Name_____

Rocket City Math League
Gemini 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. Zorbog drove through spikes and got a flat tire. He went to Jardon's Tire Repair to get a replacement. He knows that the surface area of each of the two circular faces of the tire is 441π square feet, but to get it replaced, Jardon needs to know the circumference of the tire. What is the circumference of Zorbog's tire (in feet)? Assume the tires are right circular cylinders. (Leave answer in terms of π.) *(3 points)*

2. A central angle of measure 60° subtends a circular arc of length 9 feet. Given these conditions, how many **inches** long is the radius of the circle? *(3 points)*

3. If Planet Zorb's radius is 1/4 the length of Planet Xerov's radius, and the circumference of Planet Xerov at its widest point is 48π miles, what is the volume of Planet Zorb in cubic miles? Assume both planets are perfect spheres. *(3 points)*

4. On Planet Xerov, aliens live in uniform octahedron houses. If each of the edges of the octahedron houses has a length of 5 meters, what is the surface area in square meters of a house on Planet Xerov? *(3 points)*

5. A rectangle with a length of 15 is inscribed in a circle of radius 8. What is the width of the rectangle? *(4 points)*

6. Aliens on Planet Zorb live in right circular conical homes. Zorbog, an alien who lives on Planet Zorb, shares 1/2 of his home with his friend Fritz. If the radius of Zorbog and Fritz's home is 10 feet and the height of their home is 8 feet, what is the volume in cubic feet of Zorbog's part of their home? *(4 points)*

7. Zorbog decides to change his rectangular-shaped garden on Planet Zorb to a square-shaped garden. His rectangular-shaped garden had dimensions of 16 feet by 9 feet. The garden was changed to a square design that has twice the area of the rectangular-shaped garden. In **yards**, what is the length of each side of Zorbog's new square-shaped garden? *(4 points)*

8. What is the positive difference between the number of diagonals in a regular 23-gon and the number of vertices in a regular dodecahedron? *(5 points)*

9. Amy the Alien is in the city of Zorb and wants to travel on her home in the city of Alonzo. The cities Xerov and Yolum are 20 miles east and 60 miles north of Amy's location, respectively. If Alonzo is halfway between Xerov and Yolum, how many miles away is Amy from Alonzo? *(5 points)*

10. Amy the Alien, who is 63 inches tall, casts a 72-inch shadow at the same time that a nearby flagpole casts a 22-foot shadow. How tall is the flagpole, in **inches**? *(6 points)*