

Your Name: _____ **Room:** _____

Grade: _____ **Teacher:** _____

Montlake Math Challenge
Montlake Elementary School
December 13, 2007

Instructions: Try to answer as many of these problems as you can. Work on your own. If you don't know how to completely solve a problem, try to write as much as you can. You don't have to solve the problems in order, and you are not expected to solve every problem.

Problem 1: Sally has a horse. Three people say things about the color of the horse:

Alan says, "The horse is not black."

Bob says, "The horse is either brown or gray."

Carl says, "The horse is brown."

At least one of the above statements is true, and at least one of the above statements is false. If Sally's horse is either black, brown, or gray, can you decide what the horse's true color is?

Problem 2: You have six coins that all have the same size and shape. Five of the coins have the exact same weight, but the sixth coin is slightly heavier than the other five. You cannot tell which coin is heavier by just looking at them or holding the coins in your hands. You also have a balance scale. Show that it is possible to find out which coin is heaviest by only using the balance scale **two** times.

Problem 3: If I have any three numbers, show that I can pick two of them whose sum is even. (For example, if my numbers are 3, 8, and 7, then $3+7 = 10$, which is even.)

Problem 4: Some bacteria are placed in a glass. Every second the number of bacteria in the glass doubles. After one minute, the glass is full of bacteria. How long did it take for the glass to be half full?

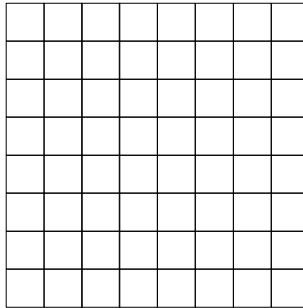
Problem 5: I have four numbers. Show that there are two of the numbers whose difference is divisible by three. (Hint: If I divide a number by three, how many possible remainders are there? First show that two of my four numbers have the same remainder when I divide them by three.)

Problem 6: You have a bunch of L-shaped dominoes that look like this:



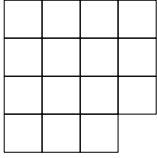
Is it possible to cover each of the following checkerboards with L-shaped dominoes that do not overlap?
Why or why not?

a)

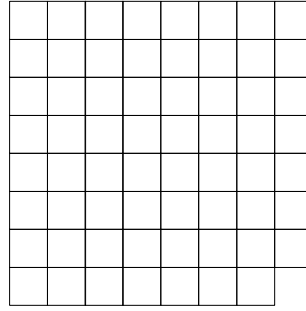


(continued on the next page)

b)



c)



Problem 7: A slug is trapped at the bottom of a well that is 30 inches deep. Every day, he climbs 3 inches up the side of the well, and every night he slides 2 inches back down the well. How long does it take him to get out of the well? Why?

Problem 8: Alice and Dana play a game in which they take turns placing quarters on a table that has the shape of a circle. The only rule for the game is that the quarters cannot overlap. The last person who can place a quarter wins all the money on the table. If Alice goes first, show that she can always win the game.