EXERCISE 3.3

1. Find the squares of the following numbers using column method. Verify the result by finding the square using the usual multiplication:
(i) 25
(ii) 37
(iii) 54
(iv) 71
(v) 96
Solution:
(i) 25
So here, a = 2 and b = 5

Column I	Column II	Column III
a^2	2ab	b^2
4	20	25
+2	+2	
6	22	
6	2	5

∴ $25^2 = 625$
Where, it can be expressed as
$25^2 = 25 \times 25 = 625$

(ii) 37
So here, a = 3 and b = 7

Column I	Column II	Column III
a^2	2ab	b^2
9	42	49
+4	+4	
13	46	
13	6	9

∴ $37^2 = 1369$
Where, it can be expressed as
$25^2 = 37 \times 37 = 1369$

(iii) 54

So here, a = 5 and b = 4

Column I	Column II	Column III
a^2 25 +4 29	2ab 40 +1 41	b^2 16
29	1	6

∴ $54^2 = 2916$

Where, it can be expressed as

$54^2 = 54 \times 54 = 2916$

(iv) 71

So here, a = 7 and b = 1

Column I	Column II	Column III
a^2 49 +1 50	2ab 14 +0 14	b^2 01
50	4	1

∴ $71^2 = 5041$

Where, it can be expressed as

$71^2 = 71 \times 71 = 5041$

(v) 96

So here, a = 9 and b = 6

Column I	Column II	Column III
a^2 81 +11 92	2ab 108 +3 111	b^2 36
92	1	6

∴ $96^2 = 9216$

Where, it can be expressed as
$96^2 = 96 \times 96 = 9216$

2. Find the squares of the following numbers using diagonal method:
(i) 98
(ii) 273
(iii) 348
(iv) 295
(v) 171
Solution:
(i) 98
Step 1: Obtain the number and count the number of digits in it. Let there be n digits in the number to be squared.

Step 2: Draw square and divide it into n^2 sub-squares of the same size by drawing (n - 1) horizontal and (n - 1) vertical lines.

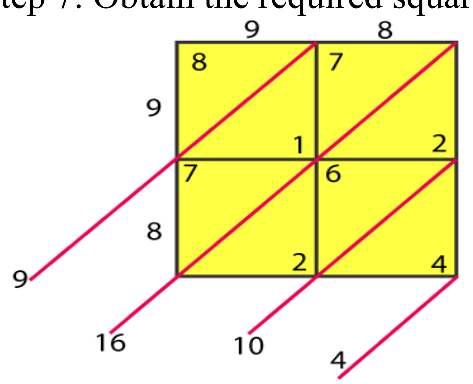
Step 3: Draw the diagonals of each sub-square.

Step 4: Write the digits of the number to be squared along left vertical side sand top horizontal side of the squares.

Step 5: Multiply each digit on the left of the square with each digit on top of the column one-by-one. Write the units digit of the product below the diagonal and tens digit above the diagonal of the corresponding sub-square.

Step 6: Starting below the lowest diagonal sum the digits along the diagonals so obtained. Write the units digit of the sum and take carry, the tens digit (if any) to the diagonal above.

Step 7: Obtain the required square by writing the digits from the left-most side.



∴ $98^2 = 9604$

(ii) 273

Step 1: Obtain the number and count the number of digits in it. Let there be n digits in the number to be squared.

Step 2: Draw square and divide it into n^2 sub-squares of the same size by drawing (n - 1) horizontal and (n - 1) vertical lines.

Step 3: Draw the diagonals of each sub-square.

Step 4: Write the digits of the number to be squared along left vertical side sand top horizontal side of the squares.

Step 5: Multiply each digit on the left of the square with each digit on top of the column one-by-one. Write the units digit of the product below the diagonal and tens digit above the diagonal of the corresponding sub-square.

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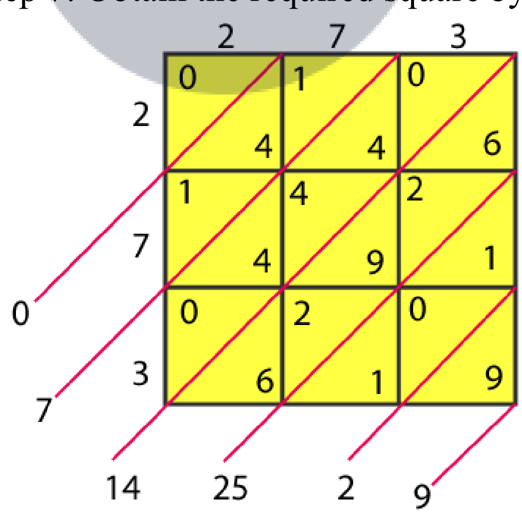


∴ $273^2 = 74529$

(iii) 348

Step 1: Obtain the number and count the number of digits in it. Let there be n digits in the number to be squared.

Step 2: Draw square and divide it into n^2 sub-squares of the same size by drawing (n - 1) horizontal and (n - 1) vertical lines.

