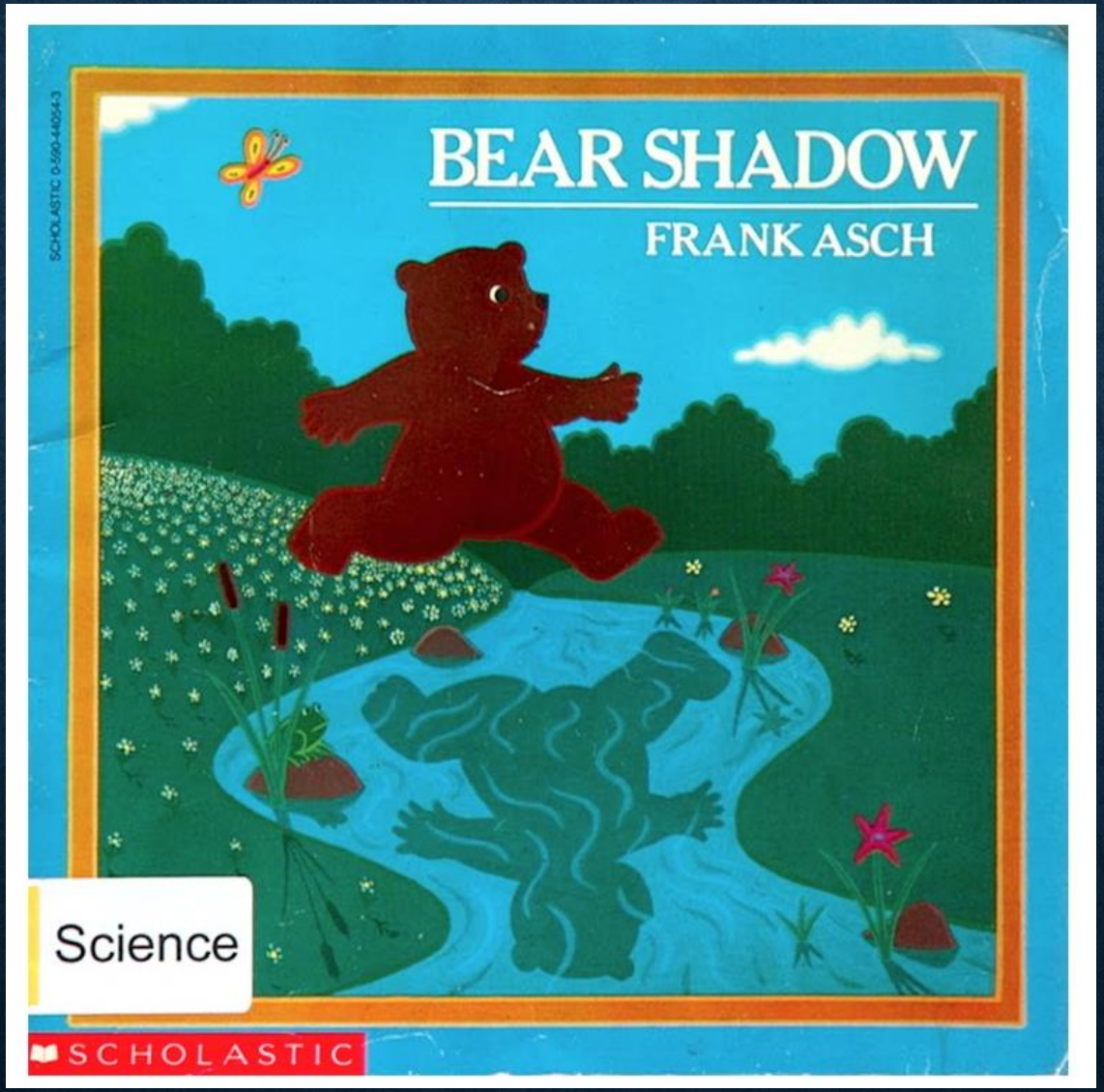
SIDEWALK CHALK

SIDEWALK CHALK

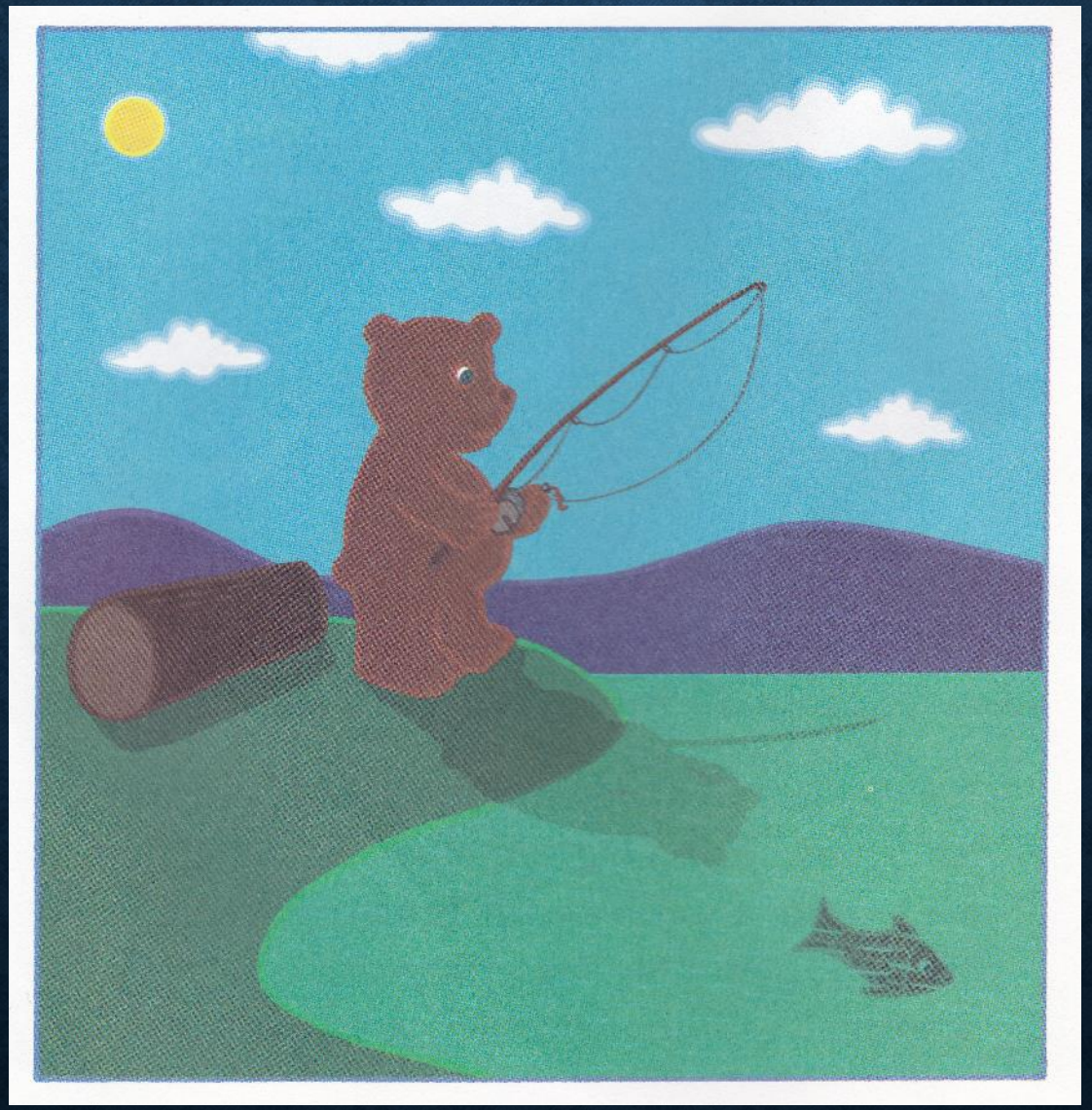
