Chapter – 06

Squares and Square Roots

Exercises 6.1

Question 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

Answer: For calculating the unit digit of a number when squared, just square the unit digit of the number and obtain the value.

For example: unit digit of square of 32 = square of 2 = 4unit digit of square of 78787 = square of 7 = 49 (Now we will only take the last digit from this) = 9 You can take any number and thus find its unit digit(i) 81

Since, here the given number has its unit place digit as 1, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(1 x 1 = 1) i.e., 1

(ii) 272

Since, here the given number has its unit's place digit as 2, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(2 x 2 = 4) i.e., 4

(iii) 799

Since the given number has its unit's place digit as 9, its square will end with the unit digit of the multiplication (9 x 9 = 81) i.e., 1

(iv) 3853

Since, here the given number has its unit's place digit as 3, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(3 x 3 = 9) i.e., 9

(v) 1234

Since, here the given number has its unit's place digit as 4, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(4 x 4 = 16) i.e., 6

(vi) 26387

Since, here the given number has its unit's place digit as 7, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(7 x 7 = 49) i.e., 9

(vii) 52698

Since, here the given number has its unit's place digit as 8, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(8 x 8 = 64) i.e., 4

(viii) 99880

Since the given number has its unit's place digit as 0.

Hence, its square will have two zeroes at the end. Therefore, the unit digit of the square of the given number is 0

(xi) 12796

Since, here the given number has its unit's place digit as 6, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(6 x 6 = 36) i.e., 6

(x) 55555

Since, here the given number has its unit's place digit as 5, its square will end with the unit digit of the multiplication of unit place digit of the number with the unit place digit of the number itself.

(5 x 5 = 25) i.e., 5

Question 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

Answer: Squares of any number have: 0, 1, 4, 5, 6, 9 as the unit digit. If there is a number with its unit's digit other than 1, 4, 5, 6, 9 and 0 then the number is not a square root.

And also note that the number of zeroes in the number should also be even for being a square root. (i) 1057 has its unit place digit as 7

Hence, it cannot be a perfect square

(ii) 23453 has its unit place digit as 3

Hence, it cannot be a perfect square

(iii) 7928 has its unit place digit as 8

Hence, it cannot be a perfect square

(iv) 222222 has its unit place digit as 2

Hence, it cannot be a perfect square

(v) 64000 has three zeros at the end of it. However, since a perfect square cannot end with odd number of zeroes, it is not a perfect square

(vi) 89722 has its unit place digit as 2

Hence, it cannot be a perfect square

(vii) 222000 has three zeroes at the end of it. And, we know that a perfect square cannot end with odd number of zeroes.

Hence, it is not a perfect square

(viii) 505050 has one zero at the end of it.

And we know that, a perfect square cannot end with odd number of zeroes,

Therefore, it is not a perfect square

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

(i) 431 (ii) 2826

(iii) 7779 (iv) 82004

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

Therefore,

(i) 431

Now 431 is an odd number so its square will also be an odd number. (ii) 28262826 is an even number so its square will also be an even number.(iii)

77797779 is an odd number and so its square will also be an odd number.(iv) 8200482004 is an even number and so its square will also be an even number.

Here, 431 and 7779 are odd numbers

Hence, the square of 431 and 7779 will be an odd number

Question 4.

Observe the following pattern and find the missing digits

$11^2 = 121$

$101^2 = 10201$

$1001^2 = 1002001$

$100001^2 = 1……….2……….1$

$10000001^2 = ………………….…$

Answer:

According to this given pattern, we can observe that the squares of the given numbers have the same number of zeroes before and after the digit 2 as it was in the original number.

Hence,

We can see that with every term, the number of zeroes that are in the square of the number, are in the solution with that many zeroes left and right of 2.

$100001^2 = 10000200001$

$10000001^2 = 100000020000001$

Question 5. Observe the following pattern and supply the missing numbers

$11^2 = 1\ 2\ 1$

$101^2 = 1\ 0\ 2\ 0\ 1$

$1001^2 = 1\ 0\ 2\ 0\ 3\ 0\ 2\ 01$

$100001^2 =$…………..……….

