Square Root and Cube Root 3

SQUARE

A number multiplied by itself is known as the *square* of a given number. For example, square of 6 is $6 \times 6 = 36$.

Square Root

Square root of a given number is that number, which, when multiplied by itself is equal to the given number.

For example, square root of 81 is 9, because $9^2 = 9 \times 9 = 81$.

The square root of a number is denoted by the symbol $\surd$ or $\sqrt{\ }$, called *radical sign*.

Thus, $\sqrt{81} = 9$, $\sqrt{64} = 8$ and, so on.

Note, $\sqrt{1} = 1$.

Methods of Finding a Square Root

I. Prime Factorization Method

1. Find the prime factors of a given number.
2. Group the factors in pairs.
3. Take one number from each pair of factors. Multiply them together.

The product thus derived the square root of the given number.

Illustration 1: Find the square root of:
(i) 4761 (ii) 207025

Solution: (i) $4761 = \underbrace{23 \times 23} \times \underbrace{3 \times 3}$

$\therefore \sqrt{4761} = 23 \times 3 = 69.$

(ii) $207025 = \underbrace{5 \times 5} \times \underbrace{7 \times 7} \times \underbrace{13 \times 13}$

$\therefore \sqrt{207025} = 5 \times 7 \times 13 = 455.$

***Note*:**

The above method is used when a given number is a perfect square or when every prime factor of that number is repeated twice.

II. Method of Division

This method is used when the number is large and the factors cannot be easily determined.

The working rule is explained with the help of following example:

Step 1: The digits of a number, whose square root is required, are separated into periods of two beginning from the right. The last period may be either single digit or a pair.

```
          476
      ------------
  8 | 22  65  76
 87 | 16
      665
      609
946 |  5676
      5676
      ----
        ×
```

Step 2: Find a number (here, 4) whose square may be equal to or less than the first period (here, 22).

Step 3: Find out the remainder (here, 6) and bring down the next period (here, 65).

Step 4: Double the quotient (here, 4) and write to the left (here, 8).

Step 5: The divisor of this stage will be equal to the above sum (here, 8) with the quotient of this stage (here, 7) suffixed to it (here, 87).

Step 6: Repeat this process (step 4 and step 5) till all the periods get exhausted.

The quotient (here, 476) is equal to the square root of the given number (here, 226576).

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Illustration 2: Find the square root of:
(i) 180625 (ii) 1498176

Solution: (i)

```
          425
      ------------
    8 | 18  06  25
   82 | 16
      |  206
      |  164
  845 |   4225
      |   4225
      |    ×
```

Thus, $\sqrt{180625} = 425$.

(ii)

```
          1224
      ------------
    1 | 1   49  8176
      | 1
   22 |    49
      |    44
  242 |     581
      |     484
 2444 |      9776
      |      9776
      |       ×
```

Thus, $\sqrt{1478176} = 1224$.

Square Root of a Decimal

If the given number is having decimal, we separate the digits of that number into periods of two to the right and left beginning from the decimal point and then proceed as in the following illustration:

Illustration 3: Find the square root of:
(i) 12.1801 (ii) 127.0129
(iii) 0.1790136 (iv) 0.000625

Solution: (i)

```
          3.49
      ------------
    3 | 12.  18  01
      | 9
   64 |  365
      |  256
  689 |   10901
      |    6201
      |    6201
      |     ×
```

$\therefore \sqrt{12.1801} = 3.49$.

(ii)

```
          11.27
      ------------
    1 | 1   27.  01  29
      | 1   .
   21 |     27
      |     21
  222 |      601
      |      444
 2447 |       15729
      |       15729
      |        ×
```

$\therefore \sqrt{127.0129} = 11.27$.

(iii) Since the number of decimal places is odd, we make it even by affixing one 0 to the right.

```
          0.423
      ------------
    4 | 0.  17  90  13  60
      |     16
   82 |      190
      |      164
  843 |       2613
      |       2529
  846 |        8460
```

In the given solution, after bringing down the last period, we note that the remainder is not zero. So, a pair of zeros can be annexed and the process can be continued to find the square root up to 4 places of decimals. The given process can be continued still further and square root up to the required number of decimal places can be obtained.

