1. How to Find the Square of Number ending with 5?

We know

- $5^2 = 25$
- $15^2 = 225$
- $25^2 = 625$

Now see the similarity. In all these numbers the last two digits are same. That is 25. The only thing it changes is the first digit.

How to find that?

a) What is 15^2?

We know the last two digits of the square will be 25. Now take the first digit of 15; i.e. 1. Multiply 1 with it's next number. i.e. 2. So 1 x 2 = 2. Answer is 225.

b) What is 25^2?

We know the last two digits of the square will be 25. Now take the first digit of 25; i.e. 2. Multiply 2 with it's next number. i.e. 3. So 2 x 3 = 6. Answer is 625.

c) What is 55^2?

(5 x 6) 25 = 3025

d) What is 85^2?

(8 x 9) 25 = 7225. Hardly it takes less than 5 seconds. You don't even need to write the numbers on the paper.

Try 105^2

As usual (10 x 11) 25 = 11025 is the answer. Our usual method will take a minimum of 30 seconds to do this simple multiplication. Now we can easily save 25 seconds. ☺ ☺ ☺

Practice Problems

1. 115^2

2. 205^2

2. How to find a Square root of a number?

The first method is inter-related to this one. This method is applicable only for perfect squares.

You have to follow Three simple steps.

1. Find the range

2. Check the Unit Digit.

3. Find the square of number ending with 5 in the particular range and fix the number.

a) What is the square root of 484?

Step 1

We all know 20^2 = 400. Also we know 30^2 = 900.

So our number lies between 20 and 30.

Step 2

The unit digit is 4. So the unit digit of square root can be either 2 or 8. The number can be either 22 or 28.

Step 3

Between 20 and 30, we can easily find the square of 25 using the first method.

25^2 = (2 x 3)25 = 625

484 is less than 25. So Answer is 22.

b) What is the square root of 9801?

Range – 90 to 100.

Square of 95 = (9 x 10) 25 = 9025.

Answer can be either 91 or 99. (Based on Unit Digit)

9025 is less than 9801. So 99 is the Answer.

c) What is the Square root of 112896?

Range – 300 to 350 (As it is a big number, we need to follow one more step)

Now we should reduce the range. Square of 33 is 1089. So 330^2 will be 108900. Square of 34 is 1156. So 340^2 will be 115600. Our number is in between 330 and 240. As the unit digit is 6, there are two possibilities. It can be either 334 or 336.

Square of 335 = (33 x 34) 25 = (11 x 3 x 34) 25 = (374 x 3) 25= 112225.

As our number is more than the square of 335, the Answer is 336.

Note: This method may look tough and time consuming. But it is really a simple one.

d) What is the Square root of 390625?

Range

Square of 600 – 360000. Square of 650 – (6 x 7)2500 = 422500. (By Method 1).

So it is in between 60 and 65.

As the unit digit is 5, the square root should also end with 5. The options we have are 605, 615, 625, 635, and 645.

We can easily eliminate 605 and 645. (Based on Difference)

Note : These steps can be done by just seeing the number and mainly with out using pen.

Square of 615 = (61 x 62)25 = (62 (60 + 1))25 = 378225

Square of 625 = (62 x 63)25 = (63 (60 + 2))25 = 390625

Practice Problems.

Find the Square Root of

1. 5776

2. 140625

3. 828100

Day Today GK

3. How to find a Square of any number?

Any number can be represented as the addition of two numbers. For example 32 can be written as 30 + 2. 46 can be written as 40 + 6. 116 can be written as 110 + 6.

The Steps are

- Split
- Use Formula
- Add

a) What is the Square of 116?

Split = 110 + 6

Formula = $(a + b)^2 = a^2 + b^2 + 2ab$ = 12100 + 36 + 1320

Addition = 13456

The concept is Simple Multiplication and Simple Addition saves your time.

b) What is the Square of 1004?