SIDEWALK CHALK

SIDEWALK CHALK

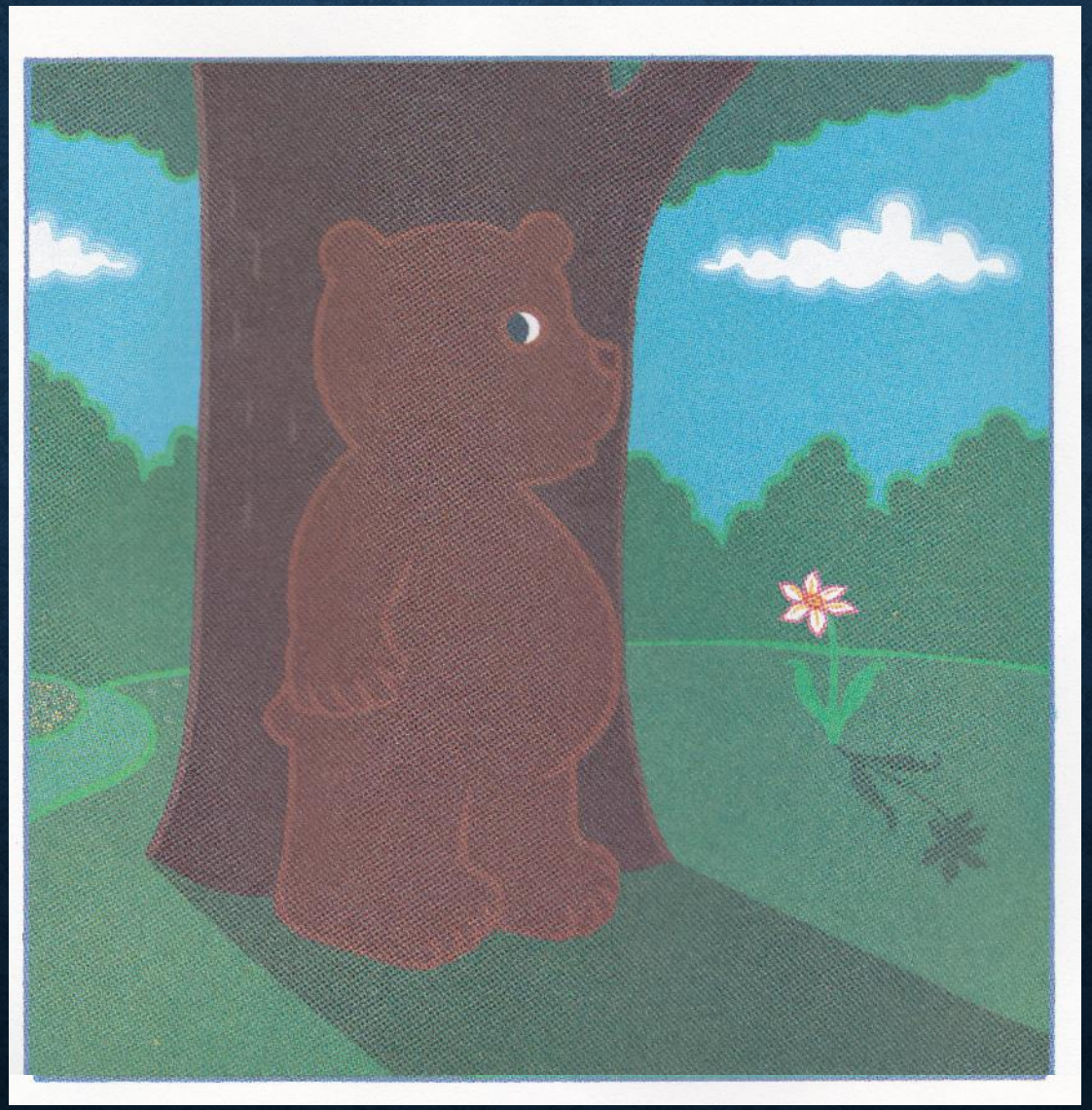
BEAR SHADOW