………. = 10203040504030201

Answer:

In the given pattern, we have

$101^2 = 10201$

$10101^2 = 102030201$

$1010101^2 = 1020304030201$

$101010101^2 = 10203040504030201$

Question 6. Using the given pattern, find the missing numbers

$1^2 + 2^2 + 2^2 = 3^2$

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

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

$4^2 + 5^2 + \ -^2 = 21^3$

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

$6^2 + 7^2 + \_\_^2 = \_\_^2$

Answer:

As per the given pattern, it can be observed that,

(i) The third number is the multiplication of the first two numbers

(ii) The fourth number can be obtained by adding 1 to the third number

Hence, the missing numbers in the pattern will be:

$4^2 + 5^2 + \underline{20}^2 = 21^2$

$5^2 + \underline{6} + 30^2 = 31^2$

$6^2 x\ 7^2 + \underline{42}^2 = \underline{43}$

Question 7. Without adding, find the sum

(i) 1 + 3 + 5 + 7 + 9

(ii) 1 + 3 + 5 + 7 + 9 + I1 + 13 + 15 + 17 +19

(iii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23

Answer:

(i) As per the question, we have to find the sum of first five odd natural numbers.

Therefore,

1 + 3 + 5 + 7 + 9

$= (5)^2$

= 25

(ii) As per the question, we have to find the sum of first ten odd natural number

Therefore,

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

$= (10)^2$

$= 100$

(iii) As per the question, we have to calculate the sum of first twelve odd natural numbers

Therefore,

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

$= (12)^2$

$= 144$

Question 8A. Express 49 as the sum of 7 odd numbers.

Answer: We know:

The sum of first n odd natural numbers is n2

Therefore,

$49 = (7)^2$

Hence, 49 is the sum of first 7 odd natural numbers

$49 = 1 + 3 + 5 + 7 + 9 + 11 + 13$

Question 8B. Express 121 as the sum of 11 odd numbers

Answer: $121 = 11^2$

Hence, 121 is the sum of first 11 odd natural numbers

121 = 1 +3 +5 +7 +9 +11 +13 +15 +17 +19 +21

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

(i) 12 and 13

(ii) 25 and 26

(iii) 99 and 100

Answer: We know

There will be 2n numbers in between the squares of the numbers n and (n + 1)

Now,

(i) Between 12^2 and 13^2:

There will be 2 x 12

= 24 numbers

(ii) Between 25^2 and 26^2:

there will be 2 x 25

= 50 numbers

(iii) Between 99^2 and 100^2, there will be 2 x 99

= 198 numbers

Exercises 6.2

Question 1. Find the square of the following numbers

(i) 32 (ii) 35

(iii) 86 (iv) 93

(v) 71 (vi) 46

Answer: (i) $32^2 = (30 + 2)(30 + 2)$

$= 30(30 + 2) + 2(30 + 2)$

$= 30^2 + 30 \times 2 + 2 \times 30 + 2^2$

$= 900 + 60 + 60 + 4$

$= 1024$

(ii)For any two-digit number having 5 as unit digit (let's say a5) its square is given by:

square= a(a+1) ×100 + 25The number 35 has 5 in its unit's place. Therefore,

$35^2 = (3)(3 + 1)$ hundreds + 25

= (3 x 4) hundreds + 25

$= 1200 + 25 = 1225$

(iii) $86^2 = (80 + 6)(80 + 6)$

$= 80(80 + 6) + 6(80 + 6)$

$= 80^2 + 80 \times 6 + 6 \times 80 + 6^2$

$= 6400 + 480 + 480 + 36$

$= 7396$

(iv) $93^2 = (90 + 3)(90 + 3)$

$= 90(90 + 3) + 3(90 + 3)$

$= 90^2 + 90 \times 3 + 3 \times 90 + 3^2$

= 8100 + 270 + 270 + 9

= 8649

(v) $71^2 = (70 + 1)(70 + 1)$

= 70 (70 + 1) + 1 (70 + 1)

$= 70^2 + 70 \times 1 + 1 \times 70 + 1^2$

= 4900 + 70 + 70 + 1

= 5041

(vi) $46^2 = (40 + 6)^2$

= 40 (40 + 6) + 6 (40 + 6)

= 402 + 40 x 6 + 6 x 40 + 62

= 1600 + 240 + 240 + 36

= 2116

Question 2. Write a Pythagorean triplet whose one member is

(i) 6 (ii) 14

(iii) 16 (iv) 18

Answer: For any natural number $m > 1$, $2m$, $m^2 - 1$, $m^2 + 1$ forms a Pythagorean triplet

Pythagorean triplet: A Pythagorean triple consists of three positive integers a, b, and c, such that $a^2 + b^2 = c^2$.