Split = 1000 + 4

Apply Formula = 1000000 + 16 + 8000 = 1008016

(If you use traditional method, finding the square of 1004 will take a minimum of 40 seconds. By this method, you just saved 25 seconds again ☺ ☺ ☺)

c) What is the Square of 605?

Here you can two methods. The unit number is 5. Always go for the easy method.

Answer = (60 x 61)25 = (60 (60 + 1))25 = 366025

Practice Problems

Find the Square of

1. 713   2. 819

3. 1009   4. 1520

4. Multiplication using Split and Merge Method

This method is the most effective method for multiplication. We usually don't do mistakes when we multiply a number with less than 10. We do mistakes only when the number is big. Let's go to the technique.

a) What is 63 x 15?

```
     63
     15
----------
    315
     63
----------
    945
```

This is the usual method we follow. It took 20 seconds for me. For you it may take less than that.

Here is the simpler method.

= 63 (10 + 5) = 630 + 315 = 945. (Hardly takes 10 seconds).

In competitive exams, every second counts and even a 0.1 mark can change your future.

b) What is 81 x 19?

= 81 (20 - 1). It don't need to be only addition. It can be subtraction also. The ultimate aim is to reduce the time by using simple calculation.

= 1620 – 81 = 1539

c) What is 131 x 26

= 26 (100 + 30 + 1) = 2600 + 780 + 26 = 3406. (You can split the number to n number of times)

d) What is 147 x 150

You can split this to 150 (100 + 40 + 4 + 3) OR 147 (100 + 50) = 14700 + 7350

NOTE: Always use the simple way to find the answer.

e) What is 1005 x 106

Traditional Method will surely take 30 plus seconds.

= 106 (1000 + 2 + 2 + 1)

```
  106000
     212
     212
     106
-------------
  106530
```

(I have split the number to many numbers for your understanding. It can be just 106 (1000 + 5)).

f) What is 1256 x 516

= 1256 (500 + 10 + 3 + 3)

```
  628000
   12560
    3768
    3768
-----------
  648096
```

(It may look big. But once you practice this method, you will understand how simple and effective it is)

Multiplication with 5 - Into 10 By 2 Method (x 10/2)

When you have to multiply any number with 5, First multiply with 10 and divide by 2.

- 2 x 5 = 20 /2 = 10
- 77 x 5 = 770/2 = 385
- 1876 x 5 = 18760/2 = 9380
- 978672 x 5 = 9786720/2 = 4893360 (You can directly write the answer)

g) What is 1082 x 107

= 1082 (100 + 5 + 2)

= 108200 + [10820/2] + 2164

= 108200 + 5410 + 2164

= 115774

(Note that I write this many steps only for your understanding)

h) What is 103 x 97

Here rather than using split and merge method, we can apply another 7th std Formula.

$(a + b)(a - b) = a^2 - b^2$

$(100 + 3)(100 - 3) = 100^2 - 3^2 = 10000 - 9 = 9991.$

i) What is 53 x 47

= $(50 + 3)(50 - 3) = 2500 - 9 = 2491.$ (It just took 5 seconds).

j) What is 163 x 157

= $(160 + 3)(160 - 3) = 25600 - 9 = 25591$

Multiplication with 11

a) 21 x 11 = ?

Leave the traditional method. Shortcut method is write 2 and 1 at the first and last position. (Always add from the left)

i.e. 2___1 Now add 2 and 1. That is 3. Answer is 231. (You got answer in one second).

b) 25 x 11 = 2 ____ 5 = 275

c) 32 x 11 = 3 ____2 = 352

d) 253 x 11 = 2 _____ 3 = 2783 (Just adding the adjacent numbers).

e) 531 x 11 = 5 ____1 = 5841

f) 277 x 11 = 2____7

Here 2 followed by (2 + 7) then (7 + 7) then 7

= 29 (14) 7

(Carry the 1 to the left)

