CHAPTER – 2

SQUARES, CUBES, SQUARE ROOTS, CUBE ROOTS

A useful property for the powers of 2

$2^0 = 1$, $2^1 = 2$, $2^2 = 4$, $2^3 = 8$
$2^4 = 16$, $2^5 = 32$, $2^6 = 64$, $2^7 = 128$
$2^8 = 256$, $2^9 = 512$, $2^{10} = 1024$, $2^{11} = 2048$

By observing the following, we can see that

$2^0 + 2^1$	$= 3 = 2^2 - 1$
$2^0 + 2^1 + 2^2$	$= 7 = 2^3 - 1$
$2^0 + 2^1 + 2^2 + 2^3$	$= 15 = 2^4 - 1$
$2^0 + 2^1 + 2^2 + + 2^3 + 2^4$	$= 31 = 2^5 - 1$

Similarly,
$2^0 + 2^1 + 2^2 + + 2^3 + 2^4$ $= 31 = 2^5 - 1$
That is, the sum of power of 2 from 0 to any number k will be equal to $2^{k+1} - 1$.
The above concept can be used in the following example

Eg.1: A trader uses only five weights which together weighed 31 kg. With these five weights he can measure all integer weights from 1 kg to 31 kg with the weight kept only in one pan of the weighing scale. Find the individual weights of the five pieces?

Sol: For measuring all integer weights upto 31 kg, the individual weights needed are the powers of 2, i.e. 2^0, 2^1, 2^2, 2^3 and 2^4
∴ if we have weights of 1 kg, 2 kg, 4 kg,, 8 kg and 16 kg, we can measure all integer weights upto 31 kg.
For example if we have to measure 23 kg, we have to use the weights 16 kg, 4 kg, 2 kg and 1 kg on one pan.

If you want to write any number from 1 to M as a sum of one or more of the integers of a given set of integers (each integer being used at the most once), it can be done by using the powers of 2. The set of integers we can use consists of all the powers of 2 starting form 1 (i.e. 2^0) to the largest power of 2 less than or equal to M. For example, if you want to build all the integers upto 255, the numbers 1, 2, 4, 8, 16, 32, 64, 128 are sufficient.

A useful property for the powers of 3

$3^0 = 1$, $3^1 = 3$, $3^2 = 9$, $3^3 = 27$
$3^4 = 81$, $3^5 = 243$, $3^6 = 729$, $3^7 = 2187$

$3^0 + 3^1 + 3^2 + 3^3 = 40$
Using a combination of these numbers each occurring at the most once, we can obtain all the numbers from 1 to 40 by using the operation of only addition and/or subtraction.
The above concept can be used in the following example

Eg.2: A trader uses only four weights which together weighed 40 kg. With the four weights he could measure all integer weights from 1 kg to 40 kg using weights in both the pans. Find the weights of the four pieces?

Sol: For measuring all weights upto 40 kg, the weights needed are the power of 3 whose sum add upto 40, i.e. 3^0, 3^1, 3^2 and 3^3 . . . if we have weights of 1 kg, 3 kg, 9 kg and 27 kg we can measure all weights from 1 to 40 kg
For example if we have to measure 33 kg, we have to keep the 27 kg and 9 kg weights on one pan and 3 kg weight on the other $27 + 9 - 3 = 33$ kg

How to find the square of a number ending in 5:

Getting the square of a number ending in 5 is very simple. If the last digit of the number is 5, the last two digits of the square will be 25. Whatever is the earlier part of the number multiply it with one more than itself and that will be the first part of the answer. (The second part of the answer will be 25 only).

$35^2 = 1225$ Here 3 x 4 = 12 so the answer is 1225
$45^2 = 2025$
$55^2 = 3025$
$75^2 = 5625$
$95^2 = 9025$
$125^2 = 15625$
$175^2 = 30625$
$235^2 = 55225$
$195^2 = 38025$
$245^2 = 60025$

So, now we know the squares of numbers 25, 30, 35, 40, 45, 50, 55, 60, 65, etc. If we want to find the squares of any other number, we find it using these squares which we already know.

To find the square of a number which is one more than the number whose squares we already know

For 26^2 we will go from 25^2, for 31^2 we go form 30^2 and so on.