Note:

If a decimal has an odd number of decimal places, its square root cannot be correctly found.

(iv)

```
          .025
      ------------
      | 0.  00  06  25
      |     00
   02 |      06
      |      04
   45 |       225
      |       225
      |        ×
```

$\therefore \sqrt{0.000625} = 0.025$.

Square Root of a Fraction

(a) *If the denominator is a perfect square*:
The square root is found by taking the square root of the numerator and denominator separately.

(b) *If the denominator is not a perfect square*:
The fraction is converted into decimal. Then square root is obtained or the denominator is made perfect square by multiplying and dividing by a suitable number. Thus, its square root is obtained.

Illustration 4: Find the square root of:

(i) $\frac{2704}{49}$ (ii) $\frac{44}{25}$

(iii) $\frac{354}{43}$ (iv) $\frac{461}{32}$

Solution: (i) $\sqrt{\frac{2704}{49}} = \frac{\sqrt{2704}}{\sqrt{49}} = \frac{\sqrt{52 \times 52}}{\sqrt{7 \times 7}} = \frac{52}{7}$

$= 7\frac{3}{7}$.

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(ii) $\sqrt{\frac{44}{25}} = \frac{\sqrt{44}}{\sqrt{25}} = \frac{\sqrt{44}}{\sqrt{5\times5}} = \frac{\sqrt{44}}{5} = \frac{6.6332}{5}$

$= 1.3266$ (nearly).

(iii) $\sqrt{\frac{354}{43}} = \sqrt{8.2325} = 2.8692$ (nearly)

(iv) $\sqrt{\frac{461}{32}} = \sqrt{\frac{461\times2}{32\times2}} = \frac{\sqrt{922}}{\sqrt{64}} = \frac{30.3644}{8}$

$= 3.7955$ (nearly).

Cube

Cube of a number is obtained by multiplying the number itself thrice.

For example, 27 is the cube of 3 as $27 = 3 \times 3 \times 3$.

Cube Root

The *cube root* of a given number is that number, which, when raised to the third power, produces the given number, that is, the cube root of a number x is the number whose cube is x.

The cube root of x is written as $\sqrt[3]{x}$.

For example, cube root of 64 is 4 as $4 \times 4 \times 4 = 64$.

Methods to Find Cube Root

I. Method of Factorization

1. Write the given number as product of prime factors.
2. Take the product of prime numbers, choosing one out of three of each type.

This product gives the cube root of the given number.

Illustration 5: Find the cube root of 42875.

Solution: Resolving 42875 into prime factors, we get

$$42875 = \underbrace{5\times5}\times\underbrace{5\times7}\times\underbrace{7\times7}$$

$$\therefore \quad \sqrt[3]{42875} = 5 \times 7 = 35$$

II. Short-cut Method to Find Cube Roots of Exact Cubes Consisting of up to 6 Digits:

Before we discuss the method to find the cube roots of exact cubes, the following two remarks are useful and must be keep in mind.

1. $1^3 = 1$; $2^3 = 8$; $3^3 = 27$; $4^3 = 64$; $5^3 = 125$; $6^3 = 216$; $7^3 = 343$; $8^3 = 512$; $9^3 = 729$; $10^3 = 1000$.
2. If the cube ends in 1, then its cube root ends in 1.
   If the cube ends in 2, then its cube root ends in 8
   If the cube ends in 3, then its cube root ends in 7
   If the cube ends in 4, then its cube root ends in 4
   If the cube ends in 5, then its cube root ends in 5
   If the cube ends in 6, then its cube root ends in 6
   If the cube ends in 7, then its cube root ends in 3
   If the cube ends in 8, then its cube root ends in 2
   If the cube ends in 9, then it cube root ends in 9
   If the cube ends in 0, then its cube root ends in 0

Clearly, from the given:

$1 \leftrightarrow 1$, $4 \leftrightarrow 4$, $5 \leftrightarrow 5$, $6 \leftrightarrow 6$, $9 \leftrightarrow 9$, $0 \leftrightarrow 0$
$2 \leftrightarrow 8$, $3 \leftrightarrow 7$.

