FOSS Planetary Science
Lab Notebook

Student sheets are printed on one side of the paper so you can remove a page and put it in a binder. The backs of the pages are printed with a grid where you can take notes, make drawings or calculations, or graph results of investigations.

Name ____________________

Period ________ Date ____________

BIRD'S-EYE VIEWS

Record what you can see in each of the Earth images.

Elevation	Human-made structures	Natural structures
100 m above Earth (neighborhood)		
1000 m above Earth (community)		
10,000 m above Earth (area)		
100,000 m above Earth (region)		
1,000,000 m above Earth (continent)		
10,000,000 m above Earth (planet)		

Name ____________________

Period __________ Date ______________

RESPONSE SHEET—WHERE AM I?

Billy was watching his favorite TV show when the question came up, “Where do you live?” Billy didn't know, so he asked his older sister. She replied, “You live in Birmingham.”

Later Billy asked his mom the same question, to which she replied, “Honey, you live in the United States.”

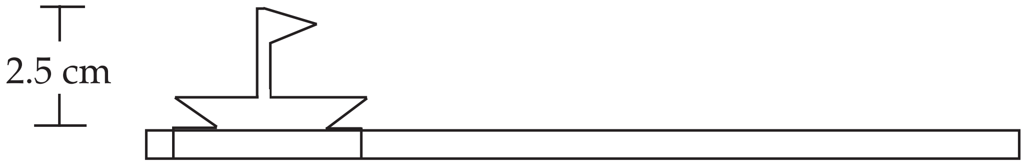
Billy was a little confused. He thought, “How can I live in two places at the same time?”

Who was right, Billy’s sister? Billy’s mom? Explain your answer.

Name ______________________________

Period __________ Date ________________

SHAPE OF EARTH



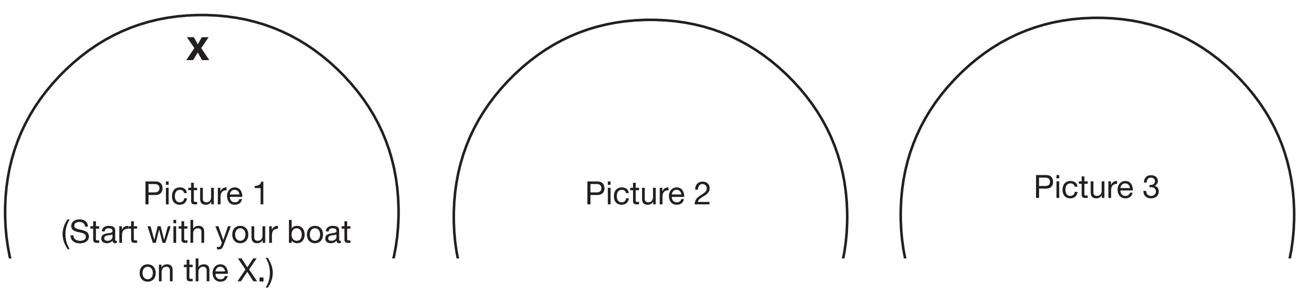
Pictures of boats sailing out to sea (directly away from you) on a flat Earth.

Picture 1 (Start with your boat on the X.)

Picture 2

Picture 3

Pictures of boats sailing out to sea (directly away from you) on a globe Earth.



Name ______________________________

Period __________ Date ________________

RESPONSE SHEET—ROUND EARTH/FLAT EARTH

Alex, a middle school student, was having a discussion with his younger brother Max. Max, a 7-year-old, insisted that Earth was flat. Alex drew a set of pictures showing a ship sailing out to sea. The ship got smaller as it sailed away from shore and then began to sink below the horizon. Max said to Alex, "See, the ship got smaller and smaller and then it started falling off the edge of Earth."

If you were Alex, what would you do or say to help Max understand how sailing ships provide evidence that Earth is round?

What other evidence could you provide?

Name ______________________________

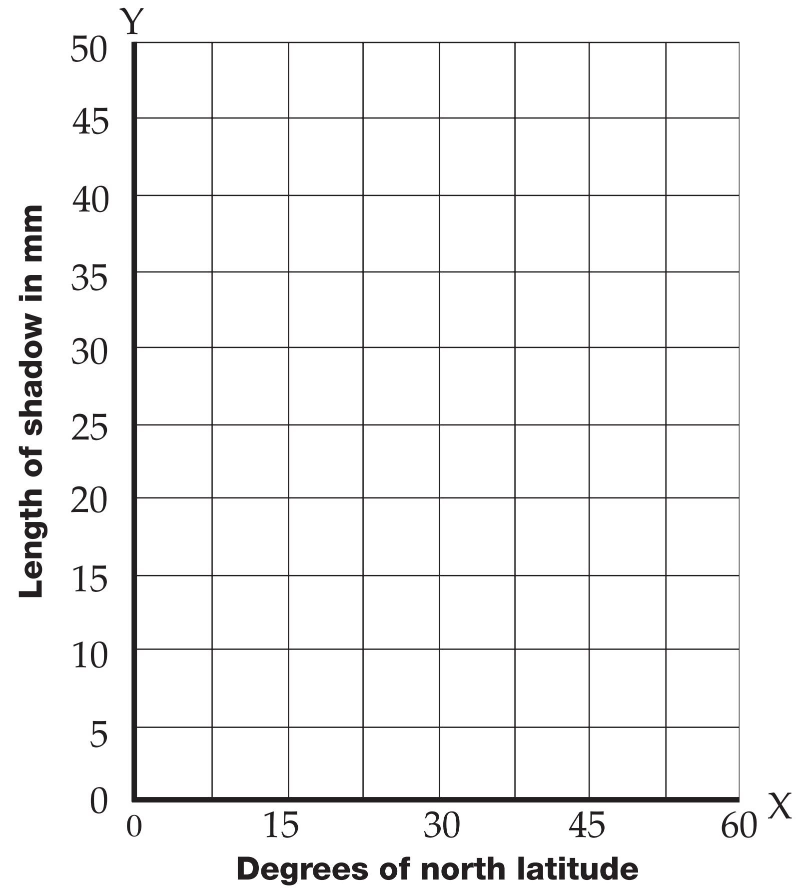
Period __________ Date ______________

SHADOW EVIDENCE

Length of Shadow on Globe Earth

Latitude	Shadow length (mm)
0° N	
15° N	
30° N	
45° N	
60° N	

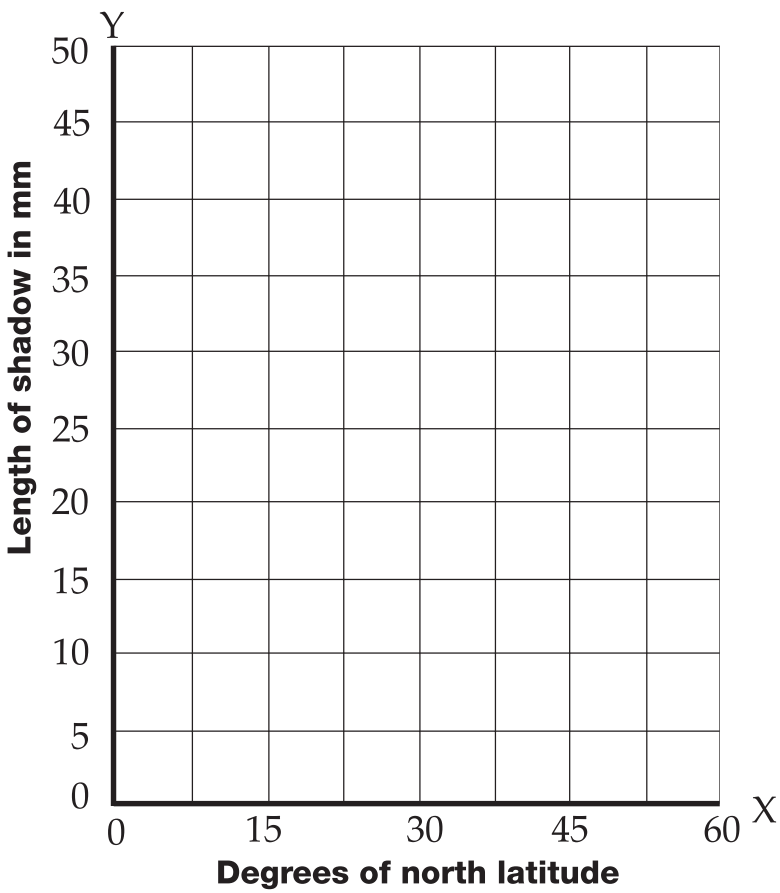
Graph of Shadow Length on Globe Earth



Length of Shadow on Flat Earth

Latitude	Shadow length (mm)
0° N	
15° N	
30° N	
45° N	
60° N	

Graph of Shadow Length on Flat Earth



DAY/NIGHT THINK QUESTIONS

1. What is day and what is night?
2. Why is it dark at night?
3. Is it day all over the world at the same time, then night all over the world at the same time? Explain.
4. At any given time, how much of Earth is in day and how much is in night?
5. Which side of Earth is in daylight?
6. How long is day and how long is night?
7. If Earth were made of glass, would we still have day and night?
8. How is the Sun like a lightbulb?
9. What makes the Sun “come up” and “go down”?
10. Does the Sun come up in the morning all over the world? Explain.
11. Does the Moon have day and night? Explain.
12. How long is one day and night on the Moon?
13. Does the Sun have day and night? Explain.
14. If Earth did not rotate, would there be day and night on Earth?