One way is writing $26^2 = (25+1)^2$. But we need not even calculate $(a + b)^2$ by adopting the following method.

$26^2 = 25^2 + 26^{th}$ odd number i.e $625 + 51 = 676$
$(a + b)^2 = a^2 + 2ab + b^2$
$26^2 = (25 + 1)^2$
$(25)^2 + 2(25 \times 1) + (1)^2$
$625 + 50 + 1 = 625 + 51 = 676$

But we will look at a different method which will enable the student perform the calculations for squares mentally.

$1^2 = 1 = 1$
$2^2 = 4 = 1 + 3$
$3^2 = 9 = 1 + 3 + 5$
$4^2 = 16 = 1 + 3 + 5 + 7$
$5^2 = 25 = 1 + 3 + 5 + 7 + 9$

i.e., to get n^2, we add up the FIRST n odd numbers. If we want 13^2, it will be the sum of the FIRST 13 odd numbers.

n^{th} odd number is equal to $(2n - 1)$.

Suppose we want to find out 6^2 knowing what 5^2 is, we can move from 5^2 to 6^2.

6^2 will be the sum of 1st 6 odd numbers. But the sum of the first 6 odd numbers can be written as "sum of the first 5 odd numbers" + "sixth odd number". Since we already know that the sum of the FIRST 5 odd numbers is 5², i.e., 25, we need to add the sixth odd number i.e., (2 x 6 – 1 =) 11 to 25 to give us 6^2 = 36.

Similarly

31^2 = 900 + 31st odd number = 900 + 61= 961
36² = 1225 + 36th odd number = 1225 + 71
 = 1296 (please remember that 35² = 1225)
41² = 1600 + 81 = 1681
46² = 2025 + 91 = 2116
126² = 15625 + 251 = 15876
196² = 38025 + 391 = 38416
216² = 46225 + 431 = 46656

We have now seen how to find the squares of numbers which are one more than those whose squares we know (eg. 25, 30, 35, etc.)

To find the square of a number which is one less than the number whose squares we already know

Similarly, we can find the squares of numbers which are one less than the numbers whose squares are known already to you. For example,

29² = 30² – 30th odd number
= 900 – 59 = 841
39² = 40² – 40th odd number = 1600 – 79 = 1521
34² = 1225 – 69 = 1156
54² = 3025 – 109 = 2916
74² = 5625 – 149 = 5476
94² = 9025 – 189 = 8836
214² = 46225 – 429 = 45796

To find the square of a number from 26 to 50

The squares of numbers from 26 to 50 can be calculated by writing down and adding two parts as explained below:
The first part is as many times 100 as the number is more than 25, for example in finding 31², as 31 is 6 more than 25, the first part is 100 x 6 = 600
The second part is the square of the number that is as much less than 25 as the number is more than 25, i.e., in finding 31², the second part is the square of 6 less than 25, i.e., (25 – 6)² = 19² = 361
Hence, 31² = First part + Second part = 600 + 361 = 961

The above method can be summarized as

1. Finding 31²
    i.   31 = 25 + 6
    ii.   25 – 6 → 19^2 →   361
    iii. 31^2 = 6 x 100 + 361 = 961

2. Finding 33²
    i.   33 = 25 + 8
    ii.   25 – 8 → 17^2 →   289
    iii. 31^2 = 8 x 100 + 289 = 1089

To find the square of a number from 51 to 75.

The squares of numbers from 51 to 75 can be calculated by writing down two parts, each of which is a two-digit number, adjacent to each other as explained below:

The second part is the two-digit number formed by the two digits which are to the extreme right of the square of the number by which the given number is more than 50.
For example, in finding 63², as 63 is 13 more than 50, the second part will be the two digits to the extreme right of 13² (= 169), i.e. 69. Since there are more than two digits in 13², the digit to the extreme left, i.e., 1, is taken as carry forward and is to be added to the first part.

The first part is the sum of (i) the carry forward, if any, from the second part and (ii) the sum of 25 (for this range (i.e., 51 to 75) 25 is taken as the base) and the number by which the given number is more than 50.

Thus, we have seen how to get the squares of numbers which are one more or one less than the numbers whose squares we already know (i.e., 25, 30, 35, 40, 45, 50, 55, etc.)

