

MAT115 Exam 1 (Fall 2011)

Name:

Directions: Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). FYI: 2 3 5 7 11 13 17 19 23 29 31 37 41 43 47 53 59 61 67 **Good luck!**

Problem 1: (15 pts) Write the following three prime factorizations: if a number is prime, then show what numbers you attempted as factors; if a number is composite, find the product of primes in its prime factorization.

a. 887

b. 888

c. 889

Problem 2: (20 pts) Counting by partition:

a. You have 53 sheep. Illustrate how to count them by partition: what string of sheep will you report to the king?

b. As priest for the king, your job is to translate the strings the peasants send into numbers of sheep, so that they can be taxed. A peasant reports the string “1, 1, 0, 1, 0, 0, 1.” How many sheep do they have? Show your work!

Problem 3: (10 pts) Monty Hall strikes again! Now he's got five doors. He gives you a choice of two doors for your own. He then shows you that behind two of the remaining three doors there are donkeys. He asks you if you'd like to trade your TWO doors for the one door he's got remaining.

What do you do? Why? What are the associated probabilities associated with sticking and with switching?

Problem 7: (20 pts) Egyptian Math

a. Use Egyptian Multiplication to multiply $47 \cdot 139$.

b. Divide 31 loaves among 18 people, writing the answer so as to make the ancient Egyptians happy (using only unit fractions). You may use either of our two methods (the unit table – Hint: $\frac{2}{9} = \frac{1}{6} + \frac{1}{18}$ – or the multiplication table backwards).

Problem 8: (5 pts) Explain the reason why 1729 is a number of interest in our class. What's the story?

Problem 9 – extra credit: (5 pts) There are three monsters, one who always lies and two who always tell the truth. They stand next to a path, which leads either to heaven or hell. You want to decide whether to take it or not. What one question could you ask of any monster to **assure** that you take the right action? [Your answer has to guarantee success, no matter which monster is asked.]