

Math Game answers (in red, in brackets)

*The three-digit prime number abc is written twice to make the six-digit number abc,abc . How many prime factors does abc,abc have? **[4]**

*The solution set of the equation $(xy - 1)(xy)(y - x - 1) = 0$ separates the plane into how many regions? **[11]**

*Jordan ordered some pizzas and sandwiches. The price of each pizza was 50% more than the price of a sandwich. When the order arrived, the number of pizzas Jordan ordered and the number of sandwiches ordered had been switched, which increased the bill by $\frac{1}{3}$. What is the ratio of the number of pizzas Jordan originally ordered to the number of sandwiches originally ordered? **[1 : 6]**

*For a positive integer n , let $P(n)$ denote the product of the digits of n , $Q(n)$ the sum of the squares of the digits of n , and $S(n)$ the sum of the digits of n . For example, $P(125) = 10$, $Q(125) = 30$, and $S(125) = 8$. What is the sum of the two two-digit numbers M for which $M = P(M) + Q(M) + S(M)$? **[123, the numbers are 33 and 90]**

*In a row of five seats, five mathematicians arrive wearing integer-valued jersey numbers 1 to 5. How many ways can they be seated in the row so that no person is between two people (and sitting next to each) whose jersey numbers sum to their jersey number? **[76]**

*What is the smallest positive integer n such that 2^{2020} is a divisor (factor) of $n!$? **[2028]**

*Three integers a , b , and c satisfy

i. $0 \leq a \leq b \leq c$ and

ii. $abc + ab + ac + bc + a + b + c = 2019$.

What is the smallest possible value of $a + b + c$? **[110, the numbers are 4, 5, and 101]**

For more Math Game questions, see [previous qualifying tests](#) and [videos of previous games](#).