= 3047

g) 9879 x 11 = 9_____9

= 9 (9 + 8) (8 + 7) (7 + 9) 9

= 9 (17) (15) (16) (9) (Add the carry over number to the left)

= (9+1) (7+1) (5+1) (6)(9)

= 108669

i) 1387 x 11 = 1 _____ 7

= 1 (1+3) (3+8) (8+7) 7

= 1 (4) (11) (15) 7

= 1(4 +1) (1+1) (5) (7)

= 15257

j) 2587 x 11 = 2_____7 = 27(13)(15)7 = 28457

k) 3768912 x 11 = 3_____2 = 3(10)(13)(14)(17)(10)(3)2 = 41458032

Practice Problems

1. 98763 x 11

2. 9659213 x 11

3. 8621098 x 11

4. 55598 x 11

5. 127409 x 11

Multiplication of Numbers near to the bases

Base is nothing but numbers like 100, 1000, 10000, 100000..etc

Case 1:

Multiplication of Numbers Below the Base

a) 99 x 98

- 99 is one less from the base 100
- 98 is two less from the base 100

Here we ll get the answer in Two Parts.

One is LHS and another is RHS.

```
 99 - 1       1. Do Cross Subtraction.
 98 - 2          (99 - 2 Or 98 - 1) = 97
-----------
 97/02        2. Multiply -1 and -2 = 2. Write as 02.
-----------
```

LHS is 97. RHS is 02. Answer is 9702.

Always ensure that the number of digits in RHS should be equal to the number of 0's in the Base.

b) 96 x 92

- 96 is less than 100 by 4
- 92 is less than 100 by 8

```
 96 - 4       Step One is Cross Subtraction
 92 - 8          (96 - 8) OR (92 - 4) = 88.
-----------
 88/32        Step Two Is Multiplication
-----------      (-4)*(-8) = 32

              Answer is 8832
```

c) What is 88 x 86

88 - 12
86 - 14
----
74 / 168

Step One is Cross Subtraction
(88 - 14) or (86 - 12) = 74.

Step Two is Multiplication
(- 12) * (-14) = 168

As the base is 100, there should be only two digits in RHS. So carry over the 1 to the left. It becomes 7568

d) What is 981 x 991

981 - 19
991 - 09

972/ 171

Step One is Cross Subtraction
(981 - 09) OR (991 - 19) = 972

Step Two is Multiplication
(-19) * (-09) = + 171

Answer is 972171

e) What is 9987 x 9994

9987 - 13
9994 - 06

9981 / 0078

Step One is Cross Subtraction
[9987 - 06] OR [9994 - 13] gives 9981

Step Two is Multiplication
(-13) * (-06) = 78

As the Base is 10000, the number of digits in RHS must be 4. So we should add two zeroes to RHS.

Answer = 99810078

Winners Don't Do Different Things They Do Things Differently

Multiplication of Numbers Above the Base

a) 105 x 106

105 + 5
106 + 6
----
111 / 30

Step One is Cross Addition as it is above the base.
So (105 + 6) OR (106 + 5) = 111

Step Two is Multiplication
(+5) * (+6) = 30

Answer is 11130

b) 112 x 118

112 + 12
118 + 18
----
130 / 216

Step One is Cross Addition
112 + 18 OR 118 + 12 = 130.

Step 2 is Multiplication
(+12) (+18) = 216

As per the Rule, the number of digits in RHS should match the number of Zeros of the base. So Carry over the 2 to LHS.

Answer is 13216

c) 1003 x 1005

1003 + 3
1005 + 5

1008/015

Step One is Cross Addition
(1003 + 5) OR (1005 + 3) = 1008

Step Two is Multiplication
(+5)*(+3) = +15

As per the condition, the number of digits in RHS should match the number of 0s in the base. So RHS is 015.

