Now You See It, Now You Don't

Major Concept: Observable patterns in the sky---Phases of the Moon.

Content	Skills
phase	observation
movement	patterns
position	using graphs
waxing	inferring
waning	using tools and models
	communicating results

Core Content

SC-E-2.2.2 Objects in the sky (e.g., Sun, clouds, moon) have properties, locations, and real or apparent movements that can be observed and described.

SC-E-2.3.3 Changes in movement of objects in the sky have patterns that can be observed and described. The Sun appears to move across the sky in the same way every day, but the Sun's apparent path changes slowly over seasons. The moon moves across the sky on a daily basis much like the Sun. The observable shape of the moon changes from day to day in a cycle that lasts about a month.

SC-M-2.3.2 Most objects in the solar system are in regular and predictable motion. Those motions explain such phenomena as the day, the year, phases of the moon, and eclipses.

Challenge

The moon, our closest neighbor in space, is shaped like a ball. Have you ever wondered why its appearance changes each night? These changes are called *phases*. But the shape of the moon only seems to change---it all depends on how much of the sunlit half we see. It's all about positions... mostly ours on Earth as we look up at the moon.

Proposed Tasks:

Task 1: The student will observe photographs of the moon and discover the reasons for phases. Scott Foresman Pg. A18-19.
See attached Task 1 activity, worksheet, and newsletter.

Task 2: The student, with a partner, will "act out" the revolution and rotation of the Earth and moon to show phases. The student will also either use or construct (teacher choice) a moon phase box.
CPR for Your Science Teaching , pg 54-59.
See attached Task 2 activity and worksheet, and moon box directions.

Task 3: The student will be able to place models of the phases of the moon in the correct positions. The student will begin observing (if possible) and drawing the phases of the moon for two months. The student will also draw the earth, sun,and moon's relative positions on this chart.
See attached Task 3 activities and worksheet.

Task 4: With gathered materials, the student will construct an individual flip-type moon calendar. Each student will shade, label, mount, consecutively order and collate 30 images of the moon.
See attached Task 4 activity pages.

Task 5: The student will answer an open response question and complete a concept map on the topic of the moon.
See attached open response and concept map.

*Moon fact pages also included

Pre-test
Phases of the Moon
Name:_____

1. Why does the moon look different to us each night?

_____

_____

_____

2. Draw and label a diagram of the sun, Earth and moon from space showing their positions in relation to one another for the first quarter phase.

Task 1

1. Follow teaching directions on the following TM pages , having the student write answers on their study sheets as the questions arise.

2. Make a transparency to duplicate the worksheet. Use TM to direct completion of the worksheet.

3. Send home newsletter.

Page A 16-21 Name_____

Lesson 1.3 **Light and Shadows**

1. How does the attraction between Earth and Moon affect both of them?

_____

_____

2. Why is one half of Earth always dark?_____

_____

3. Why don't the sun's rays light up space?_____

_____

4. What would happen if Earth's rotation were to speed up or slow down?___

_____

_____

5. How does the diagram on pg. 18-19 explain why the shape of the moon seems to change?_____

_____

_____

6. Define:

phase:_____

_____

eclipse:_____

_____

solar:_____

_____

7. How can a much smaller moon block the sun's light from Earth?_____

_____

_____

8. Checkpoint

1. Why is Earth always half dark?_____

_____

2. What determines how much of the moon is visible to us on Earth?

_____

_____

3. How are Earth, the sun, and the moon lined up during an eclipse?

_____

_____

4. Name four systems to which Earth belongs._____

_____

_____

Task 2

See attached pages from CPR For Your Science Teaching. Worksheet is included for individual accountablilty.

Using the attached directions, construct the moon phase box ahead of time or do this as a class project in groups. Experiment with the box to reinforce the reason for phases.

Task 3

See attached activity for placement of paper plate moons.

Then explain to the students that they are to observe the moon every night for two months and that they are to draw how it appears in the sky on the grid. Under the drawing, they are to draw the relative positions of the earth, sun and moon that makes this observation possible. Tell them that this will be discussed each day in class, as some nights the moon may not be easily viewable. Have the students look for patterns in their observations. Date the grid before photocopying. Make a transparency for easier guided practice and class discussion. (Task 4 may be better as combined with this task on a daily basis rather than a separate task.)

