Earth Science Sun Time: Tracking the Earth's Rotation Mr. Traeger

Name: $\qquad$ Period: $\qquad$ Date: $\qquad$

## Purpose

The purpose of this activity is to learn about the rotation of the Earth and how it affects the measurement of time.

## Materials

- World Map or Globe
- String
- glue
- tape
- Ruler
- pencil
- 
- scissors

Part 1: Basics of Rotation

1. What did Jean Foucalt do in 1851 to prove that the Earth was rotating?
2. What is the Coriolis Effect and how does it affect the rotation of storms and ocean currents in the three different places noted below?

| What is Coriolis Effect? | Northern Hemisphere <br> Effects | Southern Hemisphere <br> Effects | Effects on the Equator |
| :--- | :--- | :--- | :--- |
|  |  |  |  |

3. How long does it take for the earth to rotate once? What do we call this time?
4. How many degrees are in one complete rotation?
5. In which direction does Earth rotate? From east to west or west to east?
6. What kind of geometric shape is the Earth?
7. What geometric shape do you see when you look down upon the Earth from the North Pole?
8. The circumference of a circle is $2 \pi r$. If the radius of the Earth is 6378 Km , then what is the circumference of the Earth at:

| The North Pole? | The Equator? |
| :--- | :--- |
|  |  |

9. How fast is the Earth moving (in Km/hr) at: (Speed $=2 \pi r /$ time $)$

| The North Pole? | The Equator? |
| :--- | :--- |
|  |  |

## Part 2: Measuring Time

1. In what direction ( $N, E, S, W$ ) would you look to see the sun rise on the equinox? Where would you look to see it set on the equinox?
2. In what direction (N, E, S, W) would you look to see the sun at mid-day today in La Cañada? How about in Cape Town, South Africa?
3. What is the purpose of time zones?
4. What is the purpose of Daylight Savings Time (ie: moving our clocks ahead in spring and moving them back in the fall), besides messing up our biological clocks?
5. How many time zones are in the world?
6. How many degrees of longitude are usually in each time zone?
7. At what reference line of longitude does the measurement of time zones start?
8. Does time increase or decrease as you move towards the east?
9. Look at the following times for San Diego, Los Angeles, and San Francisco on March 20, 2009. Why is there a difference in the times, given that all of these locations are in the same time zone?

|  | San Diego | Los Angeles | San Francisco |
| :--- | :--- | :--- | :--- |
| Sunrise Time | $6: 52 \mathrm{AM}$ | $6: 57 \mathrm{AM}$ | $7: 13 \mathrm{AM}$ |
| Solar Noon | $12: 56 \mathrm{PM}$ | $1: 01 \mathrm{PM}$ | $1: 17 \mathrm{PM}$ |
| Sunset Time | $7: 00 \mathrm{PM}$ | $7: 05 \mathrm{PM}$ | $7: 22 \mathrm{PM}$ |

10. This question involves the possibility of crossing of the International Date Line. Remember that you add a day when going west and subtract a day when going east. Imagine that you like to call your friends around the world on the telephone. If it is 12:00 PM here on March 20, 2009, then what day and time will it be in the following cities? The center of the Pacific Time Zone is at $120^{\circ}$ West longitude and the width of each time zone is $15^{\circ}$ of longitude. Assume that all of your friends are on Daylight Savings Time like we are. Show your work!

| City | Colombo, <br> Sri Lanka | Honolulu, <br> HI | New <br> York, <br> NY | Auckland, <br> New <br> Zealand | Baghdad, <br> Iraq | London, <br> England | Seoul, <br> South <br> Korea | Moscow, <br> Russia |
| :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- | :--- |
| Day? |  |  |  |  |  |  |  |  |
| Time? |  |  |  |  |  |  |  |  |

## Part 3: Making a Sundial Sun clock

Obtain half a manila folder, scissors, glue, 20 cm of string, and the Pocket Sun Clock pattern. Construct a sun clock as seen in the illustration below.


1. Take your sun clock outside and position it correctly by using a compass. Make sure that the string is tight and that the clock is at a $90^{\circ}$ angle. Describe what you did in order to correctly read the time.
2. How did peoples of ancient times read the time?
3. What kind of technology do we use nowadays to keep time?
4. What causes your sun clock to read different times? What are we doing?

Cut out the sun clock template as seen below. Use this to make your Sun Clock.


Use this Sun Clock if you live in: Southern California,
Southem Nevada, Arizona, New Mexico, Oklahoma,
Texas, Arkansas, Lovisiana, Tennessee, Mississippi, Ala
bama, Georgia, Forida, North Carolina, South Carolina