(i)

Let us take 2 m = 6

So, m = 3

Hence, the Pythagorean triplets are:

2 x 3, 3^2 - 1, 3^2 + 1 or 6, 8, and 10

(ii) Let 2 m = 14

m = 7

Hence, $m^2 - 1 = 49 - 1 = 48$ and $m^2 + 1 = 49 + 1 = 50$

Hence, the required Pythagorean triplet is 14, 48, and 50

(iii) Now, let 2 m = 16

m = 8

Therefore, $m^2 - 1 = 64 - 1 = 63$ and $m^2 + 1 = 64 + 1 = 65$

Therefore, the Pythagorean triplet is 16, 63, and 65

(iv) Let 2 m =18

m = 9

Thus, $m^2 - 1 = 81 - 1 = 80$ and $m^2 + 1 = 81 + 1 = 82$

Therefore, the Pythagorean triplet is 18, 80, and 82

Exercises 6.3

Question 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

Answer: We need to find the number's unit digit whose square are given to us.

For example, square root of 400 is 20 and thus the unit digit of 20 is 0. We need to know some properties. When unit digit of a number is 1, The square of the number will also contain 1 as the unit digit. when unit digit of the number is 2. the square of the number will contain 4 as the unit digit. When unit digit of the number is 3, the square of the number will contain 9 as the unit digit. When unit digit of the number is 4, the square of the number will contain 6 as the unit digit. When unit digit of the number is 5, the square of the number will also contain 5 as the unit digit. When unit digit of the number is 6, The square of the number will contain 6 as the unit digit. When unit digit of the number is 7, the square of the number will contain 9 as the unit digit. When unit digit of the number is 8, the square of the number will contain 4 as the unit digit. When unit digit of the number is 9, the square of the number will contain 1 as the unit digit. When unit digit of the number is 0, the square of the number will contain 0 as the unit digit.(i) If the number ends with 1, then the one's digit of the square root of that number may be 1 or 9. Hence, one's digit of the square root of 9801 is either 1 or 9

(ii) If the number ends with 6, then the one's digit of the square root of that number may be 4 or 6. Hence, one's digit of the square root of 99856 is either 4 or 6

(iii) If the number ends with 1, then the one's digit of the square root of that number may be 1 or 9. Hence, one's digit of the square root of 998001 is either 1 or 9

(iv) If the number ends with 5, then the one's digit of the square root of that number will be 5. Hence, the one's digit of the square root of 657666025 is 5

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

(i) 153 (ii) 257

(iii) 408 (iv) 441

Answer:

The perfect squares of a number may end with any of the following digits at unit's place:

0, 1, 4, 5, 6, or 9

And, a perfect square will end with even number of zeroes

(i) Since the unit place digit of number 153 is 3, hence it is not a perfect square

(ii) Since the unit place digit of number 257 is 7, hence it is not a perfect square

(iii) Since the number 408 has its unit place digit as 8, it is not a perfect square

(iv) Since the number 441 has its unit place digit as 1, it is a perfect square

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

Answer: The square root of 100 can be obtained by the method of repeated subtraction as:

(i) 100 - 1 = 99 (ii) 99 - 3 = 96 (iii) 96 - 5 = 91

(iv) 91 - 7 = 84 (v) 84 - 9 = 75 (vi) 75 - 11= 64

(vii) 64 - 13 = 51 (viii) 51 - 15 = 36 (ix) 36 - 17 = 19

(x) 19 - 19 = 0

In this we have subtracted successive odd numbers starting from 1 to 100, and obtained 0 at 10th step

Therefore,

$\sqrt{100} = 10$

The square root of 169 can be obtained by the method of repeated subtraction as:

(i) 169 - 1 = 168 (ii) 168 - 3 = 165 (iii) 165 - 5 = 160

(iv) 160 - 7 = 153 (v) 153 - 9 = 144 (vi) 144 - 11 = 133

(vii) 133 - 13 = 120 (viii) 120 - 15 = 105 (ix) 105 - 17 = 88

(x) 88 - 19 = 69 (xi) 69 - 21 = 48 (xii) 48 - 23 = 25

(xiii)25 - 25 = 0

We have subtracted successive odd numbers starting from 1 to 169, and obtained 0 at 13th step

Hence,

$\sqrt{169} = 13$

Question 4. Find the square roots of the following numbers by the Prime Factorization Method

(i) 729 (ii) 400

(iii) 1764 (iv) 4096

(v) 7744 (vi) 9604

(vii) 5929 (viii) 9216

(ix) 529 (x) 8100

Answer:

