MAT115 Test 1 (Fall 2005): 1.1-2.5

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).

Work exactly 10 of the 12 problems. Write "skip" on the other two. You must skip two! Don't do them all and suppose that I'll drop the two lowest....

Good luck!

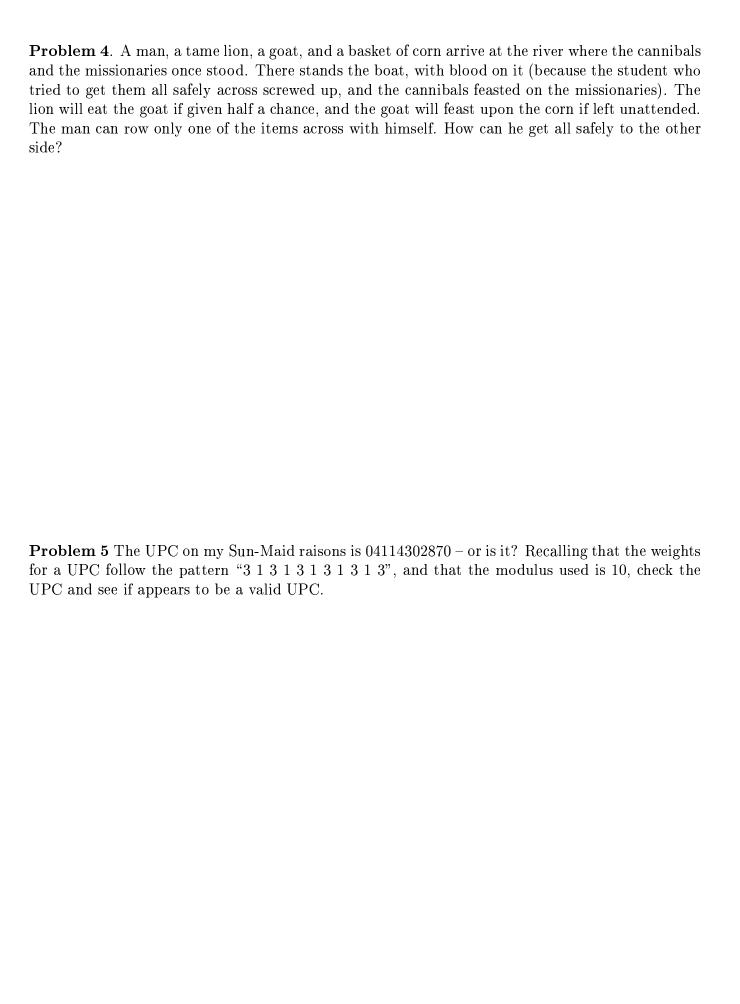
Pro	blem	1	The	two	public	num	$_{ m bers}$	in	your	RSA	code	are	7 and	143.
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1. Explain how would you encode the message "3".

2. Now actually encode the message "3".

3. Without actually performing the calculation, explain how you would you use the secret decoding number 103 to decode the encrypted message?

Problem 2 . A game of Fibonacci Nim begins with 42 sticks.
1. If you are player 1, and employ the winning strategy, how many sticks should you take? Why?
2. Suppose you are player 2: if the game starts with 42 sticks, and player 1 starts by taking 7 sticks, how many sticks would you choose to assure your victory? Why?
Problem 3 A porch is designed to hold at most 2000 pounds. Your kids have a "kiddy pool" that is 8 feet in diameter, and which gets filled 2.5 feet deep with water. Should you put the pool on the porch and fill it with water? (Hint: Area of a circle: πr^2 ; volume of a cylinder: $\pi r^2 h$, where r is the radius, and h the height; $\pi \approx 3.14$).

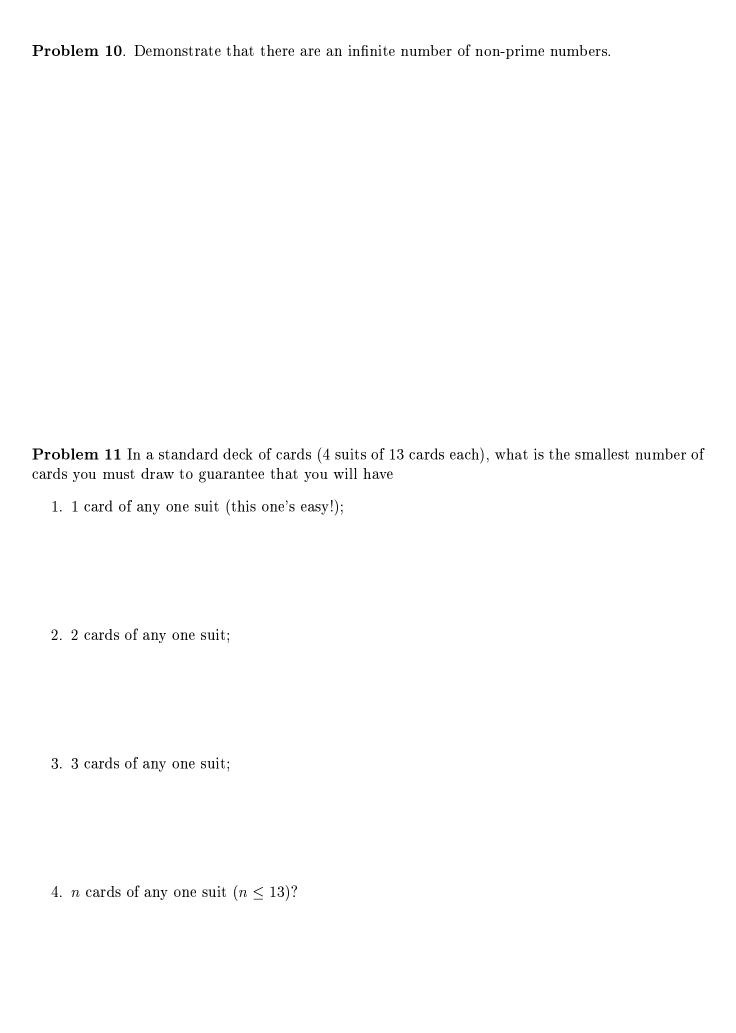


Problem 6 . Determine whether or not the following expression prime:
$1\times2\times3\times4\times5\times6+1$
If it is not prime, find its prime factorization.
Problem 7 Monty Hall concocts a devilish new game: instead of three doors, there are now four

doors! What a concept. The game is played precisely as before, only now there are three doors with donkeys behind them and one door with the car. You choose your door, Monty shows you a door behind which a donkey is standing, and you are invited to switch to one of the other doors.

Do you switch? Why or why not?





Problem 12. Draw the spirals in the following picture, and demonstrate that they are in a relationship of consecutive Fibonacci numbers. (Photo thanks to R. Knott)

