Divisibility
by Total Gadha - Saturday, 10 February 2007, 02:22 AM

1.6 A Divisibility by 2, 4, 8, 16, 32..

A number is divisible by 2, 4, 8, 16, 32,.. 2^n when the number formed by the last one, two, three, four, five...n digits is divisible by 2, 4, 8, 16, 32,..2^n respectively.

Example: 1246384 is divisible by 8 because the number formed by the last three digits i.e. 384 is divisible by 8. The number 89764 is divisible by 4 because the number formed by the last two digits, 64 is divisible by 4.

1.6 B Divisibility by 3 and 9

A number is divisible by 3 or 9 when the sum of the digits of the number is divisible by 3 or 9 respectively.

Example: 313644 is divisible by 3 because the sum of the digits- 3 + 1 + 3 + 6 + 4 + 4 = 21 is divisible by 3.

The number 212364 is divisible by 9 because the sum of the digit- 2 + 1 + 2 + 3 + 6 + 4 = 18 is divisible by 9.

1.6 c Divisibily by 6, 12, 14, 15, 18..

Whenever we have to check the divisibility of a number N by a composite number C, the number N should be divisible by all the prime factors (the highest power of every prime factor) present in C .

divisibility by 6: the number should be divisible by both 2 and 3.

divisibility by 12: the number should be divisible by both 3 and 4.

divisibility by 14: the number should be divisible by both 2 and 7.

divisibility by 15: the number should be divisible by both 3 and 5.

divisibility by 18: the number should be divisible by both 2 and 9.

EXAMPLES

35. The six-digit number 73A998 is divisible by 6. How many values of A are possible?

Answer: Since the number is ending in an even digit, the number is divisible by 2. To find divisibility by 3, we need to consider sum of the digits of the number.

The sum of the digits = 7 + 3 + A + 9 + 9 + 8 = 36 + A.

For the number to be divisible by 3, the sum of the digits should be divisible by 3. Hence A can take values equal to 0, 3, 6, and 9.

Answer = 4

1.6 d Divisibility by 7, 11, and 13

Let a number be ....kjlhgfedcba where a, b, c, d, are respectively units digits, tens digits, hundreds digits, thousands digits and so on. Starting from right to left, we make groups of three digit numbers successively and continue till the end. It is not necessary that the leftmost group has three digits.

Grouping of the above number in groups of three, from right to left, is done in the following manner Ã kj,ihg,fed,cba

We add the alternate groups (1st, 3rd, 5th etc.. and 2nd, 4th, 6th, etc..) to obtain two sets of numbers, N_1 and N_2.

In the above example, N_1 = cba + ihg and N_2 = fed + kj

Let D be difference of two numbers, N_1 and N_2 i.e. D = N_1 â€“ N_2.

Ã If D is divisible by 7, then the original number is divisible by 7.

Ã If D is divisible by 11, then the original number is divisible by 11

Ã If D is divisible by 13 then the original number is divisible by 13.

Corollary:

Any six-digit, or twelve-digit, or eighteen-digit, or any such number with number of digits equal to multiple of 6, is divisible by ***EACH*** of 7, 11 and 13 if all of its digits are **same** .

For example 666666, 888888888888 etc. are all divisible by 7, 11, and 13.

Example

36. Find if the number 29088276 is divisible by 7.

Answer: We make the groups of three as said above- 29,088,276

N_1 = 29 + 276 = 305 and N_2 = 88

D = N_1 â€“ N_2 = 305 â€“ 88 = 217. We can see that D is divisible by 7. Hence, the original number is divisible by 7.

37. Find the digit A if the number 888â€¦888A999â€¦999 is divisible by 7, where both the digits 8 and 9 are 50 in number.

Answer: We know that 888888 and 999999 will be divisible by 7. Hence 8 written 48 times in a row and 9 written 48 times in a row will be divisible by 7. Hence we need to find the value of A for which the number 88A99 is divisible by 7. By trial we can find A is = 5.

Answer = 5.