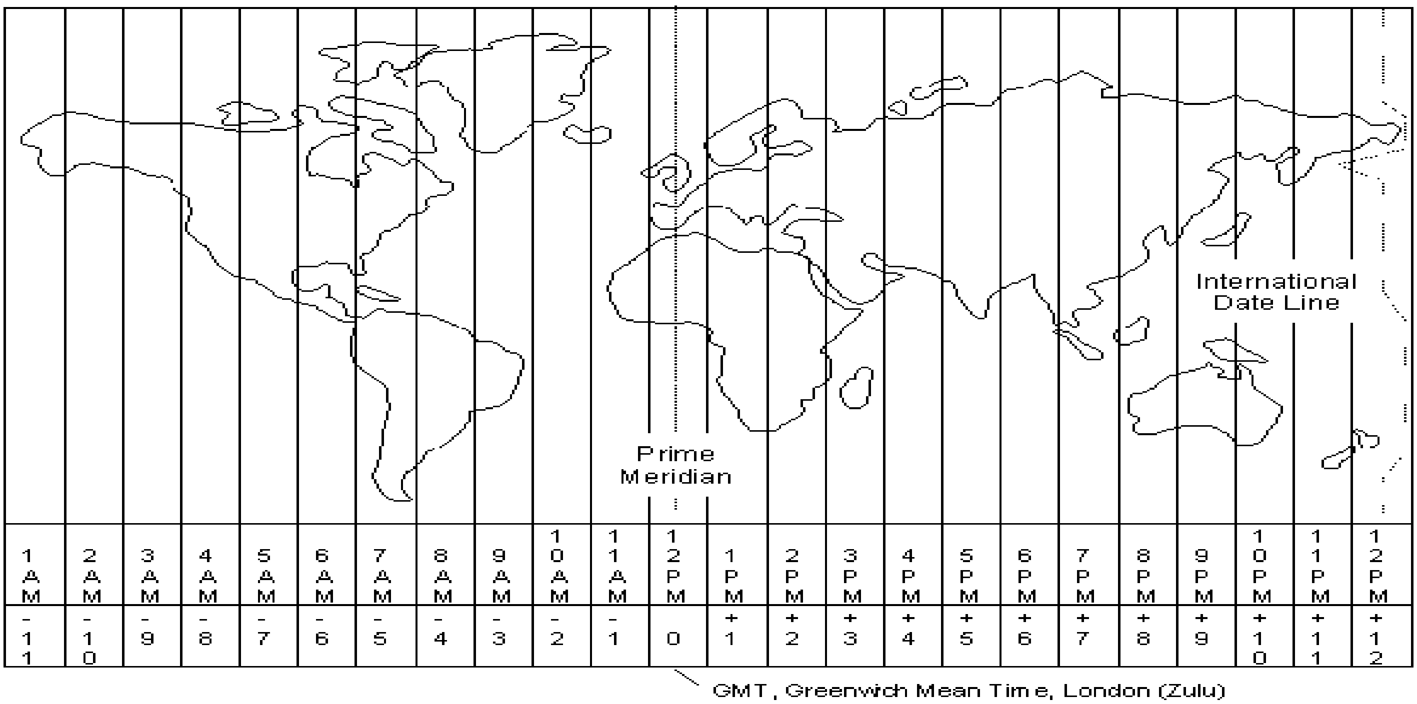

The above diagram shows the 24 time zones around the world. If you live in New York and want to call someone in San Francisco, you have to remember that the local time in San Francisco (Pacific Standard Time) is 3 hours BEHIND New York Time (Eastern Standard Time). By counting the timezones between the locations and keeping track of 'ahead' or 'behind' you can figure out the correct local times anywhere on the planet. Suppose an astronomer in Texas spots a solar flare at 6:00 AM Central Standard Time near sunrise. Meanwhile, an astronomer in India spots the same solar flare at 5:00 PM India Time near sunset.

Question 1) How can exactly the same event be seen at two different times on Earth?

Question 2) What time would an astronomer in West Africa have seen the same solar flare according to her local time?

Question 3) Would an astronomer living in Central Australia have seen the flare? How about an astronomer living in Alaska?

Question 4) Suppose a solar flare happened at 10:31 AM Greenwich Mean Time. What time would the event have happened in California according to Pacific Standard Time?

Question 5) A satellite registers a major solar explosion that lasts from 3:15 PM to 4:26 PM Greenwich Mean Time. A solar scientist monitoring the satellite data decided to go to Starbucks for a quick coffee between 7:00 AM and 7:45 AM Pacific Standard Time.

e) How long did the explosion last?
f) Did the scientist know about the flare before he left for coffee?
g) How much of the flare event did the scientist get to see in the satellite data as it happened?
h) Should the scientist have gone for coffee?

One of the most basic ideas that astronomers have to work with is the idea of the 'time zone'. When one astronomer observes a phenomenon from one place on Earth, it is often important to be able to communicate when that phenomenon occurred to another astronomer located somewhere else on Earth. To make this as easy as possible, we adopt the time of the phenomenon as it would have been observed in Greenwich England – called Greenwich Mean Time (GMT). This required converting the astronomers local time to GMT.

This activity is an exercise in adding and subtracting time, and how to use a timezone map of the world, to convert from local time to Greenwich Mean Time.

Question 1) How can exactly the same event be seen at two different times on Earth? **Answer** – Because the surface of Earth has different time zones.

Question 2) What time would an astronomer in West Africa have seen the same solar flare according to her local time? **Answer** – From the diagram and the location of West Africa, the local time would be 11:00 AM.

Question 3) Would an astronomer living in Central Australia have seen the flare? How about an astronomer living in Alaska? **Answer** – Neither would have seen it because the sun had already set (Australia) or had not yet risen (Alaska).

Question 4) Suppose a solar flare happened at 10:31 AM Greenwich Mean Time. What time would the event have happened in California according to Pacific Standard Time? **Answer** – By the diagram, PST is 8 hours behind GMT so 10:31 AM – 8hrs = 2:31 AM PST. This is well before sunrise so it wouldn't have been seen.

Question 5) A satellite registers a major solar explosion that lasts from 3:15 PM to 4:26 PM Greenwich Mean Time. A solar scientist monitoring the satellite data decided to go to Starbucks for a quick coffee between 7:00 AM and 7:45 AM Pacific Standard Time.

a) How long did the explosion last? **Answer** 4:26 PM– 3:15 PM = 1hour and 11 minutes.
b) Did the scientist know about the flare before he left for coffee? **Answer:** He left for coffee at 7:00 AM PST which is 7:00 + 8hrs = 3:00 PM GMT so he didn't know about the solar explosion which happened 15 minutes after he left.
c) How much of the flare event did the scientist get to see in the satellite data as it happened? **Answer:** When he returned to the satellite station, the time was 7:45 AM PST + 8hrs = 3:45 PM GMT. The explosion ended at 4:26 PM GMT, so the scientist got to see 4:26 PM – 3:45 PM = 41 minutes of the last part of the explosion.
d) Should the scientist have gone for coffee? **Answer.** Yes, of course! Because if he had been smart, he would have made sure that his data was being recorded for playback, just the way you use a tape in your VCR to record favorite programs you have to miss at the time they broadcast them. Also, no scientist using satellite data ever relies on on-the-spot analysis. We always record the satellite data so we can study it in detail later. Still, I'm sure after a long night at the satellite terminal, he would have loved to have been there to see it happen in 'real-time'!!