The method of finding the cube root of a number up to 6 digits, which is actually a cube of some number consisting of 2 digits, is best illustrated with the help of the following examples.

Illustration 6: Find the cube roots of the following.

(i) 2744 (ii) 9261
(iii) 19684 (iv) 54872
(v) 614125

Solution

(i) Make groups of 3 digits from the right side. 2 744
2 lies between 1^3 and 2^3, so the left digit is 1.
744 ends in 4, so the right digit is 4.
Thus, cube root of 2744 is 14.

(ii) 9 261
9 lies between 2^3 and 3^3, so left digit is 2.
261 ends in 1, so right digit is 1.
Thus, cube root of 9261 is 21.

(iii) 19 683
19 lies between 2^3 and 3^3, so the left digit is 2.
683 ends in 3, so the right digit is 7.
Thus, cube root of 19683 is 27.

(iv) 54 872
54 lies between 3^3 and 4^3, so the left digit is 3.
872 ends in 2, so the right digit is 8.
Thus, cwube root of 19683 is 38.

(iv) 614 125
614 lies between 8^3 and 9^3, so the left digit is 8.
125 ends in 5, so the right digit is 5.
Thus, cube root of 614125 is 85.

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EXERCISE-I

1. Find the square root of 4356.
(a) 68 (b) 64
(c) 66 (d) None of these

2. Find the square root of 104976.
(a) 324 (b) 424
(c) 326 (d) None of these

3. Find the square root of 211600.
(a) 460 (b) 440
(c) 480 (d) None of these

4. Find the value of $\sqrt{6492304}$.
(a) 2384 (b) 2484
(c) 2548 (d) 2684

5. Find the least number, which, when multiplied with 74088 will make it a perfect square.
(a) 42 (b) 44
(c) 46 (d) 48

6. $\sqrt{10} \times \sqrt{250} = ?$
(a) 46.95 (b) 43.75
(c) 50.25 (d) 50.00

7. $\sqrt{80} + 3\sqrt{245} - \sqrt{125} = ?$
(a) $20\sqrt{5}$ (b) $25\sqrt{2}$
(c) $15\sqrt{2}$ (d) None of these

8. $\frac{250}{\sqrt{?}} = 10$
(a) 25 (b) 250
(c) 625 (d) 2500

9. If $\sqrt{256}\sqrt{\sqrt{x}} = 2$, then x is equal to:
(a) 64 (b) 128
(c) 512 (d) 1024

10. Find the smallest number by which 216 should be divided to make the result a perfect square.
(a) 4 (b) 3
(c) 6 (d) 2

11. $\frac{\sqrt{?}}{200} = 0.02$
(a) 0.4 (b) 4
(c) 16 (d) 1.6

12. $\frac{\sqrt{6727}}{\sqrt{7}} = ?$
(a) 30.79 (b) 32.29
(c) 31 (d) None of these

13. $\sqrt{.09} = ?$
(a) 0.3 (b) 0.03
(c) 0.003 (d) None of these

14. $\frac{14}{3+\sqrt{2}} = ?$
(a) 3.172 (b) 4.586
(c) 8.828 (d) None of these

15. Find the smallest number, which, when added to 3579 gives a perfect square.
(a) 27 (b) 24
(c) 21 (d) 18

16. If $\sqrt{\left(1+\frac{27}{169}\right)} = 1+\frac{x}{13}$, then x equals:
(a) 1 (b) 3
(c) 5 (d) 7

17. $\frac{\sqrt{4375}}{\sqrt{7}} = ?$
(a) 24.75 (b) 27.75
(c) 25 (d) 35

18. If $\sqrt{0.04 \times 0.4 \times a} = 0.4 \times 0.04 \times \sqrt{b}$, then the value of $\frac{a}{b}$ is:
(a) 0.016 (b) 1.60
(c) 0.16 (d) None of these