To find the square of a number which is 2 more than the number whose squares we already know

Now, we will see how to get the squares of numbers which are 2 more (or less) than the numbers whose squares we already know.

27² = 26² + 27th odd number = 25² + 26th odd number + 27th odd number.
The sum of the 26th odd number and 27th odd number is the same as 4 times 26. Hence

27² = 25² + 4 x 26 = 625 + 104 = 729
57² = 3025 + 224 (4 times 56) = 3249
77² = 5625 + 304 (4 times 76) = 5929
97² = 9025 + 384 (4 times 96) = 9409

To find the square of a number which is 2 less than the number whose squares we already know

Similarly, we can find out the squares of numbers which are 2 less than the numbers whose squares we know.

28² = (30² – 4 times 29) = 900 – 116 = 784
53² = (55² – 4 times 54) = 3025 – 216 = 2809
93² = 9025 – 376 = 8649
243² = 60025 – 976 = 59049
143² =(145²– 4 x 144) = 21025 – 576 = 20449

As 63 is 13 more than 50, the first part will be 25 + 13 + 1 (carry forward from the second part) = 39
Therefore 63² = <u>39</u> <u>69</u>

The above can be summarized as

     First Part   Second Part
1. 63² = (25 + 13) / 13² = 38 / <u>69</u> = 38 + 1 / 69 = <u>39</u> <u>69</u>
            C.F

     First Part   Second Part
2. 61² = (25 + 11) / 11² = 36 / <u>21</u> = <u>37</u> <u>21</u>
            C.F

     First Part   Second Part
3. 56² = (25 + 6) / 6² = 31/36 = <u>31</u> <u>36</u>

Note: For Squares in the range of 50 to 60, as there is no carry forward, finding the squares in this range is faster.

To find the square of a number from 76 to 100

The squares of numbers from 76 to 100 can be calculated by writing down two parts, each of which is a two-digit number, adjacent to each other as explained below:
The second part is the two-digit number formed by the two digits to the extreme right of the square of the number by which the given number is less than 100.
For example in 88², as 88 is 12 less than 100, the second part will be the two digits to the extreme right of 12²(= 1<u>44</u>), i.e., 44. Since there are more than two digits in 12², the digit to the extreme left, i.e., 1, is taken as carry forward and is to be added to the first part.
The first part is the sum of (i) the carry forward, if any, from the second part and (ii) the difference between the given number and the number by which the given number is less than 100. As 88 is 12 less than 100, the first part will be 88 – 12 + 1(carry forward from the second part) = 77.
Therefore, 88² = <u>77</u> <u>44</u>

The above can be summarized as
     First Part   Second Part
1. 88² = (88 - 12) / 12² = 76 / <u>44</u> = (76 + 1) / 44 = <u>77</u> <u>44</u>
            C.F
     First Part   Second Part
2. 89² = (89 - 11) / 11² = 78 / <u>21</u> = <u>79</u> <u>21</u>
            C.F
     First Part   Second Part
3. 96² = (96 - 4) / 4² = 92/16 = <u>92</u> <u>16</u>

Note: For Squares in the range of 90 to 100 as there is no carry forward, finding the squares in this range is faster.

To find the square of a number from 101 to 125

The squares of numbers from 101 to 125 can be calculated by writing down two parts, each of which is a two-digit number, adjacent to each other as explained below:

The second part is the two-digit number formed by the two digits to the extreme right of the square of the number by which the given number is more than 100.
For example finding 112², as 112 is 12 more than 100 the second part will be the two digits of 12²(= 144), i.e., 44. Since there are more than two digits in 12², the digit to the extreme left, i.e., 1, is taken as carry forward and is to be added to the first part.

The first part is the sum of (i) the carry forward, if any from the second part and (ii) the sum of the given number and the number by which the given number is more than 100. As 112 is 12 more than 100, the first part will be 112 + 12 + 1(carry forward from the first part) = 125
Therefore, 88² = <u>125</u> <u>44</u>
The above can be summarized as
     First Part   Second Part
1. 112² = (112 + 12) / 12² = 124 / 44 = (124 + 1) / 44 = <u>125</u> <u>44</u>
             C.F
     First Part   Second Part
2. 113² = (113 + 13) / 13² = 126 / 169 = <u>127</u> <u>69</u>
             C.F
3. 106² = (106 + 6) / 6² = 112/36 = <u>112</u> <u>36</u>

Square Root of a Perfect Square

We will see how to find the square root of a perfect square by "square root division method." Let us find the square root of 95824521.

