



Rocket City Math League Mercury Test

**2005-2006
Round 2**

Answers must be written inside the adjacent answer boxes. All answers must be written in exact, reduced, simplified, and rationalized form. All decimals and mixed numbers must be written as improper fractions. **No calculators, books, or other aides may be used.**

1. If $f(x) = 2x+1$, find $f(2006)$? (1 point)	
2. Convert 216 (base seven) to base ten. (1 point)	
3. A bag consists of 7 marbles, of which 2 are blue, 4 are black, and 1 is orange. What is the probability that 1 marble chosen at random is neither black nor orange? (1 point)	
4. In how many ways can the letters in the word STAR be arranged? (1 point)	
5. Find the greatest positive integer n such that the sum of n and three times its reciprocal is equal to four. (2 points)	
6. On an alien ant farm, there are three species of ants, each with a different number of legs. The blue ants have 4 legs, while the orange ants have 5, and the yellow ants have 3. The total number of legs among the ants is 38, and the total number of heads is 10. If the number of legs among both the blue ants and yellow ants equals 28, then how many orange ants are in the ant farm? (2 points)	
7. There are twenty members in the MAO club who each play at least one of three sports: tennis, ping-pong, or badminton. Twelve play tennis, six play ping-pong, and fifteen play badminton. There is only one person who plays all three sports. Two people play tennis and ping-pong but not badminton, and two play ping-pong and badminton but not tennis. How many people play tennis and badminton but not ping-pong? (2 points)	
8. Find the sum of the first sixteen terms in the arithmetic sequence: 1, 7, 13, 19, 25... (2 points)	
9. While monitoring the distance from the space shuttle Jupiter from the moon, the computer at NASA relates two sets of data, sets A and B. Set A contains all integers that can be written in the form $n^2 + n + 1$, where n is a positive integer between 1 and 100 inclusive. Set B contains all numbers whose absolute value is less than or equal to 100. How many elements of set A coincide with those of set B? (3 points)	
10. Johnny's school is 10 miles from his house. When he runs, Johnny always arrives at school twenty minutes later than when he drives. If Johnny drives at an average rate that is eight miles an hour faster than the average rate at which he runs, how fast does Johnny drive? (3 points)	
11. Containers A and B hold equal amounts of two different kinds of jet fuel. The fuel in A takes 6 hours to completely combust, while the fuel in B takes 2 hours to completely combust. Assume the fuel in both takes burns at a constant rate. If the fuel in both containers is ignited at the same time, how many hours will it take until the amount of fuel remaining in container A is twice the amount remaining in container B? (3 points)	
12. On a regular cylinder of radius 2 and height 5, what is the shortest distance along the face of the cylinder from point A on the top base of the cylinder to point B diametrically opposite A on the bottom base? (4 points).	

The material on this page is the property of the Rocket City Math League. Reproduction other than for non-profit educational purposes is strictly prohibited without the expressed written consent of the RCML.