19. $\sqrt{\sqrt[3]{\sqrt[3]{\sqrt[3]{\sqrt[3]{\sqrt[3]{3}}}}}} = ?$
(a) $3^{31/64}$ (b) $3^{31/32}$
(c) $3^{1/64}$ (d) None of these

20. $\frac{\sqrt{1296}}{?} = \frac{?}{2.25}$
(a) 6 (b) 7
(c) 8 (d) 9

21. $\sqrt{176+\sqrt{2401}} = ?$
(a) 14 (b) 15
(c) 18 (d) 24

22. $\sqrt{10} \times \sqrt{15} = ?$
(a) $5\sqrt{6}$ (b) $6\sqrt{5}$
(c) 5 (d) $\sqrt{30}$

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23. $\sqrt{\frac{4}{3}}-\sqrt{\frac{3}{4}}$ = ?

(a) $\frac{1}{2\sqrt{3}}$ (b) $-\frac{1}{2\sqrt{3}}$

(c) 1 (d) $\frac{5\sqrt{3}}{6}$

24. $\sqrt{248+\sqrt{52+\sqrt{144}}}$ = 1

(a) 14 (b) 16

(c) 16.6 (d) 18.8

25. $\sqrt{0.0009}\sqrt{\sqrt{0.01}}$ = ?

(a) 3 (b) 0.3

(c) $\frac{1}{3}$ (d) None of these

26. $\frac{1}{\sqrt{9}-\sqrt{8}}$ = ?

(a) $\frac{1}{2}(3-2\sqrt{2})$

(b) $\frac{1}{3+2\sqrt{2}}$

(c) $3-2\sqrt{2}$

(d) $3+2\sqrt{2}$

27. If $\sqrt{\frac{x}{169}}=\frac{54}{39}$, then x is equal to:

(a) 108 (b) 324

(c) 2916 (d) 4800

28. $\sqrt{12+\sqrt{12+\sqrt{12+\cdots}}}$ = ?

(a) 3 (b) 4

(c) 6 (d) Greater than 6

29. $\frac{112}{\sqrt{196}}\times\frac{\sqrt{576}}{12}\times\frac{\sqrt{256}}{8}$ = ?

(a) 8 (b) 12

(c) 16 (d) 32

30. If $\sqrt{12}$ = 3.464, value of $\sqrt{\frac{3}{4}}+2\sqrt{\frac{4}{3}}$ is:

(a) 3.17 (b) 3.464

(c) 3.1753 (d) None of these.

31. If $\sqrt{15625}$ = 125, then the value of: $\sqrt{15625}+\sqrt{156.25}+\sqrt{1.5625}$, is

(a) 1.3875 (b) 13.875

(c) 138.75 (d) 156.25

32. If $\sqrt{0.03\times0.3\times a}=0.03\times0.3\times\sqrt{b}$, the value of $\frac{a}{b}$, is:

(a) 0.009 (b) 0.03

(c) 0.09 (d) None of these

33. Given that $\sqrt{4096}$ = 64, the value of $\sqrt{4096}+\sqrt{4096}+\sqrt{.004096}$, is:

(a) 70.4 (b) 70.464

(c) 71.104 (d) 71.4

34. If $\sqrt{1+\sqrt{1-\frac{2176}{2401}}}=1+\frac{x}{7}$, the value of x is:

(a) 3 (b) 1

(c) 5 (d) 7

35. Which of the following numbers, wherein some of the digits have been suppressed by symbols, can possibly be the perfect square of a 3 digit odd number?

(a) 65 ××× 1 (b) 9 ×× 1

(c) 10 ××× 4 (d) 9 ×××××× 5

36. $\sqrt{\frac{0.324\times0.081\times4.624}{1.5625\times0.0289\times72.9\times64}}$ = ?

(a) 24 (b) 2.40

(c) 0.024 (d) None of these

37. Find the cube root of $\frac{512}{3375}$.

(a) 12/15 (b) 16/25

(c) 8/15 (d) None of these

38. $\sqrt{0.01+\sqrt{0.0064}}$ = ?