Name ______________________________

Period __________ Date ________________

HOW MANY HOURS HAVE YOU WORKED?

When you get paid by the hour, you need to know how many hours you worked in the week to calculate how much money you earned. Let's start with a typical day.

1. You start work at 8:00 a.m., and leave work at 3:10 p.m.
   How many hours and minutes were you at work?

2. Below is a time sheet filled out for your employer. The time you "punched in," or started work, and the time you "punched out," or stopped working, are recorded each day. You will be paid $10 per hour. Figure out the number of hours you worked in the week, and how much money you earned.

Employee Name: ______________________________

	Monday	Tuesday	Wednesday	Thursday	Friday
In	7:45 a.m.	7:30 a.m.	7:55 a.m.	8:03 a.m.	8:12 a.m.
Out	3:45 p.m.	4:30 p.m.	3:20 p.m.	4:50 p.m.	4:15 p.m.
Hours					

Total hours this week ____________

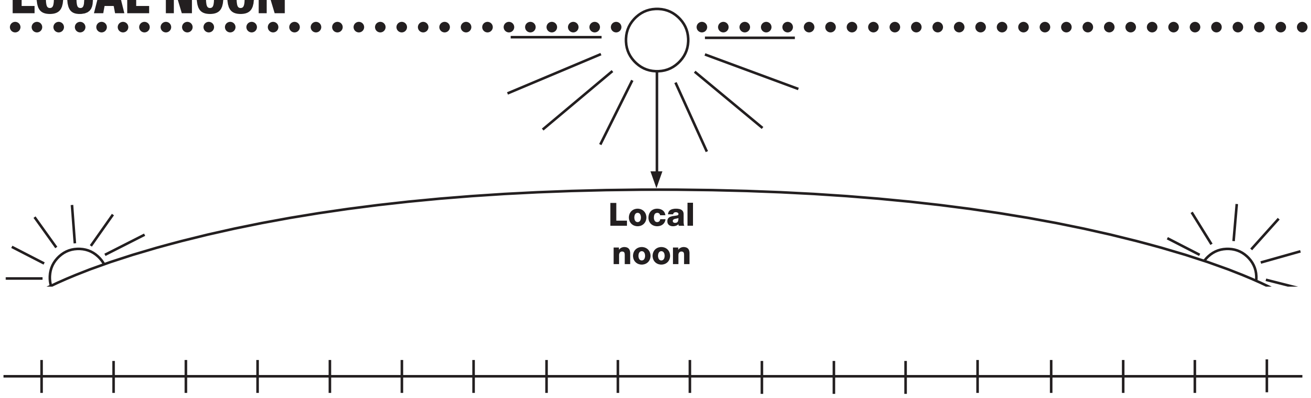
Pay for this week ________________

Show your work here.

Name ____________________

Period __________ Date ______________

LOCAL NOON



Let's say sunrise is at 7:15 a.m. and sunset is at 6:45 p.m.

1. Figure out how long the day is. In this case there are 4 hours and 45 minutes (4:45) before noon, and 6 hours and 45 minutes (6:45) after noon. Add them.

   4:45 + 6:45 = 10:90 This day is 10 hours and 90 minutes long, or

   11 hours and 30 minutes.

2. Divide the day in half.

   11:30 = 10:90 (10 hours and 90 minutes)

   10:90 ÷ 2 = 5:45 (5 hours and 45 minutes)

3. Calculate local noon. Local noon is halfway between sunrise and sunset, or in this case, 5 hours and 45 minutes after sunrise. Add 5:45 to the time of sunrise to find local noon.

   Local noon is 5:45 + 7:15 = 12:60 or 1:00 p.m.

Hint 1: It may be easier to calculate the duration of a day if you first convert standard time to military time. Thus 5:00 p.m. becomes 17:00.

Hint 2: Time is *not* the same as the decimal system. One in the hours column is equal to 60 in the minutes column.

Figure out local noon for the following sunrise and sunset times. Show your work.

	Local noon
Sunrise = 6:00 a.m. Sunset = 6:00 p.m.	
Sunrise = 5:28 a.m. Sunset = 7:02 p.m.	
Sunrise = 8:02 a.m. Sunset = 4:35 p.m.	

Name ______________________

Period ________ Date ______________

THINKING IN TIME

Answer questions a–d

a. Which way is Earth rotating (when viewed from above the North Pole)?

b. Where in the United States does the Sun first rise? Where does the Sun set last?

c. How many time zones are there on Earth? How many time zones are there in the United States? How many hours difference is there in the United States?

d. The whole Earth has 360° of longitude, like a circle. It takes 24 hours for Earth to turn once on its axis. How many degrees of longitude does the Sun appear to move *each hour,* if it moves 360° in 24 hours?

Answer the two questions in <u>one of the groups</u> below.

Group 1

1. How many hours separate Boston (East Coast) and Los Angeles (West Coast)?

2. A friend in San Diego wants you to call her at 8:00 p.m. California time. You are in Miami. What time will it be in Miami when you place the call?

Group 2

3. Where is it 9 hours earlier than it is in Dallas? Give one Northern Hemisphere and one Southern Hemisphere example.

4. If days had 36 hours, how many degrees of longitude would each time zone be?

Group 3

5. The east coast of Brazil and the entire country of Argentina are in the same time zone. When the Sun comes up on the east coast of Brazil, it is 5:30 a.m. What time would you guess the Sun would come up in central Argentina?

6. It's vacation time! What time should you place a call in Hawaii so that your granny can receive the call at 6:30 p.m. in Chicago?

Group 4

7. Sunrise today in Salt Lake City was 7:15 a.m. Would you expect sunrise to be earlier or later in Denver? Why?

8. If a day had 18 hours instead of 24 hours, how many time zones would there be around the world? How many degrees would each time zone have?

Bonus question

9. Where is the first sunrise on Earth each day?

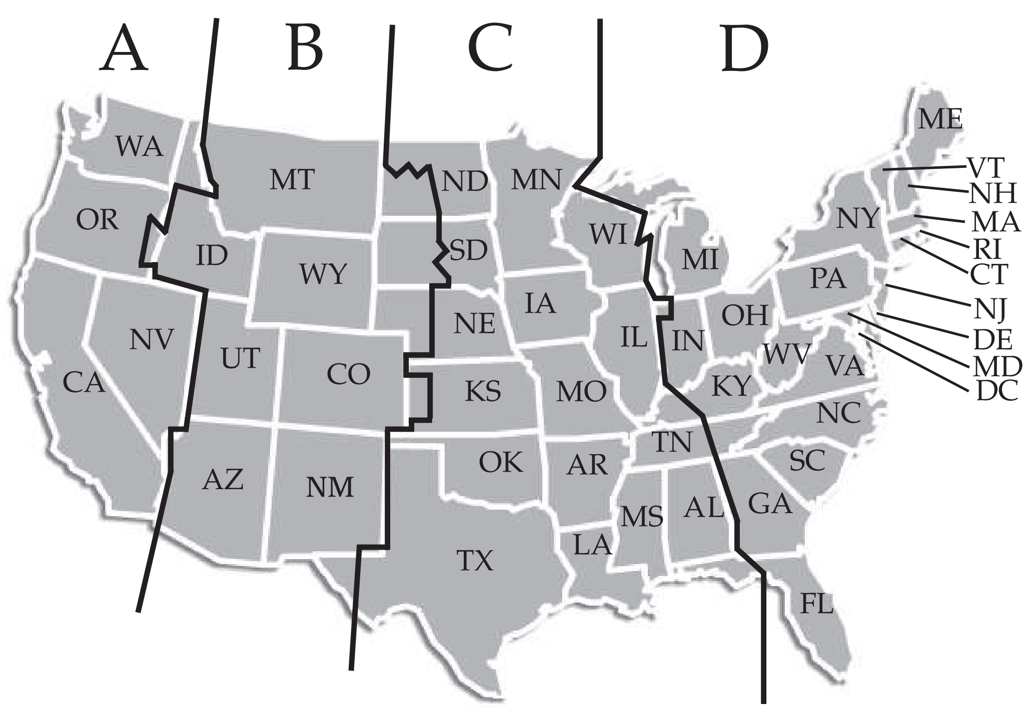
Name ____________________

Period __________ Date ______________

TIME-ZONE HOMEWORK

Look at the map of time zones of the continental United States below, and answer these questions.

1. How many hours separate the East Coast and the West Coast?
2. Where in the country does the Sun first shine in the morning?
3. Which way is Earth turning? Indicate with an arrow on the map.
4. Find Massachusetts and Michigan. Which state will see the Sun first? Why?
5. Sunrise today in Oakland, CA, was at 7:15 a.m. Would you expect sunrise to be earlier or later in Nevada? Why?
6. A friend in New York tells you to call at 6 p.m. New York time. What time should you place your call in your local time?
7. Why do you think we have time zones?

