

ASSIGNMENT #8 - SECTION D

March 3

DATE: FEBRUARY 4, 2019 DUE: ~~FEBRUARY 24~~, 2019

Your assignment should include complete sentences and explanations and not just a few equations or numbers. A solution will not receive full credit unless you explain what your answer represents and where it came from. You may discuss the homework with other students in the class, but please write your own solutions.

- (1) I went to the store the other day and was only able to find hot dogs in packages of either 8 or 15.

If I wanted to make exactly 30 hot dogs I could buy 2 packages of 15 hot dogs, but I cannot have exactly 25 hot dogs because no combination of 8 and 15 will make 25. What is the largest number of hot dogs that I *cannot* have using only packages of 8 and 15?

- (2) Hot dog buns on the other hand come in packages of 10 or 14. What is the largest number of hot dog buns that I *cannot* have?
- (3) More generally, if hot dogs (or anything else) comes in packages of r and s (where r and s are positive integers), how do we determine the largest number that we cannot have? Start experimenting with values like 2 and 3, or 5 and 9 and see if you can find the answer. What conditions need to exist on r and s so that a solution exists? Then try larger integers and try packages of different sizes. Prove (by induction?) that every amount higher than your guess can be obtained by packages of size r and s .
- (4) Consider the same problem when an item comes in packages with three different amounts instead of two. For the specific case that there are packages of sizes 15, 17 and 19, can you explain how to find the largest number which cannot be expressed as a sum of these amounts? Explain how you organize your information so that you can find this number. How do you prove that every number larger than this number is expressible as a sum of 15, 17 and 19?