

MATH 512 OPTIONAL PROBLEM, SPRING 2009

DUE TUESDAY, MARCH 17

Here is problem 1 from the first exam:

- (1) *Suppose you have two hourglasses, the first measures a time of  $a$  minutes, and the second measures a time period of  $b$  minutes. Explain how you can use them to measure a time period of  $c$  minutes, where  $a$ ,  $b$ , and  $c$  are given as follows:*
  - (a)  $a = 3$ ,  $b = 7$ ,  $c = 8$ .
  - (b)  $a = 6$ ,  $b = 11$ ,  $c = 13$ .
- (2) *Will this work for any values of  $a$ ,  $b$ , and  $c$ , with  $a, b \leq c$ ? Either prove that this will always work or find a counterexample.*

- (1) Do part 1 of this problem; clearly explain your solution.
- (2) Clearly state which triples  $a, b, c$ , (as described in part 2), will have a solution and which triples will not. Use the Euclidean Algorithm to prove your result.

*You are encouraged to collaborate while working on this problem. Your write-up, however, should be your own, original, work.*