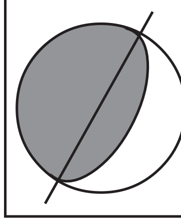


Name ____________________

Period __________ Date ____________

MOON LOG

12 | 6:10 pm



Moon log for the month of ____________________

1. Observe the Moon, day or night.
2. Record your observations, including shape and orientation.
3. Record the time of your observation.

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Name ______________________________

Period ________ Date ______________

MOON-PICTURE OBSERVATIONS

Part 1: Observe the Moon photograph carefully.
Record the interesting features.

1. ______________________________
2. ______________________________
3. ______________________________
4. ______________________________
5. ______________________________
6. ______________________________
7. ______________________________

Part 2: What two kinds of features dominate the lunar surface?

____

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Part 3: Definitions of lunar features

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Name ______________________________

Period __________ Date ________________

GROUP QUESTIONS ABOUT THE MOON

Group number ________ **Names of group members**

____

____

____

____

After discussing the Moon photograph as a group, we decided these were our five most important questions.

1. ______________________________

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2. ______________________________

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3. ______________________________

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4. ______________________________

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5. ______________________________

____

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LUNAR CRATER FORMATION

1. Get a basin with 1.5 liters of flour. This is your small area of lunar regolith.

2. Smooth the surface with a ruler or a small piece of cardboard, but do *not* pack the flour.

3. Sprinkle a *thin* layer of cocoa on the surface of the flour.

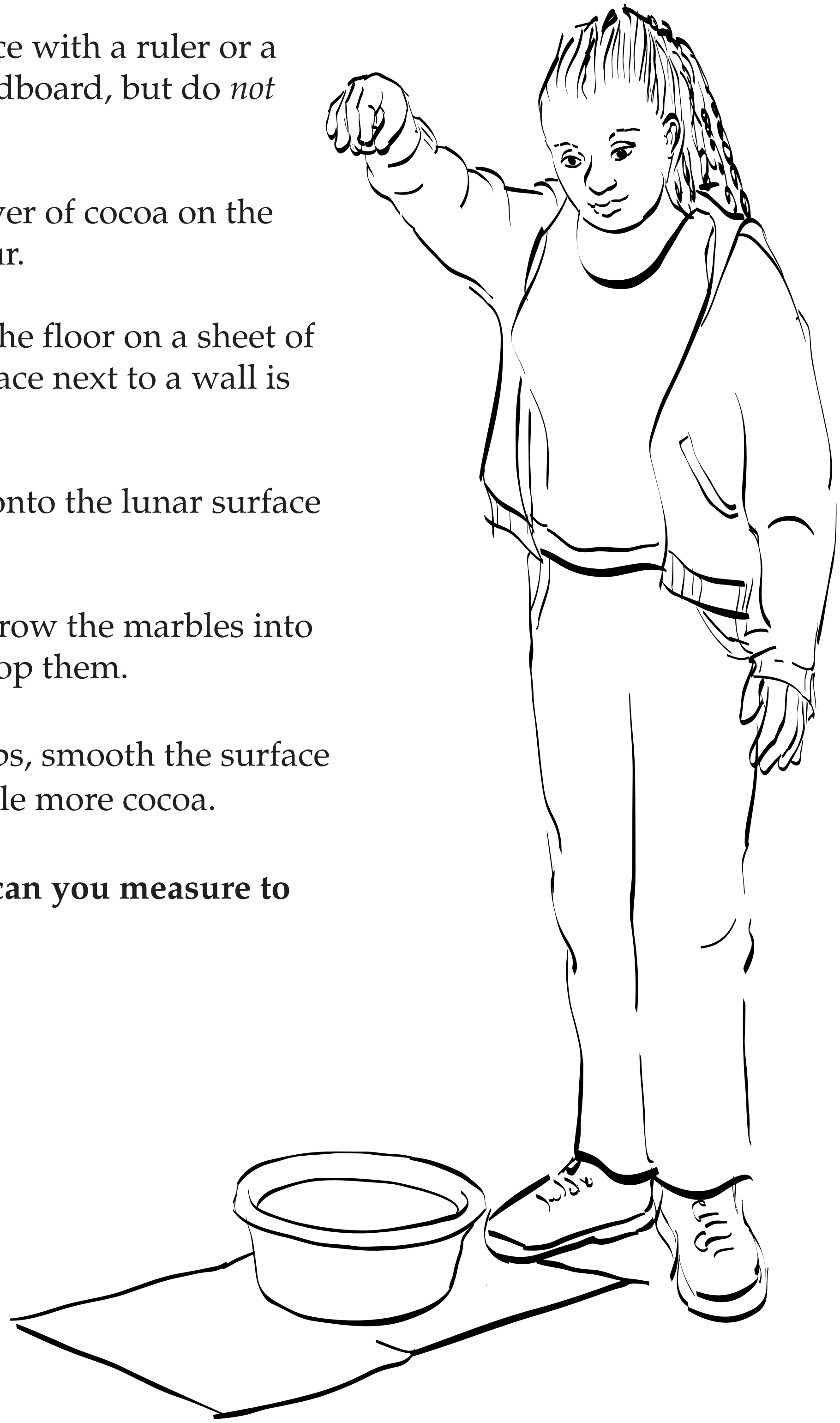
4. Put the basin on the floor on a sheet of newspaper. A place next to a wall is best.

5. Drop meteorites onto the lunar surface and observe.

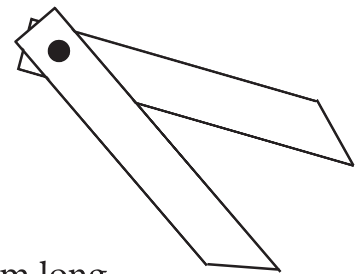
   NOTE: Do *not* throw the marbles into the flour—just drop them.

6. After several drops, smooth the surface and sprinkle a little more cocoa.

What crater features can you measure to compare craters?



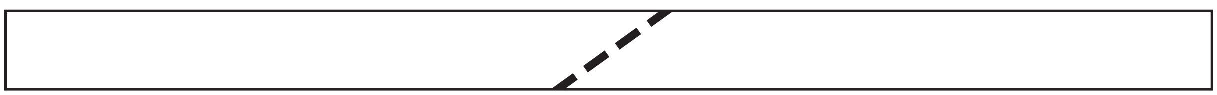
TAGBOARD DIVIDER



Make a tagboard divider as follows.

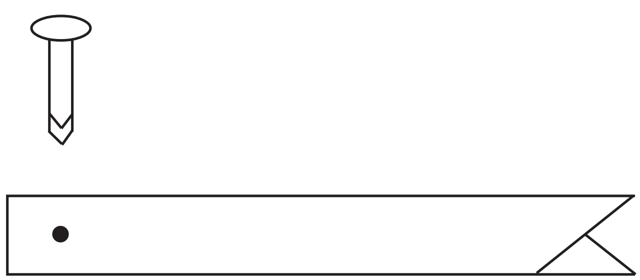
1. Cut a strip of tagboard 1 cm wide and about 20 to 25 cm long.

2. Cut the strip in half on an angle.



3. Stack the two pieces and poke a small hole through them near the squared ends.

4. Use a metal paper fastener to hold the two arms of the divider together.



5. To use the divider, open the arms until the distance between the points is equal to the length of the object to be measured. Hold the divider tightly in that position. Measure the distance between the points on a ruler.

Name ______________________

Period __________ Date ____________

MODEL IMPACT CRATERS

1. In your group, prepare the lunar surface.

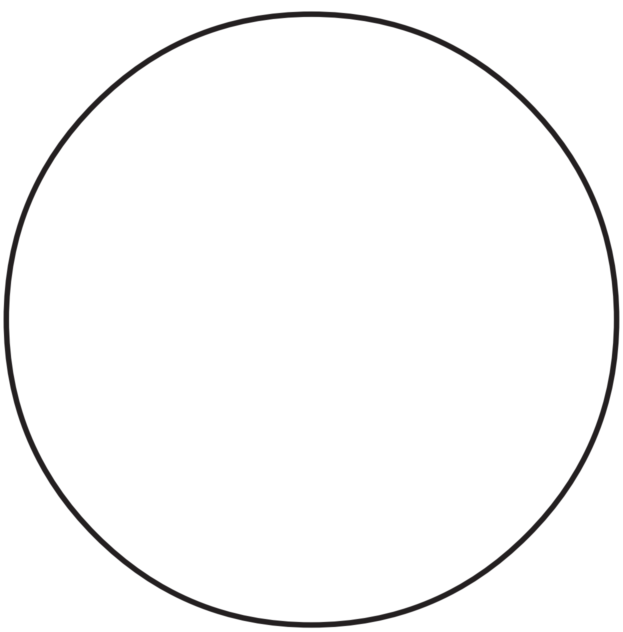
2. Drop all four marbles from different heights.

3. Measure the diameter and several rays on each crater.
   Average the length of rays.

4. *Each person* collects data in the chart below.

5. *Each person* graphs the crater diameter and ray length on the sheet called *Crater-Diameter and Ray-Length Graphs.*

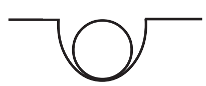
Drop height (cm)	Crater diameter (mm)	Ray lengths			Average ray	Depth of crater (above, even, below)*
50						
100						
150						
200						



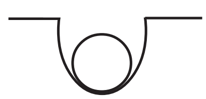
Picture of the basin with craters

* Is the marble:

Above the surface?