SCARING THE FISH

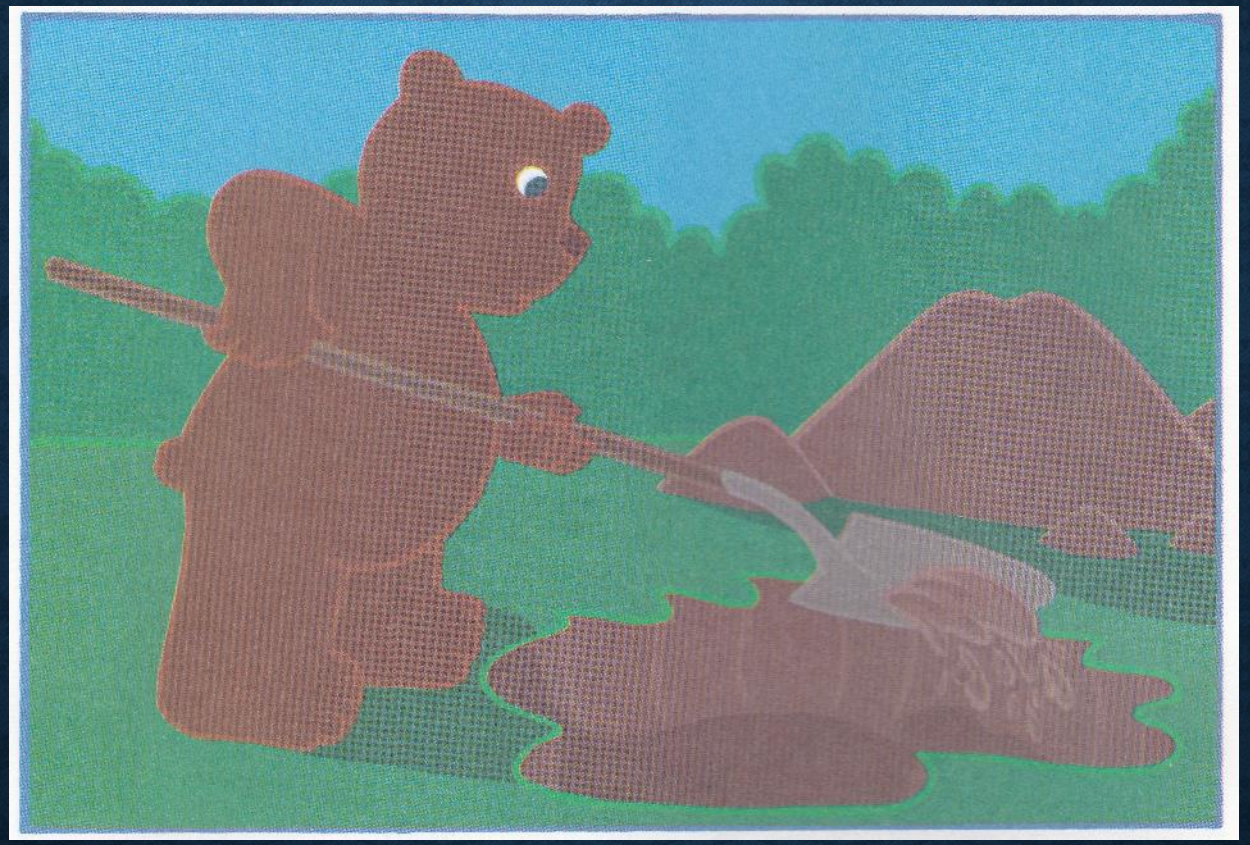


HIDING BEHIND THE TREE