In normal division, we take one digit at a time from the dividend for the purpose of division. In square root division, we take two digits at a time from the given number. For this purpose, we first mark blocks of two digits in the given number starting from the units digit. The number 95824521 will then look like

$$\overline{95}\ \overline{82}\ \overline{45}\ \overline{21}$$

(If the number of digits in the number is odd, then the last block, i.e., the extreme left block, will have only one digit)

$$\overline{)95}\ \overline{82}\ \overline{45}\ \overline{21}$$

In normal division, the divisor is given and it is the same in each step. However, in square root division, the divisor in all the steps is not the same and it will have to be built separately in each step. We will first build the divisor in the first step in this case. The divisor in the first step is the integral part of the square root of the first block of two digits. Since the square root of 95 will be between 9 and 10, the divisor in the first step is 9. We write this as the divisor in the divison shown above and also on the top of the horizontal line as shown below:

$$9\ )\overline{95}\ \overline{82}\ \overline{45}\ \overline{21} \nearrow$$

The figure that we will finally get on the top of the line above (shown by arrow mark) will be the square root of the given number.

The 9 written as divisor and the digit 9 written in the quotient are multiplied to give 81 which is then subtracted from the block of two digits 95 giving a remainder of 14 (= 95 – 81)

$$
\begin{array}{r}
9 \\
9\,)\overline{95}\ \overline{82}\ \overline{45}\ \overline{21} \\
81 \\
\hline
1482
\end{array}
$$

Now we bring down the next block of two digits 82 thus giving us 1482 as the dividend in the next step.

Now we will have to build the divisor for this step. The divisor in any step during the square root division has two parts and is built as follows:

Take the divisor in the previous step and add its last digit to itself. This gives the first part of the divisor. In this case, take the divisor 9 and add 9 to itself getting 18 as the first part of the divisor.

$$
\begin{array}{r}
9k \\
9 \qquad 95\ 82\ 45\ 21 \\
81 \\
\hline
18k \qquad 1482
\end{array}
$$

Now we need the second part of the divisor which will come in the place of the letter k (shown by arrow mark) in this step.

To get the second part of the divisor, we need to find a digit so that it can come in place of k in the divisor as well as the quotient such that the product of the entire divisor (including the digit coming in place of k) and the digit k is the greatest possible number which is less than or equal to 1482 (which is the number being divided in this step). In this case we find that if we take the digit 7 in place of k, 187 multiplied by 7 gives 1309 which is less than 1482. However if we take 8 in place of k, we have 188 multiplied by 8 giving us 1504 which is greater than 1482. So, we need to take the digit 7 in place of k and the product 1309 subtracted from 1482 gives a remainder of 173 as shown.

$$
\begin{array}{r}
97 \\
9\,)\overline{95}\ \overline{82}\ \overline{45}\ \overline{21} \\
81 \\
\hline
187\,)\,1482 \\
1309 \\
\hline
17345
\end{array}
$$

Now we bring down the next block of two digits 45 next to the remainder of 173 giving us the new number 17345 as the dividend.

This process of building the divisor in the step from the divisor of the previous step and finding a new digit as the second part of the divisor should be continued in the same manner as explained above. In this case, the first part of the divisor is 187 + 7 (which is the last digit of the divisor) giving us 194. Now a digit (k) has to be selected such that the number having 194 followed by that digit (i.e., the number 194k) multiplied by that digit itself i.e., k, will give the largest product less than or equal to 17345.

$$
\begin{array}{r}
97k \\
9\,)\overline{95}\ \overline{82}\ \overline{45}\ \overline{21} \\
81 \\
\hline
187\,)\,1482 \\
1309 \\
\hline
194k\,)\,17345
\end{array}
$$

We find that k = 8 will give 1948 x 8 = 15584 where as for k = 9, we get 1949 x 9 = 17541 which is greater than 17345.

Hence the value of k is taken as 8 and the product 15584 is subtracted from 17345 giving a remainder of 1761. We now bring down the next block of two digits 21 giving us the number to be divided in the next step as 176121.

