



Rocket City Math League Gemini Test

**2006-2007
Round 1**

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

1. The cross section of one of the components of Armvark's spaceship is a triangle. What is the ratio of the sum of the interior angles to the sum of the exterior angles (one at each vertex)? (1 point)	
2. The circumference of a circle is 22π . If its radius is halved, then what is the area of the resulting circle? (1 point)	
3. If a and b are the lengths of the legs of a right triangle whose hypotenuse is 10 and whose area is 20, what is the value of $a+b$? (1 point)	
4. The measure of the supplement of an angle is 4 times the measure of its complement. Find the sum, in degrees, of the measures of the angle, its supplement, and its complement. (1 point)	
5. A regular polygon with sides measuring 8 centimeters has 27 diagonals. Find the perimeter of the polygon (in centimeters). (2 points)	
6. Find the area of a circle inscribed in a triangle with side lengths of 13, 14 and 15. (2 points)	
7. The regular hexagon shown has side length 11, and is overlapped by two tangent circles with radii of 11 and centers that are concurrent with opposite vertices of the hexagon. What is the ratio of the area of the shaded region to the area of the unshaded region? (2 points)	
8. If a non-degenerate scalene triangle has sides of 7, 12, and x , what is the sum of all possible integer values of x ? (2 points)	
9. \overline{AD} contains the centers, A, B, C, D of four tangent circles as shown. Circle A is congruent to circle D, and circle B is congruent to circle C. If the ratio of the area of circle C to the area of circle A is 9:16, and $AD = 50$, then find the length of an external tangent from circle B to circle D. (3 points)	
10. \overline{AC} and \overline{BC} are tangents to circle P at points A and B respectively, $PC = 7$, and the diameter of circle P is 7. If the area of the region inside quadrilateral APBC, but outside the circle, is expressed in simplest form as $a\sqrt{b} + c\pi$, what is the value of $\frac{8a^2b}{c} + 3$? (3 points)	
11. The triangle defined by the points A (2,0), B (8,0), and C (4,4) is rotated about the y-axis. Find the volume of the resulting solid. (3 points)	
12. Pozh, who lives on Mars, has to go get water for his friend's dog that is tied to a post five and a half miles from the river. Pozh's farm is ten and a half miles from the river and thirteen miles away from his friend's dog as shown. If Pozh starts at his farm and jogs at a steady pace of six miles per hour, how many minutes will it take him to get water from the river, feed the dog, and jog back home to the farm, if he spends five minutes at each stop and travels the least possible total distance? (4 points)	

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