Even with the surface?



Below the surface?

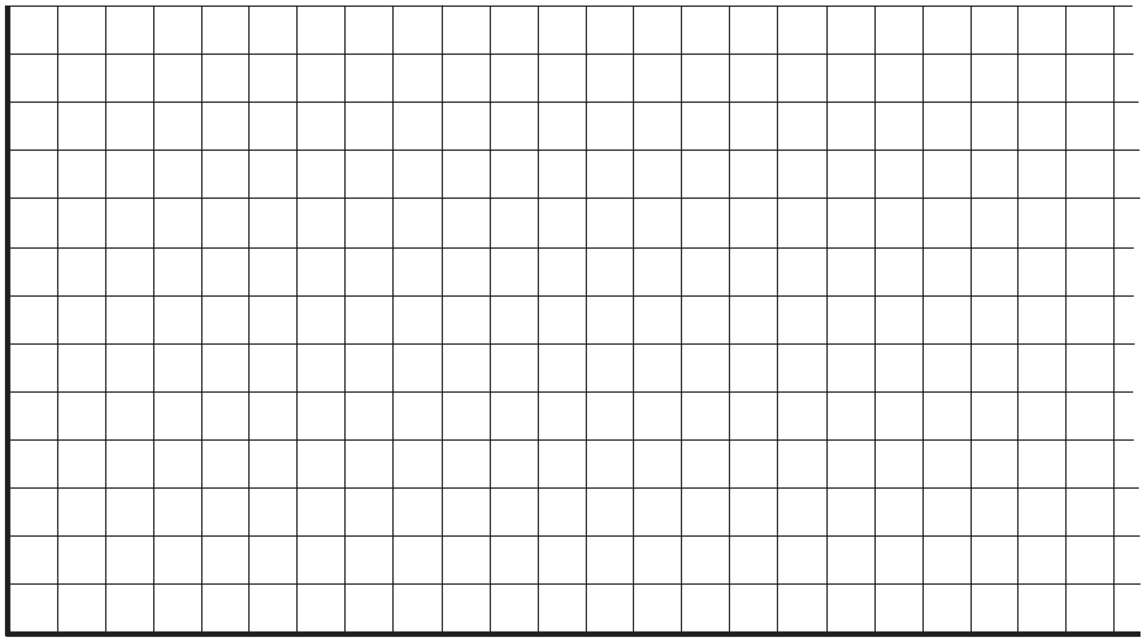
Name ______________________________

Period ____________ Date ____________________

CRATER-DIAMETER AND RAY-LENGTH GRAPHS

Y Title **Meteoroid Speed vs. Crater Diameter**

Dependent variable ______________________

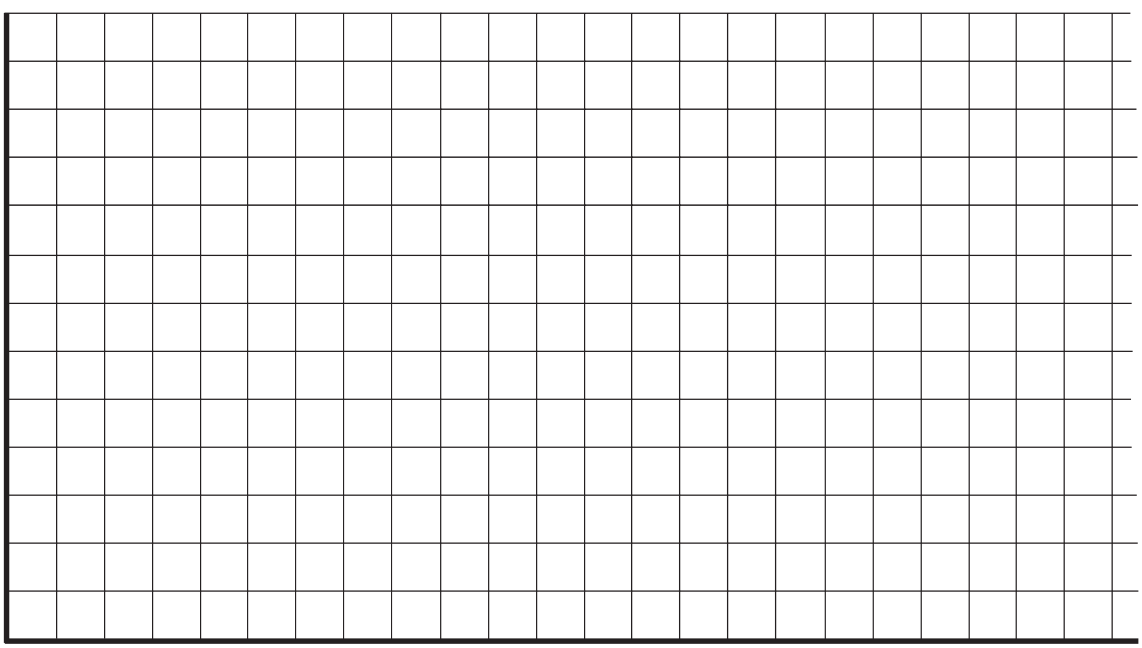


X

Independent variable ______________________

Y Title **Meteoroid Speed vs. Ray Length**

Dependent variable ______________________



X

Independent variable ______________________

Name ______________________

Period __________ Date ______________

INVESTIGATING METEOROID SIZE

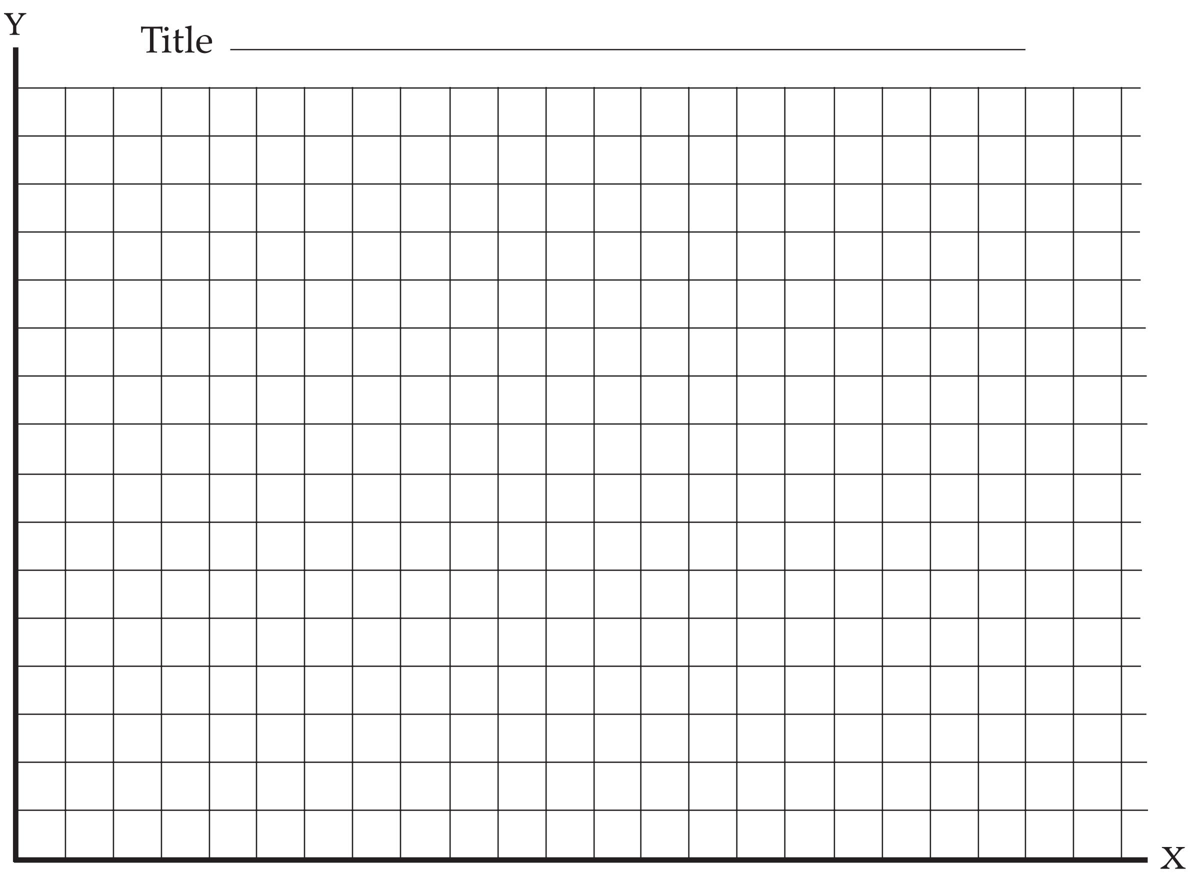
Not all meteoroids hitting the Moon are the same size. Find out how meteoroid size affects the features of craters.

