# Number Theory

Units digit of a number raised to power

Here, we will see how to find the units digit of a number that is in the form x^y. We will first t understand what is a units digit, then we will look at the technique to find the units digit of large po and then using this technique we will solve some problems on Units digit of a number raised to power

At the end, please take the **QUIZ** to test your understanding.

Video :
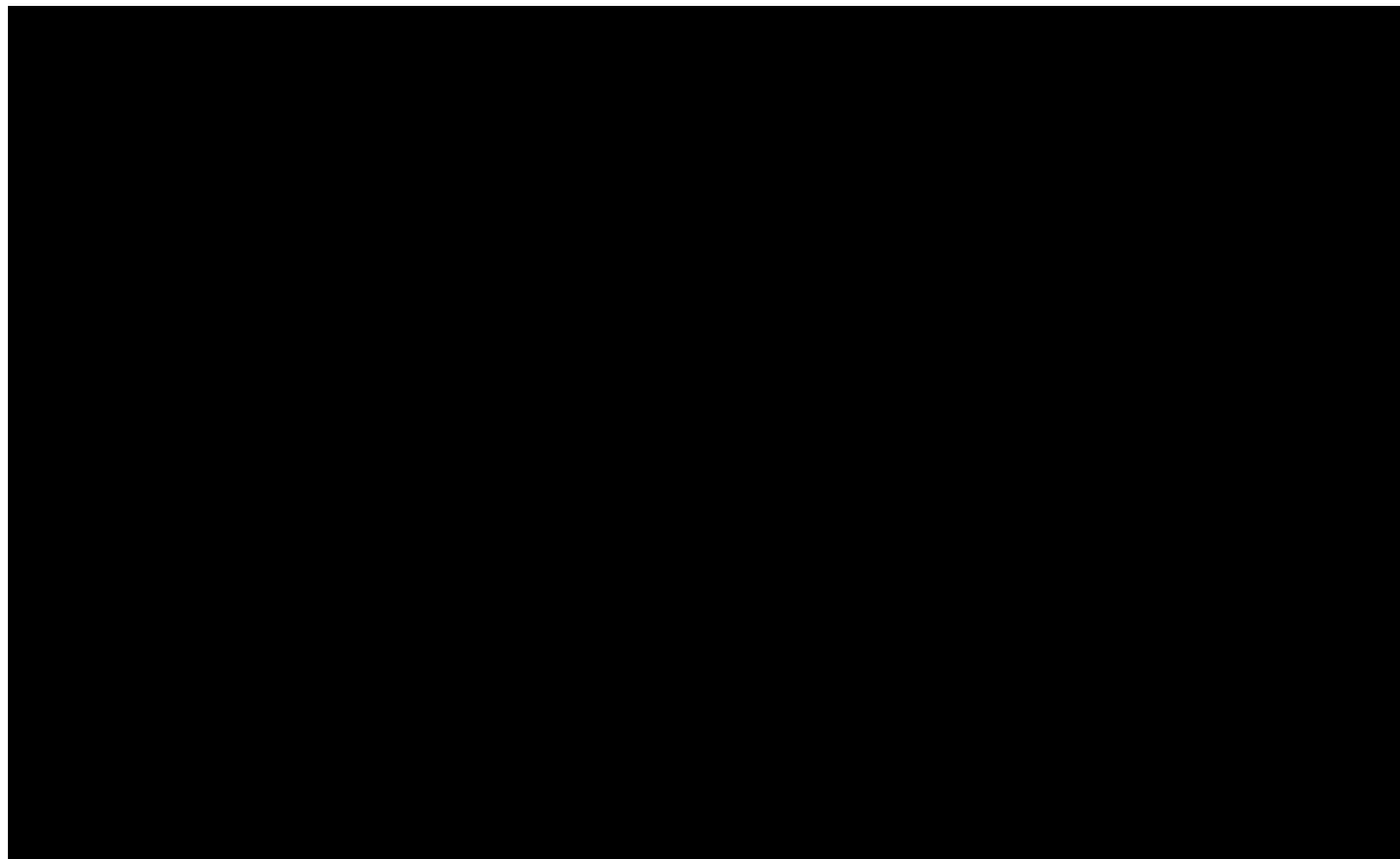
What is a Units digit?

Units digit of a number is the digit in the one's place of the number. i.e It is the rightmost digit o number. For example, the units digit of 243 is 3, the units digit of 39 is 9.

But then what is the units digit of large numbers like 23 to the power 46 or what is the units digit of to the power of 2014? Here, it is not straight forward to calculate the units digit of these numbers. S have a look at the technique to calculate the units digit of large numbers.

Units digit of Large Numbers – number raised to power

One of the ways of finding the units digit of a power is by finding the remainder when that numb divided by 10.
Another general and one of the easier ways to find the units digit of a number in the form x^y, is done the help of the following steps:

1. Identify the units digit in the base 'x' and call it say 'l'. {For example, If x = 24, then the units digit in 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 $x^y = l^r$

Problems on Units digit of large powers

+ **Example 1:** what is the units digit of 2014 to the power of 2012?

− **Example 2:** what is the units digit in the expansion 1453 raised to 71?

Here, we have to find the units digit of 1453^{71}

1. The base is 1453 and hence its units digit is 3. Therefore, l = 3.

2. The exponent is 71, which when divided by 4 gives a remainder 3.

- Since l is 3 and the exponent leaves a remainder 3 when divided by 4, we have

the units digit of 1453^{71} = the units digit of 3^3 = 7

+ **Example 3.** what is the units digit in the expansion of 2 the power of 51?

Quiz : Test Your Understanding

We hope that you now have a good idea on how to find the units digit of a number raised to power. is a small quiz to test your understanding.

Find the units digit of 2016^{2015} - 2015^{2016}

☐ 9

☐ 1

☐ 5

☐ 6

0%

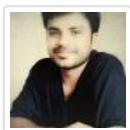14 Number Theory

Comments

Akshay October 12, 2015   Reply

Thank You !!!

sam January 4, 2016   Reply

answer of second one is 7

Sujith Patnaik January 4, 2016

Thanks Sam:) I have updated it!

Nora Martinez February 29, 2016   Reply

Sujith...what is the answer to the following:

(0.1 mol/L) raised to the zero power. I am really interested in knowing what happens to units.

thanks!

Sujith Patnaik March 4, 2016

Hi,
Anything to zero power is 1.
Answer to your problem – https://www.google.co.in/webhp?sourceid=chrom instant&ion=1&espv=2&ie=UTF-8#q= (+0.1+mol%2FL)+raised+to+the+zero+power

Prakash September 17, 2017 💬 Reply

Hey what if l=1 or 5

Sujith Patnaik October 9, 2017

Any number whose units digit ends in 1 or 5, the power of that number will end in 1 or 5 respectively.

Rudranil Ghosh October 5, 2017 💬 Reply

What when l=5?

Sujith Patnaik October 9, 2017

Any number whose units digit ends in 5, the power of that number will also in 5.

Abhishek November 15, 2017 💬 Reply

Question 1) 0 कैसे आता he.
Question 2) 1×2×3×4.........1000? Right hand side mein कितने zero आएंगे
!1000= ?

Question 3) 1234567 ke power 1234567
=Unit place?

venky December 18, 2017 💬 Reply

72216^7 mod 15

Username December 27, 2017 💬 Reply

thnks.....!

Parveen April 29, 2018 💬 Reply

Very easy and useful trick .Thankx a lot!!!!!

anoymous June 1, 2018 💬 Reply

this does'nt apply to 17^153, why??

Comment

Name

Email

Math Captcha

8 + 2 =

Add Comment

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