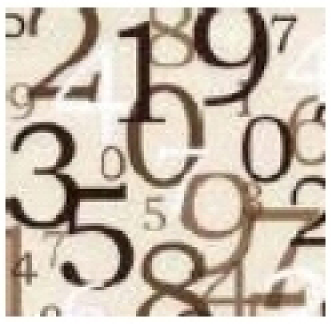
**How to find last two digits of a number**
by Total Gadha - Saturday, 17 January 2009, 05:33 PM



*This brilliant article was contributed to Total Gadha by Ashish Tyagi, a regular TGite. I do not think there can be easier or more lucid method of finding the last two digits of a number. Kudos to Ashish for this article. We will also welcome similar contributions from our other users. Do you have some useful or life-saving funda that you would like to share? Send it to us and we will publish it with your name- Total Gadha*

I am dividing this method into four parts and we will discuss each part one by one:

a. Last two digits of numbers which end in one
b. Last two digits of numbers which end in 3, 7 and 9
c. Last two digits of numbers which end in 2
d. Last two digits of numbers which end in 4, 6 and 8

Before we start, let me mention binomial theorem in brief as we will need it for our calculations.

$$(x + a)^n = {}^nC_0a^n + {}^nC_1a^{n-1}x + {}^nC_2a^{n-2}x^2 + \dots \text{ where } {}^nC_r = \frac{n!}{r!(n-r)!}$$

**Last two digits of numbers ending in 1**

Let's start with an example.

**What are the last two digits of $31^{786}$?**

Solution: $31^{786} = (30 + 1)^{786} = {}^{786}C_0 \times 1^{786} + {}^{786}C_1 \times 1^{785} \times (30) + {}^{786}C_2 \times 1^{784} \times 30^2 + \dots$, Note that all the terms after the second term will end in two or more zeroes. The first two terms are ${}^{786}C_0 \times 1^{786}$ and ${}^{786}C_1 \times 1^{785} \times (30)$. Now, the second term will end with one zero and the tens digit of the second term will be the product of 786 and 3 i.e. 8. Therefore, the last two digits of the second term will be 80. The last digit of the first term is 1. So the last two digits of $31^{786}$ are 81.

Now, here is the shortcut:

Multiply the tens digit of the number (3 here) with the last digit of the exponent (6 here) to get the tens digit. The units digit is equal to one.

Here are some more examples:

**Find the last two digits of $41^{2789}$**

In no time at all you can calculate the answer to be 61 ($4 \times 9 = 36$). Therefore, 6 will be the tens digit and one will be the units digit)

**Find the last two digits of $71^{56747}$**

Last two digits will be 91 ($7 \times 7$ gives 9 and 1 as units digit)

Now try to get the answer to this question within 10 s:

**Find the last two digits of $51^{456} \times 61^{567}$**

The last two digits of $51^{456}$ will be 01 and the last two digits of $61^{567}$ will be 21. Therefore, the last two digits of $51^{456} \times 61^{567}$ will be the last two digits of $01 \times 21 = 21$

**Last two digits of numbers ending in 3, 7 or 9**

**Find the last two digits of $19^{266}$.**

$19^{266} = (19^2)^{133}$. Now, $19^2$ ends in 61 ($19^2 = 361$) therefore, we need to find the last two digits of $(61)^{133}$.

Once the number is ending in 1 we can straight away get the last two digits with the help of the previous method. The last two digits are 81 ($6 \times 3 = 18$, so the tens digit will be 8 and last digit will be 1)

**Find the last two digits of $33^{288}$.**

$33^{288} = (33^4)^{72}$. Now $33^4$ ends in 21 ($33^4 = 33^2 \times 33^2 = 1089 \times 1089 = xxxxx21$) therefore, we need to find the last two digits of $21^{72}$. By the previous method, the last two digits of $21^{72} = 41$ (tens digit $= 2 \times 2 = 4$, unit digit $= 1$)

So here's the rule for finding the last two digits of numbers ending in 3, 7 and 9:

Convert the number till the number gives 1 as the last digit and then find the last two digits according to the previous method.

Now try the method with a number ending in 7:

**Find the last two digits of $87^{474}$.**

$87^{474} = 87^{472} \times 87^2 = (87^4)^{118} \times 87^2 = (69 \times 69)^{118} \times 69$ (The last two digits of $87^2$ are 69) $= 61^{118} \times 69 = 81 \times 69 = 89$

If you understood the method then try your hands on these questions:

**Find the last two digits of:**

1. $27^{456}$
2. $79^{83}$
3. $583^{512}$

**Last two digits of numbers ending in 2, 4, 6 or 8**

There is only one even two-digit number which always ends in itself (last two digits) - 76 i.e. 76 raised to any power gives the last two digits as 76. Therefore, our purpose is to get 76 as last two digits for even numbers. We know that $24^2$ ends in 76 and $2^{10}$ ends in 24. Also, 24 raised to an even power always ends with 76 and 24 raised to an odd power always ends with 24. Therefore, $24^{34}$ will end in 76 and $24^{53}$ will end in 24.

Let's apply this funda:

**Find the last two digits of $2^{543}$.**

$2^{543} = (2^{10})^{54} \times 2^3 = (24)^{54}$ (24 raised to an even power) $\times 2^3 = 76 \times 8 = 08$

(**NOTE:** Here if you need to multiply 76 with $2^n$, then you can straightaway write the last two digits of $2^n$ because when 76 is multiplied with $2^n$ the last two digits remain the same as the last two digits of $2^n$. Therefore, the last two digits of $76 \times 2^7$ will be the last two digits of $2^7 = 28$)

Same method we can use for any number which is of the form $2^n$. Here is an example:

**Find the last two digits of $64^{236}$.**

$64^{236} = (2^6)^{236} = 2^{1416} = (2^{10})^{141} \times 2^6 = 24^{141}$ (24 raised to odd power) $\times 64 = 24 \times 64 = 36$

Now those numbers which are not in the form of 2n can be broken down into the form 2n ´ odd number. We can find the last two digits of both the parts separately.

Here are some examples:

**Find the last two digits of $62^{586}$.**

$62^{586} = (2 \times 31)^{586} = 2^{586} \times 3^{586} = (2^{10})^{58} \times 2^6 \times 31^{586} = 76 \times 64 \times 81 = 84$

**Find the last two digits of $54^{380}$.**

$54^{380} = (2 \times 3^3)^{380} = 2^{380} \times 3^{1140} = (2^{10})^{38} \times (3^4)^{285} = 76 \times 81^{285} = 76 \times 01 = 76.$

**Find the last two digits of $56^{283}$.**

$56^{283} = (2^3 \times 7)^{283} = 2^{849} \times 7^{283} = (2^{10})^{84} \times 2^9 \times (7^4)^{70} \times 7^3 = 76 \times 12 \times (01)^{70} \times 43 = 16$

**Find the last two digits of $78^{379}$.**

$78^{379} = (2 \times 39)^{379} = 2^{379} \times 39^{379} = (2^{10})^{37} \times 2^9 \times (39^2)^{189} \times 39 = 24 \times 12 \times 81 \times 39 = 92$

Now try to find the last two digits of
1. $34^{576}$
2. $28^{287}$

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