

## The Celestial Sphere: Lost at Sea

One fine autumn day in Berkeley, you are enthusiastically walking to your Astro 10 lecture (which of course you attend each and every day). However, as you're crossing Sproul Plaza, you are suddenly kidnapped by ninjas!

You awaken some unknown length of time later aboard a small rowboat floating in the middle of the ocean with only the clothes you were wearing, your watch, a small two-way radio, and a whiteboard equipped with colored pens. After much effort you finally manage to contact a rescue service on the radio... but unfortunately, they can offer you no assistance because they do not know your location and have no idea where to send a rescue plane. Can you figure out where you are based on your Astro 10 knowledge of the motion of the Moon and Sun? Use your handy whiteboard to reason it through, drawing diagrams wherever possible.

1. The first thing you want to do is get your bearings – so, using your detailed knowledge of the night sky you acquired by going to star parties, you immediately locate the star Polaris (which is at the North Celestial Pole) and note that it's ten degrees above the horizon somewhere off the stern of your boat. Which way is north?
2. What is your current latitude (angle in degrees from the equator)?
3. Unfortunately, you need both latitude *and* longitude to figure out your location, and can think of no way to reliably determine the latter. Distraught, you turn to the west, and see a quarter-Moon wistfully setting beneath the waves. Hoping to distract yourself from your imminent demise, you try to figure out whether this is a first-quarter or third-quarter moon. Which is it?
4. What is the *local* time?
5. You look at your wristwatch, and to your surprise notice that it reads 6:00 AM. Why, those no-good ninjas never gave you a chance to adjust it from Berkeley time! How many time zones do you have to adjust it to get the time accurate again?
6. As you fiddle with your watch, you suddenly realize that you have a way to figure out your longitude after all! Remembering that there are 24 time zones around the Earth (spanning all 360 degrees of longitude), how many degrees east or west of Berkeley must you be?
7. Using all the information in this worksheet, pinpoint your location on the map below.

