Mu Division
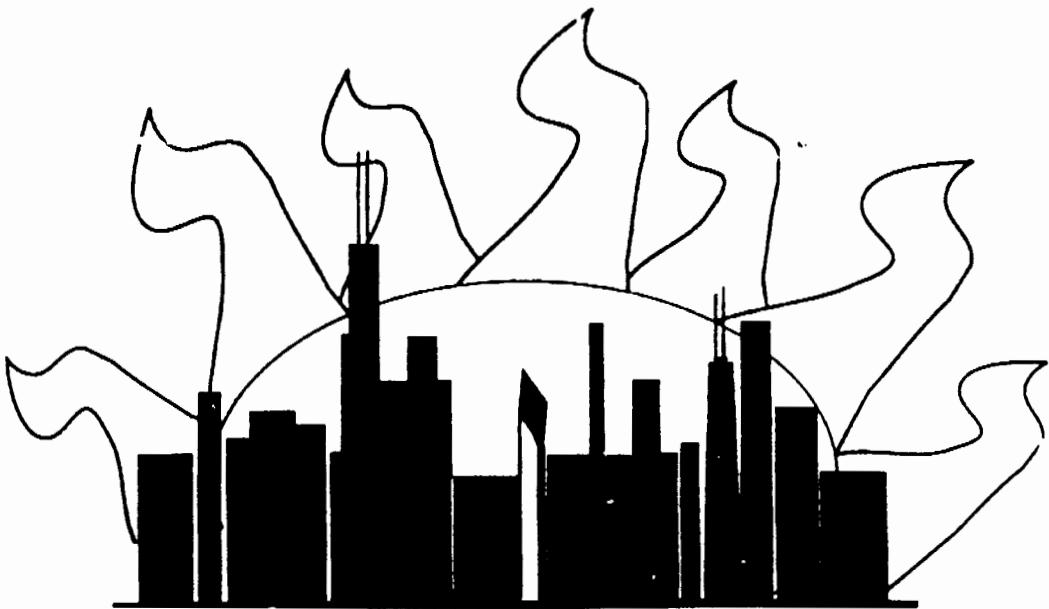
School Bowl

Mu Alpha Theta National Convention
Chicago 1998

1. If the radius of the circle $x^2 + y^2 + 18x - 12y + 17 = 0$ is r and p is the solution to $\log_2 (3p) + \log_2 (2p - 1) = \log_2 9$, find p/r.

2. Find the sum $\displaystyle\sum_{b=4}^{8} (b^2 + 2b) + \sum_{i=1}^{\infty} 60\left(\frac{2}{5}\right)^i$.

3. Suppose $\log_3 x = \log_y 4 = 2$, what is the area of a right triangle which has a hypotenuse of length x and one leg of length y?

4. In the following diagram, $AY \perp YR$, $AM \perp MR$, and $AY = YR$. If $AR = 12$ and the measure of $\angle MAR$ is $30°$, find the length of MY. Give your answer correct to four significant digits.
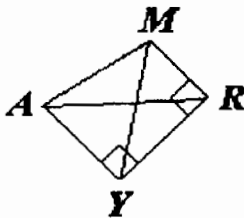
5. Find the distance from the focus of the parabola whose equation is $x^2 = 8y - 56$ to the center of the circle whose equation is $x^2 + y^2 + 6x - 10y + 1 = 0$.

6. Let n be defined by $2^4 \, 4^2 = n^8$. Let r be the remainder when $x^3 - 31x + 30$ is divided by $x - 1$. What is the value of the product nr ?

7. If f and g are defined by $f(x) = 3x + 2$ and $g(x) = 3x^2$, respectively, find $g\left(f^{-1}\left(\frac{3}{2}\right)\right)$.

8. Let $A = \{1, 2, 3, ..., 5\}$. Find the sum of all the elements of all the proper subsets of A.

9. Let s be the sum of $\displaystyle\sum_{i=2}^{\infty} \left(\frac{2}{3}\right)^i$. Let r be the remainder when $2x^3 - 3x^2 + x + 8$ is divided by $x + 1$. Find $r + s$. Give your answer as a reduced fraction.

10. Find the area of the triangle whose vertices are $(2, 1)$, $(4, 5)$, and $(-3, 2)$.