(a) 0.3 (b) 0.03

(c) $\sqrt{0.18}$ (d) None of these

39. Find the cube root of 15.625.

(a) 3.5 (b) 2.5

(c) 4.5 (d) 5.5

40. What is the value of $\sqrt[3]{.000064}$?

(a) 0.4 (b) 0.08

(c) 0.04 (d) 0.16

41. What is the value of $\sqrt[3]{\sqrt{441}+\sqrt{16}+\sqrt{4}}$

(a) 3 (b) 5

(c) 7 (d) 9

42. The least number by which 14175 be divided to make it a perfect square is:

(a) 3 (b) 5

(c) 7 (d) 15

43. $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}$ is equal to:

(a) 4 + $\sqrt{15}$ (b) 4 − $\sqrt{15}$

(c) $\frac{1}{2}$ (d) 1

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44. $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}} = ?$

(a) $2\sqrt{6}$ (b) $6\sqrt{2}$

(c) 2 (d) $\frac{2}{\sqrt{6}}$

45. Given that $\sqrt{20} = 4.472$, find the square root of $2\frac{2}{9}$ up to two places of decimals.

(a) 1.56 (b) 1.69

(c) 1.49 (d) None of these

46. If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$, then the value of $\frac{a^2+ab+b^2}{a^2-ab+b^2}$ is:

(a) $\frac{3}{4}$ (b) $\frac{4}{3}$

(c) $\frac{3}{5}$ (d) $\frac{5}{3}$

47. The least number by which 10584 be multiplied to make it a perfect square is:

(a) 2 (b) 3

(c) 6 (d) 8

48. The smallest number which is a perfect square and contains 7936 as a factor is:

(a) 12008 (b) 246016

(c) 61504 (d) 240616

49. $\sqrt{0.00059049} = ?$

(a) 0.243 (b) 0.0243

(c) 0.00243 (d) 0.000243

50. Given that $\sqrt{10} = 3.16$, what is the value of $\sqrt{\frac{4}{12.1}}$ to one place of decimal?

(a) 0.16 (b) 0.06

(c) 0.6 (d) 0.016

51. $\sqrt{\frac{0.256\times0.081\times4.356}{1.5625\times0.0121\times129.6\times64}} = ?$

(a) 0.0124 (b) 0.124

(c) 0.0024 (d) 0.024

52. A general wishing to draw up his 16160 men in the form of a solid square found that he had 31 men over. The number of men in the front row is:

(a) 127 (b) 123

(c) 137 (d) 129

53. The areas of two square fields are 420.25 m^2 and 441 m^2, respectively. The ratio of their sides is:

(a) 20:21 (b) 40:41

(c) 41:42 (d) 40:42

54. A General wishing to draw up his 5180 men in the form of a solid square found that he had 4 men less. If he could get four more men and form the solid square, the number of men in the front row is:

(a) 68 (b) 72

(c) 78 (d) 82

55. The largest number of three digits which is a perfect square is:

(a) 900 (b) 841

(c) 961 (c) 784

56. What least number should be subtracted from the square root of $21\frac{15}{289}$ so that the result is a whole number?

(a) 15/289 (b) 7/17

(c) 10/17 (d) 5/17

57. The smallest number which when subtracted from the number 62512 makes it a perfect square is:

(a) 22 (b) 32

(c) 12 (d) 2

58. The largest number of five digits which is a perfect square is:

(a) 97344 (b) 98596

(c) 99856 (d) None of these

59. By what least number, 2450 be multiplied, so that the resulting number is perfect square?

(a) 8 (b) 10

(c) 5 (d) 2

60. The smallest number by which 3600 must be multiplied to make it a perfect cube is:

(a) 40 (b) 60

(c) 20 (d) 15

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EXERCISE-2
(BASED ON MEMORY)

1. If $\sqrt{4096} = 64$, then the value of $\sqrt{40.96} + \sqrt{0.4096} + \sqrt{0.004096} + \sqrt{0.00004096}$ up to two decimal places is:

(a) 7.09 (b) 7.10
(c) 7.11 (d) 7.12

[SSC (GL) Prel. Examination, 2005]

2. $\sqrt[3]{19683} = ? \times 3$

(a) 90 (b) 27
(c) 3 (d) 18
(e) None of these

[Corporation Bank, PO Examination, 2006]

3. $\sqrt{\sqrt{1024} + \sqrt{7921}} \times 48.5 = ?$

(a) 586.5 (b) 423.5
(c) 348.5 (d) 521.5
(e) None of these

[Corporation Bank, PO Examination, 2006]

4. $\sqrt{\sqrt{2500} + \sqrt{961}} = (?)^2$

(a) 81 (b) 3
(c) 6561 (d) 9
(e) None of these

[Central Bank of India, PO Examination, 2006]

5. The digit in the unit's place in the cube root of 21952 is:

(a) 8 (b) 6
(c) 4 (d) 2

[SSC (GL) Prel. Examination, 2000]

6. Given $\sqrt{5} = 2.2361$, $\sqrt{3} = 1.7321$, then $\frac{1}{\sqrt{5} - \sqrt{3}}$ is equal to:

(a) 1.984 (b) 1.9841
(c) 1.98 (d) 2

[SSC (GL) Prel. Examination, 2000]

7. $\frac{\sqrt{625}}{11} \times \frac{14}{\sqrt{25}} \times \frac{11}{\sqrt{196}}$ is equal to:

(a) 15 (b) 5
(c) 0.5 (d) 1.5

[SSC (GL) Prel. Examination, 2000]

8. The square root of $(272^2 - 128^2)$ is:

(a) 256 (b) 200
(c) 240 (d) 144

[SSC (GL) Prel. Examination, 2000]

9. The square root of 0.9 is equal to:

(a) 0.3 (b) 0.03
(c) 0.94 (d) 0.81

[SSC (GL) Prel. Examination, 2000]

10. The value of $\frac{\sqrt{0.441}}{\sqrt{0.625}}$ is equal to:

(a) 0.048 (b) 0.84
(c) 0.48 (d) 0.084

[SSC (GL) Prel. Examination, 2002]

11. The square root of $\frac{0.342 \times 0.684}{0.000342 \times 0.000171}$ is:

(a) 250 (b) 2500
(c) 2000 (d) 4000

[SSC (GL) Prel. Examination, 2002]

12. The sum of $\sqrt{0.01} + \sqrt{0.81} + \sqrt{1.21} + \sqrt{0.0009}$ is:

(a) 2.1 (b) 2.13
(c) 2.03 (d) 2.11

13. If cube root of 175616 is 56, then the value of $\sqrt[3]{175.616} + \sqrt[3]{0.175616} + \sqrt[3]{0.000175616}$ is equal to:

(a) 0.168 (b) 62.16
(c) 6.216 (d) 6.116

[SSC (GL) Prel. Examination, 2002]

14. Given $\sqrt{2} = 1.414$, then the value of $\sqrt{8} + \sqrt[2]{32} - \sqrt[3]{128} + \sqrt[4]{50}$ is:

(a) 8.484 (b) 8.526
(c) 8.426 (d) 8.876

[SSC (GL) Prel. Examination, 2003]

15. $\sqrt{\sqrt[3]{0.004096}}$ is equal to:

(a) 4 (b) 0.4
(c) 0.04 (d) 0.004

[SSC (GL) Prel. Examination, 2003]

16. If $\sqrt{15} = 3.88$, then what is the value of $\sqrt{\frac{5}{3}}$?

(a) $1.29\overline{3}$ (b) 1.2934
(c) 1.29 (d) 1.295

[SSC (GL) Prel. Examination, 2003]

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17. If the square root of 5625 is 75, then $\sqrt{5625} + \sqrt{56.25} + \sqrt{?} =$

(a) 9 (b) 83.25
(c) 82.80 (d) 8.325

[SSC (GL) Prel. Examination, 2002]

