

## EXERCISE 6.1

PAGE: 96

1. What will be the unit digit of the squares of the following numbers?

- i. 81
- ii. 272
- iii. 799
- iv. 3853
- v. 1234
- vi. 26387
- vii. 52698
- viii. 99880
- ix. 12796
- x. 55555

**Solution:**

The unit digit of square of a number having 'a' at its unit place ends with  $a \times a$ .

- i. The unit digit of the square of a number having digit 1 as unit's place is 1.  
 $\therefore$  Unit digit of the square of number 81 is equal to 1.
- ii. The unit digit of the square of a number having digit 2 as unit's place is 4.  
 $\therefore$  Unit digit of the square of number 272 is equal to 4.
- iii. The unit digit of the square of a number having digit 9 as unit's place is 1.  
 $\therefore$  Unit digit of the square of number 799 is equal to 1.
- iv. The unit digit of the square of a number having digit 3 as unit's place is 9.  
 $\therefore$  Unit digit of the square of number 3853 is equal to 9.
- v. The unit digit of the square of a number having digit 4 as unit's place is 6.  
 $\therefore$  Unit digit of the square of number 1234 is equal to 6.
- vi. The unit digit of the square of a number having digit 7 as unit's place is 9.  
 $\therefore$  Unit digit of the square of number 26387 is equal to 9.
- vii. The unit digit of the square of a number having digit 8 as unit's place is 4.  
 $\therefore$  Unit digit of the square of number 52698 is equal to 4.
- viii. The unit digit of the square of a number having digit 0 as unit's place is 0.  
 $\therefore$  Unit digit of the square of number 99880 is equal to 0.
- ix. The unit digit of the square of a number having digit 6 as unit's place is 6.  
 $\therefore$  Unit digit of the square of number 12796 is equal to 6.
- x. The unit digit of the square of a number having digit 5 as unit's place is 5.  
 $\therefore$  Unit digit of the square of number 55555 is equal to 5.

2. The following numbers are obviously not perfect squares. Give reason.

- i. 1057
- ii. 23453
- iii. 7928
- iv. 222222
- v. 64000
- vi. 89722
- vii. 222000
- viii. 505050

**Solution:**

We know that natural numbers ending in the digits 0, 2, 3, 7 and 8 are not perfect squares.

- i.  $1057 \Rightarrow$  Ends with 7
- ii.  $23453 \Rightarrow$  Ends with 3
- iii.  $7928 \Rightarrow$  Ends with 8
- iv.  $222222 \Rightarrow$  Ends with 2
- v.  $64000 \Rightarrow$  Ends with 0
- vi.  $89722 \Rightarrow$  Ends with 2
- vii.  $222000 \Rightarrow$  Ends with 0
- viii.  $505050 \Rightarrow$  Ends with 0

3. The squares of which of the following would be odd numbers?

- i. 431
- ii. 2826
- iii. 7779
- iv. 82004

**Solution:**

We know that the square of an odd number is odd and the square of an even number is even.

- i. The square of 431 is an odd number.
- ii. The square of 2826 is an even number.
- iii. The square of 7779 is an odd number.
- iv. The square of 82004 is an even number.

4. Observe the following pattern and find the missing numbers.  $11^2 = 121$

$$101^2 = 10201$$

$$1001^2 = 1002001$$

$$100001^2 = 1 \dots\dots 2 \dots\dots 1$$

$$10000001^2 = \dots\dots\dots$$

**Solution:**

We observe that the square on the number on R.H.S of the equality has an odd number of digits such that the first and last digits both are 1 and middle digit is 2. And the number of zeros between left most digits 1 and the middle digit 2 and right most digit 1 and the middle digit 2 is same as the number of zeros in the given number.

$$\therefore 100001^2 = 10000200001$$

$$10000001^2 = 100000020000001$$

5. Observe the following pattern and supply the missing numbers.  $11^2 = 121$

$$101^2 = 10201$$

$$10101^2 = 102030201$$

$$1010101^2 = \dots\dots\dots$$

$$\dots\dots\dots^2 = 10203040504030201$$

**Solution:**

We observe that the square on the number on R.H.S of the equality has an odd number of digits such that the first and last digits both are 1. And, the square is symmetric about the middle digit. If the middle digit is 4, then the number to be squared is 10101 and its square is 102030201.

$$\text{So, } 1010101^2 = 1020304030201$$

$$101010101^2 = 10203040505030201$$

6. Using the given pattern, find the missing numbers.  $1^2 + 2^2 + 2^2 = 3^2$

$$2^2 + 3^2 + 6^2 = 7^2$$

$$3^2 + 4^2 + 12^2 = 13^2$$

$$4^2 + 5^2 + \_ = 21^2$$

$$5 + \_ + 30^2 = 31^2$$

$$6 + 7 + \_ = \_$$

**Solution:**

$$\text{Given, } 1^2 + 2^2 + 2^2 = 3^2$$

$$\text{i.e } 1^2 + 2^2 + (1 \times 2)^2 = (1^2 + 2^2 - 1 \times 2)^2$$

$$2^2 + 3^2 + 6^2 = 7^2$$

$$\therefore 2^2 + 3^2 + (2 \times 3)^2 = (2^2 + 3^2 - 2 \times 3)^2$$

$$3^2 + 4^2 + 12^2 = 13^2$$

$$\therefore 3^2 + 4^2 + (3 \times 4)^2 = (3^2 + 4^2 - 3 \times 4)^2$$

$$4^2 + 5^2 + (4 \times 5)^2 = (4^2 + 5^2 - 4 \times 5)^2$$

$$\therefore 4^2 + 5^2 + 20^2 = 21^2$$

$$5^2 + 6^2 + (5 \times 6)^2 = (5^2 + 6^2 - 5 \times 6)^2$$

$$\therefore 5^2 + 6^2 + 30^2 = 31^2$$

$$6^2 + 7^2 + (6 \times 7)^2 = (6^2 + 7^2 - 6 \times 7)^2$$

$$\therefore 6^2 + 7^2 + 42^2 = 43^2$$

7. Without adding, find the sum.

i.  $1 + 3 + 5 + 7 + 9$

**Solution:**

$$\text{Sum of first five odd number} = (5)^2 = 25$$

ii.  $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19$

**Solution:**

$$\text{Sum of first ten odd number} = (10)^2 = 100$$

iii.  $1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23$

**Solution:**

$$\text{Sum of first thirteen odd number} = (12)^2 = 144$$

8. (i) Express 49 as the sum of 7 odd numbers.

