

Name \_\_\_\_\_



## Rocket City Math League Gemini 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. Caro keeps his pet, Porani, in a box that has a height of 5 inches, a length of 4 inches, and a width of 3 inches. Find the length of the internal diagonal of the Porani's box. <span style="float: right;"><i>(1 point)</i></span></p>	
<p>2. Caro is building a space kite in the shape of a rhombus. He found two sticks, one with length two feet and another with length 8 inches, and plans to use these sticks as the diagonals for his kite. What will the area of Caro's kite be, in square inches? <span style="float: right;"><i>(1 point)</i></span></p>	
<p>3. Caro has just invented a brand new toy called The Magical Hexahedron, which is in the shape of a regular hexahedron and has side length 6. Before he can sell his invention, he must find out the volume and the surface area of this new toy. Let <math>x</math> be the magnitude of the volume of The Magical Hexahedron, and <math>y</math> be the magnitude of the surface area. Find <math>x + y</math>. <span style="float: right;"><i>(1 point)</i></span></p>	
<p>4. Zoka is painting patterns on her spaceship. She draws two big triangles. In triangle ABC, <math>AB = 4</math>, <math>BC = 5</math>, and <math>AC = x</math>. In triangle DEF, <math>DE = (AB)^2</math>, <math>EF = (BC)^2</math>, and <math>DF = (x)^2</math>. What is the sum of all possible integer values of <math>x</math>? <span style="float: right;"><i>(1 point)</i></span></p>	
<p>5. The midpoints of a square are connected to form a square inside of the original square, and then the midpoints of this smaller square are connected to form an even smaller square. If the area of the region inside of the middle sized square but outside of the smallest square is 4, what is the sum of the areas of the three squares? <span style="float: right;"><i>(2 points)</i></span></p>	
<p>6. Caro and Zoka are playing Isoball. Before they can play, Caro wants to know how many edges the Isoball has. If the Isoball is in the shape of a regular icosahedron, how many edges does the Isoball have? <span style="float: right;"><i>(2 points)</i></span></p>	
<p>7. Porani the space dog's age in years is equal to twice the number of degrees in the larger angle formed by the hour and minute hands of a clock at 5:45. How old is Porani in years? <span style="float: right;"><i>(2 points)</i></span></p>	
<p>8. The Meteor Toy Store is drawing designs for a new Frisbee. The Frisbee is a regular polygon ABC... with <math>x</math> sides. If the measure of angle ACE is <math>120^\circ</math>, what is the value of <math>x</math>? <span style="float: right;"><i>(2 points)</i></span></p>	
<p>9. Tako and Caro are brothers. Tako's age is equal to the sum of the <math>x</math> and <math>y</math> coordinates of the center of the circle defined by the equation <math>x^2 + y^2 - 4x - 8y - 5 = 0</math>. Caro's age is equal to the radius of the same circle. What is the positive difference between the ages of the two brothers? <span style="float: right;"><i>(3 points)</i></span></p>	
<p>10. Triangle ABC has an angle bisector from point A to a point D on side BC. If <math>AB = 9</math>, <math>AC = 6</math>, and <math>CB = 12</math>, Find AD. <span style="float: right;"><i>(3 points)</i></span></p>	
<p>11. Two Lightyear Ships are suspended in space. The distance between the two ships is <math>8\sqrt{6}</math>. One Ship has coordinates <math>(5, 0, 2)</math> and the coordinates of the second Ship are <math>(-1, 1, z)</math>. Find the sum of all possible values of <math>z</math>. <span style="float: right;"><i>(3 points)</i></span></p>	
<p>12. Luke Skywalker has been given a mission to shoot at an area shown on his radar. His radar is a circle, and the designated area where Luke is to shoot is a triangle, ABC, whose vertices are all on the circle. The centroid of triangle ABC is <math>(3, 3)</math>, the coordinates of A are <math>(2, 3)</math>, and the coordinates of B are <math>(3, 2)</math>. If Luke shoots at a random point on his radar, what is the probability that the point at which he shoots is in the designated area? <span style="float: right;"><i>(4 points)</i></span></p>	

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