FACTORS AND MULTIPLES:

Factors:
When a number is said to be a factor of any other second number, then the first number must divide the second number completely without leaving any remainder. In simple words, if a number (dividend) is exactly divisible by any number (divisor), then the divisor is a factor of that dividend. Every number has a common factor that is one and the number itself.

5 * 4 = 20

For example, 4 is a factor of 24, i.e. 4 divides 24 exactly giving 6 as quotient and leaving zero as remainder. Alternatively, 6 is also a factor of 24 as it gives 4 as a quotient on division. Therefore, 24 has 1, 24, 4, 6 as its factors in addition to 2, 3, 8 and 12 and all these numbers divide 24 exactly leaving no remainder.

Multiples:
A multiple of a number is a number that is the product of a given number and some other natural number. Multiples can be observed in a multiplication table. Multiples of some numbers are as follows:

Multiples of 2 are 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, and so on.
Hence, multiples of 2 will be even numbers and will end with 0, 2, 4, 6 or 8.

Multiples of 3 are 3, 6, 9, 12, 15, 18, 21, and so on.
Multiples of 5 are 5, 10, 15, 20, 25, and so on. Every multiple of 5 has its last digit as 0 or 5.

In the above-mentioned examples, say multiples of 2, the number 2 can be multiplied by infinite numbers to find the "n" number of multiples.

Now, let us assume an example, **3 × 4 = 12**
Here, 3 and 4 are the factors of 12, 12 is multiple of 3 and 4

Thus, we can conclude that if X and Y are two numbers and;

- If X divides Y, X is a factor of Y
- If Y is divisible by X, Y is a multiple of X

Since the number 1 divides every integer, it is a common factor of every integer. Also, every number is divisible by 1 and every number is a multiple of 1.

Finding the unit's digit

Generally, a unit digit can be identified by looking at the number and identifying the rightmost number before the decimal. But in some cases, it is not so direct. In numbers with exponents, the unit digit has to be calculated. For example, to calculate the unit digit of 260 it is advisable to use an indirect method rather than calculate the exact value and then find the unit digit.

Pattern or Cyclicity:

When any number is raised to the power n, where n = 1, 2, 3..., its unit digit follows a pattern or a cycle.

For example, 21, 22, 23, 24... and so on end with 2, 4, 8, 6, 2, 4, 8, 6, 2, 4... In this case, the unit's digit repeats after every 4 powers. Therefore 21 will have the same units digit as 25, 29, 213.. all 2(4k+1), where k = 0, 1, 2, 3...

The following table gives the patterns or cycles of all natural numbers from 1 to 9:

NUMBER	CYCLE	PATTERN
1	1	1
2	4	2, 4, 8, 6
3	4	3, 9, 7, 1
4	2	4, 6
5	1	5
6	1	6
7	4	7, 9, 3, 1
8	4	8, 4, 2, 6
9	2	9, 1

Another general and one of the easier ways to find the units digit of a number in the form xy, is done with the help of the following steps:

1. Identify the unit's digit in the base 'x' and call it 'l'. {For example, if x = 24, then the unit's digit of 24 is 4. Hence l = 4.}
2. Divide the exponent 'y' by 4.

- If the exponent y is exactly divisible by 4. i.e., y leaves a remainder 0 when divided by 4. Then,
- the units digit of x^y is 6, if l = 2, 4, 6, 8.

- the units digit of x^y is 1, if $l = 3, 7, 9$.
- If y leaves a non-zero remainder r, when divided by 4 (i.e. $y = 4k + r$). Then,
- the units digit of $x^y = l^r$

Example: Find the Unit digit of 287^{562581}