Name_____   Math Level_____

Rocket City Math League
Apollo Test

2004-2005
Round 3

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, and all times must specify AM or PM (unless requested otherwise in the problem). **No calculators, books, or other aides may be used.**

1. To operate the rocket, *Tefu*, a correct code must be entered. The code consists of an ordered set of three two-digit numbers. How many possibilities for this code are there? Assume the tens digit cannot be zero and digits can be repeated. *(1 point)*	
2. A rocket scientist is making rocket fuel. He needs 25 gallons of a 40% mixture. He has at his disposal a 60% mixture and a 10% mixture. How many gallons of the 60% mixture does he use? *(1 point)*	
3. If the solutions of $3x^2 + 5x - 1 = 0$ are *m* and *n*, what is $\dfrac{1}{m} + \dfrac{1}{n}$? *(1 point)*	
4. The numbers 1 through 10 (inclusive) are listed numerically with each number designating the number of times that number should be listed (for example: 1, 2, 2, 3, 3, 3...., 10, 10, 10). Let A= (median $\times$ mode) $\div$ (range – mean). Find A. *(1 point)*	
5. Frank's rocket ship, *Zuro*, needs a paint job on its cylindrical fuel tank. If a gallon of paint can cover 100π square feet of area, how many gallons of paint does *Zuro* need, if the fuel tank can hold $12{,}000\pi$ cubic feet of oil, and has a base radius of 20 feet? *(2 points)*	
6. The Earth rotates once on its axis every 24 hours and revolves once around its sun every 365 days. If planet Octon rotates on its axis 8 times as fast as the Earth, and revolves around its sun in one-fifth of an Earth year, then how many Octon days are in a normal Earth year? *(2 points)*	
7. The builders of Space Shuttle *Saturn* cut off an isosceles right triangle with an area of 24 from the corner of a rectangular sheet of metal with $4\sqrt{3}$ and $4(\sqrt{3} + 2)$ as its side lengths. What is the sum of the area and the perimeter of the remaining piece, disregarding units? *(2 points)*	
8. Martians, having only 8 fingers, count in base 8. How many three digit numbers in base eight are divisible by five? *(2 points)*	
9. Alex can build a rocket in 7 days by himself; Tim and Justin can do the same thing in 6 and 10 days, respectively. Justin, who is a major procrastinator, slows down everyone else he works with by 20%. How long will it take Alex, Tim, and Justin, working together, to build a rocket? *(3 points)*	
10. Kevin is playing with his Solar System Creator game. The game is meant for little kids, so the solar systems are two dimensional. He creates a system with suns at the points (6, 1) and (-2, 1). He creates a planet with an elliptical orbit with the two suns as foci and with a major axis of 10. He then creates a new system. The new sun is at the midpoint of the two suns in the original system. The planet in the new system has a circular orbit around the new sun with a radius of 4. If the two planets' orbits are plotted on a sheet of graph paper, find the coordinates of the point of intersection of the two orbits in the fourth quadrant. *(3 points)*	
11. Phileas Fogg begins another journey around the world along the equator, finishing the voyage in eighty days. His companion, Passé-partout, makes a similar journey around the world along the 30º latitude (30° above the equator) and finishes his trip in eighty days as well. If the world has a radius of 20,000 miles, what is the sum of both the men's average travel speeds per day? *(3 points)*	
12. For Mrs. Trig's birthday, Mr. Trig decided to project the graph of $y = 4\sin(x) + 5\cos(x)$ onto the night sky. What is the amplitude of this graph? *(4 points)*	