**Solution:**

We know, sum of first  $n$  odd natural numbers is  $n^2$ . Since,  $49 = 7^2$

$$\therefore 49 = \text{sum of first 7 odd natural numbers} = 1 + 3 + 5 + 7 + 9 + 11 + 13$$

(ii) Express 121 as the sum of 11 odd numbers. **Solution:**

Since,  $121 = 11^2$

$$\therefore 121 = \text{sum of first 11 odd natural numbers} = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21$$

9. How many numbers lie between squares of the following numbers?

i. 12 and 13

ii. 25 and 26

iii. 99 and 100

**Solution:**

Between  $n^2$  and  $(n+1)^2$ , there are  $2n$  non-perfect square numbers.

i. 122 and 132 there are  $2 \times 12 = 24$  natural numbers.

ii. 252 and 262 there are  $2 \times 25 = 50$  natural numbers.

iii. 992 and 1002 there are  $2 \times 99 = 198$  natural numbers.

**EXERCISE 6.2****PAGE: 98****1. Find the square of the following numbers.****i. 32****ii. 35****iii. 86****iv. 93****v. 71****vi. 46****Solution:**

$$\begin{aligned}\text{i. } (32)^2 &= (30 + 2)^2 \\ &= (30)^2 + (2)^2 + 2 \times 30 \times 2 \quad [\text{Since, } (a+b)^2 = a^2 + b^2 + 2ab] \\ &= 900 + 4 + 120 \\ &= 1024\end{aligned}$$

$$\begin{aligned}\text{ii. } (35)^2 &= (30 + 5)^2 \\ &= (30)^2 + (5)^2 + 2 \times 30 \times 5 \quad [\text{Since, } (a+b)^2 = a^2 + b^2 + 2ab] \\ &= 900 + 25 + 300 \\ &= 1225\end{aligned}$$

$$\begin{aligned}\text{iii. } (86)^2 &= (90 - 4)^2 \\ &= (90)^2 + (4)^2 - 2 \times 90 \times 4 \quad [\text{Since, } (a+b)^2 = a^2 + b^2 + 2ab] \\ &= 8100 + 16 - 720 \\ &= 8116 - 720 \\ &= 7396\end{aligned}$$

$$\begin{aligned}\text{iv. } (93)^2 &= (90 + 3)^2 \\ &= (90)^2 + (3)^2 + 2 \times 90 \times 3 \quad [\text{Since, } (a+b)^2 = a^2 + b^2 + 2ab] \\ &= 8100 + 9 + 540 \\ &= 8649\end{aligned}$$

$$\begin{aligned}\text{v. } (71)^2 &= (70 + 1)^2 \\ &= (70)^2 + (1)^2 + 2 \times 70 \times 1 \quad [\text{Since, } (a+b)^2 = a^2 + b^2 + 2ab] \\ &= 4900 + 1 + 140 \\ &= 5041\end{aligned}$$

$$\begin{aligned}\text{vi. } (46)^2 &= (50 - 4)^2 \\ &= (50)^2 + (4)^2 - 2 \times 50 \times 4 \quad [\text{Since, } (a+b)^2 = a^2 + b^2 + 2ab] \\ &= 2500 + 16 - 400 \\ &= 2116\end{aligned}$$

2. Write a Pythagorean triplet whose one member is.

i. 6

ii. 14

iii. 16

iv. 18

**Solution:**

For any natural number  $m$ , we know that  $2m, m^2-1, m^2+1$  is a Pythagorean triplet.

i.  $2m = 6$

$$\Rightarrow m = 6/2 = 3$$

$$m^2-1 = 3^2-1 = 9-1 = 8$$

$$m^2+1 = 3^2+1 = 9+1 = 10$$

$\therefore (6, 8, 10)$  is a Pythagorean triplet.

ii.  $2m = 14$

$$\Rightarrow m = 14/2 = 7$$

$$m^2-1 = 7^2-1 = 49-1 = 48$$

$$m^2+1 = 7^2+1 = 49+1 = 50$$

$\therefore (14, 48, 50)$  is not a Pythagorean triplet.

iii.  $2m = 16$

$$\Rightarrow m = 16/2 = 8$$

$$m^2-1 = 8^2-1 = 64-1 = 63$$

$$m^2+1 = 8^2+1 = 64+1 = 65$$

$\therefore (16, 63, 65)$  is a Pythagorean triplet.

iv.  $2m = 18$

$$\Rightarrow m = 18/2 = 9$$

$$m^2-1 = 9^2-1 = 81-1 = 80$$

$$m^2+1 = 9^2+1 = 81+1 = 82$$

$\therefore (18, 80, 82)$  is a Pythagorean triplet.

## EXERCISE 6.3

PAGE: 102

1. What could be the possible 'one's' digits of the square root of each of the following numbers?

i. 9801

ii. 99856

iii. 998001

iv. 657666025

**Solution:**

i. We know that the unit's digit of the square of a number having digit as unit's place 1 is 1 and also 9 is 1 [ $9^2=81$  whose unit place is 1].

$\therefore$  Unit's digit of the square root of number 9801 is equal to 1 or 9.

ii. We know that the unit's digit of the square of a number having digit as unit's place 6 is 6 and also 4 is 6 [ $6^2=36$  and  $4^2=16$ , both the squares have unit digit 6].

$\therefore$  Unit's digit of the square root of number 99856 is equal to 6.

iii. We know that the unit's digit of the square of a number having digit as unit's place 1 is 1 and also 9 is 1 [ $9^2=81$  whose unit place is 1].