NAILING THE SHADOW TO THE GROUND

BURYING THE SHADOW

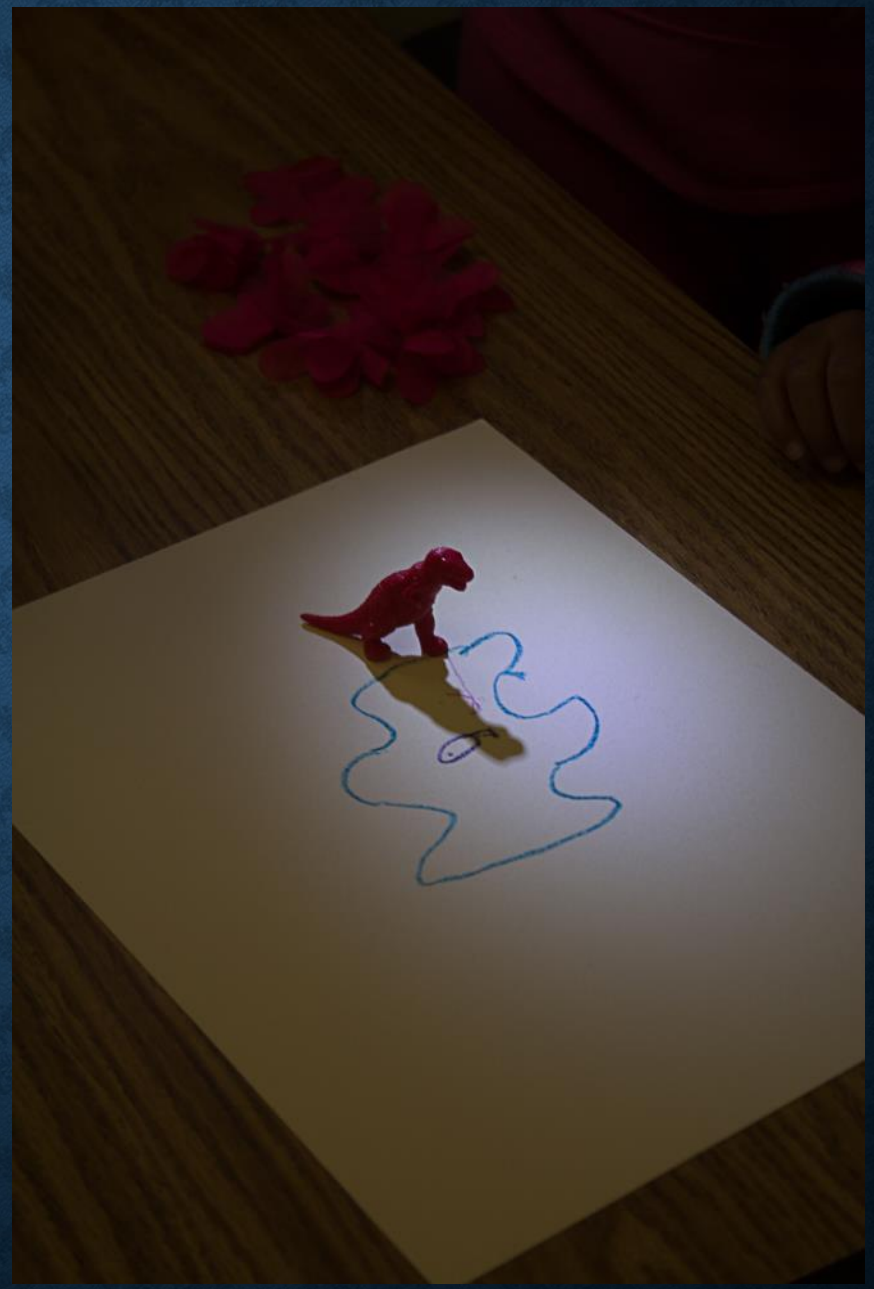


No more shadow?

