Divisibility and Large number

1. Check if a large no is divisible by 3 or not.
   1. Since input number may be very large, we cannot use n % 3 to check if a number is divisible by 3 or not, especially in languages like C/C++. The idea is based on following fact.
   2. A number is divisible by 3 if sum of its digits is divisible by 3.
2. Check if a large no is divisible by 4 or not.
   1. A number is divisible by 4 if number formed by last two digits of it is divisible by 4.
3. Check if a large no is divisible by 6 or not.
   1. A number is divisible by 6 if it is divisible by 2 and 3.
   2. A number is divisible by 3 if sum of its digits is divisible by 3.
   3. A number is divisible by 2 if its last digit is divisible by 2.
4. Check if a large no is divisible by 7 or not.
   1. A number is divisible by 7 if and only if a-2b is divisible by 7. In other words, **subtract twice the last digit from the number formed by the remaining digits. Continue to do this until a small number is formed.**
   2. EX: the number 371: 37 – (2×1) = 37 – 2 = 35; 3 – (2 × 5) = 3 – 10 = -7; thus, since -7 is divisible by 7, 371 is divisible by 7.
5. Check if a large no is divisible by 9 or not.
   1. A number is divisible by 9 if sum of its digits is divisible by 9.
6. Check if a large no is divisible by 11 or not.
   1. A number is divisible by 11 if difference of following two is divisible by 11.
   2. Sum of digits at odd places.
   3. Sum of digits at even places.
7. Check if a large no is divisible by 12 or not
   1. A number is divisible by 12 if a number is divisible by 4 and 3.
   2. A number is divisible by 4 if number formed by last two digits of it is divisible by 4.
   3. A number is divisible by 3 if sum of its digits is divisible by 3.
8. Check if a large no is divisible by 13 or not
   1. A number is divisible by 12 if a number is divisible by 4 and 3.
   2. A number is divisible by 13 if and if the alternating sum (alternatively adding and subtracting) of blocks of three from right to left is divisible by 13. For example, 2911285 is divisible by 13 because the alternating sum of blocks of size 3 is 2 – 911 + 285 = -650 which is divisible by 13.
   3. A number is divisible by 13 if and only if the number obtained by adding the last digit multiplied by 4 to the rest is also divisible by 13.   
      For example, consider 2353. Applying above rule, we get 235 + 3\*4 = 247. Again we apply the rule and get 24 + 7\*4 = 52. Since 52 is divisible by 13, the given number is divisible by 13.
9. Check if a large no is divisible by 15 or not
   1. A number is divisible by 15 if it is divisible by 5 and 3.
   2. A number is divisible by 5 if the last digit is 5 or 0.
   3. A number is divisible by 3 if sum of digits is divisible by 3.
10. Check if a large no is divisible by 29 or not
    1. A number is divisible by 29 or not . Add 3 times of last digit to rest number and repeat this process until number comes 2 digit. Then the number is divisible by 29 if the obtained two digit number is divisible by 29.
    2. EX: no- 348. Three times of last digit + Rest of the number = 8\*3 + 34 = 58  
       Since 58 is divisible by 29, 348 is also divisible by 29.