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`

For the "free response" questions below, type your own answer before revealing the hint.

Problem 1 *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 2 *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 from beginning at* 11.

11, 12, 20, 21, 22, 100, 101, 102,
110, 111, 112, 120, 121, 122, 200, 201

(b) *What number comes immediately before* 10*?* 2

(c) *Before* 210*?* 202

(d) *Before* 20110*?* 20102 *Explain your reasoning.*

Problem 3 *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.)*

Author(s): Bart Snapp and Brad Findell

(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.)*

$DD, \boxed{DE}, \boxed{DF}, \boxed{EO}, \boxed{EA}, \boxed{EB}, \boxed{EC},$
$\boxed{ED}, \boxed{EF}, \boxed{FO}, \boxed{FA}, \boxed{FB}, \boxed{FC}, \boxed{FD},$
$\boxed{FE}, \boxed{FF}, \boxed{AOO}, \boxed{AOA}, \boxed{AOB}, \boxed{AOC}$

(c) *What number comes immediately before AO?* $\boxed{F}$

(d) *Before ABO?* $\boxed{AAF}$

(e) *Before $EOFFA$?* $\boxed{EOFFO}$

Problem 4 *Now, suppose that you meet a hermit who tallies by thirteens. Demonstrate the hermit's counting below.* $8, 9, \boxed{A}, \boxed{B}, \boxed{C}, \boxed{10}, \boxed{11}, \boxed{12}, \ldots, 18, \boxed{19}, \boxed{1A}, \boxed{1B}, \boxed{1C}, \boxed{20}, \boxed{2}$
