Numeration Systems Name:_____

MA 201

WARNING: You must **SHOW ALL OF YOUR WORK**. You will receive NO CREDIT if you do not show your work.

1. (a) Use Egyptian symbols to represent $456,973$.
   (b) Use Egyptian symbols to represent $22,145$.
   (c) Add $456,973$ and $22,145$ using Egyptian symbols. Your final answer should use the minimum number of symbols possible. What exchanges did you make to reduce the number of symbols in your answer? How do these exchanges relate to "carrying" in addition?
   (d) Subtract $22,145$ from $456,973$ using Egyptian symbols. Your final answer should use the minimum number of symbols possible. What exchanges did you need to make to be able to carry out the subtraction algorithm by using take-away? How do these exchanges relate to borrowing in subtraction?

2. Jake owns a shipping company. He has four different box sizes:XL, L, M, and S. Today Jake must ship $51,339$ books to Indiana. Jake wants to use the minimum number of boxes possible, but he also must be certain that each box is completely full. If an XL box holds $7,200$ books, and L box holds 360 books, an M box holds 20 books, and an S box holds 1 book, how many boxes of each type must Jake use?

3. Will Jake ever need to use 19 M boxes for a shipment of books? Explain briefly.

4. If Jake ships 2 XL boxes, 6 L boxes, 18 M boxes, and 0 S boxes to West Virginia, how many books did Jake ship to West Virginia?

5. Write the Mayan notation for $51,339$.

6. Do exercise 1(k) on page 152 of your text.

7. How does Mayan notation relate to Jake's shipping problem?

Suppose that you live in Blockville. The residents of Blockville use colored blocks for money. The following table shows how their money system works.

Every	b*lue* p*ink* y*ellow* b*rown* o*range* g*reen* r*ed*	block is worth five	p*ink* y*ellow* b*rown* o*range* g*reen* r*ed* w*hite*	blocks.

The citizens of Blockville must never carry more blocks than absolutely necessary. Answer the following questions based on the above information.

8. One yellow block is equivalent to _____ white blocks.

9. One green block is equivalent to _____ white blocks.

10. Joni has four thousand five hundred fifty-three white blocks. She must exchange these blocks so that she has the minimum number of blocks possible. In the chart below, record the number of each type of block that Joni will have after the exchange.

blue	pink	yellow	brown	orange	green	red	white

11. Joni has three blue blocks, four yellow blocks, one brown block, two green blocks, four red blocks, and three white blocks. All of Joni's blocks (taken together) are equivalent to _____ white blocks.

12. Will you ever need to have five orange blocks? Briefly explain.

13. How is this exercise related to base five notation?