

M316 Exam 1

September 16, 2008

Name _____

This is a closed book, closed note exam. It consists of 6 pages. The first 4 pages are worth 20 points each, and the last 2 are worth 10 points each. You may not use a calculator on this exam. Good luck!

1. First, describe at least 3 assumptions that you need to make in order to solve the problem below. Then, solve the problem and show your work.

You are throwing a party and have invited 70 people. You want to buy enough of your favorite fizzy beverage for all the guests. The fizzy beverage comes in packages of 6 cans each. Each package costs 5 dollars. How much should you buy?

2. Write your solution to the following problem in words, as though you were explaining it to a 3rd or 4th grade child.

At the first meeting of the UT Math Club, Emily orders 2 meat lovers' pizzas and 2 veggie lovers' pizzas for 30 dollars. The meat pizzas are not very popular, so the next week she orders 1 meat pizza and 3 veggie pizzas, for a total of 29 dollars. What is the cost of a veggie lovers' pizza?

3. Below is a graph representing Brian's distance as he walks from his office in RLM to Chipotle for lunch. Write a story about Brian's walk that describes the behavior of this graph.

4. Find a pattern in each of the following sets of equations. Explain your pattern in words, and then use it to predict the next equation. (For extra credit, prove that your pattern will continue indefinitely.)

(a) $1^3 + 2^3 = 3^2$
 $1^3 + 2^3 + 3^3 = 6^2$
 $1^3 + 2^3 + 3^3 + 4^3 = 10^2$

(b) $1 + 2 = 3$
 $4 + 5 + 6 = 7 + 8$
 $9 + 10 + 11 + 12 = 13 + 14 + 15$

5. One crucial difference between our modern enumerative system and that of the ancient Romans is that we have a symbol for zero.
 - (a) Why didn't the Romans need a symbol for zero in order to express every positive whole number in Roman numerals?
 - (b) Why does our modern system require a symbol for zero?

6. If you were to place a mirror at the top of this page, the digits 0,1, and 8 would appear the same in the mirror as they do on the page. All the other digits – 2,3,4,5,6,7, and 9 – would look different. Any number that uses only these digits, such as 18 or 801, for example, would also appear the same in the mirror as they do on the page. Let's call such numbers *mirror numbers*. For each of the following questions about mirror numbers, provide an explanation along with your answer. (Hint: what does this have to do with the Alphabitia exploration?)
- (a) What is the next mirror number after 18?
 - (b) What is the last mirror number before 800?
 - (c) What is the 100th mirror number?