Please answer these questions on your own paper (not on this page -- seriously, there is not enough room to squeeze decent answers in) and please write "Problem Set #1" at the top!

Some of these questions are open-ended enough that you could write a book on them. Rest assured that I don't expect you to; a short paragraph in which you make a couple of interesting points is enough for any of them.

You are invited and encouraged to draw diagrams as part of your answers. This will make it much easier to reason out some of the questions, and to answer them clearly.

**Question #1:**
Consider Eratosthenes's experiment to measure the size of the Earth. Suppose the Earth were a smaller planet -- but the sun were still directly overhead in Syene at noon on the Summer Solstice, and it was still 500 miles from Syene to Alexandria. Would the shadow of the stick in Alexandria at noon on the Summer Solstice have been longer, shorter, or the same as it was on our Earth? Explain your reasoning.

**Question #2:**
Why do lunar eclipses always happen when there is a full moon? How can watching a lunar eclipse help you figure out the size of the moon?
Question #3:
Why was Aristarchus's measurement of the distance between the Earth and the Sun so much less accurate than his measurement of the distance between the Earth and the Moon? Would you say that his measurements of the Sun's distance accomplished anything useful at all?

Question #4:
Before his famous (or infamous) voyage from Europe to the Americas in 1492, Christopher Columbus was advised by other navigators not to attempt the trip. How did Columbus's view of the Earth differ from that of his contemporaries, and why did this make him willing to attempt a voyage that others considered suicidal?

Question #5:
You are discussing science education with a friend, who says "Science classes should focus on known facts and laws, not on mere theories. If we teach a theory at all, we should make it clear that it's not proven, and give equal time to opposing theories." Does his argument make sense to you? Why or why not?
(Food for thought: If you generally agree with what he said, is there any part you disagree with? If you generally disagree, is there any part you agree on? And finally, does the word "theory" really mean what he think it means?)

Question #6:
We discussed several impressive discoveries made by astronomers over 2000 years ago. What were some aspects of the solar system that they did NOT yet understand? What limitations prevented them from figuring these things out at the time?

Question #7:
You are trying to settle an argument between three scientists. Amy is widely acknowledged to be a brilliant researcher, and has two Nobel Prizes, but she is also famous for playing practical jokes. She says that if you roll a marble and a soda can down a hill, the marble will reach the bottom first. Bill is a younger physicist who just finished his PhD, and is known to be meticulously honest. He says that the soda can will get there first. Carl is a medical researcher who has never studied physics, but his work on heart disease has saved countless lives. He says that the soda can and the marble will reach the bottom of the hill at the same time. What is the best way to decide who is right?