

Name:

MVMSC Monthly Math Contest

Time: Whole lunch period.

Directions: No calculators. For answers expressible in multiple ways, any is allowed, but fractions must be simplified and denominators rationalized. Your score is the sum of the point values of problems you solve.

#	Question	Answer
1 (1)	A pro athlete played for 17 years and earned 72 million dollars. She was paid k million a year where k is an integer and received an extra one million each year that her team made the playoffs. Compute the number of years her team made the playoffs.	
2 (1)	Compute the largest prime factor of $3(3(3(3(3(3(3(3(3+1)+1)+1)+1)+1)+1)+1)+1)+1$	
3 (2)	The sides of a non-right isosceles $\triangle ABC$ are $\sin x$, $\cos x$, and $\tan x$. Compute $\sin x$.	
4 (2)	There are n triangles of positive area that have one vertex at $A(0,0)$ and the other two vertices at points with coordinates in $\{0, 1, 2\}$. Compute n .	
5 (2)	If, from left to right, the last seven digits of $n!$ are 8000000, compute the value of n .	
6 (3)	Let circles O and Q have a common chord \overline{PS} . If $OQ = 324$ and $MN : NT = 2 : 1$, compute $OP - PQ$. (The intersections of segment \overline{OQ} with circle Q , segment \overline{PS} , and circle O are M, N, T respectively)	
7 (3)	For $0 < x < 1$, let $f(x) = (1+x)(1+x^4)(1+x^{16})(1+x^{64})(1+x^{256}) \dots$. Compute $f^{-1}\left(\frac{8}{5f(3/8)}\right)$	