THE CRUSTY LOAF OF BREAD   Write-Pair-Share

Once upon a time, there lived a fisherman and his family who dwelt in the northern reaches of a far away land where summers were short and winters sometimes seemed endless. As a means of putting the long winter season to good use, as well as to satisfy the appetites of his family, the fisherman developed the art and practice of baking bread. All kinds of bread!

He baked loaves of whole wheat bread, rye bread, pumpernickel bread, oatmeal bread and barley bread, and for variety he combined some of the grains together to make seven-grain bread and nine-grain bread. He baked salt and soda breads and quick breads that were wonderfully sweet.

He even became adept at baking loaves in all sorts of shapes: rectangular, round, figure eight, triangular, and more. And then one day he baked a loaf in the shape of a perfect **hemisphere of radius 6 inches.** It was a rich, crusty loaf of bread made with a mixture of whole wheat and white flours and some sunflower seeds for extra flavor and it filled the house with a delightful aroma—the kind that beckons one to partake.

Shortly thereafter, his children came in after playing outdoors and were captivated by the heavenly fragrance of the bread. The fisherman very gently and carefully sliced the loaf into **12 slices of equal width.** The fisherman's youngest son, however, liked to eat only the crust on the very bottom of the loaf but didn't like to eat the upper crust. And so he asked has father to please give him the slice with the least amount of upper crust.

And herein lies the problem. Just which slice has the least upper crust?

Part 1
Imagine that the slices of bread are numbered from 1 to 12 from left to right as you look at the loaf of bread. **Please identify which slices have the least upper crust by circling your choices;** due to symmetry, the slices are grouped in pairs below:

> **A. 1, 12   B. 2, 11   C. 3, 10   D. 4, 9   E. 5, 8   F. 6, 7**

> **Note:** Please make a mathematical conjecture concerning the above question and do not perform any computations.

After making your decision concerning the possible answer choices, please discuss your conjecture with your nearest neighbor and explain to each other the underlying reasoning. You don't necessarily have to agree with each other's assessment, but do have a candid discussion; you are free to change your initial reasoning in light of your neighbor's explanation

Part 2
Afterwards, **please record your conjecture and reasoning in written form;** a single paragraph will be sufficient.

Part 3

1. With the help of a graphing calculator, find the surface area of the upper crust of each slice of bread in the loaf.

2. Do your calculations uphold your conjecture (from Parts 1 and 2) concerning which slices of bread contain the least upper crust? If not, please explain in more detail.