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Mathematical Challenger-1

Target: PRMO

1. Find the number of positive integers n, such that $\sqrt{n}+\sqrt{n+1}<11$
2. How many positive integers less than 1000 have the property that the sum of the digits of each such number is divisible by 7 and the number itself is divisible by 3?
3. What is the smallest positive integer k such that $k(3^3+4^3+5^3) = a^n$ for some positive integers a and n, with $n > 1$?
4. A natural number k is such that $K^2 < 2020 < (k+1)^2$ what is the largest prime factor of K?
5. What is the units digit of $4^{217}+9^{217}+6^{217}+7^{217}$?
6. Consider two positive integer a and b. find the least possible value of the product ab if $a^b b^a$ is divisible by 2000
7. Find the smallest natural number n which has last digit 6 & if this last is moved to the front of the number, the number becomes 4 times larger.
8. The number of natural number pairs (x, y) in which x > y and $\frac{5}{x}+\frac{6}{y}=1$ is?
9. If $\frac{1}{\sqrt{2011+\sqrt{2011^2-1}}} = \sqrt{m}-\sqrt{n}$ where m and n are positive integers, what is the value of m + n.
10. If real numbers a, b, c, d, e satisfy a + 1 = b + 2 = c + 3 = d + 4 = e + 5 = a + b + c + d + e + 3, then find the value of $a^2 + b^2 + c^2 + d^2 + e^2$
11. Write the sum of all possible digit(s), which should come in place of # in the 9 digit number 15549 # 325, for which the number is divisible by 3?
12. There are 20 people in a party. If every person shakes hand with every other person, person, what is the total number of handshakes?
13. A 107 digit number is formed by writing first 58 natural numbers next to each other. Find the remainder when number is divided by 8
14. Find the total number of solutions to the equations $x^2 + y^2 = 2015$ where both x and y are integers.
15. Find the number of natural number less than 10^7 which have exactly 77 divisors.