The first part of the divisor in this step is 1956 (= 1948 + the last digit 8).

```
        978k
      _____
   9 ) 95‾ 82‾ 45‾ 21‾
       81
      _ _ _ _ _
 187 ) 1482
        1309
      _ _ _ _ _
1948 ) 17345
        15584
      _ _ _ _ _
1956k ) 176121
```

Now we need to find a value for k such that 1956k multiplied by k should be less than or equal to 176121. We find that if we take k equal to 9, 19569 x 9 = 176121 giving us a remainder 0.

```
        9789
      _____
   9 ) 95‾ 82‾ 45‾ 21‾
       81
      _ _ _ _ _
 187 ) 1482
        1309
      _ _ _ _ _
1948 ) 17345
        15584
      _ _ _ _ _
19569 ) 176121
         176121
      _ _ _ _ _
              0
```

At this stage, there are no more digits to bring down. At the stage where there are no more digits to bring down, if the remainder is 0, then the given number is a perfect square and the quotient which we wrote at the top is the square root. (When there are no more digits to be brought down, if the remainder is not 0, the given number is not a perfect square).

In this case, the given number is a perfect square and the square root is 9789.

Square Root of any Number

If the given number is not a perfect square, then the square root can be found to any desired decimal place when the divisor does not terminate. The procedure for finding out the square root is the same as for a perfect square till all the digits in the given number have been brought down. At this stage where there are no more digits to bring down and the remainder is not zero, we **put a decimal point in the quotient** and take TWO zeroes in number to be divided in that particular step (i.e., it is treated as if we have blocks of two zeroes at the end of the given number) and we just continue the square root division as usual till the required number of decimal places are obtained in the quotient. (Compare this process with normal division where, if all the digits are used up and we still have some remainder, we put a decimal point in the quotient and then keep bringing down a zero in each step and continue the division process. The only difference is that we take blocks of two zeroes in square root division. The process of building the divisor in each step does not change at any stage of the square root division).

If the given number itself has some decimal places, then the process of making the blocks of two digits will start at the decimal point and proceed with two digits at a time to the left of the decimal **as well as** to the right of the decimal point. For example, if we have to find the square root of the number 2738474.235, then making the blocks of two digits will be as shown below:

$$\overline{2}\ \overline{73}\ \overline{84}\ \overline{74}\ .\ \overline{23}\ \overline{5}$$

On the left side of the decimal place, the extreme left block has only one digit and it will be dealt with as it is (as discussed in case of perfect squares). On the right side of the decimal place, on the extreme right, the block has only one digit 5. In the square root division, this will be treated as "50" which will not change the value of the number, but gives a block of two digits.

Exercise – 2(a)   Time: 45 min.

Questions 1 to 25: Squares and Cubes

1. $(808)^2 = ?$

2. $(102)^2 = ?$

3. $(297)^2 = ?$

4. $(1002)^2 = ?$

5. $(373)^2 = ?$

6. $(991)^2 = ?$

7. $(737)^2 - (27)^2 = ?$

8. $(394)^2 = ?$

9. $(9.98)^2 = ?$

10. $87^2 = ?$

11. $137^2 = ?$

12. $113^2 = ?$

13. $23^2 = ?$

14. $(319)^2 = ?$

15. $(218)^2 = ?$

16. $(2197)^2 / (169)^2 = ?$

17. $(164)^2 = ?$

18. $(653)^2 = ?$

19. $(99)^2 = ?$

20. $(10025)^2 = ?$

21. $(786)^2 = ?$

22. $4^3 - (1^1/_2)^3 - (2^1/_2)^3 = ?$

23. $(129)^2 = ?$

24. $(1111)^2 = ?$

25. $56^2 - 27^2 = ?$

Directions for questions 26 and 27: Select the correct alternative from the given choices.

26. $\dfrac{(3.572)^3 + (2.428)^3}{(3.572)^2 - (3.572) \times (2.428) + (2.428)^2}$ is equal to _____.
(A) 1.144 (B) 4 (C) 5 (D) 6

27. The value of $(2.75)^3 - (2.00)^3 - (0.75)^3$ is
(A) $3 \times 2.75 \times 2.75 \times 2.75$
(B) $3 \times 2.00 \times 2.00 \times 2.00$
(C) $3 \times 2.75 \times 0.75 \times 2.75$
(D) 4.5×2.75

Directions for questions 28 to 45: What approximate value should come in the place of question mark(?) in the following questions.