(i) The prime factorization of 729 is as follows:

$729 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$

Now, Square root of 3 × 3 is 3, Taking square root booth side, we get

$\sqrt{729} = 3 * 3 * 3$

$= 27$

(ii) The prime factorization of 400 is as follows:

$400 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

Now, Square root of 2 × 2 is 2 and 5 × 5 is 5, Taking square root both side, we get

$\sqrt{400} = 2 * 2 * 5$

$= 20$

(iii) The prime factorization of 1764 is as follows:

$1764 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7}$

Now, Square root of 2×2 is $2, 3 \times 3$ and 7×7 is 7, Taking square root both side, we get

$\sqrt{1764} = 2 * 3 * 7$

$= 42$

(iv) The prime factorization of 4096 is as follows:

$4096 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2}$

Now, Square root of 2 × 2 is 2, Taking square root both side, we get

$\sqrt{4096} = 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$= 64$

(v) The prime factorization of 7744 is as follows:

$7744 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{11 \times 11}$

Now, Square root of 2 × 2 is 2 and 11 × 11 is 11, Taking square root both side, we get

$\sqrt{7744} = 2 \times 2 \times 2 \times 11$

$= 8$

(vi) The prime factorization of 9604 is as follows:

$9604 = \underline{2 \times 2} \times \underline{7 \times 7} \times \underline{7 \times 7}$

Now, Square root of 2 × 2 is 2 and 7 × 7 is 7, Taking square root both side, we get

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

$= 98$

(vii) The prime factorization of 5929 is as follows:
5929 = 11 × 11 × 7 × 7
Now, Square root of 11 × 11 is 11 and 7 × 7 is 7, Taking square root both side, we get
$\sqrt{5929} = 11 \times 7$

$= 77$

(viii) 9216 can be factorized as follows:

$9216 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3}$

$\sqrt{9216} = 2 \times 2 \times 2 \times 2 \times 2 \times 396$

(ix) The prime factorization of 529 is as follows:

$529 = \underline{23 \times 23}$

$\sqrt{529} = 23$

(x) The prime factorization of 8100 is as follows:

$8100 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3 \times 5 \times 5}$

$\sqrt{8100} = 2 \times 5 \times 3 \times 3$

$= 90$

Question 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

Answer:

(i) The prime factorization of 252 is follows:

$252 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here,

Prime factor 7 does not have its pair.

It 7 gets a pair, then the number will become a perfect square.

Therefore, 252 has to be multiplied with 7 to obtain a perfect square

$252 \times 7 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{7 \times 7}$

Hence, $252 \times 7 = 1764$ is a perfect square

$\sqrt{1764} = 2 * 3 * 7$

$= 42$

(ii) The prime factorization of 180 is as follows:

$180 = \underline{2 \times 2} \times \underline{3 \times 3} \times 5$

Here, prime factor 5 does not have its pair.

If 5 gets a pair, then the number will become a perfect square.

Therefore, 180 has to be multiplied with 5 to obtain a perfect square.

$180 \times 5 = 900 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{5 \times 5}$

Therefore,

$180 \times 5 = 900$ is a perfect square

$\sqrt{900} = 2 * 3 * 5$

$= 30$

(iii) The prime factorization of 1008 is as follows:

$1008 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair.

If 7 gets a pair, then the number will become a perfect square.

Therefore, 1008 can be multiplied with 7 to obtain a perfect square.

$1008 \times 7 = 7056 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Therefore,

$1008 \times 7 = 7056$ is a perfect square

$\sqrt{7056} = 2 * 2 * 3 * 7$

$= 84$

(iv) The prime factorization of 2028 is as follows:

$2028 = \underline{2 * 2} * 3 * \underline{13 * 13}$

Here, prime factor 3 does not have its pair. If 3 gets a pair, then the number will become a perfect square. Therefore, 2028 can be multiplied with 3 to obtain a perfect square.

$2028 \times 3 = 6084 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{13 \times 13}$

Therefore,

$2028 \times 3 = 6084$ is a perfect square

$\sqrt{6084} = 2 * 3 * 13$

$= 78$

(v) The prime factorization of 1458 is as follows:

$1458 = 2 * \underline{3 * 3} * \underline{3 * 3} * \underline{3 * 3}$

Here, prime factor 2 does not have its pair.

If 2 gets a pair, then the number will become a perfect square.

