Divisibility Rules

An integer *N* is evenly divisible by

- **2 if the last digit is even (0, 2, 4, 6, or 8);**
  Example: 123,456 is divisible by 2, because the last digit, 6, is even.
- **3 if the sum of its digits is divisible by 3;**
  Example: 123,456 is divisible by 3, because 1 + 2 + 3 + 4 + 5 + 6 = 21, which is divisible by 3. (21 ÷ 3 = 7)
- **4 if the number formed by the two last digits is divisible by 4;**
  Example: 123,456 is divisible by 4, because 56 is divisible by 4.
  (56 ÷ 4 = 14)
- **5 if it ends in 5 or 0;**
  Examples:
  123,456 is *not* divisible by 5, because the last digit, 6, is *not* 0 or 5.
  12,345 *is* divisible by 5, because the last digit *is* 5.
- **6 if it is divisible by both 2 and 3;**
  Example: 123,456 is divisible by 6, since it is divisible by both 2 and 3. (See examples for 2 and 3 above.)
- **7 if the number formed after the following two steps is divisible by 7:**
  - **First, remove the last digit,**
  - **Then, from the number remaining, subtract two times the digit we just removed;**

  See examples on the back of this page.
- **8 if the number formed by the last three digits is divisible by 8;**
  Example: 123,456 is divisible by 8, because 456 is divisible by 8.
  (456 ÷ 8 = 57)
- **9 if the sum of its digits is divisible by 9;**
  Examples:
  123,456 is *not* divisible by 9, since 1 + 2 + 3 + 4 + 5 + 6 = 21 is *not* divisible by 9.
  123,453 *is* divisible by 9, since 1 + 2 + 3 + 4 + 5 + 3 = 18 *is* divisible by 9. (18 ÷ 9 = 2)
- **10 if it ends in 0;**
  Examples:
  123,456 is *not* divisible by 10, since its last digit, 6, is *not* 0.
  123,450 *is* divisible by 10, since its last digit *is* 0.
- **11 for two-digit numbers, if it is double,**
  Examples: 11, 22, 33, 44, 55, 66, 77, 88, and 99 are each divisible by 11.
  for larger numbers, if the number formed after the following three steps is divisible by 11:
  - **find the sum of alternate digits,**
  - **find the sum of the remaining digits,**
  - **find the difference of these two sums;**

  See examples on the back of this page.
- **12 if it is divisible by both 3 and 4.**
  Example: 123,456 is divisible by 12, since it is divisible by both 3 and 4.
  (See examples for 3 and 4 above.)

Example: 343 is divisible by 7.

First start with the number	343	
Separate the last digit from the rest of the number	34	3
Take two times the last digit	34	3 × 2 = 6
And subtract that answer from the rest of the number	34 – 6 = 28	

Since this number, 28, is divisible by 7, (28 ÷ 7 = 4), we know that the original number, 343, is divisible by 7.

Example: 12,334 is divisible by 7.

First start with the number	12,334	
Separate the last digit from the rest of the number	1233	4
Take two times the last digit	1233	4 × 2 = 8
And subtract that answer from the rest of the number	1233 – 8 = 1225	

Although it turns out that 1,225 is divisible by 7, (1,225 ÷ 7 = 175), most of us can't do that one in our heads. You can, however, repeat the above steps on this number to see if it is divisible by 7:

First start with the number	1,225	
Separate the last digit from the rest of the number	122	5
Take two times the last digit	122	5 × 2 = 10
And subtract that answer from the rest of the number	122 – 10 = 112	

which you may recognize as divisible by 7, since 112 ÷ 7 = 16. If not:

First start with the number	112	
Separate the last digit from the rest of the number	11	2
Take two times the last digit	11	2 × 2 = 4
And subtract that answer from the rest of the number	11 – 4 = 7	

which is definitely divisible by 7, so the original number, 123,445 is divisible by 7.

Note: This shows that sometimes you may have to repeat the steps to get a small enough number to know if it is divisible. This can also happen with the rules for 3, 9, and 11.

Example: 623,381 is divisible by 11.

Take the number 623,381.
The alternate digits of **6**2**3**,3**8**1 are 6, 3, and 8, whose sum is 6 + 3 + 8 = 17.
The remaining digits are 2, 3, and 1, whose sum is 2 + 3 + 1 = 6.
The difference of these two sums is 17 – 6 = 11, which is divisible by 11,
so the original number, 623,381, is divisible by 11.