$\therefore$  Unit's digit of the square root of number 998001 is equal to 1 or 9.

iv. We know that the unit's digit of the square of a number having digit as unit's place 5 is 5.

$\therefore$  Unit's digit of the square root of number 657666025 is equal to 5.

2. Without doing any calculation, find the numbers which are surely not perfect squares.

i. 153

ii. 257

iii. 408

iv. 441

**Solution:**

We know that natural numbers ending with the digits 0, 2, 3, 7 and 8 are not perfect square.

i.  $153 \Rightarrow$  Ends with 3.

$\therefore$ , 153 is not a perfect square

ii.  $257 \Rightarrow$  Ends with 7

$\therefore$ , 257 is not a perfect square

iii.  $408 \Rightarrow$  Ends with 8

$\therefore$ , 408 is not a perfect square

iv.  $441 \Rightarrow$  Ends with 1

$\therefore$ , 441 is a perfect square.

**3. Find the square roots of 100 and 169 by the method of repeated subtraction.**

**Solution:**

100

$$100 - 1 = 99$$

$$99 - 3 = 96$$

$$96 - 5 = 91$$

$$91 - 7 = 84$$

$$84 - 9 = 75$$

$$75 - 11 = 64$$

$$64 - 13 = 51$$

$$51 - 15 = 36$$

$$36 - 17 = 19$$

$$19 - 19 = 0$$

Here, we have performed subtraction ten times.

$$\therefore \sqrt{100} = 10$$

169

$$169 - 1 = 168$$

$$168 - 3 = 165$$

$$165 - 5 = 160$$

$$160 - 7 = 153$$

$$153 - 9 = 144$$

$$144 - 11 = 133$$

$$133 - 13 = 120$$

$$120 - 15 = 105$$

$$105 - 17 = 88$$

$$88 - 19 = 69$$

$$69 - 21 = 48$$

$$48 - 23 = 25$$

$$25 - 25 = 0$$

Here, we have performed subtraction thirteen times.

$$\therefore \sqrt{169} = 13$$

**4. Find the square roots of the following numbers by the Prime Factorisation Method.**

i. 729

ii. 400

iii. 1764

iv. 4096

v. 7744

vi. 9604

vii. 5929

viii. 9216

ix. 529

x. 8100

**Solution:**



i.

3	729
3	243
3	81
3	27
3	9
3	3
	1

$$\begin{aligned}
 729 &= 3 \times 3 \times 3 \times 3 \times 3 \times 3 \times 1 \\
 \Rightarrow 729 &= (3 \times 3) \times (3 \times 3) \times (3 \times 3) \\
 \Rightarrow 729 &= (3 \times 3 \times 3) \times (3 \times 3 \times 3) \\
 \Rightarrow 729 &= (3 \times 3 \times 3)^2 \\
 \Rightarrow \sqrt{729} &= 3 \times 3 \times 3 = 27
 \end{aligned}$$

ii.

2	400
2	200
2	100
2	50
5	25
5	5
	1

$$\begin{aligned}
 400 &= 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 1 \\
 \Rightarrow 400 &= (2 \times 2) \times (2 \times 2) \times (5 \times 5) \\
 \Rightarrow 400 &= (2 \times 2 \times 5) \times (2 \times 2 \times 5) \\
 \Rightarrow 400 &= (2 \times 2 \times 5)^2 \\
 \Rightarrow \sqrt{400} &= 2 \times 2 \times 5 = 20
 \end{aligned}$$

iii.

2	1764
2	882
3	441
3	147
7	49
7	7
	1

$$\begin{aligned}
 1764 &= 2 \times 2 \times 3 \times 3 \times 7 \times 7 \\
 \Rightarrow 1764 &= (2 \times 2) \times (3 \times 3) \times (7 \times 7) \\
 \Rightarrow 1764 &= (2 \times 3 \times 7) \times (2 \times 3 \times 7) \\
 \Rightarrow 1764 &= (2 \times 3 \times 7)^2 \\
 \Rightarrow \sqrt{1764} &= 2 \times 3 \times 7 = 42
 \end{aligned}$$

iv.

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$$\begin{aligned}
 4096 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \\
 \Rightarrow 4096 &= (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \\
 \Rightarrow 4096 &= (2 \times 2 \times 2 \times 2 \times 2 \times 2) \times (2 \times 2 \times 2 \times 2 \times 2 \times 2) \\
 \Rightarrow 4096 &= (2 \times 2 \times 2 \times 2 \times 2 \times 2)^2 \\
 \Rightarrow \sqrt{4096} &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64
 \end{aligned}$$

v.

$$\begin{array}{r}
 2 \overline{) 7744} \\
 \underline{2 \phantom{0} 3872} \\
 2 \phantom{00} 1936 \\
 \underline{2 \phantom{000} 968} \\
 2 \phantom{0000} 484 \\
 \underline{2 \phantom{00000} 242} \\
 11 \phantom{000000} 121 \\
 \underline{11 \phantom{0000000} 11} \\
 1
 \end{array}$$

$$\begin{aligned}
 7744 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11 \times 1 \\
 \Rightarrow 7744 &= (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (11 \times 11) \\
 \Rightarrow 7744 &= (2 \times 2 \times 2 \times 11) \times (2 \times 2 \times 2 \times 11) \\
 \Rightarrow 7744 &= (2 \times 2 \times 2 \times 11)^2 \\
 \Rightarrow \sqrt{7744} &= 2 \times 2 \times 2 \times 11 = 88
 \end{aligned}$$

vi.

$$\begin{array}{r}
 2 \overline{) 9604} \\
 \underline{2 \phantom{00} 4802} \\
 7 \phantom{000} 2401 \\
 \underline{7 \phantom{0000} 343} \\
 7 \phantom{00000} 49 \\
 \underline{7 \phantom{000000} 7} \\
 1
 \end{array}$$

$$9604 = 62 \times 2 \times 7 \times 7 \times 7 \times 7$$

$$\Rightarrow 9604 = (2 \times 2) \times (7 \times 7) \times (7 \times 7)$$

$$\Rightarrow 9604 = (2 \times 7 \times 7) \times (2 \times 7 \times 7)$$

$$\Rightarrow 9604 = (2 \times 7 \times 7)^2$$

$$\Rightarrow \sqrt{9604} = 2 \times 7 \times 7 = 98$$

vii.

