MATH FIELD DAY 2023 Name: _____

NON-ROUTINE PROBLEM-SOLVING LEVEL II School: _____

_____1. How many whole numbers from 1 to 2023 are divisible by 4 or 42?

_____2. Find the smallest common multiple of 420 and 2023.

_____3. Find the 2023rd after the decimal point in the decimal expansion of $\frac{100}{9999}$.

_____4. Express $\frac{\sqrt{11.1111111....}}{20}$ as a common fraction.

_____5. Find the largest product of two odd numbers whose sum is 420.

_____6. Find the last digit of 7^{2023}.

_____7. A list of 12 consecutive even integers has an arithmetic average of 2023. Find the largest integer in the list.

_____8. Find the number of factors for 6534.

_____9. Find the sum of the solutions of $x^3 + 4x^2 - 20x + 2023 = 7x^2 - 10x + 1999$.

_____10. A number is given as $420,201,3ab$ where a and b are both digits and $a + b = 9$. Find the largest possible value of $420,201,3ab$ such that it is divisible by 4.

_____11. The sum of the first three terms of a geometric sequence is 342. The sum of the square of these first three terms is $88,236$. Find the largest value among the first three terms in the geometric sequence.

_____12. Suppose that $f(x) = ax^4 - bx^2 + 20x - 2023$ and that $f(-4) = 2023$. Find $f(4)$.

_____13. A waterpark pool has multiple pumps to fill in water. There are two sizes of the pumps: small and large. All the small pumps are the same power, and all the large pumps are the same power. It takes 3 hours to fill the pool if water is pumped in with 10 large pumps and 5 small pumps. It takes 2 hours to fill the pool if water is pumped in with 14 large pumps and 9 small pumps. How many hours does it take to fill half of the pool if water is pumped in with 8 large pumps and 6 small pumps? Express your answer as a reduced fraction.