MAKING A DEAL

SHADOW GETS A FISH


love
love
love

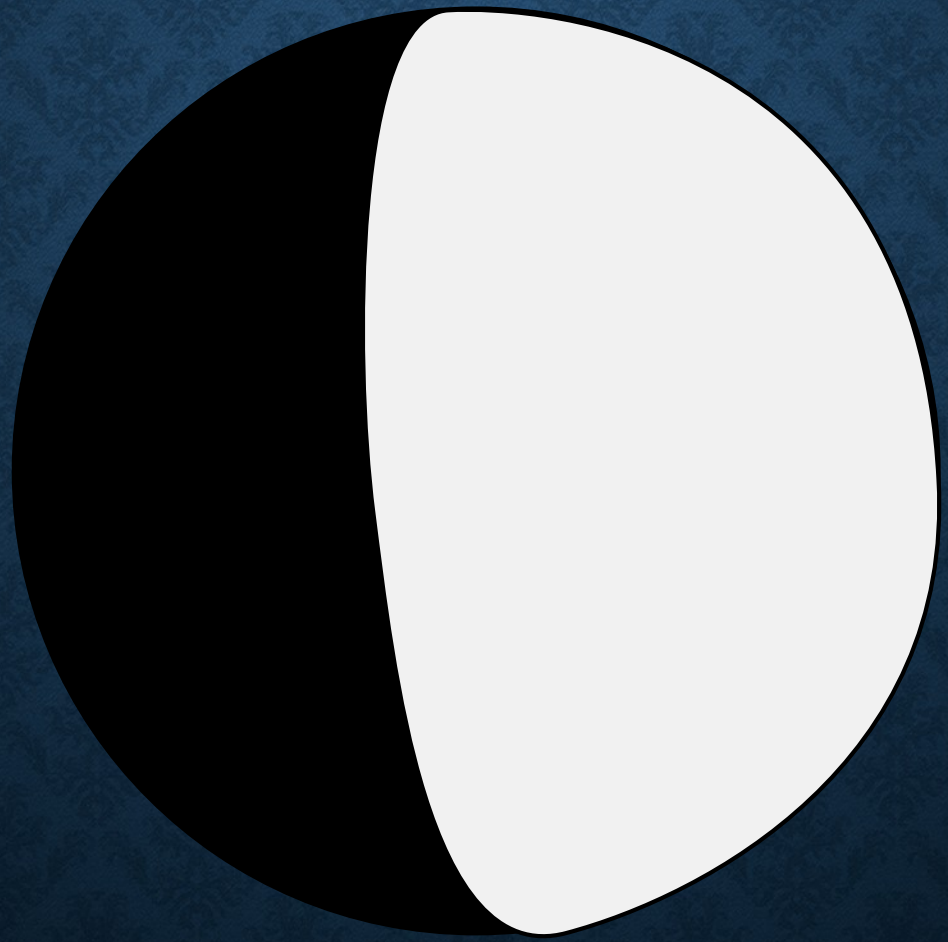


MOON PHASES

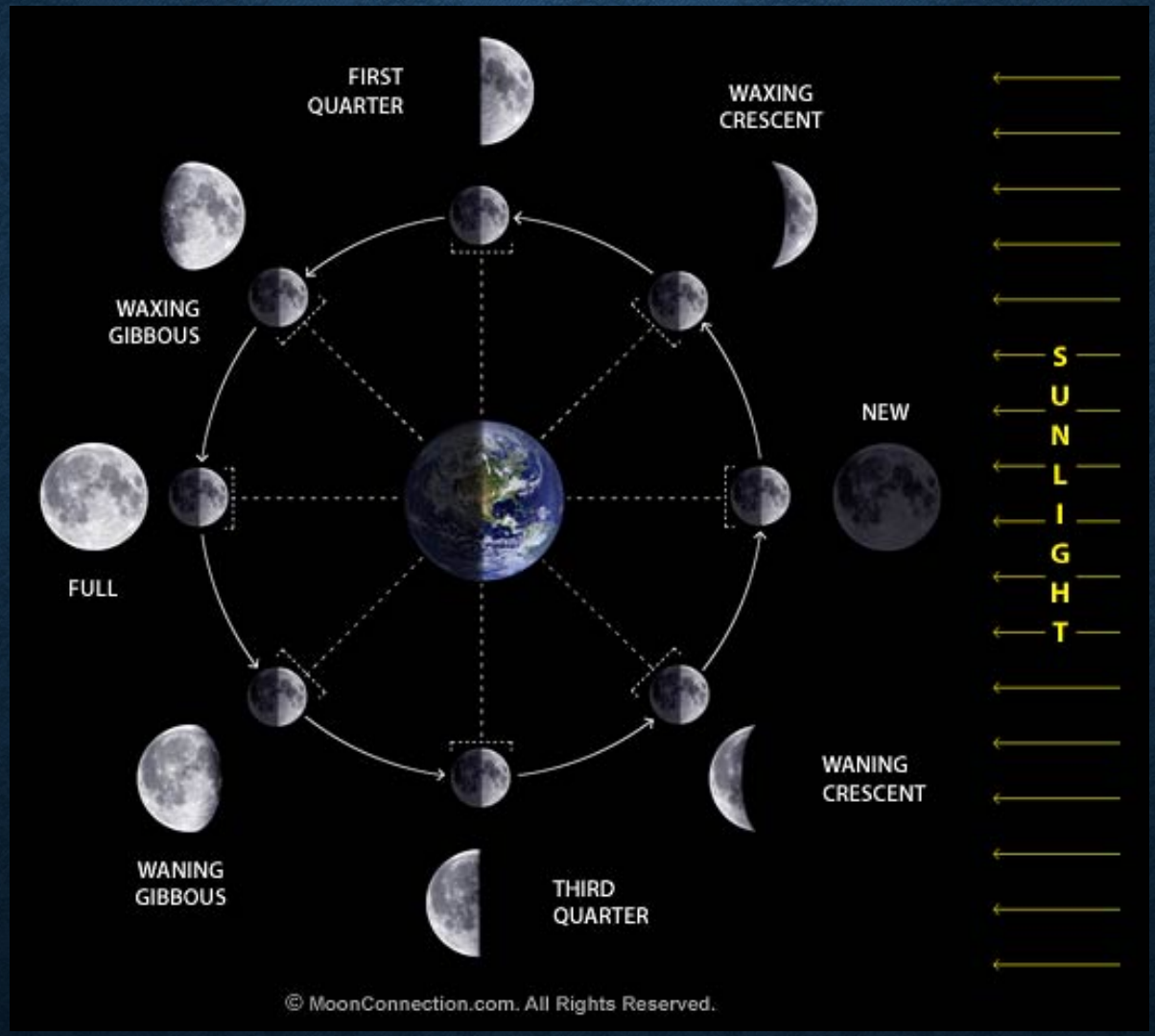
Source: https://apod.nasa.gov/apod/image/1202/lunation_cidadao_300.gif


The Earth
(You)
The Moon
The Sun

MOONBALL



MOON PHASES



Source: http://veronicaschneider.pbworks.com/f/1304047806/moon_phases_diagram.jpg

MOON PHASES

Source: http://www.acaoh.org/_MoonPhases/Calendars/2013/MoonPhase_2013-04.jpg

MOON PHASES

Time Sequence #	Moon Phase	Rise Time	Highest Overhead Time	Set Time
1	New	6 am	Noon	6 pm
2	Waxing Crescent	8 am	2 pm	8 pm
3	First Quarter	Noon	6 pm	Midnight
4	Waxing Gibbous	4 pm	10 pm	4 am
5	Full	6 pm	Midnight	6 am
6	Waning Gibbous	8 pm	2 am	8 am
7	Third Quarter	Midnight	6 am	Noon
8	Waning Crescent	4 am	10 am	4 pm