1. Work in your group to design an experiment.

2. Conduct your experiment and record your data.

3. Graph your results.

Title ______________________



Dependent variable ______________________

Independent variable ______________________

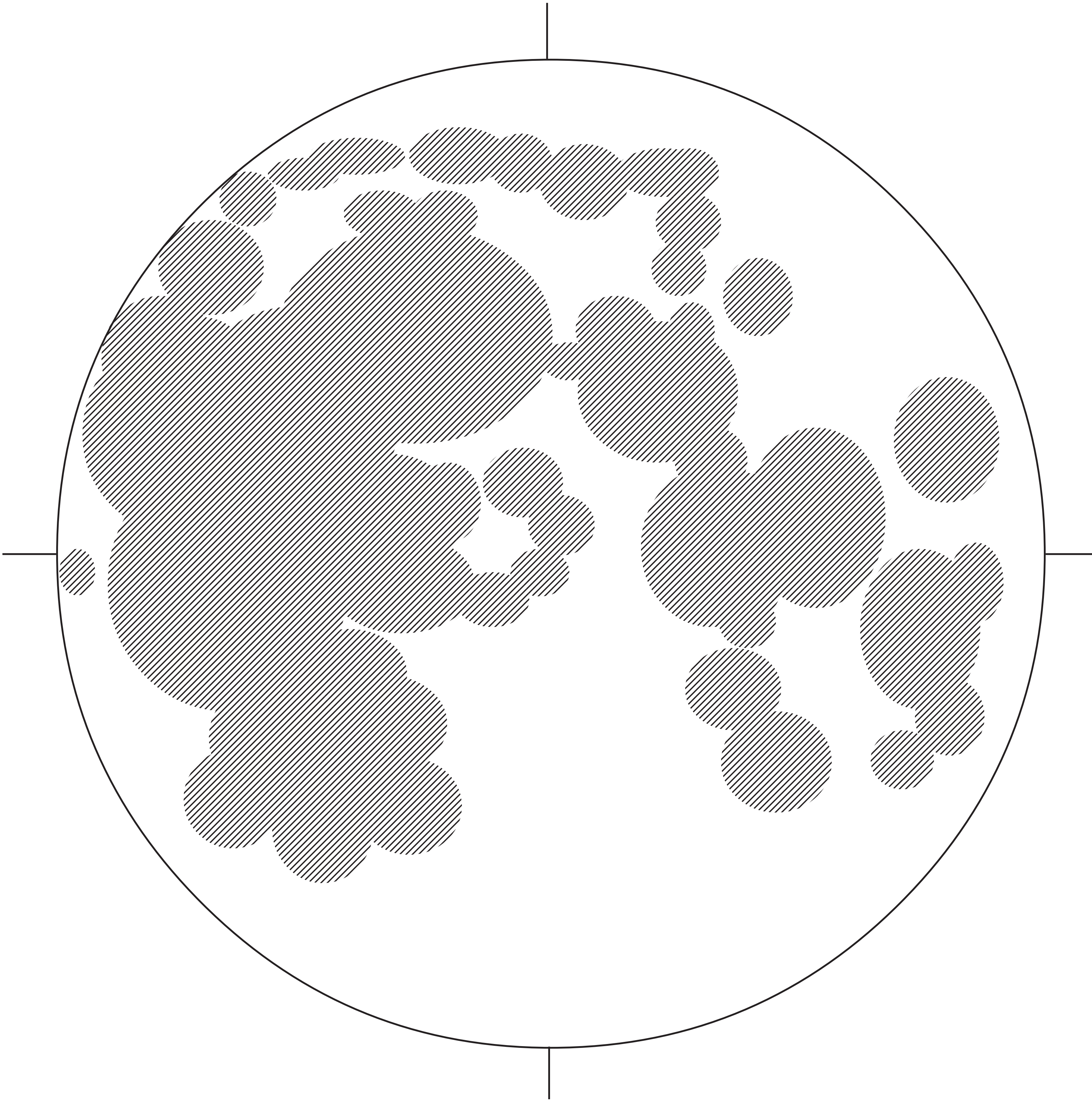
Name ______________________________

Period __________ Date ________________

ORGANIZING LUNAR CRATERS

Crater type	Picture	Description
Basin or ringed		
Tiered		
Complex		
Simple		
Flooded		

MAP OF THE MOON

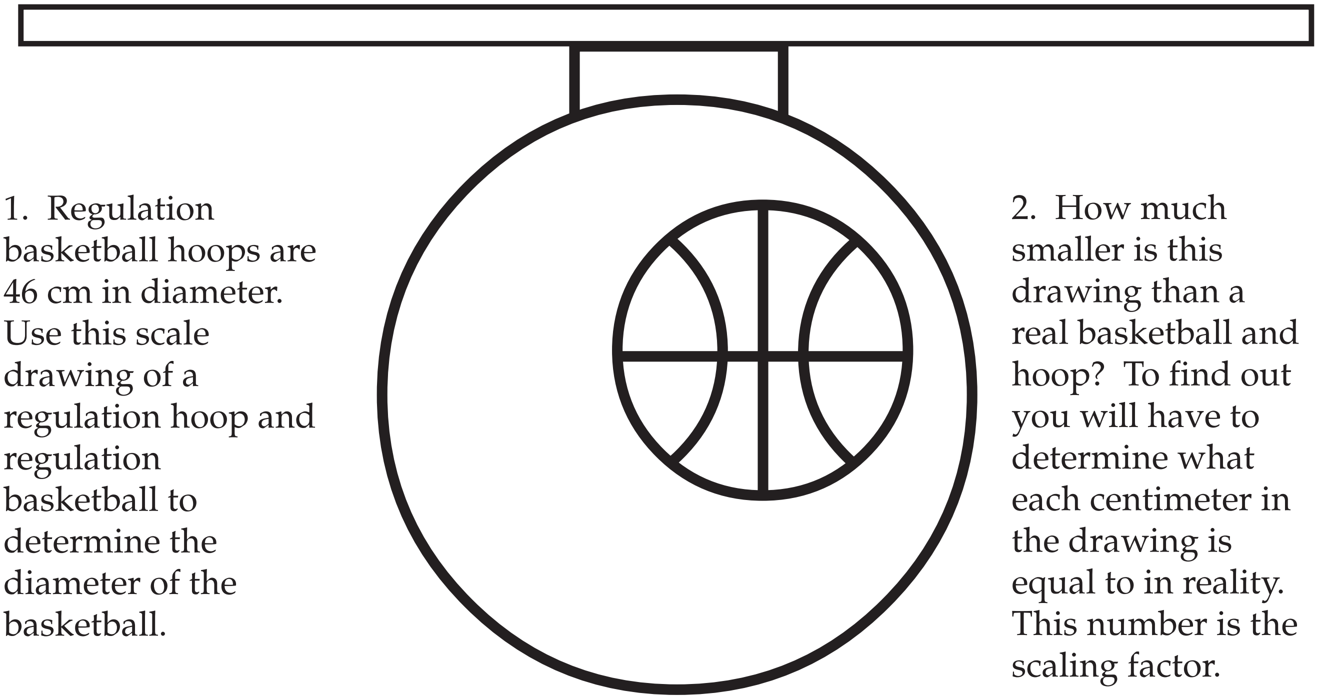


Name ____________________________________

Period ________ Date ______________________

SCALING INTRODUCTION

1. Regulation basketball hoops are 46 cm in diameter. Use this scale drawing of a regulation hoop and regulation basketball to determine the diameter of the basketball.

