

Playing with Numbers

Numbers can be written in general form.

A two-digit number ab will be written as

$$ab = 10a + b$$

A three-digit number abc will be written as

$$abc = 100a + 10b + c$$

A four-digit number $abcd$ will be written as

$$abcd = 1000a + 100b + 10c + d$$

S.no	Divisibility	How it works
1	Divisibility by 10	Numbers ending with 0 are divisible by 10 Why? A three-digit number abc will be written as $abc = 100a + 10b + c$ So c has to be 0 for divisibility by 10
2	Divisibility by 5	Numbers ending with 0 and 5 are divisible by 5 Why? A three-digit number abc will be written as $abc = 100a + 10b + c$ So c has to be 0 or 5 for divisibility by 5
3	Divisibility by 2	Numbers ending with 0,2,4,6 and 8 are divisible by 2 Why? A three-digit number abc will be written as $abc = 100a + 10b + c$ So c has to be 2,4,6,8 or 0 for divisibility by 2
4	Divisibility by 3	The sum of digits should be divisible by 3 Why? A three-digit number abc will be written as

$$abc = 100a + 10b + c$$

$$= 99c + 9b + (a + b + c)$$

$$= 9(11c + b) + (a + b + c)$$

Now 9 is divisible by 3, so sum of digits should be divisible by 3

5 Divisibility by 9

The sum of digits should be divisible by 9
Why?
 A three-digit number abc will be written as
 $abc = 100a + 10b + c$
 $= 99c + 9b + (a + b + c)$
 $= 9(11c + b) + (a + b + c)$

6 Divisibility by 11

Now 9 is divisible by 9, so sum of digits should be divisible by 9
 The difference between the sum of digits at its odd places and that of digits at the even places should be divisible by 11

Why?
 $abcd = 1000a + 100b + 10c + d$
 $= (1001a + 99b + 11c) - (a - b + c - d)$
 $= 11(91a + 9b + c) + [(b + d) - (a + c)]$