

Name _____



Rocket City Math League Discovery Test

**2018-2019
Round 1**

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

Time Limit: 45 minutes

1. Evaluate the following: $\begin{bmatrix} 5 & 4 \\ 3 & 6 \end{bmatrix} \times \begin{bmatrix} 7 & 1 \\ 2 & 9 \end{bmatrix}$	<i>(3 points)</i>
2. On Jupiter, Grepples are a form of currency. Julia from Jupiter works at an intergalactic supermarket that pays 55 Grepples a day. If Julia currently has 190 Grepples, how many will she have after working for 3 months (90 days)?	<i>(3 points)</i>
3. At an interplanetary meeting set up by Rick Sanchez, all attendees are in one of two groups: Gazorpazorps and Plutonians. Furthermore, each attendee is classified either as an administrator or as a regular member. The probability of randomly selecting a Gazorpazorp is 20%. The probability of randomly selecting a regular member given that the member is a Plutonian is 45%. If there are a total of 600 attendees at the meeting, how many Plutonian administrators are present?	<i>(3 points)</i>
4. Mark the Martian has an empty bucket that he plans to fill with water. He first adds 1 gallon of water in 1 minute, followed by $\frac{1}{3}$ of a gallon in 30 seconds, followed by $\frac{1}{9}$ of a gallon in 15 seconds, followed by $\frac{1}{27}$ of a gallon in 7.5 seconds, and so on. Assuming the pattern continues, how many gallons of water will be in the bucket after 2 minutes?	<i>(3 points)</i>
5. The Mars Rover is on a mission to map out a part of Mars for NASA's new Martian outpost. The rover is programmed to travel in a straight line 50° north of west for 160 miles. It will then turn to 40° north of east and travel in a straight line for 120 miles. At this point, how far is the rover from its starting point, in miles?	<i>(4 points)</i>
6. Expand the following expression and combine like terms: $(3x^3 + 2y^2)^4$ What is the coefficient of the term containing x^3y^6 ?	<i>(4 points)</i>
7. Julia from Jupiter is a computer scientist who is interested in searching through large lists of numbers. She implements the <i>binary search</i> algorithm, which, in the least efficient case, requires $\log_2 N$ processor cycles, where N is the number of elements in the list. When searching for a particular item in a list, her computer required 10 processor cycles, and she knows that the search was the least efficient case. How many items were in the list?	<i>(4 points)</i>
8. If there is a 35% chance of planet Zuro being attacked, and a 74% chance of planet Teno being attacked, and both events are independent, what is the probability Zuro will be attacked, given Teno is not attacked? Write your answer as a decimal.	<i>(5 points)</i>
9. Find the amplitude of the function $y = 33 \sin(x) + 56 \cos(x)$.	<i>(5 points)</i>
10. Maggy the Space Microbe pilots a rickety space ship. She starts at the origin on the 2-D coordinate plane of Space. She first travels 4 units right to (4,0). Maggy then makes a 45° turn counterclockwise and travels a straight path for $2\sqrt{2}$ units since her engine starts to break down. If she continues in this fashion forever, making a 45° turn counterclockwise and then travelling a factor of $\sqrt{2}$ less than the last move, at what coordinate will Maggy approach?	<i>(6 points)</i>

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