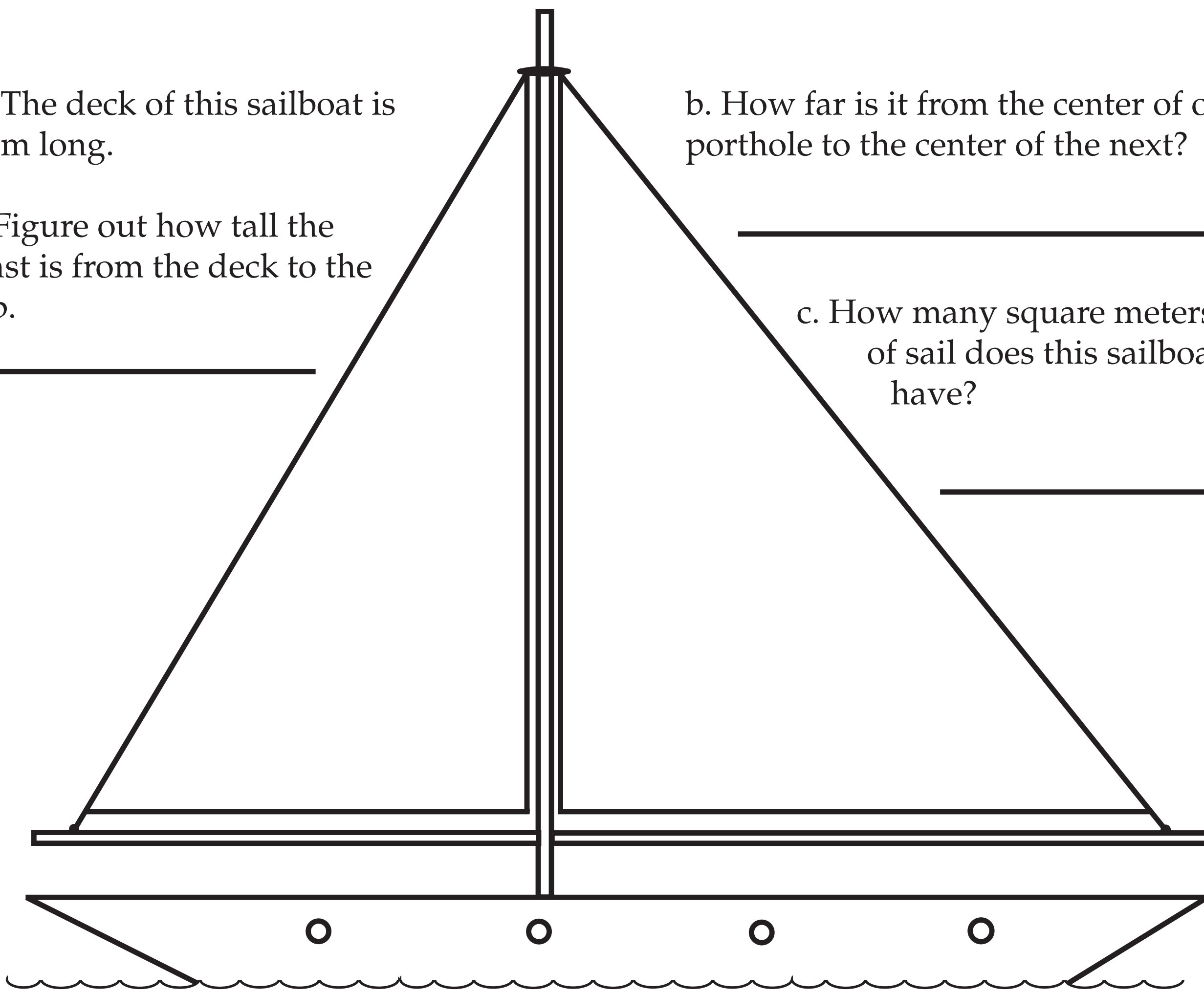


2. How much smaller is this drawing than a real basketball and hoop? To find out you will have to determine what each centimeter in the drawing is equal to in reality. This number is the scaling factor.

3. The deck of this sailboat is 16 m long.

a. Figure out how tall the mast is from the deck to the top.

____



b. How far is it from the center of one porthole to the center of the next?

____

c. How many square meters of sail does this sailboat have?

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Name ______________________

Period ________ Date ______________

SCALING WITH PHOTOS

1. You have a photo of yourself in which your image is exactly 25 cm tall.

   a. What is the scaling factor between you in real life and the image in the photo? (In other words, what is 1 cm in the photo equal to in the real world?)

   Example: Photo image = 25 cm. I am 190 cm tall in real life. $\frac{190}{25} = 7.6$

   The scaling factor is 1 cm (photo) = 7.6 cm (real life).

   b. Calculate your personal scaling factor and write it here: ______________

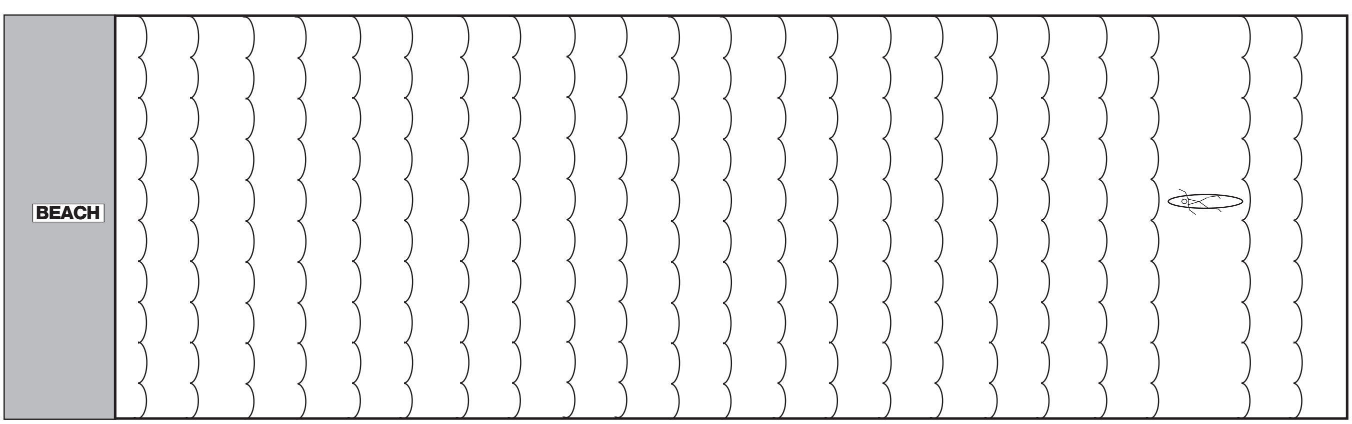
2. The yearbook committee would like to put the photo in the yearbook, but they have only enough room for a photo in which your image is 10 cm tall.

   a. What is the scaling factor between the photo that will appear in the yearbook and the photo you have in hand? ______________

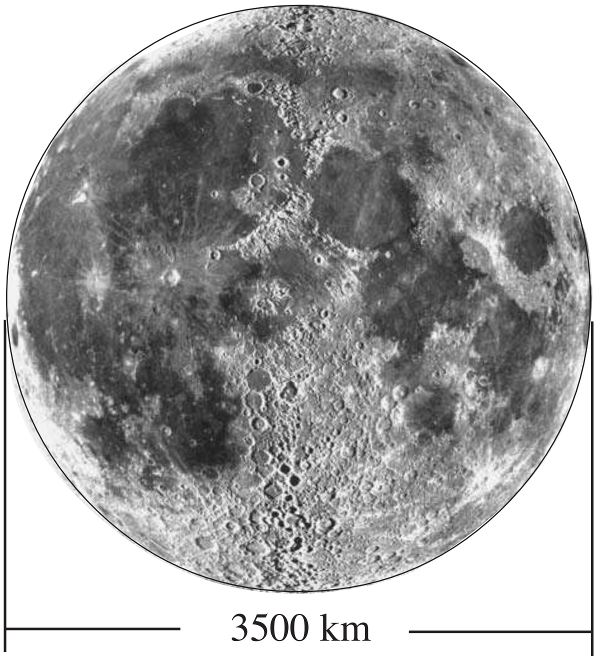
   b. What is the scaling factor between the photo that will appear in the yearbook and you in real life? ______________

3. Shelby got a new surfboard that was 2.5 m long. Here is an aerial photograph of her out in the ocean waiting for a wave. How far is she from the beach?

   Scaling factor ____________ Distance to the beach ______________



SCALING MOON FEATURES



The real Moon is 3500 km in diameter.

How do I find the diameter of a Moon crater?

1. Calculate the scale of the Moon image seen on a Moon poster.

   a. Measure the diameter of the Moon image. Let's say the image of the Moon on your Moon poster is 62 cm.

   b. Think: 62 cm on the image is equal to 3500 km on the Moon.

   $$62 \text{ cm} = 3500 \text{ km}$$

   c. Think: Each centimeter on the image is equal to some number of kilometers on the real Moon.

   d. Divide both sides of the equation by 62. $\frac{62 \text{ cm}}{62} = \frac{3500 \text{ km}}{62}$ 1 cm = 56 km

2. Calculate the size of a crater (or other feature).

   a. Measure the diameter of the crater on the Moon poster in centimeters. On the poster Copernicus measures 1.5 cm.

   b. Multiply the measured diameter (1.5 cm) by 56. (Remember, each centimeter on the image equals 56 km on the Moon.)

Name ______________________________

Period __________ Date ________________

MAJOR SURFACE FEATURES OF THE MOON

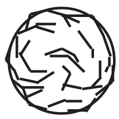
Craters	Diameter (km)	Maria	Diameter (km)
Copernicus		Sea of Rains	
Plato		Ocean of Storms	
Archimedes		Sea of Clouds	
Kepler		Sea of Fertility	
Tycho		Sea of Tranquility	
Ptolemaeus		Sea of Crises	
Theophilus		Sea of Serenity	
Posidonius			
Aristoteles			
Other craters or maria that I found and labeled			

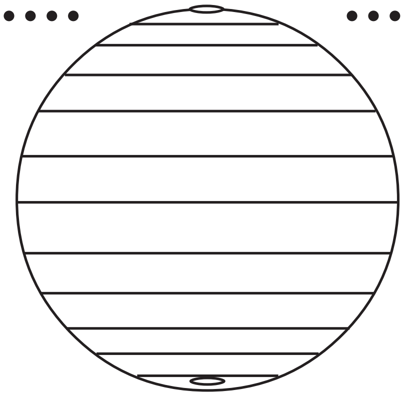
Notes

Name ____________________

Period __________ Date __________

EARTH/MOON MODEL





1. Find the diameter of Earth and the Moon, and the distance between them in *Planetary Science Resources.*

   Earth diameter = 12,756 km
   Moon diameter = 3474 km
   Distance = 384,000 km

2. Measure the diameter of the globe (model Earth): the diameter = 12 cm.

3. Set up an equation: 12 cm (diameter of model) = 12,756 km (Earth diameter).

4. What is each centimeter on the model equal to on Earth?

   Divide both sides of the equation by 12. $\frac{12 \text{ cm}}{12} = \frac{12{,}756 \text{ km}}{12}$

   $1 \text{ cm} = 1063 \text{ km}$

Moon

Another way to say this is: **The scale of the model is 1063 km/cm.**

5. Calculate the diameter of a Moon model. Each 1063 km in reality is represented by 1 cm on the model. Divide the diameter of the Moon by 1063 to determine the diameter of the Moon model.