PAPER PLATE MOONS

This activity is designed to:

a. Help students better understand why the Moon doesn't always look the same.

After completing this activity, the students will be able to:

a. Understand that the reason the Moon looks different to us at various times during the month is because of the location of the Moon and Earth in relationship to the Sun.

Vocabulary and definitions:

a. Earth - the planet third closest to the Sun where we live.

b. Moon - an object in space one quarter the size of the Earth. It travels around this planet at a distance of 240,000 miles.

c. Phase - one of a series of changes which may be shown by a planet or moon.

d. Sun - the star closest to the Earth. Its light gives us daytime on Earth. This sunlight also provides the illumination to the Moon. The Sun is about 93,000,000 miles from Earth.

Preparation:

a. Have each of the students in the class take a plain white paper plate home the night before the lesson and, weather and cloud cover permitting, have each student color the plate so that it would look similar to the way the Moon looked that evening.

b. Read the children a story about real astronauts visiting the Moon.

a. 8 white paper plates

b. pencil

c. black poster paints

d. paint brushes

Procedure:

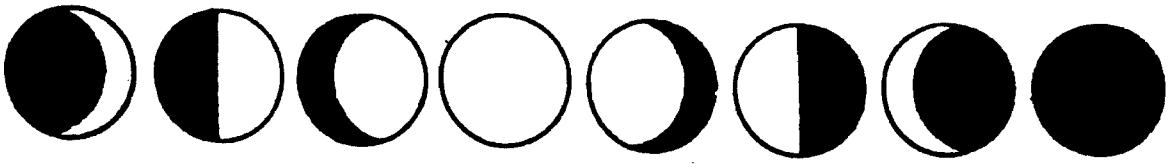
I do this.

a. Select a small group of students to prepare the paper plate Moon phases shown below. Have them draw the outline of the Moon's bright area with pencil and then color in the dark area with black paint.

b. Have eight students sit in a circle. Have them face out away from the circle. Let this circle of students be the Earth. Pretend that a window in the room is the Sun.

c. Mix up the Moon plates and pass them around the circle of students. The students are to look at each plate as it comes to them. When they find one plate which they think shows how the Moon would look from where they are located on the Earth they are to keep that plate, and place it on the floor in front of them.

d. When all of the plates have been chosen then the students are to stand up and look at the plates selected by the other students.