7	5929
7	847
11	121
11	11
	1

$$5929 = 7 \times 7 \times 11 \times 11$$

$$\Rightarrow 5929 = (7 \times 7) \times (11 \times 11)$$

$$\Rightarrow 5929 = (7 \times 11) \times (7 \times 11)$$

$$\Rightarrow 5929 = (7 \times 11)^2$$

$$\Rightarrow \sqrt{5929} = 7 \times 11 = 77$$

viii.

2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

$$\begin{aligned}
 9216 &= 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 1 \\
 \Rightarrow 9216 &= (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (3 \times 3) \\
 \Rightarrow 9216 &= (2 \times 2 \times 2 \times 2 \times 2 \times 3) \times (2 \times 2 \times 2 \times 2 \times 2 \times 3) \\
 \Rightarrow 9216 &= 96 \times 96 \\
 \Rightarrow 9216 &= (96)^2 \\
 \Rightarrow \sqrt{9216} &= 96
 \end{aligned}$$

ix.

23	529
23	23
	1

$$\begin{aligned}
 529 &= 23 \times 23 \\
 529 &= (23)^2 \\
 \sqrt{529} &= 23
 \end{aligned}$$

x.

2	8100
2	4050
3	2025
3	675
3	225
3	75
5	25
5	5
	1

$$\begin{aligned}
 8100 &= 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5 \times 1 \\
 \Rightarrow 8100 &= (2 \times 2) \times (3 \times 3) \times (3 \times 3) \times (5 \times 5) \\
 \Rightarrow 8100 &= (2 \times 3 \times 3 \times 5) \times (2 \times 3 \times 3 \times 5) \\
 \Rightarrow 8100 &= 90 \times 90 \\
 \Rightarrow 8100 &= (90)^2 \\
 \Rightarrow \sqrt{8100} &= 90
 \end{aligned}$$

5. For each of the following numbers, find the smallest whole number by which it should be multiplied so as to get a perfect square number. Also find the square root of the square number so obtained.

i. 252

ii. 180

iii. 1008

iv. 2028

v. 1458

vi. 768

Solution:

i.

2	252
2	126
3	63
3	21
7	7
	1

$$252 = 2 \times 2 \times 3 \times 3 \times 7$$

$$= (2 \times 2) \times (3 \times 3) \times 7$$

Here, 7 cannot be paired.

$\therefore$  We will multiply 252 by 7 to get perfect square.

$$\text{New number} = 252 \times 7 = 1764$$

2	1764
2	882
3	441
3	147
7	49
7	7
	1

$$1764 = 2 \times 2 \times 3 \times 3 \times 7 \times 7$$

$$\Rightarrow 1764 = (2 \times 2) \times (3 \times 3) \times (7 \times 7)$$

$$\Rightarrow 1764 = 2^2 \times 3^2 \times 7^2$$

$$\Rightarrow 1764 = (2 \times 3 \times 7)^2$$

$$\Rightarrow \sqrt{1764} = 2 \times 3 \times 7 = 42$$

ii.

2	180
2	90
3	45
3	15
5	5
	1

$$180 = 2 \times 2 \times 3 \times 3 \times 5$$

$$= (2 \times 2) \times (3 \times 3) \times 5$$

Here, 5 cannot be paired.

$\therefore$  We will multiply 180 by 5 to get perfect square.

$$\text{New number} = 180 \times 5 = 900$$

2	900
2	450
3	225
3	75
5	25
5	5
	1

$$900 = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 1$$

$$\Rightarrow 900 = (2 \times 2) \times (3 \times 3) \times (5 \times 5)$$

$$\Rightarrow 900 = 2^2 \times 3^2 \times 5^2$$

$$\Rightarrow 900 = (2 \times 3 \times 5)^2$$

$$\Rightarrow \sqrt{900} = 2 \times 3 \times 5 = 30$$

iii.

2	1008
2	504
2	252
2	126
3	63
3	21
7	7
	1

$$1008 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7$$

$$= (2 \times 2) \times (2 \times 2) \times (3 \times 3) \times 7$$

Here, 7 cannot be paired.

$\therefore$  We will multiply 1008 by 7 to get perfect square.

$$\text{New number} = 1008 \times 7 = 7056$$

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
7	7
	1

$$7056 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 7 \times 7$$

$$\Rightarrow 7056 = (2 \times 2) \times (2 \times 2) \times (3 \times 3) \times (7 \times 7)$$

$$\Rightarrow 7056 = 2^2 \times 2^2 \times 3^2 \times 7^2$$

$$\Rightarrow 7056 = (2 \times 2 \times 3 \times 7)^2$$

$$\Rightarrow \sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$$

iv.



2	2028
2	1014
3	507
13	169
13	13
	1

$$2028 = 2 \times 2 \times 3 \times 13 \times 13$$

$$= (2 \times 2) \times (13 \times 13) \times 3$$

Here, 3 cannot be paired.

∴ We will multiply 2028 by 3 to get perfect square. New number =  $2028 \times 3 = 6084$

2	6084
2	3042
3	1521
3	507
13	169
13	13
	1

$$6084 = 2 \times 2 \times 3 \times 3 \times 13 \times 13$$

$$\Rightarrow 6084 = (2 \times 2) \times (3 \times 3) \times (13 \times 13)$$

$$\Rightarrow 6084 = 2^2 \times 3^2 \times 13^2$$

$$\Rightarrow 6084 = (2 \times 3 \times 13)^2$$

$$\Rightarrow \sqrt{6084} = 2 \times 3 \times 13 = 78$$

v.

# NCERT Solution For Class 8 Maths Chapter 6- Squares and Square roots roots

2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$$1458 = 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$= (3 \times 3) \times (3 \times 3) \times (3 \times 3) \times 2$$

Here, 2 cannot be paired.