28. $\sqrt{3584} \times 52.034 = ?$
(A) 3180 (B) 3200 (C) 3120 (D) 3210

29. $\sqrt[3]{4900} + 123 = ? \div 33.004$
(A) 4620 (B) 4720 (C) 4520 (D) 4920

30. $\sqrt[3]{216400} + \sqrt{280} + \sqrt{322} = ?$
(A) 651 (B) 361 (C) 100 (D) 95

31. $125^2 \times 2^3 + 35000 = (?)^2$
(A) 200 (B) 400 (C) 1600 (D) 800

32. $\sqrt[3]{\dfrac{?}{9261}} = \dfrac{11}{21}$
(A) 121 (B) 1331 (C) 14641 (D) 2662

33. $\dfrac{49^2 \times 18^2}{324} = ?$
(A) 49 (B) 98 (C) 49^2 (D) 98^2

34. $\sqrt[3]{27400} + \sqrt[3]{64100} + \sqrt[3]{7980} = ?$
(A) 80 (B) 85 (C) 90 (D) 94

35. $\dfrac{(1.8)^3 + (1.2)^3}{3.24 - 2.16 + 1.44} =$
(A) 2 (B) 5 (C) 6 (D) 3

36. $(28.02)^2 + (33.98)^2 - (19.11)^2 = ?$
(A) 1580 (B) 1680 (C) 1480 (D) 1380

37. $\sqrt{200} \times \sqrt{1300} \div \sqrt{150} = ?$
(A) 36 (B) 38 (C) 40 (D) 42

38. $\sqrt{?} + 14 = \sqrt{3136}$
(A) 1724 (B) 42 (C) 1764 (D) 2116

39. $\sqrt{2809} + \sqrt{2209} = \sqrt{7744} + \sqrt{?}$
(A) 12 (B) 144 (C) 13 (D) 169

40. $\sqrt[3]{110592} = ?$
(A) 28 (B) 38 (C) 48 (D) 58

41. $(48)^2 \div \sqrt{?} = 2^5 \times 3$
(A) 16 (B) 12
(C) 24 (D) None of these

42. $(?)^3 + 5^3 \times 40 = (88)^2$
(A) 11 (B) 12 (C) 14 (D) 24

43. $\sqrt{12996} \times \sqrt{2916} - (74)^2 = \sqrt{?} + (25)^2$
(A) 1225 (B) 2025 (C) 3025 (D) 4225

44. $\sqrt{21900} + \sqrt{5775} = ? \div 28$
(A) 6262 (B) 5262 (C) 5272 (D) 6272

45. $\sqrt[3]{32770} + \sqrt{2600} \times 49 = (?)^2 + 31$
(A) 48 (B) 49 (C) 50 (D) 51

Exercise – 2(b)   Time: 45 min.

Directions for questions 1 to 24: What should come in place of the question mark (?) in the following questions?

1. $(59)^2 - (55)^2 = (?)^2 + 200$
(A) 12 (B) 14 (C) 16 (D) 18

2. $20^2 + 21^2 = (?)^2$
(A) 25 (B) 27 (C) 29 (D) 31

3. $72^3 - 72^2 = ?$
(A) 366084 (B) 386084 (C) 388064 (D) 368064

4. $27^2 \times 5^2 - 115^2 = (?) \times 2^3$
(A) 125 (B) 500 (C) 625 (D) 1250

5. $(?)^2 \times 25 = (525)^2$
(A) 101 (B) 105 (C) 115 (D) 125

6. $\sqrt[3]{103823} \times ? = 1175$
(A) 15 (B) 25 (C) 35 (D) 45

7. $(47)^2 + (?)^2 = 2942 + 2516$
(A) 57 (B) 67 (C) 53 (D) 63

8. $\dfrac{29^2 - 21^2}{12^2 + 16^2} = ?$
(A) 1 (B) 2 (C) 4 (D) 8

9. $[(11)^3 \times (?)^2] \div 33 = 1452$
(A) 4 (B) 6 (C) 36 (D) 16

10. $(43.91)^2 - (50.01)^2 + (26.02)^2 = ?$
(A) 40 (B) 75 (C) 150 (D) 105

11. $\sqrt{3601} \times \sqrt{624} \div \sqrt{399} = ?$
(A) 45 (B) 75 (C) 105 (D) 135

