

Math 208 goes to Venus

The date is March 12, 2136. Thanks to a combination of deep-sea technology and the fusion space drive, together with your outstanding knowledge of calculus (learned at UNL), you were selected by NASA to be the first human to land on Venus. In fact, you are there now!

Although you have already completed the primary scientific mission of the trip, you are not yet ready to go home. Your boss in Houston has radioed a small request to you, which must be completed before you leave the planet. He thinks (and I'm sure you'll agree) that it is essential that your country's accomplishment be recorded for all time. To please your boss, bring pride to your country, and come home, you will need to answer his questions:

“After you leave, a small flat circular plaque will be left behind at the landing site, engraved with my name and “United Worlds of America”. I am worried that it will not be resting completely flat. Please calculate the angle which it will be slanted at.”

“It is possible that in the future, NASA's budget will allow for the placement of a larger plaque, just like the small one, but having a radius of 50 meters. For this, it would clearly be desirable to create a level spot of the same size around the ship, all at altitude zero. To achieve this, how much material (in cubic meters) would we have to bring in (or ship out)?”

If you like, you may go outside to answer these questions. However, at 900 degrees (Fahrenheit) and 95 Earth atmospheric pressures, the environment might well be described as stifling. Also the floating droplets of sulfuric acid could be bad for your suit. So I'm going to politely suggest that you perform measurements from **inside** the ship.

You have one instrument for doing this: a radar gun which will tell you the altitude of any spot within one hundred meters of the ship. You just point it in the direction you want, enter the distance (from 0 to 100), and push the “measure” button. You can also operate the gun automatically from your console, by entering

<http://www.math.unl.edu/~djaffe/208/venus/fly.html>.

Your boss is basically a nice person, but also a perfectionist. He will want to see the data that you have gathered, and he will expect it to be well-organized. He will also want to see your calculations, with clear explanations (in English) of why they make sense. Think, think, think: is there a better way to explain your points?

Like you, your boss has a dictionary and uses it regularly. The very thought of an incomplete sentence makes him foam at the mouth. Please him by typing your report.

Include the names of all the crewmembers in your report, but clearly indicate who is the captain. It is possible that ships from other nations are present on the planet's surface. Do **not** use your ship's radio to consult with their crew. They might give you misleading data.

One small point to remember. The ship's cooling equipment is in decline. Each day it gets hotter inside the cabin. By **April 7**, life support will fail. You will want to finish your report by then, so you can safely return to Earth.