∴ We will multiply 1458 by 2 to get perfect square. New number =  $1458 \times 2 = 2916$

2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

$$2916 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 \times 3$$

$$\Rightarrow 2916 = (3 \times 3) \times (3 \times 3) \times (3 \times 3) \times (2 \times 2)$$

$$\Rightarrow 2916 = 3^2 \times 3^2 \times 3^2 \times 2^2$$

$$\Rightarrow 2916 = (3 \times 3 \times 3 \times 2)^2$$

$$\Rightarrow \sqrt{2916} = 3 \times 3 \times 3 \times 2 = 54$$

vi.

2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

$$768 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3$$

$$= (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times 3$$

Here, 3 cannot be paired.

$\therefore$  We will multiply 768 by 3 to get perfect square.

$$\text{New number} = 768 \times 3 = 2304$$

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

$$2304 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$$

$$\Rightarrow 2304 = (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (2 \times 2) \times (3 \times 3)$$

$$\Rightarrow 2304 = 2^2 \times 2^2 \times 2^2 \times 2^2 \times 3^2$$

$$\Rightarrow 2304 = (2 \times 2 \times 2 \times 2 \times 3)^2$$

$$\Rightarrow \sqrt{2304} = 2 \times 2 \times 2 \times 2 \times 3 = 48$$

6. For each of the following numbers, find the smallest whole number by which it should be divided so as to get a perfect square. Also find the square root of the square number so obtained.

- i. 252
- ii. 2925
- iii. 396
- iv. 2645
- v. 2800
- vi. 1620

**Solution:**

i.

2	252
2	126
3	63
3	21
7	7
	1

$$252 = 2 \times 2 \times 3 \times 3 \times 7$$

$$= (2 \times 2) \times (3 \times 3) \times 7$$

Here, 7 cannot be paired.

$\therefore$  We will divide 252 by 7 to get perfect square. New number =  $252 \div 7 = 36$

2	36
2	18
3	9
3	3
	1

$$36 = 2 \times 2 \times 3 \times 3$$

$$\Rightarrow 36 = (2 \times 2) \times (3 \times 3)$$

$$\Rightarrow 36 = 2^2 \times 3^2$$

$$\Rightarrow 36 = (2 \times 3)^2$$

$$\Rightarrow \sqrt{36} = 2 \times 3 = 6$$

ii.

3	2925
3	975
5	325
5	65
13	13
	1

$$2925 = 3 \times 3 \times 5 \times 5 \times 13$$

$$= (3 \times 3) \times (5 \times 5) \times 13$$

Here, 13 cannot be paired.

∴ We will divide 2925 by 13 to get perfect square. New number =  $2925 \div 13 = 225$

3	225
3	75
5	25
5	5
	1

$$225 = 3 \times 3 \times 5 \times 5$$

$$\Rightarrow 225 = (3 \times 3) \times (5 \times 5)$$

$$\Rightarrow 225 = 3^2 \times 5^2$$

$$\Rightarrow 225 = (3 \times 5)^2$$

$$\Rightarrow \sqrt{225} = 3 \times 5 = 15$$

iii.

2	396
2	198
3	99
3	33
11	11
	1

$$396 = 2 \times 2 \times 3 \times 3 \times 11$$

$$= (2 \times 2) \times (3 \times 3) \times 11$$

Here, 11 cannot be paired.

$\therefore$  We will divide 396 by 11 to get perfect square. New number =  $396 \div 11 = 36$

2	36
2	18
3	9
3	3
	1

$$36 = 2 \times 2 \times 3 \times 3$$

$$\Rightarrow 36 = (2 \times 2) \times (3 \times 3)$$

$$\Rightarrow 36 = 2^2 \times 3^2$$

$$\Rightarrow 36 = (2 \times 3)^2$$

$$\Rightarrow \sqrt{36} = 2 \times 3 = 6$$

iv.

5	2645
23	529
23	23
	1

$$2645 = 5 \times 23 \times 23$$

$$\Rightarrow 2645 = (23 \times 23) \times 5$$

Here, 5 cannot be paired.

$\therefore$  We will divide 2645 by 5 to get perfect square.

$$\text{New number} = 2645 \div 5 = 529$$

$$\begin{array}{r|l}
 23 & 529 \\
 \hline
 23 & 23 \\
 \hline
 & 1
 \end{array}$$

$$\begin{aligned}
 529 &= 23 \times 23 \\
 \Rightarrow 529 &= (23)^2 \\
 \Rightarrow \sqrt{529} &= 23
 \end{aligned}$$

v.

$$\begin{array}{r|l}
 2 & 2800 \\
 \hline
 2 & 1400 \\
 \hline
 2 & 700 \\
 \hline
 2 & 350 \\
 \hline
 5 & 175 \\
 \hline
 5 & 35 \\
 \hline
 7 & 7 \\
 \hline
 & 1
 \end{array}$$

$$\begin{aligned}
 2800 &= 2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 7 \\
 &= (2 \times 2) \times (2 \times 2) \times (5 \times 5) \times 7
 \end{aligned}$$

Here, 7 cannot be paired.

$\therefore$  We will divide 2800 by 7 to get perfect square. New number =  $2800 \div 7 = 400$

$$\begin{array}{r|l}
 2 & 400 \\
 \hline
 2 & 200 \\
 \hline
 2 & 100 \\
 \hline
 2 & 50 \\
 \hline
 5 & 25 \\
 \hline
 5 & 5 \\
 \hline
 & 1
 \end{array}$$

$$\begin{aligned}
 400 &= 2 \times 2 \times 2 \times 2 \times 5 \times 5 \\
 \Rightarrow 400 &= (2 \times 2) \times (2 \times 2) \times (5 \times 5) \\
 \Rightarrow 400 &= (2 \times 2 \times 5)^2
 \end{aligned}$$

$$\Rightarrow \sqrt{400} = 20$$

vi.