   $\frac{3474}{1063} = 3.27 \text{ cm}$

6. Calculate the Earth/Moon distance. The same scale applies, so we divide the distance from Earth to the Moon by 1063 to determine the distance in our model.

   $\frac{384{,}000 \text{ km}}{1063 \text{ km}} = 361 \text{ cm}$

Earth

(Tiny Earth and corresponding Moon at representative distance.)

Name ______________________________

Period __________ Date ________________

RESPONSE SHEET—LANDING ON THE MOON

Two students were having a disagreement about day and night on the Moon.

One said, "Day and night on the Moon are just like on Earth. Half of the Moon is always in sunlight. As the Moon rotates, the part of the Moon that is illuminated changes, so it has day and night just like we do on Earth."

The second student said, "No, that's not right. The Moon revolves around Earth, but it doesn't rotate. It takes 24 hours for the Moon to go around Earth. Each time the Moon gets in Earth's shadow, it's night on the Moon."

If you were involved in this conversation, what would you say when it was your turn to speak?

Name ______________________________

Period ____________ Date ____________________

EVA–1: MOON ROCK SURVEY

You have been selected as part of the team that will survey and collect rocks from the Moon. You and your partner will be assigned a landing site on the Moon. You will take part in several extravehicular activities (EVAs) of the area. Because the Moon has no atmosphere and environmental conditions are harsh, you will be able to work outside your lunar lander for only brief periods of time.

Part 1: Lunar Landing-Site Description

Record the following information about your landing site, using information from the label on your Moon rock canister and the *Lunar Landing Site Chart*.

Mission name ____________________________ **Date** __________________ **Bag no.** _______

Location **Latitude** _______________ **Longitude** ____________

Type of terrain ☐ **Mare** ☐ **Highland**

Part 2: Moon Rock Survey

You will have *10 minutes* to complete this initial observation of the site. In addition to your canister of Moon rocks, you will be supplied with

- one sheet of white paper
- one hand lens

When you receive your equipment, spread the contents of the canister on the white paper. Find out as much as you can about the rocks at your landing site on the Moon.

Part 3: Thinking about Collecting Moon Rock Samples

On your next EVA you will collect *a few* Moon rocks to bring back to Earth for analysis. What rocks should you collect to provide the most information about the Moon? Work with your partner to come up with three questions that can be answered by analyzing a collection of rocks that was selected carefully. (One question might be, How many different kinds of rocks are there in your area?)

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Name ______________________

Period __________ Date ______________

EVA–2: COLLECTING SAMPLES

On your second EVA you and your partner will select rock samples to bring back to Earth. You can collect only as many rocks as can fit in your little collection vial. Collect the samples that you think will provide the most information for the scientists who will analyze the rocks back on Earth in a lunar geology lab.

Part 1: Collecting Moon Rock Samples

You will have *10 minutes* to collect a sample of the rocks at your survey site. Space is limited on the spacecraft, so choose carefully. You will be supplied with

- one canister of Moon rocks
- one sheet of white paper
- one small vial
- one pair of forceps
- one hand lens

When you have your materials, spread the rocks on the paper and select the samples that will provide the most information.

Part 2: Identifying Moon Rock Samples

When you return your samples to the lunar geology lab, you need to determine what kinds of rocks you collected. Use the *Moon Rock and Mineral Key* to identify the rocks and to add a few notes for reference. In the notes column, indicate the *most common rock* at your site.

Quantity: number of samples	Identification: name of rock or mineral	Notes: properties (color, luster, texture, etc.)

Name ____________________

Period __________ Date ____________

MOON ROCK AND MINERAL KEY

Sample		Name	Important properties	High-lands	Mare
		Pyroxene	Dark gray/green mineral. Opaque. Luster: glassy. Cleavage: breaks into pieces with flat, shiny surfaces. May fracture in splinters.		
		Ilmenite	Black to brownish-black mineral. Heavy. Opaque. Luster: metallic to submetallic. Magnetic.		
		Feldspar (plagioclase)	White to gray mineral. Translucent. Luster: metallic to submetallic. Cleavage: breaks into pieces with flat, shiny surfaces.		
		Olivine	Green mineral. Composed of rounded, sandlike grains. Luster: glassy.		
		Anorthosite	Purplish gray rock composed mostly of feldspar. Pieces of feldspar can be easily identified if the texture is coarse.		
		Basalt (fine-grained)	Fine-grained, dark-gray igneous rock without noticeable luster. Without holes.		
		Basalt (vesicular)	Fine-grained, dark-gray to black igneous rock containing many holes or cavities that once contained gas bubbles.		
		Breccia	Rock composed of fragments of other rocks melted together. Multicolored.		
		Glass	Rounded, often beadlike rock particles, usually orange. Transparent to translucent. Astronauts called it "orange soil."		
		Norite	Dark-gray to black igneous rock with small shiny surfaces.		

Name ______________________________

Period __________ Date ________________

MOON ROCK CONFERENCE DATA

Part 1: After you have identified your rocks, share your discoveries with the other team in your group that explored another area. Work together to answer the questions below and enter the data in the chart to the right. You should end up with information about the rocks found in both a highland site and a mare site.

1. Which rocks and minerals were most common in the maria?

2. Which rocks and minerals were most common in the highlands?

3. Which rocks and minerals are found only in the highlands?

4. Which rocks and minerals are found only in the maria?

	Most common rocks in...	Rocks found only in...
Highlands		
Maria		

Part 2: Work with the other team to determine which rocks and minerals are found in the highlands, which are found in the maria, and which are found in both locations. Record by making check marks in the appropriate columns.

Rock or mineral	Found in highlands	Found in maria
Pyroxene		
Ilmenite		
Feldspar (plagioclase)		
Olivine		
Anorthosite		
Basalt (fine-grained)		
Basalt (vesicular)		
Breccia		
Glass		
Norite		

Name ____________________

Period __________ Date ______________

EXPLORING DENSITY

All of the real objects and materials that we interact with in our daily adventures are made of matter. Matter can be solid and down-to-earth like rocks, cats, cupcakes, and videotapes. Matter can be liquid and hard to hold onto like water, fruit juice, shampoo, and honey. Matter can be gas, invisible and often unnoticed, like oxygen, carbon dioxide, and helium. Matter in any of its forms—solid, liquid, or gas—has a number of predictable properties. Matter always has mass and occupies space.

Mass is a measure of the amount of stuff in a sample of matter. Mass is measured in grams (g). The mass of an automobile is large, and the mass of a handful of sawdust is quite small.

Space, or **volume,** is the three-dimensional area that something takes up. It is measured in cubic centimeters (cc) or cubic meters (cm). School buildings occupy a huge volume, and a paper clip has a very small volume.

Density is a property of matter. **Density** is how close together the bits of matter are packed. For example, plastic foam cups and cotton balls are not very dense, and lead fishing weights and steel nails are very dense.

Density is defined as the number of grams of matter in a cubic centimeter of the matter. Expressed as a formula,

$$\text{Density} = \frac{\text{Mass in grams}}{\text{Volume in cubic centimeters}} = \frac{\text{g}}{\text{cc}}$$

1. Measure and record the mass and volume of the five materials in the chart below.
2. Calculate the density of each material.
3. Assign a ranking to each material, with 1 being the densest material.

Material	Mass (g)	Volume (cc)	Density (g/cc)	Density ranking
Iron				
Wood				
Pebble				
Apple				
Water				

Name ______________________________

Period __________ Date ________________

LUNAR DENSITY

Material	Mass (g)	Volume (cc)	Density (g/cc)	Density ranking
Olivine				
Pyroxene				
Ilmenite				
Feldspar				

Soon after the Moon formed, it was molten (liquid) to a depth of at least 500 km. Many kinds of materials were in the molten mixture, called a **magma ocean**—rocks, minerals, and elements.

Four of the main materials in the molten mixture were the **minerals** olivine, pyroxene, feldspar, and ilmenite. As the Moon cooled, these minerals began to crystallize and move through the molten magma. Eventually, all of the magma solidified to form the Moon's **mantle,** covered by an outermost layer called the **crust.** Think about what materials would find their way to the crust of the Moon, what materials would lie just under the crust, and what materials might be found deep in the mantle of the Moon.