Evaluation

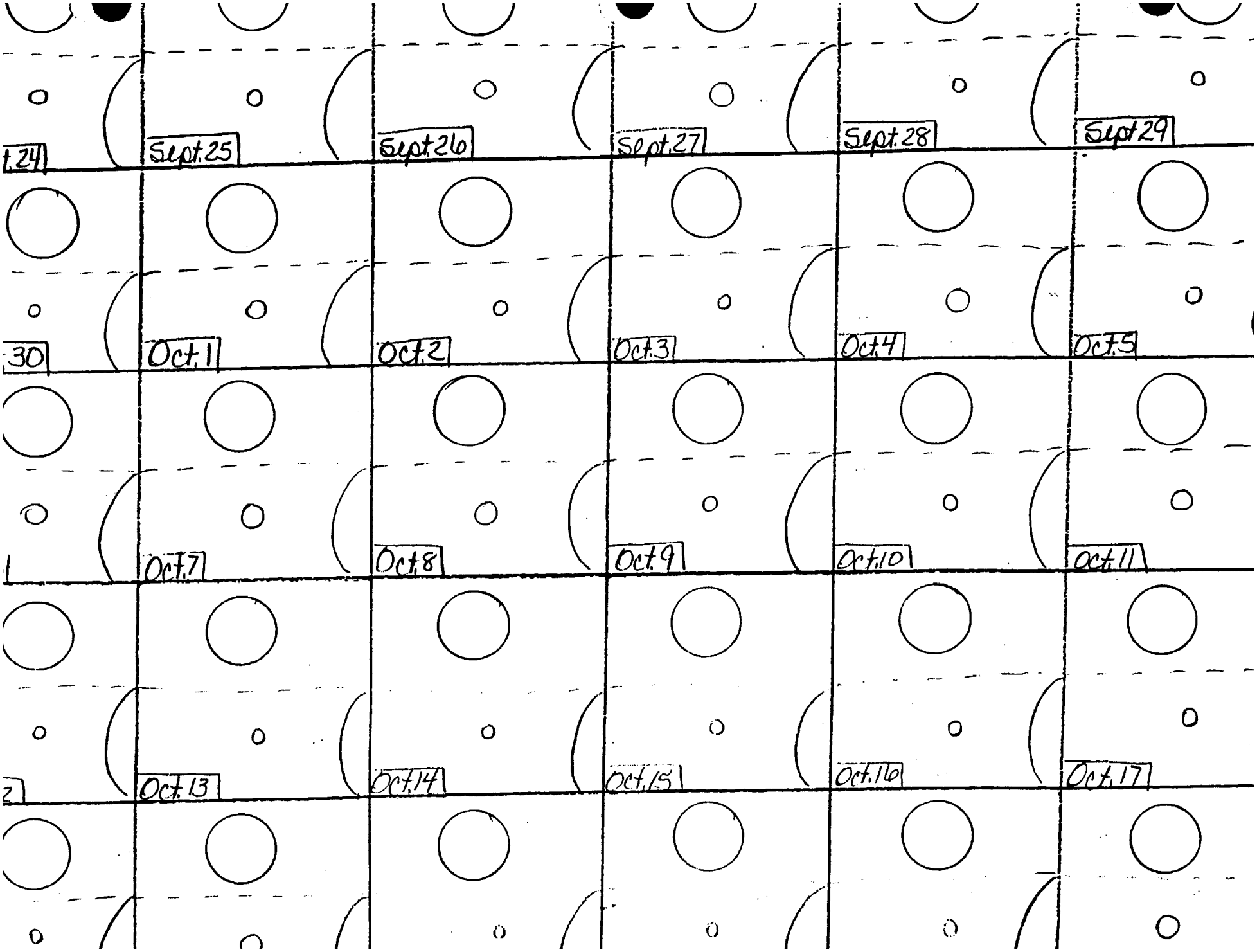
a. Are all of the Moon phases (paper plates) in their prope places around the circle ? If not, how can you convinc the person who selected that plate that they are wrong?

b. How much of the Moon would the student in the circl sitting closest to the "Sun" be able to see? Why?

Extending Thoughts

a. When the Moon is only half lit by sunlight it is called "quarter Moon". Why is this name used? What would b some other good names for the other phases of the Moon?

b. What do you think could happen to the way the Moon look to us if the Earth was directly between it and the Sun?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Oct.15
Oct.16
Oct.17

Task 4

Using the attached directions and gathered materials, the student will construct a flip-type moon phase calendar. The student may use this calendar to reinforce the nightly viewing of the moon and to help record phases on the evenings that the moon is not visible. (This is a new activity for me...I have not tried this yet, but wanted to share with you anyway. The kit is available from *Science Kit & Boreal Laboratories*. It costs about $64 and includes everything needed to produce 31 calendars. It may be better to do an image each day over the period of one month rather than trying to construct it all in one day. I added the description of each day to the back of each image card.)

