Name_____
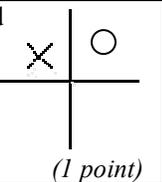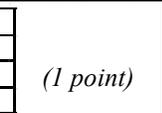
Rocket City Math League
Explorer Test

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.**

1. The dance floor for prom is a square that is divided into quadrants like a Cartesian plane. Alera and her date Laon are dancing in the spot marked with an "X" in the diagram. If someone is looking at the diagram so that the circle is in the top right-hand corner, in what quadrant are Alera and her date currently in, from that person's perspective? *(1 point)*	
2. The prom committee spent 2.4099×10^4 quans on prom. If they plan on selling tickets for 27 quans each, how many tickets must they sell to make a profit of 1.2×10^3? (Assume that tickets are their only form of revenue.) *(1 point)*	
3. The committee plans to tile the square dance floor with 16 congruent square tiles, as shown in the figure. How many squares of any size can be found in the design? *(1 point)*	
4. The prom committee is looking to hire the cheapest DJ for prom, which will be 4 hours long. DJ Taka charges 500 quans plus 75 additional quans per hour. DJ Maude charges 750 quans plus 50 additional quans per hour. DJ Mat charges 250 quans per hour. How many quans does the prom committee save by hiring the least expensive of the three DJs instead of the most expensive? *(1 point)*	
5. The disco cube being used at the prom has an edge length of 2 feet. The prom committee is covering it with small square tiles each with an area of 9 square inches. How many tiles must be used to cover the entire surface of the disco cube if none of the tiles overlap? *(2 points)*	
6. The dance floor is a square with sides of length 20 feet. A dancing couple takes up 5 square feet of space, and a single dancer takes up 3 square feet of space. The dance floor is filled with single dancers and dancing couples with only 10 square feet of unused space, and there are 18 dancing couples on the floor. How many single dancers are on the dance floor? (Dancers' spaces can't overlap.) *(2 points)*	
7. Each cup of punch is cylindrical and is filled three-quarters of the way full, and there are 3 different sizes of cups. They have cups with base radii of 3cm, 4 cm, and 5 cm with corresponding heights of 12cm, 9cm, and 16 cm, respectively. If Alera gets a cup that is filled with at least 100π ml but no more than 120π ml of punch, what is the volume of the cup that she gets in milliliters, given that $1\text{cm}^3 = 1$ milliliter? (Leave π in your answer.) *(2 points)*	
8. Alera is looking for the perfect dress to take to prom, but has only 230 quans to spend. After hours of searching she thinks she has found the perfect dress. If it originally costs 400 quans and she found the dress marked down by 30%, how many more quans does she need to buy the dress? *(2 points)*	
9. Riell, the ticket salesman, only has 4 fingers and counts only in base 4. Riell sells tickets at the door and sells 312_4 tickets. Festoya has 6 fingers and he only counts in base 6. Festoya sells 4523_6 pre-ordered tickets. They submit the total number of tickets sold to Zorkon, the head of the committee, who has 9 fingers and requires all numbers submitted to him in base 9. What number of total tickets sold (in base 9) do they submit to Zorkon, assuming they counted correctly? *(3 points)*	
10. Laon is trying to decide what to wear to prom. He has 4 different ties, 3 different pairs of shades, 7 different belts, 5 different pairs of socks, 9 different pairs of shoes, and 2 different jackets to choose from. He must wear at least one pink item so he matches his date Alera; the only pink item he has is a pink jacket, and he only has 1 pink jacket. How many different outfits can he choose from, if he must wear exactly one of every item? *(3 points)*	
11. None of the 200 students at prom like anything other than ice cream, potato salad, and haggis. If 98 of them like ice cream and potato salad but not haggis, 42 like only ice cream, 3 like all three items, 11 like haggis, and 6 of the 11 that like haggis like exactly one other item, how many students only like haggis? *(3 points)*	
12. One of the prom decorations is a frustum (a cone with the top cut off) with a height of 8 feet, and the radius of the bottom face is 2 feet while the radius of the top face is 6 inches. What is the length, in inches, of a string that is wrapped around the frustum exactly once so that it creates a circle that is equidistant from both faces? *(4 points)*	

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