Therefore, 1458 can be multiplied with 2 to obtain a perfect square.

$1458 \times 2 = 2916 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3}$

Therefore,

$1458 \times 2 = 2916$ is a perfect square

$\sqrt{2916} = 2 * 3 * 3 * 3$

$= 54$

(vi) The prime factorization of 768 is as:

$768 = \underline{2 * 2} * \underline{2 * 2} * \underline{2 * 2} * \underline{2 * 2} * 3$

Here, prime factor 3 does not have its pair.

If 3 gets a pair, then the number will become a perfect square.

Therefore, 768 can be multiplied with 3 to obtain a perfect square.

$768 \times 3 = 2304 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3}$

Therefore,

$768 \times 3 = 2304$ is a perfect square

$\sqrt{2304} = 2 * 2 * 2 * 2 * 3$

= 48

Question 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

Answer:

(i) 252 can be factorized as follows:

252 = $\underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Here, prime factor 7 does not have its pair

If we divide this number by 7, then the number will become a perfect square.

Therefore, 252 has to be divided by 7 to obtain a perfect square

$\frac{252}{7} = 36$ is a perfect square

36 = $\underline{2 \times 2} \times \underline{3 \times 3}$

$\sqrt{36} = 2 * 3$

= 6

(ii) The prime factorization of 2925 is as follows:

2925 = $\underline{3 \times 3} \times \underline{5 \times 5} \times 13$

Here, prime factor 13 does not have its pair

If we divide this number by 13, then the number will become a perfect square.

Therefore, 2925 has to be divided by 13 to obtain a perfect square

$\frac{2925}{13} = 225$ is a perfect square

225 = $\underline{3 \times 3} \times \underline{5 \times 5}$

$\sqrt{225} = 3 * 5$

= 15

(iii) The prime factorization of 396 is as follows:

396 = 2 x 2 x 3 x 3 x 11

Here, prime factor 11 does not have its pair

If we divide this number by 11, then the number will become a perfect square.

Therefore, 396 has to be divided by 11 to obtain a perfect square

is a perfect square

$\frac{369}{11} = 36$ is a perfect square

$36 = \underline{2 \times 2} \times \underline{3 \times 3}$

$\sqrt{36} = 2 * 3$

= 6

(iv) The prime factorization of 2645 is as follows:

$2645 = 5 \times \underline{23 \times 23}$

Here, prime factor 5 does not have its pair

If we divide this number by 5, then the number will become a perfect square. Therefore, 2645 has to be divided by 5 to obtain a perfect square

$\frac{2645}{5} = 529$ is a perfect square

$529 = \underline{23 \times 23}$

$\sqrt{529} = 23$

= 23

(v) 2800 can be factorized as follows:

$2800 = \underline{2 \times 2} \times 7 \times \underline{10 \times 10}$

Here, prime factor 7 does not have its pair

If we divide this number by 7, then the number will become a perfect square. Therefore, 2800 has to be divided by 7 to obtain a perfect square

is a perfect square

$400 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5}$

$\sqrt{400} = 2 \times 2 \times 5$

= 20

(vi) The prime factorization of 1620 is as follows:

$1620 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times 5$

Here, prime factor 5 does not have its pair

If we divide this number by 5, then the number will become a perfect square.

Therefore, 1620 has to be divided by 5 to obtain a perfect square

is a perfect square

$\frac{1620}{5} = 324$ is a perfect square

$324 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3}$

$\sqrt{324} = 2 * 3 * 3$

= 18

Question 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.

Answer: Let the number of students be x.

Each student donated as many rupees as the number of students of the class.

The donation amount w= no. of students × amount of donation

$2401 = x(x)2401 = x^2$

Hence,

Number of students in the class $= \sqrt{2401}$

$2401 = \underline{7 \times 7} \times \underline{7 \times 7}$

$\sqrt{2401} = 7 * 7$

$= 49$

Hence, the number of students in the class is 49.

Question 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

Answer: Given:

In the garden, each row contains as many plants as the number of rows.

Hence,

Number of rows = Number of plants in each row

Total number of plants = Number of rows × Number of plants in each row

Number of rows × Number of plants in each row = 2025

(Number of rows)^2 = 2025

Number of rows = $\sqrt{2025}$

$2025 = \underline{5 * 5} * \underline{3 * 3} * \underline{3 * 3}$

$\sqrt{2025} = 5 * 3 * 3$

$= 45$

Hence, the number of rows and the number of plants in each row is 45

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

Answer: We know that the number that will be perfectly divisible by each one of 4, 9, and 10 is their LCM.