Day 1 New moon

Not seen

Day 2 Waxing crescent

Early afternoon through evening

Day 3 Waxing crescent

Early afternoon through evening

Day 4 Waxing crescent

Early afternoon through evening

Day 5 Waxing crescent

Early afternoon through evening

Day 6 Waxing crescent

Early afternoon through evening

Day 7 Waxing crescent

Early afternoon through evening

Day 8 First quarter

Afternoon until about midnight

Day 9 Waxing gibbous

Late afternoon until past midnight

Day 10 Waxing gibbous

Late afternoon until past midnight

Day 11 Waxing gibbous

Late afternoon until past midnight

Day 12 Waxing gibbous

Late afternoon until past midnight

Day 13 Waxing gibbous

Late afternoon until past midnight

Day 14 Waxing gibbous

Late afternoon until past midnight

Day 15 Waxing gibbous

From sunset until sunrise

Day 16 Full moon

Late afternoon until past midnight

Day 17 Waning gibbous

From after sunset until early morning

Day 18 Waning gibbous

From after sunset until early morning

Day 19 Waning gibbous

From after sunset until early morning

Day 20 Waning gibbous

From after sunset until early morning

Day 21 Waning gibbous

From after sunset until early morning

Day 22 Waning gibbous

From after sunset until early morning

Day 23 Waning gibbous

From midnight until late morning

Day 24 Last quarter

From after sunset until early morning

Day 25 Waning crescent

Past midnight through morning

Day 26 Waning crescent

Past midnight through morning

Day 27 Waning crescent

Past midnight through morning

Day 28 Waning crescent

Past midnight through morning

Day 29 Waning crescent

Past midnight through morning

Day 30 Waning crescent

Past midnight through morning

Task 5

The student will complete an open response question and a concept map on the topic of the moon.

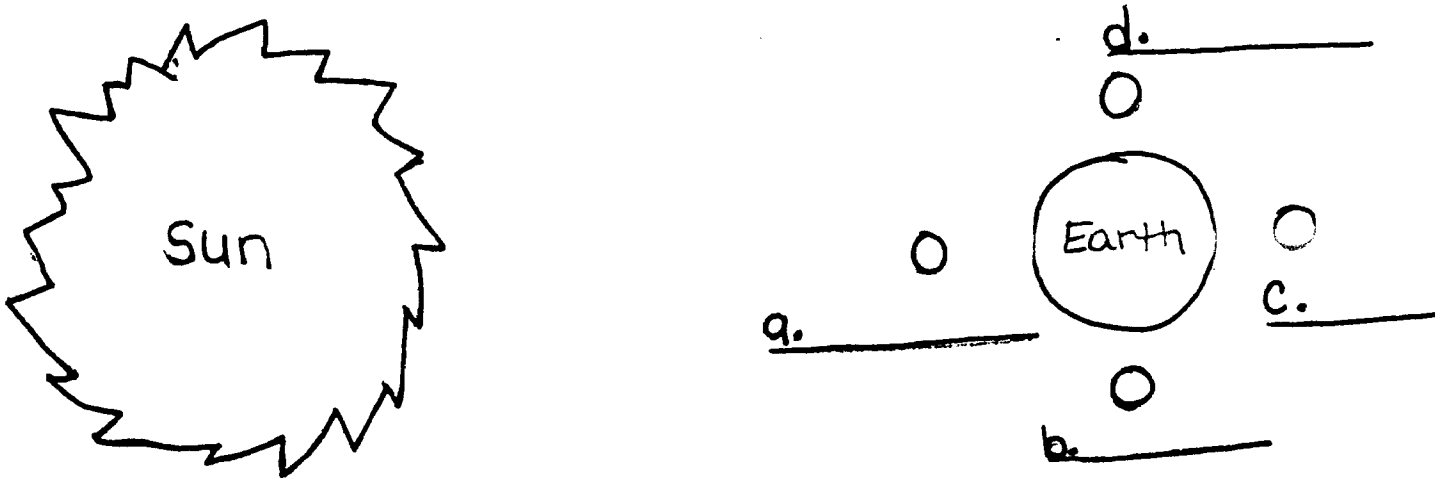
SCIENCE OPEN-RESPONSE

Write your answer in the space provided on the following page.

Now You See It, Now You Don't

The moon's light is actually light from the sun reflecting off the moon. Sometimes we cannot see all the light reflecting off the moon. It depends on where the moon is in its orbit around the earth.

Study the figure below.



a. Copy the figure onto your answer sheet. Color the dark side of the moon in each position around the earth.
b. Draw and label each of these four phases of the moon as we would see them from earth.
c. Explain why the shape of the moon appears to change each night.

