Washington State Math Championship 2008
Potpourri Test – Grade 7

Give an exact answer or one rounded to the nearest thousandth unless otherwise directed.

1. A 3x3x3 cube, made of all 1x1x1 blocks, has all six of its faces covered in bright neon pink paint. What fraction of the 1x1x1 blocks will have an *odd* number of faces covered with the bright neon pink paint?

2. At a local farm, horses cost \$10, pigs cost \$3, and cute little bunny rabbits are only \$0.50. A farmer wants to buy 100 animals for \$100. How many cute rabbits must the farmer buy? (There are two possible solutions; you need to find one of them)

3. How many possible seven-digit phone numbers are there if each of the seven digits is positive, each of the first six digits is a prime number, and the last digit is composite (in that order)?

4. Two three digit numbers are chosen such that the six digits used to represent the numbers are all different (i.e. 107 and 528). What is the largest possible product of these two three-digit numbers?

5. Ancient Egyptians described all of their fractions as the sum of unit fractions (a fraction with numerator equal to 1). What are the three unit fractions that sum to 6/7 if no fractions are less than 1/50? (hint: go about this systematically)

6. Each time that either the second, minute or hour hand *is pointing to* the '12' on the clock between 7:30am and 9:01am (inclusive), a penny is added to a jar. How much money will be in the jar at 9:01am?

7. 100 students at some strange math competition in Blaine stood in a single-file line. Ahead of them were 100 lockers. The first student walks and opened every locker. The second student then walks and changes the position of every second locker (i.e. if a locker was closed, he/she opened it, and vice versa). The third student changes the position of every third locker, and so on. So, in other words, the kth student changes the position of every k^{th} locker until the 100th student goes and changes the position of the 100th locker. How many lockers will be open at the end of this process?

8. For what values of x will the following inequality hold true?

$$7|x| + 5 \geq 24$$

9. If:

$$\begin{array}{r} ABCDE \\ \underline{\times \quad\quad 4} \\ EDCBA, \end{array}$$

What is the sum of A, B, C, D, and E, where each letter represents a unique digit between 0 and 9 inclusively?

10. A number to be considered a "frugal number" if it has more digits than the number of digits used in its prime factorization. For example, 125 (5^3) is a frugal number because it has three digits but only two digits are used in its prime factorization. Another example is 128 (2^7). What is the next frugal number after 128?