

# Lines of Longitude & Latitude

## Lesson Objective & Summary

**Objective:** Students will identify the locations of cities based on their distance from the Equator and Prime Meridian. Students will calculate the time in different time zones based on a given time.

**Summary:** Students label maps and create and solve story problems that ask to calculate the time in different time zones.

## Standards & Benchmarks

- Develop spatial views and perspectives of the world, to understand where people, places, and resources are located and why they are there, and to explore the relationship between human beings and the environment. (*National Curriculum Standards for Social Studies - People, Places, and Environments*)
- Explore the relationships among science, technology, and society, and develop an understanding of past and present advances in science and technology and their impact. (*National Curriculum Standards for Social Studies - Science, Technology and Society*)
- How to use maps and other geographic representations, geospatial technologies, and spatial thinking to understand and communicate information. (*National Geography Standards, Index 1*)

## Background Information for Educators

As the world became increasingly connected through global trade routes during the 17<sup>th</sup>, 18<sup>th</sup>, and 19<sup>th</sup> centuries, it became apparent that different places had differing concepts of time, usually using sunrise, noon, and sunset as guidelines. In some places, pendulums were used to help mark time, but it was later discovered that chronometers more accurately measured time, particularly on moving ships.

As the British Empire continued to build colonies across the globe, it became necessary to create a standardized measurement for time. In 1878, Sir Sanford Fleming, a Canadian, suggested a system that divided the world into 24 time zones. In 1884, Sir Fleming's model was adopted at an international convention between 25 nations, and the Prime Meridian was established in Greenwich, England, as 0° longitude. This was due in particular to the fact that much of the world already used Greenwich, England, as the standard longitudinal starting point, thanks to the expansive British Empire's influence across the globe.

The phrase "The sun never sets on the British Empire" was coined to reflect the vast expanse of the British Empire's control across the world. To this day, much of the British Empire's influence can be seen in countries throughout the world, in most of the 24 time zones that we use today.

**Grade Level:**  
Upper Elementary

**DURATION:**  
1 Lesson

**SUBJECTS:**  
Science, Mathematics

**LESSON CREATORS:**  
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## Guiding Questions

**When and how were time zones developed?**

**What does the phrase “The sun never sets on the British Empire” mean?**

**How are time zones measured?**

**Why was “universal time” established?**

**Why is an understanding of time zones important in today’s world?**

## Key Vocabulary

**Chronometer**

**Greenwich Mean Time**

**Prime Meridian**

**Longitude**

**Latitude**

**Equator**

## Lesson Plan

1. After watching [the video](#), ask students to list new words they heard (turn and talk if possible).
2. Agree on a class definition for longitude, latitude, equator, prime meridian, degree(s) and Greenwich Mean Time.
3. Ask students to use black and white map and colored pencils to draw and diagram representations of all of the vocabulary except GMT and degree.
  - a. Teachers must choose a map that is appropriate for their age groups.
    - i. For third graders, the maps should display the degrees of lines through key cities more clearly. Maps for fifth graders can have degrees marked less frequently in order for students to be challenged to approximate measurements.
    - ii. All 24 time zones must be labeled on the maps.
4. Have each student write a brief story/scenario that explains the difference between two time zones.
  - a. e. g. Kat lives in New York. She wants to watch a soccer game on TV that starts in Seoul, Korea at 7PM, so she must watch it at 6AM in New York, NY.
5. Have each student write a brief story/scenario that explains the distance (in degrees) between two cities.
  - a. e. g. New York is 75 degrees west of the Prime Meridian.
6. Have each student write a story problem for a classmate to solve. The story problem can either be about different time zones or distances (in degrees)
  - a. E.g. Kat lives in New York and Pierre lives in Paris. If Kat calls Pierre at 3PM New York time, what time is it where Pierre lives?
  - b. E.g. In degrees, how far is Los Angeles from Chicago?
  - c. They should write the solution on the back of the story problem.

7. Once the student shows the story problem to a teacher, they share it with a classmate to solve.
8. Have students share the problem with another student.
9. Time permitting, have students write and solve another story problem using the different type of problem (degrees vs. time zone) than they used the first time.

## Assesment

### Evidence of Understanding

Students can clearly identify a line of latitude, a line of longitude, the equator and the Prime Meridian.

Students can calculate the distance (in degrees) of a city from the Equator or from the Prime Meridian.

Students can clearly identify different time zones on Earth.

| Assessment Rubric   | Below Expectations  | Meets Expectations   | Exceeds Expectations  |
|---|---|--|-----------------------|
| Identifying a line of latitude  | Student cannot label a line of latitude   | Student can label a line of latitude   | <i>not applicable</i> |
| Identifying a line of longitude   | Student cannot label a line of longitude  | Student can label a line of longitude  | <i>not applicable</i> |
| Identifying the Equator   | Student cannot label the Equator  | Student can label the Equator  | <i>not applicable</i> |
| Determining time zones when given the time in another city a line of latitude | Student cannot determine the time zone in a city when given the time in another city. | Student can determine the time zone in a city when given the time in another city. | <i>not applicable</i> |
| Calculating distances in degrees  | Student cannot calculate the distance (in degrees) between two cities.                | Student can calculate the distance (in degrees) between two cities.                | <i>not applicable</i> |

Students can calculate the time in a time zone when given a time in another zone.

## Challenge Questions

If 5<sup>th</sup> graders have learned the Pythagorean theorem, ask them to calculate the distance (in degrees) between two cities on a map. They should draw a line connecting the two cities and a right triangle with the line as the hypotenuse.

## Curriculum Connections

Students consider why countries fought over where and how the location of the Prime Meridian would be selected.