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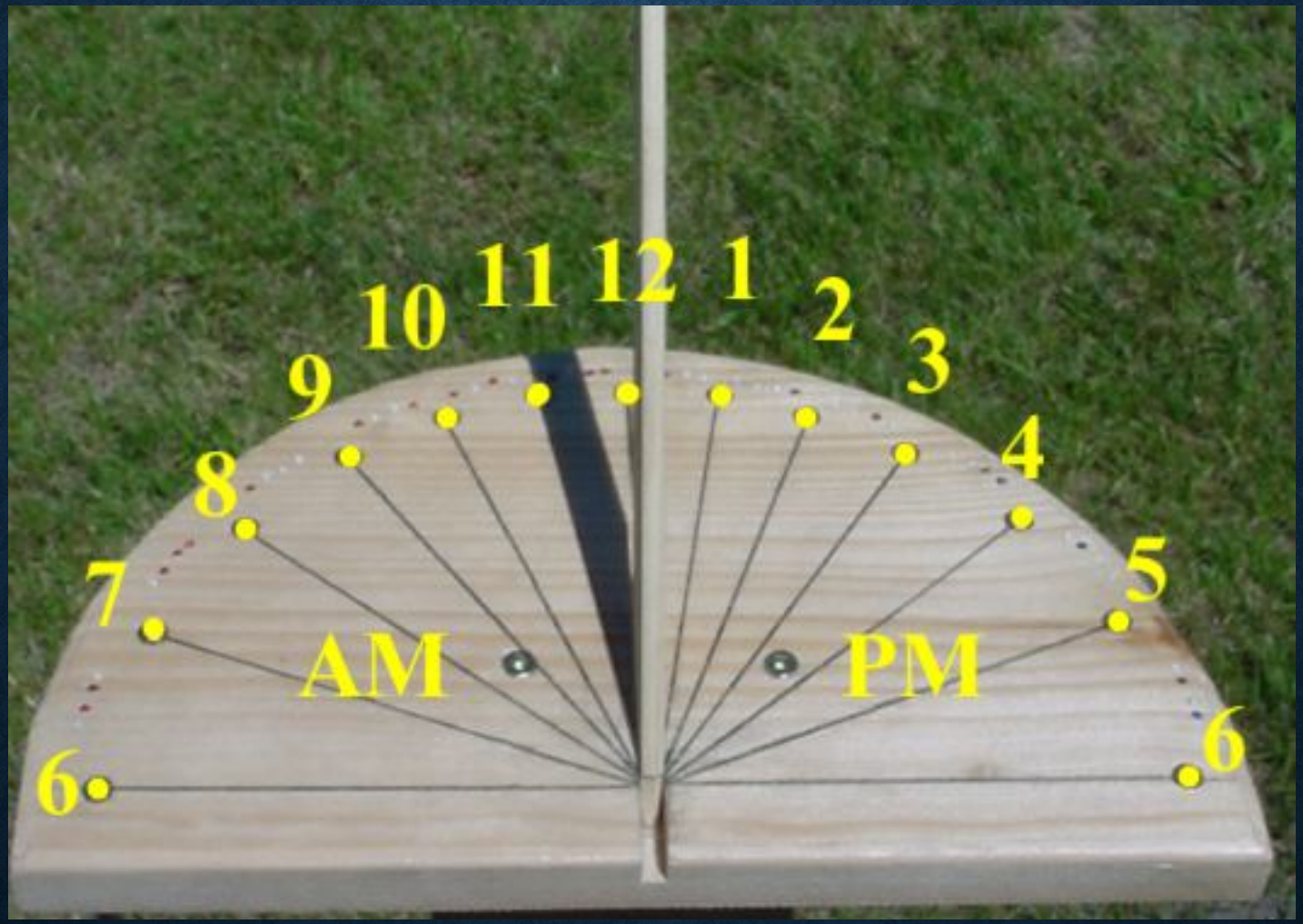
Moon Phase	Rise Time	Set Time
New	Sunrise	Sunset
Waxing Cresent	Morning	Bedtime
First Quarter	Lunch	Midnight
Waxing Gibbous	After School	Middle of the night
Full	Sunset	Sunrise
Waning Gibbous	Bedtime	Beginning of school
Third Quarter	Middle of the Night	Lunch
Waning Cresent	Middle of the Night	After School

