Rocket City Math League **2008-2009**
Mercury Test Solutions **Round 2**

1. Subtract 1,672 from 2,061, which yields 389, which means there are 389 more male Florps.	**389**
2. First, the actual radius of Pluto must be determined. To do this, use the original scale and multiply 239 by 5. 239x5=1195, so the radius of Pluto is 1195km. Then, divide by the new scale to find the radius of the new model, so $\frac{1195}{59.75} = 20$ so the answer is 20km	**20**
3. 14 Grubnors = 9 Zigzogz and 5 Zigzogz = 10 Miks so 1 Zigzog = 2 Miks and 18 Zigzogz = 28 Grubnors. Further simplification shows that 9 Miks = 7 Grubnors. Multiple each side by five and you will find that 45 Miks = 35 Grubnors	**35**
4. 1,672x3=5,016, meaning 5,016 children are born. Since only half of the children are female, this number must be divided by two. 5,016 divided by two is 2,508, so there are 2,508 female children. This number must then be added to the original number of females, yielding 4,180 female Florps.	**4,180**
5. Ernie's rocket goes 14.5 turbo miles/hour x 4 hours= 58 turbo miles. Jenn goes 18 turbo miles/hour x 3 hours= 54 turbo miles. 58+54=112 turbo miles. 4+3=7 hours. The average is equal to the distance traveled divided by the time taken. That gives 112 turbo miles divided by 7 hours or 112/7 = 16	**16**
6. It is a right triangle, so the Pythagorean Theorem can be used. $a^2 + b^2 = c^2$ 21 and 72 are a and b. $21^2 = 441$ and $72^2 = 5184$ and 441+5184=5625. $\sqrt{5625} = 75$ so Ernie is 75 miles from home. It can also be seen as a 7-24-25 triangle times 3 because it is 7(3)-24(3)-25(3) or 21-72-75. Either way, the speed is irrelevant.	**75**
7. The mid-point is the point $(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2})$. In this case, the mid-point is $(\frac{x-13}{2}, \frac{-6+y}{2}) = (-4, \frac{1}{2})$. This means that $x = 2(-4) + 13 = 5$ and $y = 2(\frac{1}{2}) + 6 = 7$ Since, x= 5, y= 7, then 5+7=12.	**12**
8. The first polynomial has power of three (x^3), while the second polynomial power of two (x^2), so the first has the highest polynomial power and its power is 3.	**3**
9. $2a^3+[a^2+3a(a+a^2)]^2$ simplifies to $2a^3+(a^2+3a^2+3a^3)^2=2a^3+(4a^2+3a^3)^2$ $=2a^3+9a^6+24a^5+16a^4$ The coefficients are 2, 9, 24, and 16. 2+9+24+16=51	**51**
10. $(X^4Z^{-3}/Y^2)^{-2} = Y^4Z^6/X^8$	$\frac{Y^4Z^6}{X^8}$
11. The pattern is a change in 1 then a change in 2 then a change in 3…but with alternating signs. This means that 1 was added to the first number to get the second, 2 was subtracted from the second to get the third, 3 was added to the third to get the fourth, and so on. The pattern is +1 -2 +3 -4 +5 -6 +7 -8 +9 -10. Therefore, a= -1 b=8 c=-2 $(a+b)^2+4c =(-1+8)^2+-8=(7)^2-8= 49-8= 41$	**41**

12. The quadratic formula can be used to find the x-intercepts. $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ is the quadratic formula for the equation in the form $ax^2+bx+c=0$ Since we are looking for the x-intercepts of the graph $y=x^2+4x-7$, then we can use it. Plug in the values of a, b, and c and you get: $x=\frac{-4\pm\sqrt{4^2-4(1)(-7)}}{2}=\frac{-4\pm\sqrt{16+28}}{2}=\frac{-4\pm\sqrt{44}}{2}=\frac{-4\pm2\sqrt{11}}{2}=-2\pm\sqrt{11}$ The x-intercepts are points, so the answers are $(-2+\sqrt{11},0);(-2-\sqrt{11},0)$	$(-2+\sqrt{11},0)$ $(-2-\sqrt{11},0)$