WMML Meet #1 Nov. 9, 2021	Name
Arithmetic and Number Theory	
1) How much, in dollars, is $2,\!021,\!000\%$ of a penny?	1
2) Starting with 1, at most how many consecutive positive integers can be added before the sum exceeds 2021?	2

3) Find two numbers whose product is 1,000,000 such that

neither number contains a zero.

Algebra 1

1) Solve the following equation for x:

$$|4x - 5| = 2x + 1$$

2) For what values of n is $n^{-3} = \left(\frac{1}{n}\right)^5$?



3) Bryan has a part-time job delivering packages. He is paid a flat rate of \$9.50 per hour. Caleb works at a competitor that pays its employees \$2 per hour plus \$3 per delivery. How many deliveries would Caleb have to make in 40 hours to earn the same pay as Bryan for a a 40 hour work week?

3._____

WMML	Name
Meet #1 Nov. 9, 2021	School
Geometry	
1) How many pipes with inside diameter 1 inch are needed to carry the same amount of water as one pipe with inside diameter 10 inches?	1
2) The length of each side of a triangle is increased by $2,\!000\%$. By what percent does the area of the triangle increase?	2

3) An equilateral triangle has perimeter P and area A. If $A=2\sqrt{3}P$, then what is the side length of the triangle?

Algebra 2

1) The vertex of the parabola $y=x^2-16x+k$ is on the x-axis. What is the value of k?

1.____

2) Years ago Jack purchased shares of Tesla for a total of \$3,000. The value of his investment grew by 350% and he wants to give the shares to his 4 children in the ratio of 3:3:2:2. How much money is the smallest gift worth?

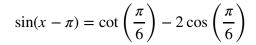
2.____

3) If $(x - 3y)^3(x + 3y)^3$ is written as a polynomial in x and y, what is the sum of its coefficients?

3.

Trigonometry and Complex Numbers

1) Solve for all x where $0 \le x < 2\pi$.



2) Simplify $(i^{2021} + i^{2022} + i^{2023} + i^{2024})^{2021}$.



3) Find all possible values of $\angle PQR$ if PQ=12, $QR=4\sqrt{3}$, and the area of $\triangle PQR$ is $12\sqrt{6}$.



Precalculus

- 1) What is the slope of the line that goes through the point (-3,2) and the intersection of the lines y = 2x + 1 and 3x + y = 11?
- 1._____

- 2) The natural numbers from 1 to 2021 are placed into a bag. If one number is drawn randomly from the bag, what is the probability that it is not a multiple of 2 or 3?
- 2._____

- 3) Find the value of k such that the graphs of $(x+2)^2+(y-5)^2=k$ and $(x-4)^2+(y-1)^2=k$ have only one point of intersection.
- 3._____

Team Round

1. Starting from right, how many zeros are there before the first non-zero digit after expanding the factorial expression 2021!?

1._____

2. How many numbers x in the set $\{1, 2, 3, ..., 2021\}$ are there such that $x^2 + x^3$ equals the square of an integer?

2._____

3. Given the regular decagon ABCDEFGHIJ, find the measure of $\angle HIA$.

3._____

4. Three whole numbers, when added together two at a time, have sums of 1202, 2223, and 3021. Determine the value of the largest of the original three numbers.

4._____

5. If $\left(\sin(x) - \cos(x)\right)^2 = a^2$, express $\frac{\sin(2x)}{1-a}$ in simplest form in terms of a.

5._____

6. Let $\mathbf{v} = \begin{pmatrix} 4\sqrt{3} \\ 4 \end{pmatrix}$ and $\mathbf{w} = \begin{pmatrix} 1 \\ \sqrt{3} \end{pmatrix}$ be vectors. Find the projection of \mathbf{v} onto \mathbf{w} .

6.