# The Ninth Grade Math Competition Class <br> Base Numbers 1 <br> Anthony Wang 

1. What is the largest base 10 number that can be expressed as a three-digit base 5 number?
2. How many natural numbers require 3 digits when written in base 12 , but require 4 digits when written in base 9 ?
3. Given $9^{6}=531441$, how would you represent 531440 in base 9 ?
4. How many integers from 1 to 1992 inclusive have a base-three representation that does not contain the digit 2 ?
5. When written in base 3 , a positive integer has two terminal zeros. When written in base 4 or base 5 , this same integer has one terminal zero. In how many other positive integral bases greater than 1 must the representation of this integer have at least one terminal zero?
6. Find the $100^{\text {th }}$ smallest positive integer that can be written using only the digits 1,3 , and 5 in base 7 .
7. A number $N$ has three digits when expressed in base 7. When $N$ is expressed in base 9 , the digits are reversed. Find the middle digit in either representation of $N$.
