DIVISIBILITY

10. FACTOR/MULTIPLE

The **factors** of integer n are the positive integers that divide into n with no remainder. The **multiples** of n are the integers that n divides into with no remainder. 6 is a factor of 12, and 24 is a multiple of 12. 12 is both a factor and a multiple of itself.

11. PRIME FACTORIZATION

A **prime number** is a positive integer that has exactly two positive integer factors: 1 and the integer itself. The first eight prime numbers are 2, 3, 5, 7, 11, 13, 17, and 19.

To find the prime factorization of an integer, just keep breaking it up into factors until **all the factors are prime.** To find the prime factorization of 36, for example, you could begin by breaking it into 4×9:

$$36 = 4 \times 9 = 2 \times 2 \times 3 \times 3$$

12. RELATIVE PRIMES

To determine whether two integers are relative primes, break them both down to their prime factorizations. For example: $35 = 5 \times 7$, and $54 = 2 \times 3 \times 3 \times 3$. They have **no prime factors in common,** so 35 and 54 are relative primes.

13. COMMON MULTIPLE

You can always get a common multiple of two numbers by **multiplying** them, but, unless the two numbers are relative primes, the product will not be the least common multiple. For example, to find a common multiple for 12 and 15, you could just multiply: $12 \times 15 = 180$.

14. LEAST COMMON MULTIPLE (LCM)

To find the least common multiple, check out the **multiples of the larger number** until you find one that's **also a multiple of the smaller.** To find the LCM of 12 and 15, begin by taking the multiples of 15: 15 is not divisible by 12; 30's not; nor is 45. But the next multiple of 15, 60, is divisible by 12, so it's the LCM.

15. GREATEST COMMON FACTOR (GCF)

To find the greatest common factor, break down both numbers into their prime factorizations and take **all the prime factors they have in common.** $36 = 2 \times 2 \times 3 \times 3$, and $48 = 2 \times 2 \times 2 \times 2 \times 3$. What they have in common is two 2s and one 3, so the GCF is $= 2 \times 2 \times 3 = 12$.

16. EVEN/ODD

To predict whether a sum, difference, or produc will be even or odd, just **take simple numbers like 1 and 2 and see what happens.** There are rules—"odd times even is even," for example—but there's no need to memorize them. What happens with one set of numbers generally happens with all similar sets.

17. MULTIPLES OF 2 AND 4

An integer is divisible by 2 if the **last digit is even.** An integer is divisible by 4 if the **last two digits form a multiple of 4.** The last digit of 562 is 2, which is even, so 562 is a multiple of 2. The last two digits make 62, which is not divisible by 4, so 562 is not a multiple of 4.

18. MULTIPLES OF 3 AND 9

An integer is divisible by 3 if the s**um of its digits is divisible by 3.** An integer is divisible by 9 if the **sum of its digits is divisible by 9.**

The sum of the digits in 957 is 21, which is divisible by 3 but not by 9, so 957 is divisible by 3 but not 9.

19. MULTIPLES OF 5 AND 10

An integer is divisible by 5 if the **last digit is 5 or 0.** An integer is divisible by 10 if the **last digit is 0.** The last digit of 665 is 5, so 665 is a multiple of 5 but not a multiple of 10.

20. REMAINDERS

The remainder is the whole number left over after division. 487 is 2 more than 485, which is a multiple of 5, so when 487 is divided by 5, the remainder will be 2.