ANSWER is 1008015

d) 1012 x 1021

```
1012 + 12
1021 + 21
------------------
1033/252
------------------
```

Step One is Cross Addition
(1021 + 12) OR (1012 + 21) = 1033

Step Two is Multiplication
(12)*(21) = 252

Answer is 1033252

Multiplication of Numbers (Mixed Base)

This is the third and final case of Multiplication with bases.

In Case 1, we saw multiplication of numbers below to the bases (99 x 98, 997 x 996..etc)

In Case 2, we saw multiplication of numbers above to the bases (101 x 103, 1012 x 1021..etc)

In case 3, ie mixed base, we will see what to do for products like 99 x 104 or 974 x 1010..etc

a) 103 x 95

```
103   +3
 95   -5
------------
 98/ -15
------------
```

Step One is Cross Addition or Subtraction
(103 -5) or (95 + 3) = 98

Step Two is Multiplication
(+3)*(-5) = -15

NOTE

RHS is Negative. Now we borrow 1 from the LHS. It becomes 98 - 1 = 97.

The 1 taken from LHS is equivalent to 100 (As 100 is the base). Now subtract 100 from 15. We get 85.

The Answer is 9785

Note: It may look tough or confusing. Believe me. Once you understand the concept, you can find the answer in just 5 seconds. You can save lots of time in Aptitude.

b) 110 x 88

```
110 + 10
 88 - 12
-----------------
 98 / -120
-----------------
```

Step One is Cross Addition or Cross Subtraction

(110 - 12) or (88 + 10) = 98

Step Two is Multiplication

(+10) * (-12) = -120

Note

RHS Cannot be Negative. RHS Should have only two digits. As the base is 100.

So, take the -1 of RHS to the Left. It becomes 97 / -20.

Now Borrow 1 from LHS and subtract the RHS from 100. It becomes 96/80

Answer is 9680

c) 1004 x 990

```
1004   + 4
 990   - 10
-----------------
 994 / -40
-----------------
```

Step One is Cross Addition or Cross Subtraction
(1004 - 10) OR (990 + 4) = 994

Step Two is Multiplication
(+4)*(-10) = - 40

Note

RHS should have three digits. As the base is 1000. So add a Zero. RHS becomes - 040.

Borrow one from LHS. Here it is equivalent to 1000 (As the base is 1000).

On Subtraction, we get 960. (1000 - 040)

Answer is 993960

Square of Numbers near to the Base

a) What is 97^2

- 97 is less than 100 by 3

So, Write like this –> (97-3) / 3^2

= 94/09. Answer is 9409.

Note that the number of digits in RHS should be equal to number of Zeros in the base.

b) What is 94^2

- 94 is less than 100 by 6.

So, Write like this → (94-6) / 6^2

= 88 / 36. Answer is 8836

c) What is 88^2

= (88 – 12) / (12^2)

= (76) / (144) = 7744 (Carry Over the One to LHS. Base is 100. So it should be two digits).

d) What is 998^2

= (998 - 2) / (2^2)

= (996) (004). Answer = 996004

e) 9993 x 9993

= (9993 - 7) / (7^2)

= (9986) / (49) = 99860049

f) 105 x 105

= (105 + 5) / (5^2) (We add as it is above the base)

= (110)/ 25. Answer = 11025.

You can answer it just by seeing the numbers. No need to Write any on paper.

g) 109 x 109

= $(109 + 9) / (9^2)$

= $(118)/(81) = 11881$

h) 1013 x 1013

= $(1013 + 13) / (13^2)$

= $(1026) / (169)$

= 1026169

i) 1025 x 1025

= $(1025 + 25) / (25^2)$

= $(1050) / (625)$

= 1050625

j) 1096 x 1096

= $(1096 + 96) / (96^2)$

= $(1192) / [(96 - 4)/ (4^2)]$

= $(1192) / (9216) = (1201) / (216)$

= 1201216 (carry over 9 to LHS. Base is 1000. Digits in RHS should be three).