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Scoring Guide
Now You See It, Now You Don't

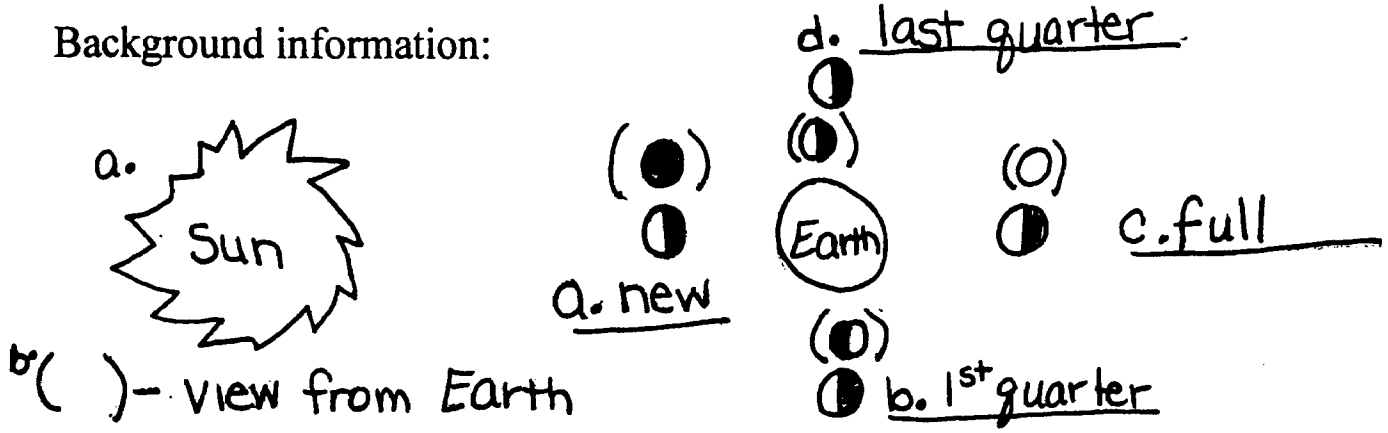
4: The student correctly colors in the dark side of the moon in each of the four positions and correctly draws andlabels each phase. The student thoroughly explains the cause of phases of the moon.

3: The student correctly colors in the dark side of the moon in 3 positions and correctly draws and labels each phase. The student's explanation is complete, but may have minor errors or omissions.

2: The student correctly colors in the dark side of two of the moons and correctly draws and labels them, or correctly colors, but does not draw and label. The explanation for part C is weak, incomplete or with major omissions.

1: The student correctly colors and/or draws and labels one of the moons. The explanation for part C is incorrect.

Background information:



C. The phases of the moon are due to the position of the Sun, Earth and moon at any given time. Half of the moon is always lit, but a different amount of the lit side is visible from earth at different positions in its orbit. They're <u>not</u> caused by the earth casting shadows on the moon. These changes occur in a cycle of about 29 days and therefore can be predicted.

MOON

1. THE MOON IS A NATURAL SATELLITE OF EARTH.
2. ITS AVERAGE DISTANCE FROM EARTH: 238,328 MILES.
3. THE MOON HAS ONLY ONE-SIXTH OF EARTH'S GRAVITY.
4. THE MOON'S DIAMETER: 2,155 MILES.
5. TEMPERATURE ON ITS SURFACE: EITHER HOT OR COLD.
6. THE MOON HAS NO MAGNETIC FIELD.
7. IT HAS LIGHT AND DARK AREAS, CALLED HIGHLANDS AND SEAS.
8. IN THE PAST, HUGE METEORITES BOMBARDED THE SURFACE AND LEFT HUNDREDS OF THOUSANDS OF IMPACT CRATERS.
9. THE MOON PASSES THROUGH PHASES AS IT TRAVELS AROUND THE EARTH.
10. HUMAN BEINGS HAVE LANDED ON THE MOON SIX TIMES.
11. ROCK AND SOIL SAMPLES RETURNED TO EARTH: 842 POUNDS.
12. FOUND: NO LIFE, NO WATER, NO OXYGEN.
13. THE MOON HAS ALSO BEEN STUDIED BY UNMANNED RANGER, SURVEYOR, LUNAR ORBITER, AND RUSSIAN LUNA LANDINGS.
14. HIGH AND LOW TIDES ON EARTH'S OCEANS ARE AFFECTED BY THE MOON'S GRAVITATIONAL PULL.
15. WHERE DID THE MOON COME FROM? NO ONE KNOWS THE ANSWER.
16. SYMBOL: A CRESCENT MOON.