

# Week 7 Lecture 1

October 9, 2017

- **Stretch 35 (Pg. 103):**

- **Solution:** Surface of the earth is a three dimensional object - not two dimensional! The North Pole is the most obvious place. Otherwise, you'd be missing a side of your journey. It can't be the South Pole since unless you work for NASA, you can't fly south 100 miles from the South Pole.

- \* Another interesting solution would be to start at the South Pole and travel up a North/South line until the point where the circumference of the circle around that part of the sphere is exactly 100 miles. Now start 100 miles north of that spot. If you travel South 100 miles, you end up on the circle whose circumference is 100 miles. Travelling 100 miles east from there takes you entirely around that circle back to the beginning of the circle. Travelling north 100 miles brings you back to where you started. The key to this solution is that travelling 100 miles east gave you no net distance, ending you up where you started to travel east.
- \* Extending this further, there must also be a spot north of the South Pole where the circumference of that circle is 50 miles. Begin 100 miles north of any point on that circle. Travelling South for 100 miles brings you to that special circle, travelling 100 miles east takes you around that circle TWICE, and 100 miles North brings you back to where you started.
- \* Thus, there are an infinite number of spots on the Earth where this will work. Just find the circle of circumference  $100/n$  and travel 100 miles north of this. You will travel South to this circle, traverse the circle  $n$  times as you travel 100 miles East, and then head back 100 miles North to where you started.

- **Stretch 36 (Pg. 102):**

- **Solution:** This is a work backwards problem. You need exactly 2 quarts in the 8 quart container so you can add 5 quarts to make 7 quarts. Now proceed forwards until you see this result coming. Fill the 5-quart container, dump into the 8-quart container. Fill the 5-quart container again and empty it into the 8-quart container until the 8-quart container is exactly full. This implies you poured 3 quarts into the 8-quart container, leaving 2 quarts in the 5-quart container. Empty the 8-quart container, and pour the two quarts into it. Fill the 5-quart container and pour this into the 8-quart container. Now you have 7 quarts.

- **Ch. 6: Stir It Up**

– **Light Switches (Pg. 64)**

- \* If there were only two switches, what would you do?
- \* How can you extend to three switches? You need more information. What other information can you gather from the lamp?
- \* If the lamp is off the bulb could be warm or cold.
- \* Using this information, we come up with the following: Turn the first switch on and leave it on. Turn the second switch on for a few minutes and turn it off. Leave the third switch off. Now we visit the room: If the lamp is on, the first switch controls the lamp. If the lamp is off but the bulb is warm, the second switch controls the lamp. If the lamp is off and the bulb is cold, the third switch controls the lamp.