2	1620
2	810
3	405
3	135
3	45
3	15
5	5
	1

$$1620 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5$$

$$= (2 \times 2) \times (3 \times 3) \times (3 \times 3) \times 5$$

Here, 5 cannot be paired.

$\therefore$  We will divide 1620 by 5 to get perfect square. New number =  $1620 \div 5 = 324$

2	324
2	162
3	81
3	27
3	9
3	3
	1

$$324 = 2 \times 2 \times 3 \times 3 \times 3 \times 3$$

$$\Rightarrow 324 = (2 \times 2) \times (3 \times 3) \times (3 \times 3)$$

$$\Rightarrow 324 = (2 \times 3 \times 3)^2$$

$$\Rightarrow \sqrt{324} = 18$$

7. The students of Class VIII of a school donated Rs 2401 in all, for Prime Minister's National Relief Fund. Each student donated as many rupees as the number of students in the class. Find the number of students in the class.

**Solution:**



Let the number of students in the school be,  $x$ .

$\therefore$  Each student donate Rs. $x$ .

Total many contributed by all the students =  $x \times x = x^2$  Given,  $x^2 = \text{Rs.}2401$

7	2401
7	343
7	49
7	7
	1

$$x^2 = 7 \times 7 \times 7 \times 7$$

$$\Rightarrow x^2 = (7 \times 7) \times (7 \times 7)$$

$$\Rightarrow x^2 = 49 \times 49$$

$$\Rightarrow x = \sqrt{(49 \times 49)}$$

$$\Rightarrow x = 49$$

$\therefore$  The number of students = 49

**8. 2025 plants are to be planted in a garden in such a way that each row contains as many plants as the number of rows. Find the number of rows and the number of plants in each row.**

**Solution**

Let the number of rows be,  $x$ .

$\therefore$  the number of plants in each rows =  $x$ .

Total many contributed by all the students =  $x \times x = x^2$

Given,

$x^2 = \text{Rs.}2025$

3	2025
3	675
3	225
3	75
5	25
5	5
	1

$$x^2 = 3 \times 3 \times 3 \times 3 \times 5 \times 5$$

$$\Rightarrow x^2 = (3 \times 3) \times (3 \times 3) \times (5 \times 5)$$

$$\Rightarrow x^2 = (3 \times 3 \times 5) \times (3 \times 3 \times 5)$$

$$\Rightarrow x^2 = 45 \times 45$$

$$\Rightarrow x = \sqrt{45 \times 45}$$

$$\Rightarrow x = 45$$

$\therefore$  The number of rows = 45 and the number of plants in each rows = 45.

**9. Find the smallest square number that is divisible by each of the numbers 4, 9 and 10.**

**Solution:**

2	4, 9, 10
	2, 9, 5

L.C.M of 4, 9 and 10 is  $(2 \times 2 \times 9 \times 5)$  180.

$$180 = 2 \times 2 \times 9 \times 5$$

$$= (2 \times 2) \times 3 \times 3 \times 5$$

$$= (2 \times 2) \times (3 \times 3) \times 5$$

Here, 5 cannot be paired.

$\therefore$  we will multiply 180 by 5 to get perfect square.

Hence, the smallest square number divisible by 4, 9 and 10 =  $180 \times 5 = 900$

**10. Find the smallest square number that is divisible by each of the numbers 8, 15 and 20.**

**Solution:**

2	8, 15, 20
2	4, 15, 10
5	2, 15, 5
	2, 3, 1

L.C.M of 8, 15 and 20 is  $(2 \times 2 \times 5 \times 2 \times 3)$  120.

$$120 = 2 \times 2 \times 3 \times 5 \times 2$$

$$= (2 \times 2) \times 3 \times 5 \times 2$$

Here, 3, 5 and 2 cannot be paired.

$\therefore$  We will multiply 120 by  $(3 \times 5 \times 2)$  30 to get perfect square.

Hence, the smallest square number divisible by 8, 15 and 20 =  $120 \times 30 = 3600$

## EXERCISE 6.4

PAGE: 107

1. Find the square root of each of the following numbers by Division method.

- i. 2304
- ii. 4489
- iii. 3481
- iv. 529
- v. 3249
- vi. 1369
- vii. 5776
- viii. 7921
- ix. 576
- x. 1024
- xi. 3136
- xii. 900

Solution:

i.

	48
4	$\overline{2304}$
+ 4	16
88	704
+8	704
96	0

$$\therefore \sqrt{2304} = 48$$

ii.

	67
6	$\overline{4489}$
+ 6	36
127	889
+7	889
134	0

$$\therefore \sqrt{4489} = 67$$

iii.

	59	
5	3481	
+5	25	
109	981	
+9	981	
118	0	

$$\therefore \sqrt{3481} = 59$$

iv.

	23	
2	529	
+2	4	
43	129	
+3	129	
46	0	

$$\therefore \sqrt{529} = 23$$

v.

	57	
5	3249	
+ 5	25	
107	749	
+7	749	
114	0	

$$\therefore \sqrt{3249} = 57$$

vi.

	37	
3	1369	
+3	9	
67	469	
+7	469	
74	0	

$$\therefore \sqrt{1369} = 37$$

vii.

	76	
7	5776	
+7	49	
146	876	
+6	876	
152	0	

$$\therefore \sqrt{5776} = 76$$

viii.

	89	
8	7921	
+8	64	
169	1521	
+9	1521	
178	0	

$$\therefore \sqrt{7921} = 89$$

ix.

	24	
2	576	
+2	4	
44	176	
+4	176	
48	0	

$$\therefore \sqrt{576} = 24$$

x.

	32	
3	1024	
+3	9	
62	124	
+2	124	
64	0	

$$\therefore \sqrt{1024} = 32$$

xi.

	56	
5	3136	
+5	25	
106	636	
+6	636	
112	0	

$$\therefore \sqrt{3136} = 56$$

xii.

30	
3	900
+3	9
60	00

$$\therefore \sqrt{900} = 30$$

2. Find the number of digits in the square root of each of the following numbers (without any calculation).64

i. 144

ii. 4489

iii. 27225

iv. 390625

**Solution:**

i.