k) 1113 x 1113

= $(1113 + 113) / (113^2)$

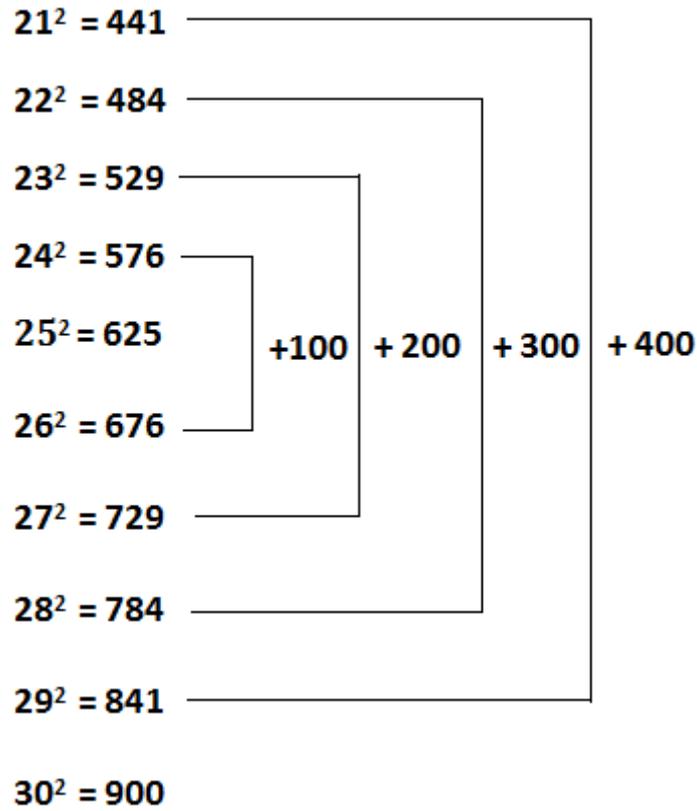= $(1226) / [(113 + 13) / (13)^2]$ (Separate 113^2 and do calculation for that alone)

= $(1226) / [126 / 169]$

= $1226 / [12769]$

= 1238769 (Carryover the 12 to the left) *(Understand that I write this many steps only for your understanding)*

 Note: This is the easiest way to find the Squares. Practice more. Then only you will know how simple it is. Assume your own numbers and do the math.

Simple Trick to remember Squares of numbers from 25 to 30

Just keep 25 as the middle number and do simple addition.

$$21^2 = 441$$
$$22^2 = 484$$
$$23^2 = 529$$
$$24^2 = 576$$
$$25^2 = 625$$
$$26^2 = 676$$
$$27^2 = 729$$
$$28^2 = 784$$
$$29^2 = 841$$
$$30^2 = 900$$

+100 | +200 | +300 | +400

Best Way to Calculate Percentage

In Percentage concept, there is division as well as multiplication. It is really time consuming for many people. In fact, it is the easiest part among all the topics. It is easier than adding two 3 digit numbers. The Split and Merge method can also be applied for Division also. Let's see ☺ ☺ ☺

Example 1

$$\frac{75}{25} \times 100 = \frac{25 + 25 + 25}{25} \times 100 = 1 + 1 + 1 = 300\%$$

Points to Note:

1. Never cancel the 100 while calculating percentage.
2. Always take the denominator as 100 %.
3. Think about 50%, 10%, and 1% of the Denominator.
4. Try to come as close as possible to the Numerator.
5. You can find the Answer.

In the above example,

What is 100% of 25? = It is 25. We just go by simple examples.

It is 3 times in the Numerator. So the answer is 300%.

