Divisibility Rule

Divisibility by 2 → If Last digit of the number is divisible by 2
Ex.: 92, 76, 112 are divisible by 2

Divisibility of 3 → All such numbers the Sum of whose digits are divisible by 3
Ex.: When 335 is added to 5A7, the result is 8B2 is divisible by 3. What is the largest possible value of A?
Sol.

$$\begin{array}{ccc} 5 & A & 7 \\ 3 & 3 & 5 \\ \hline 8 & B & 2 \end{array}$$

$\Longrightarrow$ A → 1, 2, 3, 4, 5 &
B → 5, 6, 7, 8, 9
8B2 is exactly ∴ 8 + B + 2 = multiple of 3
∴ B = 5 or 8 $\Longrightarrow$ A = 1 or 4

Divisibility by 4 → If Last two digits of the number are divisible by 4
Ex.: Take the number 6316. Consider the last two digits 16. As 16 is divisible by 4, the original number 6316 is also divisible by 4.

Divisibility by 5 → If Last digit (0 and 5) is divisible by 5
Ex.: 100, 195, 118975 are divisible by 5

Divisibility by 6 → A number is divisible by 6 If it is simultaneously divisible by 2 and 3
Ex.: 834, the number is divisible by 2 as the last digit is 4.
The sum of digits is 8+3+4 = 15, which is also divisible by 3.
Hence 834 is divisible by 6.

Divisibility by 7 → Double the last digit and subtract it from the remaining leading truncated number. If the result is divisible by 7, then so was the original number.
Ex.: Check to see if 203 is divisible by 7
Sol.

$$\begin{array}{r|l} 20 & 3 \\ -6 & \times 2 \\ \hline 14 & \end{array}$$

Step I. Double the last digit = 3 × 2
= 6
Step.2 Subtract that from the rest of the Number = 20 – 6 = 14

Step.3 Check to see if the difference is divisible by 7. 14 is divisible by 7 therefore 203 is also divisible by 7

Divisibility by 8 → If Last three digits of the number are divisible by 8

Divisibility of 9 → All such numbers the Sum of whose digits are divisible by 9
Ex.: If 5432*7 is divisible by 9, then the digit in place of * is
Sol. $\frac{5+4+3+2+x+7}{9} = \frac{21+x}{9}$
Put the value of 'x'. So, the number is completely divisible by 9. Put x = 6
$= \frac{21+6}{9} = \frac{27}{9} = 0$ remainder

Divisibility by 11→ The difference of the sum of the digits in the odd places and the sum of digits in the even places is '0' or multiple of 11 is divisible
Ex.: If * is a digit such that 5824* is divisible by 11, then * equals:
Sol:

5 8 2 4 *

$\Longrightarrow 5 + 2 + * = 8 + 4$
$7 + * = 12$
$* = 12 - 7 = 5$

Divisibility by 16 → If Last four digits of the number are divisible by 16

Divisibility by 25 → If Last two digits of the number are divisible by 25

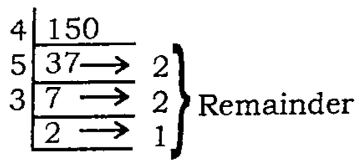
Divisibility by 32 → If Last five digits of the number are divisible by 32

Divisibility by 125 → If Last three digits of the number are divisible by 125

Divisibility by 3, 7, 11, 13, 21, 37 and 1001 → (i) If any number is made by repeating a digit 6 times the number will be divisible by 3, 7, 11, 13, 21, 37 and 1001 etc.
(ii) A six digit number if formed by repeating a three digit number; for example, 256, 256 or 678, 678 etc. Any number of this form is always exactly divisible by 7, 11, 13, 1001 etc.

Some important points →
(a) If a is divisible by b then ac is also divisible by b.
(b) If a is divisible by b and b is divisible by c then a is divisible by c.
(c) If n is divisible by d and m is divisible by d then (m + n) and (m-n) are both divisible by d. This has an important implication. Suppose 48 and 528 are both divisible by 8. Then (528 + 48) as well as (528 - 48) are divisible by 8)

Successive Division : If the quotient in a division is further used as a dividend for the next divisor and again the latest obtained divisor is used as a dividend for another divisor and so on, then it is called then " successive division" i.e, if we divide 150 by 4, we get 37 as quotient and 2 as a remainder then if 37 it divided by another divisor say 5 then we get 7 as a quotient and 2 remainder and again if we divide 7 by another divisor say 3 we get 2 as quotient and 1 as a remainder i.e, we can represent it as following



Now you can see that the quotient obtained in the first division behaves as a dividend for another divisor 5. Once again the quotient 7 is treated as a dividend for the next divisor 3. Thus it is clear from the above discussion as

Dividend	**Divisor**	**Quotient**	**Reminder**
150	4	37	2
37	5	7	2
7	3	2	1

So, the 150 is successively divided by 4, 5, and 3 the corresponding remainders are 2, 2 and 1.