12	
1	144
+1	1
22	44
+2	44
24	0

$$\therefore \sqrt{144} = 12$$

Hence, the square root of the number 144 has 2 digits.

ii.

	67	
6	4489	
+ 6	36	
127	889	
+ 7	889	
134	0	

$\therefore \sqrt{4489} = 67$

Hence, the square root of the number 4489 has 2 digits.

iii.

	165	
1	27225	
+1	1	
26	172	
+6	156	
325	1625	
+5	1625	
350	0	

$\sqrt{27225} = 165$

Hence, the square root of the number 27225 has 3 digits.

iv.

	625	
6	390625	
+6	36	
122	306	
+ 2	244	
1245	6225	
+5	6225	
1250	0	



$$\therefore \sqrt{390625} = 625$$

Hence, the square root of the number 390625 has 3 digits.

3. Find the square root of the following decimal numbers.

i. 2.56

ii. 7.29

iii. 51.84

iv. 42.25

v. 31.36

**Solution:**

i.

	1.6
1	2.56
+1	1
26	156
+6	156
32	0

$$\therefore \sqrt{2.56} = 1.6$$

ii.

	2.7
2	7.29
+2	4
47	329
+7	329
54	0

$$\therefore \sqrt{7.29} = 2.7$$

iii.

	7.2	
7	51.84	
+ 7	49	
142	284	
+ 2	284	
144	0	

$$\therefore \sqrt{51.84} = 7.2$$

iv.

	6.5	
6	42.25	
+ 6	36	
125	625	
+ 5	625	
130	0	

$$\therefore \sqrt{42.25} = 6.5$$

v.

	5.6	
5	31.36	
+ 5	25	
106	636	
+ 6	636	
112	0	

$$\therefore \sqrt{31.36} = 5.6$$

4. Find the least number which must be subtracted from each of the following numbers so as to get a perfect square. Also find the square root of the perfect square so obtained.

i. 402

ii. 1989

iii. 3250

iv. 825

v. 4000

**Solution:**

i.

2	402
+2	4
4	02

$\therefore \sqrt{400} = 20$

$\therefore$  We must subtracted 2 from 402 to get a perfect square.

New number =  $402 - 2 = 400$

20	400
+2	4
40	00

$$\therefore \sqrt{400} = 20$$

ii.

44	1989
+4	16
84	389
+4	336
88	53

$\therefore$  We must subtracted 53 from 1989 to get a perfect square. New number =  $1989 - 53 = 1936$

44	
4	1936
+4	16
84	336
+4	336
88	0

$\therefore \sqrt{1936} = 44$

iii.

57	
5	3250
+5	25
107	750
+7	749
114	1

$\therefore$  We must subtracted 1 from 3250 to get a perfect square.  
 New number =  $3250 - 1 = 3249$

57	
5	3249
+5	25
107	749
+7	749
114	0

$\therefore \sqrt{3249} = 57$

iv.

$$\begin{array}{r}
 28 \\
 \hline
 2 \quad \overline{825} \\
 +2 \quad 4 \\
 \hline
 48 \quad 425 \\
 +8 \quad 384 \\
 \hline
 56 \quad 41
 \end{array}$$

$\therefore$  We must subtracted 41 from 825 to get a perfect square.

New number =  $825 - 41 = 784$

$$\begin{array}{r}
 28 \\
 \hline
 2 \quad \overline{784} \\
 +2 \quad 4 \\
 \hline
 48 \quad 384 \\
 +8 \quad 384 \\
 \hline
 56 \quad 0
 \end{array}$$

$\therefore \sqrt{784} = 28$

$$\begin{array}{r}
 63 \\
 \hline
 6 \quad \overline{4000} \\
 +6 \quad 36 \\
 \hline
 123 \quad 400 \\
 +3 \quad 369 \\
 \hline
 126 \quad 31
 \end{array}$$

$\therefore$  We must subtracted 31 from 4000 to get a perfect square. New number =  $4000 - 31 = 3969$

$\therefore \sqrt{3969} = 63$

5. Find the least number which must be added to each of the following numbers so as to get a perfect square. Also find the square root of the perfect square so obtained.

(i) 525

(ii) 1750

(iii) 252

(iv) 1825

(v) 6412

Solution:

(i)

	22
2	525
+2	4
42	125
+2	84
44	41

	23
2	525
+2	4
43	125
+3	129

Here,  $(22)^2 < 525 > (23)^2$

We can say 525 is ( 129 – 125 ) 4 less than  $(23)^2$ .

∴ If we add 4 to 525, it will be perfect square. New number =  $525 + 4 = 529$

	23	
2	529	
+2	4	
43	129	
+3	129	
46	0	

$\therefore \sqrt{529} = 23$

(ii)

	41	
4	1750	
+4	16	
81	150	
+1	81	
82	69	

	42	
4	1750	
4	16	
82	150	
+2	164	

Here,  $(41)^2 < 1750 < (42)^2$

We can say 1750 is ( 164 – 150 ) 14 less than  $(42)^2$ .

$\therefore$  If we add 14 to 1750, it will be perfect square.

New number =  $1750 + 14 = 1764$

$$\begin{array}{r}
 42 \\
 4 \overline{) 1764} \\
 \underline{4 \phantom{00} 16} \\
 82 \phantom{00} 164 \\
 \underline{+2 \phantom{00} 164} \\
 0
 \end{array}$$

$$\therefore \sqrt{1764} = 42$$

(iii)

$$\begin{array}{r}
 15 \\
 1 \overline{) 252} \\
 \underline{+1 \phantom{00} 1} \\
 25 \phantom{00} 152 \\
 \underline{+5 \phantom{00} 125} \\
 30 \phantom{00} 27
 \end{array}$$

$$\begin{array}{r}
 16 \\
 1 \overline{) 252} \\
 \underline{+1 \phantom{00} 1} \\
 26 \phantom{00} 152 \\
 \underline{+6 \phantom{00} 156} \\
 4
 \end{array}$$

Here,  $(15)^2 < 252 < (16)^2$

We can say 252 is (156 - 152) 4 less than  $(16)^2$ .