SUNDIALS

SUNDIALS


12
1
2
3
4
5
6
7
8
9
10
11


RootsAndWingsCo.blogspot.com
Noon
1:00
2:00


10
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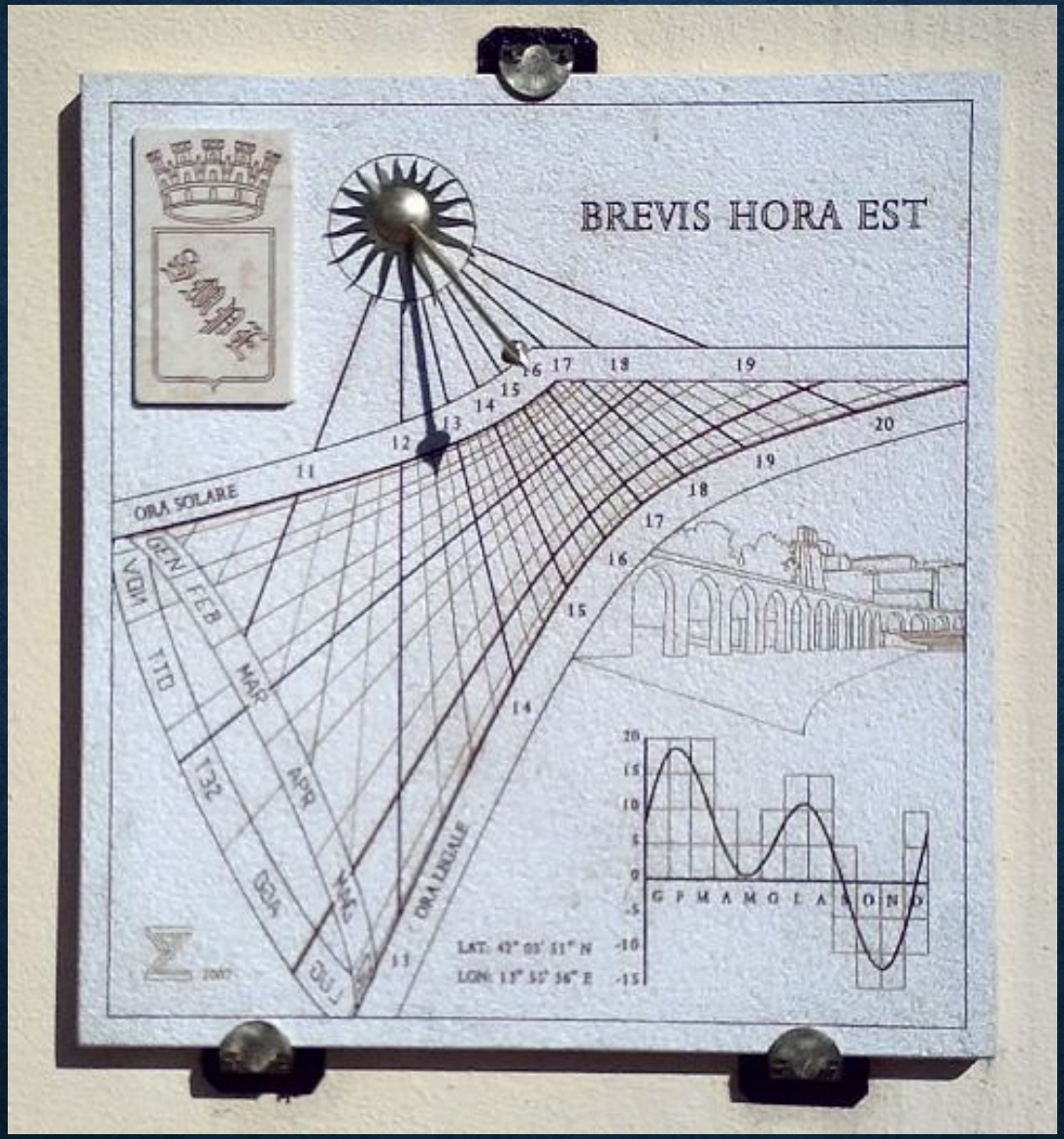
AM
PM
6
6



Source: http://www.shadowspro.com/en/sundials.html

LAHAINA NOON

Lahaina Noon at the Subaru Telescope

MISCONCEPTIONS

- The Moon is only a reflection
- The Moon is only out at night
- The Sun is directly overhead at Noon (Exception in the USA – Lahaina Noon)
- The color of the Moon
- The Moon is bigger on the Horizon
- Sundials look like clocks (exception – Arctic Circles in Summer)
- ???

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