

## 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 ✓/ minimize) my learning, I plan to  my own answer (before ✓/ after) revealing the .

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**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.*

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**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.*

11, , , , , , , ,  
, , , , , , ,

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

(c) *Before 210?*

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

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Author(s): Bart Snapp and Brad Findell

**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.)

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

- (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.

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