Section 5.1: Divisibility Tests

Divisibility: A positive integer a is **divisible** by the positive integer b if there exists a positive integer k such that $a = b \cdot k$. If b divides a, then we write $b|a$.

Factors and Multiples: If a is divisible by b, then b is a **factor** of a, and a is a **multiple** of b.

Primes: A positive integer greater than 1 is **prime** if it has only itself and 1 as factors.

Composites: A positive integer greater than 1 is **composite** if it is NOT prime. (NOTE: 1 is neither prime nor composite.)

- Divisible by 2: if and only if the ones digit is 0, 2, 4, 6, or 8.

- Divisible by 3: if and only if the sum of its digits is divisible by 3.

- Divisible by 4: if and only if the number represented by its last two digits is divisible by 4.

- Divisible by 5: if and only if the ones digit is 0 or 5.

- Divisible by 6: if and only if the number is divisible by 2 and 3.

- Divisible by 8: if and only if the number represented by its last three digits is divisible by 8.

- Divisible by 9: if and only if the sum of its digits is divisible by 9.

- Divisible by 10: if and only if the ones digit is 0.

- Divisible by 12: if and only if the number is divisible by 3 and 4.

Example 1: Use divisibility tests to determine whether

$$437,892,463,248$$

is divisible by the following numbers.

2 3 4 5 6 8 9 10 12

- Divisible by 11: if and only if 11 divides the difference of the sum of the digits whose place values are odd powers of 10 and the sum of the digits whose place values are even powers of 10.

  Example 2: Use the divisibility test for 11 to determine if each of the following is divisible by 11.

  (a) $398,747,256$

  (b) $395,013,124$

- Divisible by 7: if and only if the integer represented without its ones digits minus twice the ones digit of the original integer is divisible by 7.

  Example 3: Determine if $3,685,479$ is divisible by 7.