## Home Base, Part A

Beginning problems about numbers in various bases.

If you haven't already practiced, take an opportunity now.

Geogebra link: https://tube.geogebra.org/m/1529377

Geogebra link: https://tube.geogebra.org/m/1527705

**Problem 1** Note: The "free response" answers are not checked for accuracy. To optimize your learning, we recommend you submit your own answer before revealing the hint.

Complete the following sentence:

To (optimize  $\checkmark$ / minimize) my learning, I plan to submit my own answer (before  $\checkmark$ / after) revealing the hint.

**Problem 2** Explain why the following "joke" is "funny:" There are 10 types of people in the world. Those who understand base two and those who don't.

Free Response: Hint: In base two, 10 is actually two. So people who do not understand base two will not get the joke.

**Problem 3** You meet some Tripod aliens, they tally by threes. Thankfully for everyone involved, they use the symbols 0, 1, and 2.

(a) Demonstrate how a Tripod would count, beginning at 11.

- (b) What number comes immediately before 10? 2
- (c) Before 210? | 202 |
- (d) Before 20110? 20102 Explain your reasoning.

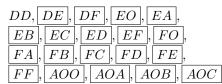
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**Problem 4** You meet some people who tally by sevens. They use the symbols O, A, B, C, D, E, and F, in that order. (Note: Although it is common to use the letters A through F for digits greater than ten, these people are doing something different.)

(a) What do the individual symbols O, A, B, C, D, E, and F mean? (Note O is not 0.)

Free Response: Hint: 0, 1, 2, 3, 4, 5, and 6, respectively.

(b) Demonstrate how to count from DD to AOC? (Note: Case matters.)



- (c) What number comes immediately before AO? F
- (d) Before ABO? AAF
- (e) Before EOFFA? EOFFO

**Problem 5** Now, suppose that you meet a hermit who tallies by thirteens. Demonstrate the hermit's counting below.

$$8, 9, A, B, C, 10, 11, 12, \dots, 18, 19, 1A, 1B, 1C, 20, 21$$