1. What materials would you expect to find in the lunar highlands (crust)? Why?

____

____

____

2. What materials would you expect to find in the maria? Why?

____

____

____

3. What materials would you expect to find deep in the Moon's mantle? Why?

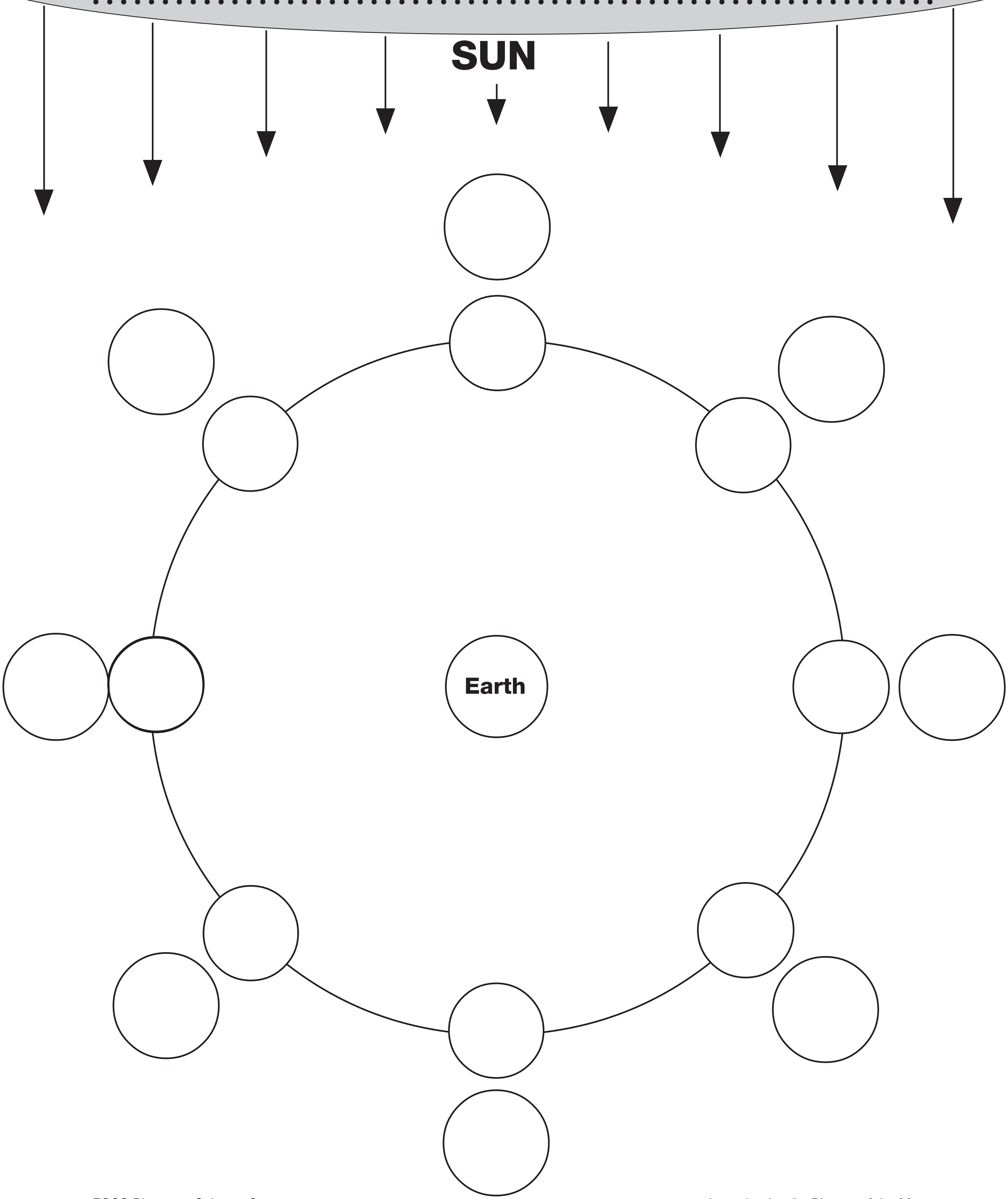
____

____

____

Name____________________ Period __________ Date __________

LOOKING AT THE MOON FROM EARTH



DIGITAL DATA—DDC–1000

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White:

AB Black: [1-6]
Gray: [7-32]
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AC Black: [1-4][13][28-29]
Gray: [5-12][14-27][30-32]
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AD Black: [5]
Gray: [1-4][6-12][16-32]
White: [13-15]

AE Black: [11-12][22-31]
Gray: [1-10][13-21][32]
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AH Black: [2][5][23-32]
Gray: [1][3-4][6-22]
White:

Block 2

AI Black: [4][8][25-32]
Gray: [1-3][5-7][9-15][18-24]
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AJ Black: [28-32]
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White: [5-6]

AK Black: [3][29-32]
Gray: [1-2][4-11][14-28]
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AL Black: [2][30-32]
Gray: [1][3][6-10][13][15-19][21-29]
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AN Black: [1-2][4]
Gray: [3][5-8][13-32]
White: [9-12]

AO Black: [4]
Gray: [1-3][5-7][9-10][14-32]
White: [8][11-13]

AP Black: [3-4]
Gray: [1-2][5-7][14-32]
White: [8-13]

Block 3

AQ Black: [2-4]
Gray: [1][5-8][18][20-32]
White: [9-17][19]

AR Black: [3-4][6-7]
Gray: [1-2][5][8][12][17-20][23-32]
White: [9-11][13-16][21-22]

AS Black: [2-4][8][22-26]
Gray: [1][5-7][9][19-21][27-32]
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AT Black: [1-2][4-6][8-9][14][18-19][21-26]
Gray: [3][7][10-13][15-17][27-32]
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AW Black: [2-7][10-18][20-24][27]
Gray: [1][8-9][19][25-26][28-32]
White:

AX Black: [1-5][11-19][23-25][32]
Gray: [6-10][20-22][26-31]
White:

Block 4

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AZ Black: [13-25][27][32]
Gray: [1-2][4-12][26][28-31]
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BA Black: [1][14-25][32]
Gray: [2-4][8-13][26-31]
White: [5-7]

BB Black: [1-3][15-24][29-30]
Gray: [9-14][25-28][31-32]
White: [4-8]

BC Black: [2-3][16-24][27][30]
Gray: [1][4-15][25-26][28-29][31-32]
White:

BD Black: [2][5][16-24][27]
Gray: [3][6-15][25-26][28-32]
White: [1][4]

BE Black: [15-24]
Gray: [1-3][8-14][25-32]
White: [4-7]

BF Black: [16-24]
Gray: [1-3][8-15][25-32]
White: [4-7]

DIGITAL-IMAGE GRID

Block 1

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Block 2

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Block 3

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AR																																	
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AT																																	
AU																																	
AV																																	
AW																																	
AX																																	

Block 4

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SOLAR SYSTEM TOURS

Your group is going into business—providing vacation tours to the planet you discovered! To bring in customers, you will need to prepare a travel brochure to generate interest.

Here are some guidelines for developing your brochure.

- Why would anyone want to visit your planet? Obtain complete and up-to-date information about the statistics (size, distance, etc.), features (craters, mountains, water, etc.), conditions (temperature, atmosphere, gravity, etc.), and points of interest on your planet.
- What activities will you be able to provide for your clients? Horseback riding, golf, and hot-air balloon rides are probably out...or are they? Put together a selection of activities.
- What should the people on your tour bring with them? Swimming suits? Skis? A good book to read? Consider technical details such as transportation, life support, food, water, exposure to radiation, atmospheric conditions, gravity, temperature, travel time, and so on. Plan what you will tell your clients that will make them feel assured that they will be safe and comfortable on the tour.
- What should a tourist pay for such an outrageous vacation, and why? Figure out how much it will cost to sign on for the adventure, and be prepared to explain the cost to your clients so they will understand what they are paying for.
- Design a travel brochure. Make a poster-size version of the brochure to present to the class. You will have only about 5 minutes for your presentation. Make sure everyone in your group has a role to play in the presentation.

Name ______________________________

Period ____________ Date ____________________

METEOROLOGIST'S REPORT

Weather issues

- Gases
- Wind
- Temperature
- Precipitation
- Unique conditions

Name ______________________________

Period __________ Date ________________

ASTRONOMER'S REPORT

Astronomy issues

- Size
- Density
- Distance
- Rotation
- Revolution
- Moons
- Gravity
- Sunlight
- Rings

Name ______________________________

Period __________ Date ________________

GEOLOGIST'S REPORT

Geology issues

- Surface
- Materials
- Processes
- Mountains
- Volcanoes
- Valleys

Name ______________________________

Period __________ Date __________________

HISTORIAN'S REPORT

History issues

- Discovery
- Reconnaissance satellites
- Probes

Name ____________________

Period __________ Date __________

PLANET DATA

Category		Earth	
Astronomer	Diameter		
	Density		
	Distance from the Sun		
	Rotation period		
	Revolution period		
	Number of moons		
Meteorologist	Atmospheric gases		
	Wind		
	Temperature		
	Precipitation		
	Unique features		
Geologist	Surface features		
	Materials		
	Processes that shape the planet		
	Wind		
	Water flows		
	Impacts		
	Volcanoes		
	Landslides		
	Tectonics (quakes)		
Historian	Discovery		
	Reconnaissance satellites		
	Probes		

ASESSMENT GENERAL RUBRIC

4	**The answer or task is completed correctly and demonstrates understanding of concepts and connections beyond the mastery level.**
3	***Mastery Level.*** **The question or task is complete and correct. All important information is included in the answer.**
2	**The answer or task has essentially correct elements; there are only minor mistakes, or minor pieces of information left out.**
1	**The answer or task contains related information, but has significant mistakes or misconceptions.**
0	**The student does not respond to the question or task, or gives an answer that has nothing to do with what was asked.**