

## CML 3 Sample

1. \_\_\_\_\_ A positive number is called  $n$ -primable if it is divisible by  $n$  and each of its digits is a one-digit prime number. How many 3-primable positive integers are there that are less than 1000?
2. \_\_\_\_\_ What is the sum of all positive integers  $q$  such that  $\frac{n^7-n^3}{q}$  is an integer for every positive integer  $n > 2021$ ?
3. \_\_\_\_\_ What is the sum of the numbers less than 200 that have exactly 9 divisors?
4. \_\_\_\_\_ The product of a set of positive integers is 144. What is the least possible sum of this set of positive integers?
5. \_\_\_\_\_  $A, B, C$  and  $D$  are distinct positive integers such that the product  $AB = 60$ , the product  $CD = 60$  and  $A - B = C + D$ . What is the value of  $A$ ?
6. \_\_\_\_\_ In base  $b$ ,  $441_b$  is equal to  $n^2$  in base 10, and  $351_b$  is equal to  $(n - 2)^2$  in base 10. What is the value of  $b$ , expressed in base 10?
7. \_\_\_\_\_ What is the greatest prime factor of  $12! + 14!$ ? (Reminder: If  $n$  is a positive integer, then  $n!$  stands for the product  $1 \cdot 2 \cdot 3 \cdot \dots \cdot (n - 1) \cdot n$ .)
8. \_\_\_\_\_ The base-10 numbers 217 and 45 are multiplied. The product is then written in base-6. What is the units digit of the base-6 representation?
9. \_\_\_\_\_ How many of the divisors of  $8!$  are larger than  $7!$ ?
10. \_\_\_\_\_ Jan is thinking of a positive integer. Her integer has exactly 16 positive divisors, two of which are 12 and 15. What is Jan's number?