Example 2

$$\frac{90}{390} \times 100$$

1. Take 390 as 100 %.
2. 10% of 390 is 39 and 1% of 390 is 3.9 (This part doesn't need any paper work)
3. You can split 90 into 39 + 39 + 12
4. So it is 10% + 10% + (Nearly 3%)
5. Answer is 23%

Example 3

$$\frac{97}{29} \times 100$$

1. Take 29 as 100%.
2. 100% of 29 is 29 and 10% of 29 is 2.9
3. 97 can be split into 29 + 29 + 29 + 10

The above three steps can be done just by using your brain with in 5 seconds
----

4. Its 300 % + (10/29) = Nearly 334%

Example 4

$$\frac{405}{360} \times 100$$

1. Take 360 as 100%.
2. 10% of 360 is 36 and 1% of 360 is 3.6
3. Split 405 into 360 + 36 + 9
4. It is 100 % + 10 % + 2 % + 0.5%
5. Answer is 112.5%.

This method is the most effective method for calculating percentage values. You don't need to remember any formulae to find answer using this method.

Example 5

$$\frac{1687}{1598} \times 100$$

1. As usual take 1598 as 100%.
2. 10% of 1598 is 159.8 and 1% of 1598 is 15.98
3. Split 1687 to 1598 + 89
4. It's 100% + (80 + 9) = 100 % + 5 % + 0.5 % = 105.5%

I am sure that the usual method will surely take more than a minute to solve this problem.

Example 6

$$\frac{132}{7985} \times 100$$

1. Take 7985 as 100%.
2. 10% of 7985 is 798.5 and 1% of 7985 is 79.85
3. Just by seeing we can say the answer is in between 1% and 2 %.
4. Divide 132 as 80 + 52. 1% is 80 (Nearly). And 0.5% is 40.
5. Answer will be nearly 1.6%.

In case of traditional method, first we cancel 7985 and 100 with 5. Then we keep on doing it until the time gets over. By this method, just by seeing, we can say it comes between 1% and 2%. If you see a little bit deeper, you can guess it is more than 1.5% and less than 2%.

In exam, if there is any option in the specific range, just mark it.

Example 7

$$\frac{0.8976}{0.75} \times 100$$

1. While solving fractions, it's better to do without decimal points.
2. We can change the above to 90/75
3. Just be seeing the fraction, I can say the answer is more than 100%.
4. Take 75 as 100%. 10% of 75 is 7.5 and 1% is 0.75.
5. 75 + 15 = 100 % + 20 % = 120%.

$$\frac{0.8976}{0.75} \times 100 \ = 119.68 \ (\text{Calculator Value})$$

If we look at the problem, just by mere observing, we can easily say the answer comes between 100 and 125.

I hope now you are clear with this type of calculation. Practice more problems. Just solve random fractions. Compare the time taken by the usual method and this method. Also have calculator with your side. Then you will know how accurate the method is and also how effective in saving time.

Dear Friends,

In case of any competitive exam, 90% of Aspirants will say "Paper is easy. But time is not enough" or "The math part is really time consuming" or "I prepared well but did some mistakes while doing calculation". The fact is those 90% are not clearing the exam. The remaining 10% do.

But most of the students don't take a perfect alternative strategy for the next exam and tells the same again and again. There are people who are clearing the exam in the first attempt itself. Do they have an extra hand and brain? No.

What the 10% do then?

The simple answer is they work in a smarter way.

In a competitive exam, every second counts. Even a 0.1 mark can change your whole life. Follow the above methods and practice again and again. I am 100% sure that, these methods will save you a minimum of 5 to 7 minutes in your exam. I hope you know the value of 5 minutes in the exam.

Before starting Aptitude topics, first be thorough with the shortcuts. Then go for individual topics. Prepare well for the exam. Always share your knowledge with others. Help other people. You can become the champion of the world.

All the Best.

DayTodayGK Team.

In case of any doubts regarding the above methods or anything, you can comment in Website or drop a mail. If you have materials or shortcut methods, share with us. It will reach 1000s of aspirants like you.

Contact us at

arunsathyan.day2daygk@gmail.com and prerikagupta.day2daygk@gmail.com

We are always ready to help you.

THANK YOU ☺ ☺ ☺

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