$\therefore$  If we add 4 to 252, it will be perfect square.

$$\text{New number} = 252 + 4 = 256$$



	16	
1	256	
+1	1	
26	156	
+6	156	
32	0	

$\therefore \sqrt{256} = 16$

(iv)

	42	
4	1825	
+4	16	
82	225	
+2	162	
84	63	

	43	
4	1825	
+4	16	
83	225	
+3	249	

Here,  $(42)^2 < 1825 < (43)^2$

We can say 1825 is ( 249 - 225 ) 24 less than  $(43)^2$ .

$\therefore$  If we add 24 to 1825, it will be perfect square.

New number =  $1825 + 24 = 1849$

	43	
4	1849	
+4	16	
83	249	
+3	249	
86	0	

$\therefore \sqrt{1849} = 43$

(v)

	80	
8	6412	
+8	64	
160	120	
0	0	

	81	
8	6412	
+8	64	
161	12	
+1	161	

Here,  $(80)^2 < 6412 < (81)^2$

We can say 6412 is  $(161 - 12)$  149 less than  $(81)^2$ .

$\therefore$  If we add 149 to 6412, it will be perfect square.

New number =  $6412 + 149 = 6561$

$$\begin{array}{r}
 81 \\
 8 \overline{) 6561} \\
 +8 \phantom{00} \overline{) 64} \\
 \hline
 161 \phantom{00} \overline{) 161} \\
 +1 \phantom{00} \overline{) 161} \\
 \hline
 162 \phantom{00} \overline{) 0}
 \end{array}$$

$$\therefore \sqrt{6561} = 81$$

6. Find the length of the side of a square whose area is 441 m<sup>2</sup>.

Solution:

Let the length of each side of the field = a Then, area of the field = 441 m<sup>2</sup>

$$\Rightarrow a^2 = 441 \text{ m}^2$$

$$\Rightarrow a = \sqrt{441} \text{ m}$$

$$\begin{array}{r}
 21 \\
 2 \overline{) 441} \\
 +2 \phantom{00} \overline{) 4} \\
 \hline
 41 \phantom{00} \overline{) 41} \\
 +1 \phantom{00} \overline{) 41} \\
 \hline
 42 \phantom{00} \overline{) 0}
 \end{array}$$

$\therefore$  The length of each side of the field = a m = 21 m.

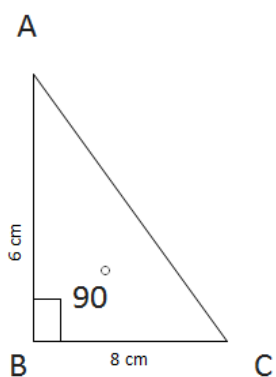
7. In a right triangle ABC,  $\angle B = 90^\circ$ .

a. If AB = 6 cm, BC = 8 cm, find AC

b. If AC = 13 cm, BC = 5 cm, find AB

Solution:

a.



Given,  $AB = 6 \text{ cm}$ ,  $BC = 8 \text{ cm}$

Let  $AC$  be  $x \text{ cm}$ .

$$\therefore AC^2 = AB^2 + BC^2$$

$$AC = \sqrt{AB^2 + BC^2}$$

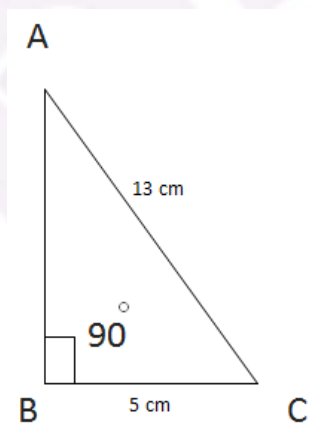
$$= \sqrt{6^2 + 8^2}$$

$$= \sqrt{36 + 64}$$

$$= \sqrt{100} = 10$$

Hence,  $AC = 10 \text{ cm}$ .

b.



Given,  $AC = 13 \text{ cm}$ ,  $BC = 5 \text{ cm}$

Let  $AB$  be  $x \text{ cm}$ .

$$\therefore AC^2 = AB^2 + BC^2$$

$$\Rightarrow AC^2 - BC^2 = AB^2$$

$$\begin{aligned}
 AB &= \sqrt{AC^2 - BC^2} \\
 &= \sqrt{13^2 - 5^2} \\
 &= \sqrt{169 - 25} \\
 &= \sqrt{144} = 12
 \end{aligned}$$

Hence,  $AB = 12$  cm

8. A gardener has 1000 plants. He wants to plant these in such a way that the number of rows and the number of columns remain same. Find the minimum number of plants he needs more for this.

Solution:

Let the number of rows and column be,  $x$ .

$\therefore$  Total number of row and column =  $x \times x = x^2$  As per question,  $x^2 = 1000$

$\Rightarrow x = \sqrt{1000}$

$$\begin{array}{r|l}
 & 31 \\
 3 & \overline{1000} \\
 +3 & 9 \\
 \hline
 61 & 100 \\
 +1 & 61 \\
 \hline
 \end{array}$$

$$\begin{array}{r|l}
 & 32 \\
 3 & \overline{1000} \\
 +3 & 9 \\
 \hline
 62 & 100 \\
 +2 & 124 \\
 \hline
 \end{array}$$

Here,  $(31)^2 < 1000 < (32)^2$

We can say 1000 is (124 - 100) 24 less than  $(32)^2$ .

$\therefore$  24 more plants are needed.

9. There are 500 children in a school. For a P.T. drill they have to stand in such a manner that the number of rows is equal to number of columns. How many children would be left out in this arrangement.

**Solution:**

Let the number of rows and column be,  $x$ .

$\therefore$  Total number of row and column =  $x \times x = x^2$  As per question,  $x^2 = 500$

$$x = \sqrt{500}$$

	22
2	500
+2	4
42	100
+2	84
44	16

Hence, 16 children would be left out in the arrangement

