

Name _____



Rocket City Math League Apollo Test

**2008-2009
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. **No calculators, books, or other aides may be used. You will be allowed 45 minutes to complete the test.**

<p>1. Astronaut Johnson has flown to Planet X to meet its inhabitants. He uses a jetpack to get around the planet. The rocket fuel for the jetpack is made of 17% Nitrogen, 23% Helium, and 60% Hydrogen. If the amount of Nitrogen in the jetpack's tank is n, how much fuel can the tank hold in terms of n? <i>(1 point)</i></p>	
<p>2. The Planet Oort, whose years are 675 days long, experiences a total solar eclipse on the 46th day of the year every 50 years and a total lunar eclipse on the 567th day of the year every 15 years. If the last time a solar and lunar eclipse occurred in the same year was 22 years ago, how many years will pass before a solar and lunar eclipse occur in the same year again? <i>(1 point)</i></p>	
<p>3. Astronauts Smith and Johnson are on an EVA (Extra Vehicular Activity) from their Lander on Planet X. Smith travels 400 meters due east from the Lander. Johnson travels 400 meters due north from the Lander. Smith and Johnson then turn at the same time and travel directly toward each other at the same speed. When they meet, how many meters from the Lander will they be? <i>(1 point)</i></p>	
<p>4. What is the largest integer value of x that satisfies the inequality $x - 3 < -x + 5$? <i>(1 point)</i></p>	
<p>5. Mark is trapped inside an Endless Quantum Radical, and the only way to escape is to correctly simplify the radical binding him. If the radical binding Mark is $\sqrt{20 + \sqrt{20 + \sqrt{20} \dots}}$, what is the answer Mark needs to escape? <i>(2 points)</i></p>	
<p>6. A space ship computer needs at least 2^9 MB of RAM in order to run Windows Spaceship Edition. Jack has 6 pieces of RAM: one 2^8 MB piece, two 2^7 MB pieces, and three 2^6 MB pieces. If the computer only has four RAM slots, in how many possible ways could you choose exactly four pieces to have at least 2^9 megabytes of RAM? Individual ram pieces are unique even when they contain the same amount of RAM. <i>(2 points)</i></p>	
<p>7. Steven loves the number 7. However, he is having trouble finding heptagonal numbers. What is the 7th heptagonal number? <i>(2 points)</i></p>	
<p>8. Every missile that Jack shoots has a $\frac{3}{8}$ probability of hitting a ship. If Jack shoots 10 missiles, what is the probability that the first 8 missiles hit a ship? <i>(2 points)</i></p>	
<p>9. What is the largest integer value of x that satisfies the inequality $2^{90} > 3^{9x}$? <i>(3points)</i></p>	
<p>10. Jack is flying his spaceship at a constant speed back and forth in the atmosphere of Mars, where a constant wind blows North. Jack flies North with the wind for 2 hours turns around, and flies against the wind for 3 hours to return to his starting point. Next, he flies South against the wind for 5 hours, turns around, and flies North with the wind for 2 hours. If Jack is still 56 miles South from his original starting point, what is the speed of wind in miles per hour? <i>(3 points)</i></p>	
<p>11. Find the tens digits of $3^{333} + 5^{555} + 7^{777} + 9^{999}$. <i>(3 points)</i></p>	
<p>12. Evaluate: $\sum_{n=1}^{25} [(-1)^{n+1} (n^3)]$ <i>(4 points)</i></p>	

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