

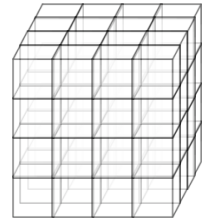


Intermediate Math Circles Number Theory I

Problems

1. Complete your Sieve of Eratosthenes for the values 151-200.
2. Determine the prime factorization of the following numbers.
(a) 364 (b) 693 (c) 3185

3. A solid rectangular box is made of 1cm^3 pieces. The volume of the rectangular prism is 1925cm^3 . How many different dimensions of the box are possible?



4. The sum of the three digit number $2A3$ and 326 is $5T9$. If $5T9$ is divisible by 9, find the value of $A + T$.
5. If n is a positive integer, then $n!$ is defined as the product of all integers from 1 to n inclusive. For example, $6! = 1 \times 2 \times 3 \times 4 \times 5 \times 6$. Determine the number of times that 5 will occur as a prime factor of $32!$.
6. Three adults are all younger than 40 years in age. The product of their ages is 17710. Determine the sum of their ages.
7. The digits 1, 2, 3, 4, 5 are each used only once to make a five digit number $abcde$. The number made by the three digits, abc is divisible by 4. The number made by the three digits, bcd is divisible by 5, and the number made by the three digits, cde is divisible by 3. Determine the digit a .
8. The product of 20^{50} and 50^{20} is written as an integer in expanded form. Determine the number of zeros at the end of the resulting integer.
9. The product of 792 and positive integer, n , is a perfect square. Determine the smallest possible value of n .
10. The number of divisors of 245, other than 1 and 245 are,
(a) 3 (b) 4 (c) 5 (d) 6 (e) 7
11. Determine the sum of the proper divisors of 1089.