12. $(72)^2 \div \sqrt[3]{46656} = (?)^2$
(A) 6 (B) 9 (C) 12 (D) 16

13. $\dfrac{\sqrt{0.16 \times 0.000064}}{0.0032} \times 100 = ?$
   (A) 0.1   (B) 1   (C) 10   (D) 100

14. $\sqrt{\dfrac{1764}{196}} = \dfrac{?}{\sqrt{784}}$
   (A) 84   (B) 252   (C) 78   (D) 234

15. $\sqrt{3.43 \times 100 \div 49 \div 7} = ?$
   (A) 0.01   (B) 0.1   (C) 0.7   (D) 1

16. $45^3 \times 3^3 - 1555^2 = ?$
   (A) 42350   (B) 43250   (C) 45320   (D) 45230

17. $\sqrt{844416 \div 23456} = ? \times 3$
   (A) 12   (B) 8   (C) 6   (D) 2

18. $\sqrt{1.5625} \times \sqrt{6.76} \times ? = 182$
   (A) 52   (B) 54   (C) 56   (D) 58

19. $\dfrac{24^2 - 13^2 + 7^2}{19} = ?$
   (A) 18   (B) 24   (C) 22   (D) 21

20. $\sqrt{529.09} - \sqrt{359.89} = ?$
   (A) 4   (B) 5   (C) 2   (D) 1

21. $\sqrt[3]{215.87} + \sqrt{63.96} = ?$
   (A) 14   (B) 33   (C) 21   (D) 4

22. $(27.96)^2 - (16.08)^2 = ?$
   (A) 491   (B) 680   (C) 528   (D) 724

23. $\sqrt[3]{124.994} - \sqrt{16.09} = ?$
   (A) 21   (B) 1   (C) 9   (D) 16

24. $\sqrt{7390} \times \sqrt{1370} \div \sqrt{680} = ?$
   (A) 120   (B) 150   (C) 180   (D) 210

Questions 25 to 45: Squares

25. $(435)^2 = ?$

26. $(864)^2 = ?$

27. $(683)^2 = ?$

28. $(832)^2 = ?$

29. $(768)^2 = ?$

30. $(295)^2 = ?$

31. $(339)^2 = ?$

32. $38^2 - 20^2 = ?$

33. $218^2 = ?$

34. $69^2 - 58^2 = ?$

35. $(271)^2 = ?$

36. $661^2 = ?$

37. $93^2 = ?$

38. $89^2 - 62^2 = ?$

39. $318^2 = ?$

40. $(217)^2 - (67)^2 = ?$

41. $(1004)^2 = ?$

42. $(598)^2 - 4 = ?$

43. $(768)^2 - (32)^2 = ?$

44. $512^2 = ?$

45. $133^2 = ?$

Key

Exercise – 2(a)

1. 652864	9. 99.6004	17. 26896	25. 2407	33. C	41. D
2. 10404	10. 7569	18. 426409	26. D	34. C	42. C
3. 88209	11. 18769	19. 9801	27. D	35. D	43. C
4. 1004004	12. 12769	20. 100500625	28. C	36. A	44. D
5. 139129	13. 529	21. 617796	29. A	37. D	45. C
6. 982081	14. 101761	22. 45	30. D	38. C	
7. 542440	15. 47524	23. 16641	31. B	39. B	
8. 155236	16. 169	24. 1234321	32. B	40. C	

Exercise – 2(b)

1. C	9. B	17. D	25. 189225	33. 47524	41. 1008016
2. C	10. D	18. C	26. 746496	34. 1397	42. 357600
3. D	11. B	19. B	27. 466489	35. 73441	43. 588800
4. C	12. C	20. A	28. 692224	36. 436921	44. 262144
5. B	13. D	21. A	29. 589824	37. 8649	45. 17689
6. B	14. A	22. C	30. 87025	38. 4077	
7. A	15. D	23. B	31. 114921	39. 101124	
8. A	16. A	24. A	32. 1044	40. 42600	