

# Astounding Wonders of Ancient Indian Vedic Mathematics

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#### What are we going to do today?



**Multiplication:** 

Multiply 87265 by 32117.





**Reciprocals:** 

Express 1/19 up to certain number of decimal places.

**Division:** 

Divide 7031985 by 823.



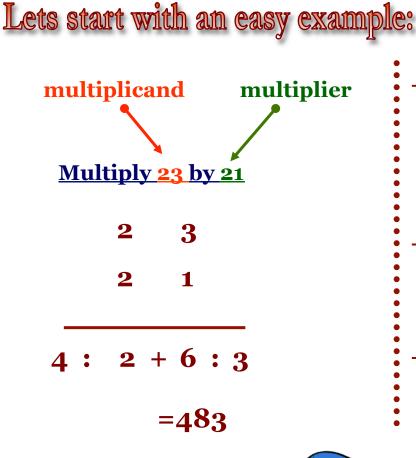


Find Square roots and Cube roots:

Extract square root of 738915489. Find cube root of 9989.

**EACH OF THESE IN MATTER OF SECONDS!!!** 

### Multiplication



→ Multiply the left-hand-most digit 2 of the multiplicand vertically by the left-handmost digit 2 of the multiplier, get their product 4 and set it down as the lefthand-most part of the answer.

→Then multiply 2 and 1, and 2 and 3 crosswise, add the two, get 8 as the sum and set it down as the middle part of the answer.

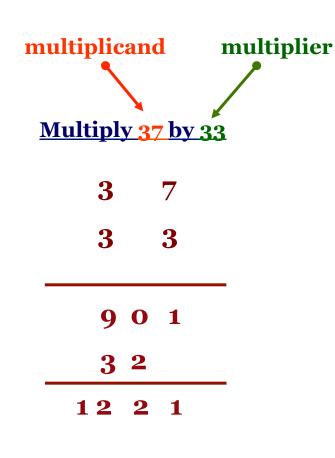
→ Multiply 3 and 1 vertically, get 3 as their product and put it down as the last, the right-hand-most, part of the answer.

Activity:

Multiply 16 by 11.



### Multiplication





Activity:

Multiply 35 by 36.

•Multiply the left-hand-most digit 3 of the multiplicand vertically by the left-handmost digit 3 of the multiplier, get their product 9 and set it down as the lefthand-most part of the answer.

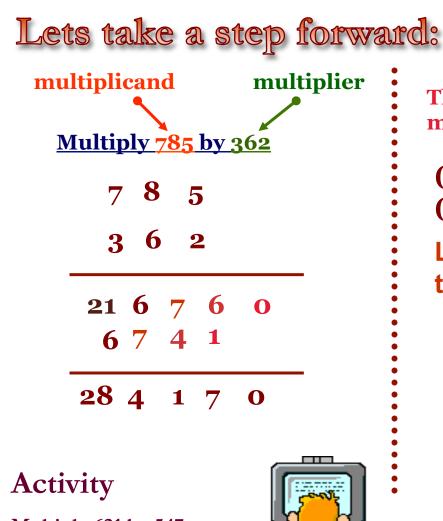
•Then multiply **3** and **3**, and **7** and **3** crosswise, add the two to get **30** as the sum.

•The right-hand-most digit is to be put down there and the preceding i.e. lefthand-side digit or digits should be carried over to the left and placed under the previous digit or digits of the upper row.

•Multiply 7 and 3 vertically, get 21 as their product and follow the previous step.

•Add the numbers in the two rows thus obtained to get the required product.

### Multiplication



This merely means that we are multiplying  $(ax^{2} + bx + c) by (dx^{2} + ex + f)$ (where x = 10). Let us try to multiply this!  $ax^2 + bx + c$  $dx^2 + ex + f$  $adx^4 + (ae+bd)x^3$ + (af +be+cd) $x^2$ 

+ (bf+ce)x + cf

Multiply 621 by 547. Multiply 795 by 362.

#### Reciprocal

Find the reciprocals of 19, 29 and 49 by division of 1 by 19, 29 and 49.



1/19 = 0.052631578947368421

#### 1/29

= 0.0344827586206896551724137931

#### 1/49

= 0.02040816326530612244897959183673 4693877551

## Reciprocal

We shall now find reciprocal of 19 by using a formula from vedic mathematics.

- 1/19 =
- 0.052631578
  - 1 1 1 1 1 1
    - 9 4 7 3 6 8 4 2 1

1 1 1

Find 1/29 and 1/49.

- Put down 1 as the right-hand most digit
- Multiply the last digit 1 by 2 and put the 2 down as the immediately preceding digit.
- Multiply that 2 by 2 and put 4 down as the next previous digit.
- Multiply that 4 by 2 and put 8 down as the next digit.
- Multiply that 8 by 2 and we get 16. Put 6 immediately to the left of the 8 and keep the 1 on hand to be carried forward over to the left at the next step.
- We continue this until we reach the 18<sup>th</sup> digit counting leftwards from the right.