The LCM of these numbers is:

LCM of 4, 9, 10 = $\underline{2 \times 2} \times \underline{3 \times 3} \times 5 = 180$

Here, prime factor 5 does not have its pair

Therefore, 180 us bit a perfect square.

If we multiply 180 with 5, then the number will become a perfect square.

Hence,

The required square number is 180 × 5 = 900

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

Answer: We know that the number that is perfectly divisible by each of the numbers 8, 15, and 20 is their LCM.

Therefore,

LCM of 8, 15, and 20 is:

$\underline{2 \times 2} \times 2 \times 3 \times 5 = 120$

Here, prime factors 2, 3, and 5 do not have their respective pairs.

Therefore, 120 is not a perfect square

Therefore, 120 should be multiplied by 2 × 3 × 5, i.e. 30, to obtain a perfect square

Hence,

The required square number = 120 × 2 × 3 × 5

= 3600

Exercises 6.4

Question 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

Answer:

(i) The square root of 2304:

	48
4	$\overline{23}\ \overline{04}$ -16
88	704 704
	0

$\sqrt{2304} = 48$

(ii) The square root of 4489:

	67
6	$\overline{44}\ \overline{89}$ -36
127	889 889
	0

$\sqrt{4489} = 67$

(iii) The square root of 3481:

	59
5	$\overline{34}\ \overline{81}$ -25
109	981 981
	0

(iv) The square root of 529:

	23
2	$\overline{5}\ \overline{29}$ -4
43	129 129
	0

$\sqrt{259} = 23$

(v) The square root of 3249

	57
5	$\overline{32}\ \overline{49}$ -25
107	749 749
	0

$\sqrt{3249} = 57$

(vi) The square root of 1369:

	37
4 3	$\overline{1}\overline{3}\ \overline{6}\overline{9}$ 9
67 7	469 469
	0

$\sqrt{1369} = 37$

(vii) The square root of 5776:

	76
7 7	$\overline{5}\overline{7}\ \overline{7}\overline{6}$ 49
146 6	876 876
	0

$\sqrt{5776} = 76$

(viii) The square root of 7921:

	89
8 8	$\overline{79}\ \overline{21}$ 64
169 9	1521 1521
	0

$\sqrt{7921} = 89$

(ix) The square root of 576:

	24
2 2	$\overline{5}\ \overline{76}$ 4
44 4	176 176

	0

$\sqrt{576} = 24$

(x) The square root of 1024:

	32
3 3	$\overline{10}\ \overline{34}$ 9
62 2	124 124
	0

$\sqrt{1024} = 32$

(xi) The square root of 3136:

	56
5 5	$\overline{31}\ \overline{36}$ 25
106 6	636 636

	0

$\sqrt{3136} = 56$

(xii) The square root of 900:

	30
3 3	$\overline{9}\ \overline{00}$ 9
60 0	000 000
	0

$\sqrt{900} = 30$

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

(i) 64 (ii) 144

(iii) 4489 (iv) 27225

(v) 390625

Answer: For calculating the number of digits in the square root of a number steps are as follows.

1. Divide the number in the pair of twos.2. Place a bar on each pair.3. Count the number of bars.4. Number of bars will be the number of digits in the square root. for example, Consider the number - 56251. Divide the number in pair of twos - 56 252. Place bar on each pair. 56 253. There will be two bars and so there will be two digits in the square root of the number. (Square root of 5625 = 75, and it is a two-digit number) (i) By placing bars, we get

$64 = \overline{64}$

Since there is only one bar, the square root of 64 will have only one digit in it

(ii) By placing bars, we get

$144 = \overline{1}\,\overline{44}$

Since there are two bars, the square root of 144 will have 2 digits in it

(iii) By placing bars, we get

$4489 = \overline{44}\,\overline{89}$

Since there are two bars, the square root of 4489 will have 2 digits in it

(iv) By placing bars, we get

$27225 = \overline{2}\,\overline{72}\,\overline{25}$

Since there are three bars, the square root of 27225 will have three digits in it

(v) By placing the bars, we get

$390625 = \overline{39}\,\overline{06}\,\overline{25}$

Since there are three bars, the square root of 390625 will have 3 digits in it

Question 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

Answer:

(i) The square root of 2.56 is an follows:

	1.6
1 1	2.56 1
26 6	156 156
	0

$\sqrt{2.56} = 1.6$

(ii) The square root 7.29 is as follows:

	2.7
2 2	7.29 4
47 7	329 329

	0

$\sqrt{7.29} = 2.7$

(iii) The square root of 51.84 is as follows:

	7.2
7 7	51.84 49
142 2	284 284
	0

$\sqrt{51.84} = 7.2$

(iv) The square root of 42.25 is as follows:

	6.5
6 6	42.25 36
125	625

5	625
	0

$\sqrt{42.25} = 6.5$

(v) The square root of 31.36 is as follows:

	5.6
5 5	31.36 25
106 6	636 636
	0

$\sqrt{31.36} = 5.6$

Question 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

Answer:

(i) The square root of 402 can be calculated by long division method as follows:

	2
2 2	$\overline{4}\ \overline{02}$ 4
4	002

The remainder is 2

This represents that the square of 20 is less than 402 by 2.

Hence, a perfect square will be obtained by subtracting 2 from the given number 402

Therefore, required perfect square = 402 – 2

$= 400$

$\sqrt{400} = 20$

(ii) The square root of 1989 can be calculated by long division method as follows:

4 4	1989 16

8	389

Now 84 × 4 = 336 and we have 3895o 389 = 5 Hence,

The remainder is 53

This represents that the square of 44 is less than 1989 by 53

Hence, a perfect square will be obtained by subtracting 53 from the given number 1989.

Therefore, required perfect square = 1989 - 53

= 1936

$\sqrt{1936} = 44$

(iii) The square root of 3250 can be calculated by long division method as follows:

5 5	3250 25
10	750

Now 107 x 7 = 749And 750 - 749 = 1Hence,

The remainder is 1

This represents that the square of 57 is less than 3250 by 1

Hence, a perfect square can be obtained by subtracting 1 from the given number 3250

Therefore, required perfect square = 3250 - 1

= 3249

$\sqrt{3249} = 57$

(iv) The square root of 825can be calculated by long division method as follows: ‘

2 2	825 4
4	425

Now, 48 x 8 = 384And 425 - 384 = 41Hence,

The remainder is 4

This represents that the square of 28 is less than 825 by 41

Hence, a perfect square can be calculated by subtracting 41 from the given number 825

Therefore, required perfect square = 825 – 41

$= 784$

$\sqrt{784} = 28$

(v) The square root of 4000 can be calculated by long division method as follows:

6 6	4000 36

12	400

Now 123 × 3 = 369 and 400 – 369 = 31 Hence,

The remainder is 31

This represents that the square of 63 is less than 4000 by 31

Hence, a perfect square can be calculated by subtracting 31 from the given number 4000

Therefore, required perfect square = 4000 – 31

= 3969

$\sqrt{3969} = 63$

Question 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

Answer:

(i) The square root of 525 can be calculated by long division method as:

	22
2	$\bar{5}\ \overline{25}$ -4

42	125 84
	41

The remainder is 41

It represents that the square of 22 is less than 525

Next number is 23 and $23^2 = 529$

Hence, number to be added to $525 = 23^3 - 525$

$= 529 - 525$

$= 529 - 525$

$= \ -4$

The required perfect square is 529 and $\sqrt{529} = 23$

(ii) The square root of 1750 can be calculated by long division method as follows:

	41
4	$\overline{17}\ \overline{50}$ -16
81	150 81
	69

The remainder is 69

It represents that the square of 41 is less than 1750

The next number is 42 and $42^2 = 1764$

Hence, number to be added to 1750 = $42^2 – 1750$

= 1764 - 1750

= 14

The required perfect square is 1764 and $\sqrt{1764} = 42$

(iii) The square root of 252 can be calculated by long division method as follows:

	15
1	$\overline{2}\ \overline{52}$ -1
25	152 125
	27

The remainder is 27. It represents that the square of 15 is less than 252

The next number is 16 and $16^2 = 256$

Hence, number to be added to $252 = 16^2 - 252$

$= 256 - 252$

$= 4$

The required perfect square is 256 and $\sqrt{256} = 16$

(iv) The square root of 1825 can be calculated by long division method as follows:

	42
4	$\overline{18}\ \overline{25}$ -16
82	225 164
	61

The remainder is 61. It represents that the square of 42 is less than 1825

The next number is 43 and $43^2 = 1849$

Hence, number to be added to 1825 = 43^2 - 1825

= 1849- 1825

= 24

Hence, number to be added to 1825 = 24

The required perfect square is 1849 and $\sqrt{1849} = 43$

(v) The square root of 6412 can be calculated by long division method as follows:

