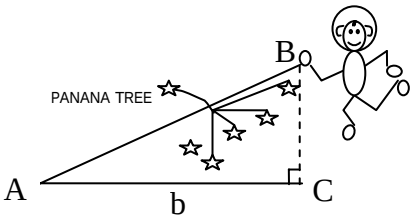
Name_____ Math Level_____

Rocket City Math League

Apollo Test

2004-2005
Round 2

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, and all times must specify AM or PM (unless requested otherwise in the problem). **No calculators, books, or other aides may be used.**

1. Find the sum of the solutions of $2^{x^2+2x-4} = 4^x$. *(1 point)*	
2. On a piece of graph paper, Astronaut Tom plots the movement of a green alien. When he is done, Tom figures out that the graph can be described by the equation: $y = \frac{\sqrt{x+7}}{x+5}$. What is the domain of the function traveled by the green alien? *(1 point)*	
3. On Planet Q, Monkey tried to reach the highest, biggest, and juiciest panana from the panana tree. Monkey forms a right triangle with a panana tree and the ground (pictured below). Side AB = 17 and BC = 15. The following observations were made: **Albert** said: $\sin^2 A + \cos^2 B = 1$ **Bert** said: sinA = cosB **Carly** said: $b = \sqrt{17^2 - 15^2}$ **Danielle** said: tanA > 1 How many of the observations were correct? *(1 point)* 	
4. Find the area of the circle with the equation $(x-2)^2 + (y-5)^2 = 37$. *(1 point)*	
5. What is the 4th term in the expansion of $(2x - 3y)^4$? *(2 points)*	
6. An engine has a cross-section in the shape of a regular dodecagon, which is able to be inscribed in a circle with a diameter of 28 feet. Another engine's cross-section is octagonal in shape with a side length of 8 feet. Find the sum of the areas of the two engines. *(2 points)*	
7. The rocket *Maomao* is on the point (3, -5) and needs to get to (10, 1) by only moving up and right. How many possible paths are there along gridlines? *(2 points)*	
8. Frank is plotting stars on an x-y graph. He plots 3 stars on the points (3, -4), (4, 6), and (2, -4) and connects them to form a triangle. Find the centroid of the triangle formed by the stars. *(2 points)*	
9. Line *m* passes through the points (a, 2) and (2, 5), and is parallel to line *k*, which has the equation 2x + ay = 5. Line *m* is also perpendicular to line *z* which is tangent to a circle with the equation $(x-3)^2 + (y+2)^2 = 5$. Line *z* passes through the first quadrant and has a y-intercept of (0, b). What is a + b? *(3 points)*	
10. The number of unsuccessful launches of Jim's model rocket is equal to the number of prime palindromes between 200 and 700. How many times did Jim's model rocket launch unsuccessfully? *(3 points)*	
11. Homer is launching a rocket on planet Dahc. The rocket's height as a function of time is given by the formula: $h(t) = at^2 + bt + c$. If the rocket is 36 feet off the ground at t=0, 56 feet at t=1 sec., and 70 feet at t=2 seconds, find the time it takes the rocket to hit the ground. *(3 points)*	
12. Erial is practicing for the laser marksmanship competition in the Milky Way Olympics. She is firing at targets on 3 planets: Sirhc, Ydnic, and Xela. (All four planets are coplanar.) Erial is 70 light years from Planet Sirhc and 60 light years from Planet Xela. Planet Ydnic is between Planet Sirhc and Planet Xela and equidistant from both. If Planet Sirhc is 20 light years from Planet Xela, find the distance from Erial to Planet Ydnic. *(4 points)*	

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