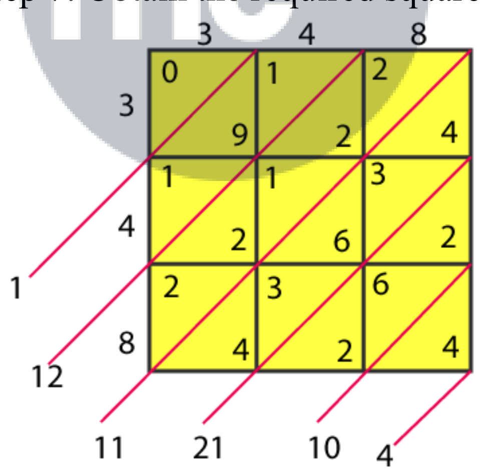
Step 3: Draw the diagonals of each sub-square.

Step 4: Write the digits of the number to be squared along left vertical side sand top horizontal side of the squares.

Step 5: Multiply each digit on the left of the square with each digit on top of the column one-by-one. Write the units digit of the product below the diagonal and tens digit above the diagonal of the corresponding sub-square.

Step 6: Starting below the lowest diagonal sum the digits along the diagonals so obtained. Write the units digit of the sum and take carry, the tens digit (if any) to the diagonal above.

Step 7: Obtain the required square by writing the digits from the left-most side.



$\therefore 348^2 = 121104$

(iv) 295

Step 1: Obtain the number and count the number of digits in it. Let there be n digits in the number to be squared.

Step 2: Draw square and divide it into n^2 sub-squares of the same size by drawing (n - 1) horizontal and (n - 1) vertical lines.

Step 3: Draw the diagonals of each sub-square.

Step 4: Write the digits of the number to be squared along left vertical side sand top horizontal side of the squares.

Step 5: Multiply each digit on the left of the square with each digit on top of the column one-by-one. Write the units digit of the product below the diagonal and tens digit above the diagonal of the corresponding sub-square.

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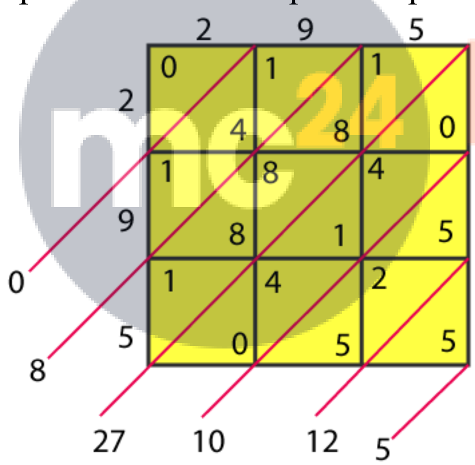
Step 7: Obtain the required square by writing the digits from the left-most side.



$\therefore 295^2 = 87025$

(v) 171

Step 1: Obtain the number and count the number of digits in it. Let there be n digits in the number to be squared.

Step 2: Draw square and divide it into n^2 sub-squares of the same size by drawing (n - 1) horizontal and (n - 1) vertical lines.

Step 3: Draw the diagonals of each sub-square.

Step 4: Write the digits of the number to be squared along left vertical side sand top horizontal side of the squares.

Step 5: Multiply each digit on the left of the square with each digit on top of the column one-by-one. Write the units digit of the product below the diagonal and tens digit above the diagonal of the corresponding sub-square.

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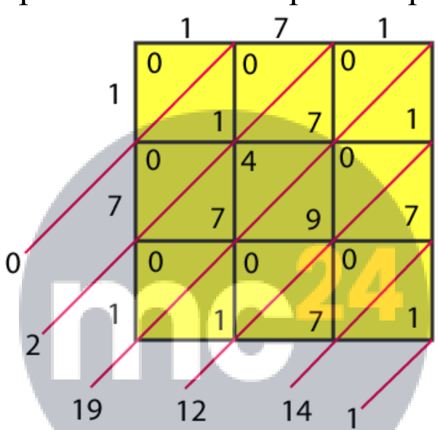

∴ $171^2 = 29241$

3. Find the squares of the following numbers:
(i) 127
(ii) 503
(iii) 450
(iv) 862
(v) 265
Solution:
(i) 127
$127^2 = 127 \times 127 = 16129$

(ii) 503
$503^2 = 503 \times 503 = 253009$

(iii) 450

$450^2 = 450 \times 450 = 203401$

(iv) 862

$862^2 = 862 \times 862 = 743044$

(v) 265

$265^2 = 265 \times 265 = 70225$

4. Find the squares of the following numbers:

(i) 425

(ii) 575

(iii) 405

(iv) 205

(v) 95

(vi) 745

(vii) 512

(viii) 995

Solution:

(i) 425

$425^2 = 425 \times 425 = 180625$

(ii) 575

$575^2 = 575 \times 575 = 330625$

(iii) 405

$405^2 = 405 \times 405 = 164025$

(iv) 205

$205^2 = 205 \times 205 = 42025$

(v) 95

$95^2 = 95 \times 95 = 9025$

(vi) 745

$745^2 = 745 \times 745 = 555025$

(vii) 512

$512^2 = 512 \times 512 = 262144$

(viii) 995

$995^2 = 995 \times 995 = 990025$

5. Find the squares of the following numbers using the identity $(a+b)^2 = a^2+2ab+b^2$:

(i) 405

(ii) 510

(iii) 1001

(iv) 209

(v) 605

Solution:

(i) 405

We know, $(a+b)^2 = a^2+2ab+b^2$

$405 = (400+5)^2$

$= (400)^2 + 5^2 + 2 (400) (5)$

$= 160000 + 25 + 4000$

$= 164025$

(ii) 510

We know, $(a+b)^2 = a^2+2ab+b^2$

$510 = (500+10)^2$

$= (500)^2 + 10^2 + 2 (500) (10)$

$= 250000 + 100 + 10000$

$= 260100$

(iii) 1001

We know, $(a+b)^2 = a^2+2ab+b^2$

$1001 = (1000+1)^2$

$= (1000)^2 + 1^2 + 2 (1000) (1)$

$= 1000000 + 1 + 2000$

$= 1002001$

(iv) 209

We know, $(a+b)^2 = a^2+2ab+b^2$

$209 = (200+9)^2$

$= (200)^2 + 9^2 + 2 (200) (9)$

$= 40000 + 81 + 3600$

$= 43681$

(v) 605

We know, $(a+b)^2 = a^2+2ab+b^2$

$605 = (600+5)^2$

$= (600)^2 + 5^2 + 2(600)(5)$

$= 360000 + 25 + 6000$

$= 366025$

6. Find the squares of the following numbers using the identity $(a-b)^2 = a^2-2ab+b^2$

(i) 395

(ii) 995

(iii) 495

(iv) 498

(v) 99

(vi) 999

(vii) 599

Solution:

(i) 395

We know, $(a-b)^2 = a^2-2ab+b^2$

$395 = (400-5)^2$

$= (400)^2 + 5^2 - 2(400)(5)$

$= 160000 + 25 – 4000$

$= 156025$

(ii) 995

We know, $(a-b)^2 = a^2-2ab+b^2$

$995 = (1000-5)^2$

$= (1000)^2 + 5^2 - 2(1000)(5)$

$= 1000000 + 25 – 10000$

$= 990025$

(iii) 495

We know, $(a-b)^2 = a^2-2ab+b^2$

$495 = (500-5)^2$

$= (500)^2 + 5^2 - 2(500)(5)$

$= 250000 + 25 – 5000$

$= 245025$

(iv) 498

We know, $(a-b)^2 = a^2-2ab+b^2$

$498 = (500-2)^2$

= $(500)^2 + 2^2 - 2\ (500)\ (2)$
= 250000 + 4 – 2000
= 248004

(v) 99
We know, $(a-b)^2 = a^2-2ab+b^2$
$99 = (100-1)^2$
= $(100)^2 + 1^2 - 2\ (100)\ (1)$
= 10000 + 1 – 200
= 9801

(vi) 999
We know, $(a-b)^2 = a^2-2ab+b^2$
$999 = (1000-1)^2$
= $(1000)^2 + 1^2 - 2\ (1000)\ (1)$
= 1000000 + 1 – 2000
= 998001

(vii) 599
We know, $(a-b)^2 = a^2-2ab+b^2$
$599 = (600-1)^2$
= $(600)^2 + 1^2 - 2\ (600)\ (1)$
= 360000 + 1 – 1200
= 358801

7. Find the squares of the following numbers by visual method:
(i) 52
(ii) 95
(iii) 505
(iv) 702
(v) 99
Solution:
(i) 52
We know, $(a+b)^2 = a^2+2ab+b^2$
$52 = (50+2)^2$
= $(50)^2 + 2^2 + 2\ (50)\ (2)$
= 2500 + 4 + 200
= 2704

(ii) 95

We know, $(a-b)^2 = a^2 - 2ab + b^2$

$95 = (100-5)^2$

$= (100)^2 + 5^2 - 2\,(100)\,(5)$

$= 10000 + 25 - 1000$

$= 9025$

(iii) 505

We know, $(a+b)^2 = a^2 + 2ab + b^2$

$505 = (500+5)^2$

$= (500)^2 + 5^2 + 2\,(500)\,(5)$

$= 250000 + 25 + 5000$

$= 255025$

(iv) 702

We know, $(a+b)^2 = a^2 + 2ab + b^2$

$702 = (700+2)^2$

$= (700)^2 + 2^2 + 2\,(700)\,(2)$

$= 490000 + 4 + 2800$

$= 492804$

(v) 99

We know, $(a-b)^2 = a^2 - 2ab + b^2$

$99 = (100-1)^2$

$= (100)^2 + 1^2 - 2\,(100)\,(1)$

$= 10000 + 1 - 200$

$= 9801$