	80
8 8	6412 64
16	12

The remainder is 12. It represents that the square of 80 is less than 6412

The next number is 81 and $81^2 = 6561$

Hence, number to be added to $6412 = 81^2 - 6412$

$= 6561 - 6412$

$= 149$

Hence, number to be added to $6412 = 149$

The required perfect square is 6561 and $\sqrt{6561} = 81$

Question 6. Find the length of the side of a square whose are in 441 m^2

Answer:

Area of square $= (X)^2$

Where × is the side of square.

Area of square = 441 m^2

$x^2 = 441$

$x = \sqrt{441}$

The square root of 441 can be calculated as:

	21
2	$\overline{4}\ \overline{41}$ -4
41	41 41
	0

$x = 21$

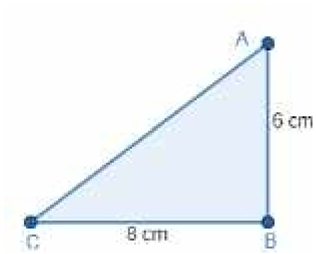
Hence, the length of the side of the square is 21 m

Question 7. In a right triangle ABC, $\angle B = 90°$

(a) If AB = 6 cm, BC = 8 cm, find AC
(b) If AC = 13 cm, BC = 5 cm, find AB

Answer:

(a) It is given that ΔABC is right-angled at B, hence the side opposite to angle B ie AC will be the hypotenuse.



Pythagoras Theorem: In a right angles triangle, square of the hypotenuse is equal to the sum of squares of other two sides.

Therefore, by using Pythagoras theorem, we get:

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

$AC^2 = (6\ \text{cm})^2 + (8\ \text{cm})^2$

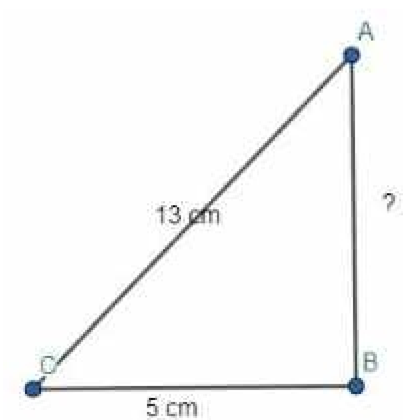
$AC^2 = (36 + 64)\text{cm}^2$

$AC^2 = 100\ \text{cm}^2$

or $AC = \sqrt{100}\ \text{cm}$

$AC = 10\ \text{cm}$

(b)



It is given that Δ ABC is right-angled at B Pythagoras Theorem: In a right angles triangle, square of the hypotenuse is equal to the sum of squares of other two sides.

Therefore, by using Pythagoras theorem, we get:

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

$(13 \text{ cm})^2 = (AB)^2 + (5 \text{ cm})^2$

$AB^2 = (13 \text{ cm})^2 - (5 \text{ cm})^2$

$AB^2 = 169 \text{ cm}^2 - 25\text{cm}^2$

$AB^2 = 144 \text{ cm}^2$

or $AB = \sqrt{144} \text{ cm}$

$AB = 12 \text{ cm}$

Question 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

Answer: It is mentioned in the question that the gardener has 1000 plants.

And,

The number of rows and the number of columns is the same

We need to find the number of more plants that should be there, such that when the gardener plants them, the number of rows and columns are equal to one another.

For this, the number which should be added to 1000 to make it a perfect square has to be calculated

Now, Perfect square just greater than 1000 is 1024, which is

Hence, number to be added to 1000 to make it a perfect square

= 1024 - 1000

= 24

Thus, the required number of plants is 24.

Question 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?

Answer: It is given in the question that there are 500 children in the school. They have to stand for a P.T. drill in such a way that the number of rows is equal to the number of columns.

The number of children who will be left out in this arrangement has to be calculated.

For this, the number which should be subtracted from 500 to make it a perfect square has to be calculated.

The square root of 500 can be calculated by long division method as follows:

	22
2	$\overline{5}\ \overline{00}$ -4
42	100 84
	16

The remainder is 16. It shows that the square of 22 is less than 500 by 16

Therefore, if we subtract 16 from 500, we will obtain a perfect square

Required perfect square = 500 - 16

= 484

Hence, the number of children who will be left out is 16