18. What approximate value should come in place of the question mark (?) ?

$36.0001 \div 5.9998 \times \sqrt{?} = 108.0005$

(a) 18 (b) 16
(c) 256 (d) 316
(e) 325

[Bank of Maharashtra PO Examination, 2003]

19. $\sqrt{1223.9975} = ?$

(a) 110 (b) 144
(c) 34 (d) 12.55
(e) 125

[IBPS Jr. Executive Examination, 2002]

20. $\sqrt{\sqrt{20800}} = ?$

(a) 12 (b) 120
(c) 140 (d) 102
(e) 1020

[IBPS Jr. Executive Examination, 2002]

21. $\sqrt{10000} + \frac{3.001}{4.987}$ of 1891.992 = ?

(a) 2500 (b) 1230
(c) 1640 (d) 1525
(e) 2130

[Canara Bank PO, 2003]

22. $\sqrt{?} = \pm 75$

(a) –562.5 (b) 75×-75
(c) 1500 (d) Cannot be determined
(e) None of these

[NABARD Assistant Manager Examination, 2002]

23. $(1.5)^2 \times \sqrt{0.0225} = ?$

(a) 0.3375 (b) 3.275
(c) 32.75 (d) 0.0373
(e) None of these

[Andhra Bank Specialist Officer's Examination, 2002]

24. $\left(\frac{8}{125}\right)^{-4/3}$ simplifies to:

(a) $\frac{625}{16}$ (b) $\frac{625}{8}$
(c) $\frac{625}{32}$ (d) $\frac{16}{625}$

[SSC (GL) Prel. Examination, 2000]

25. $\left(\frac{1+\sqrt{2}}{\sqrt{5}+\sqrt{3}} + \frac{1-\sqrt{2}}{\sqrt{5}-\sqrt{3}}\right)$ simplifies to:

(a) $\sqrt{5}+\sqrt{6}$ (b) $2\sqrt{5}+\sqrt{6}$
(c) $\sqrt{5}-\sqrt{6}$ (d) $2\sqrt{5}-3\sqrt{6}$

[SSC (GL) Prel. Examination, 2000]

26. If $x = 7 - 4\sqrt{3}$, then the value of $x + \frac{1}{x}$ is:

(a) $3\sqrt{3}$ (b) $8\sqrt{3}$
(c) $14 + 8\sqrt{3}$ (d) 14

[SSC (GL) Prel. Examination, 2000]

27. $7^{1/4} \times (343)^{0.25}$ is equal to:

(a) $\sqrt{\ }$ (b) 49
(c) 7 (d) $7\sqrt{7}$

[SSC (GL) Prel. Examination, 2000]

28. One less than $(49)^{15}$ is exactly divisible by:

(a) 50 (b) 51
(c) 14 (d) 8

[SSC (GL) Prel. Examination, 2000]

29. The value of $\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+2}\right)\left(1+\frac{1}{x+3}\right)$ is:

(a) $1+\frac{1}{x+4}$ (b) $x + 4$
(c) $\frac{1}{x}$ (d) $\frac{x+4}{x}$

[SSC (GL) Prel. Examination, 2000]

30. When $\left(\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}\right)$ is divided by $\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}$, the result is:

(a) $5\frac{1}{10}$ (b) $2\frac{1}{18}$
(c) $3\frac{1}{6}$ (d) $3\frac{3}{10}$

[SSC (GL) Prel. Examination, 2000]

31. $\left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)^2 + \left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)^2$ is equal to:

(a) 64 (b) 62
(c) 66 (d) 68

[SSC (GL) Prel. Examination, 2000]

32. If 25^{25} is divisible by 26, the remainder is:

(a) 1 (b) 2
(c) 24 (d) 25

[SSC (GL) Prel. Examination, 2000]

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33. $\sqrt{6+\sqrt{6+\sqrt{6+\cdots}}}$

(a) $6^{2/3}$ (b) 6
(c) $3^{1/3}$ (d) 3

[SSC (GL) Prel. Examination, 2000]

34. $(16)^{0.16} \times (16)^{0.04} \times (2)^{0.2}$ is equal to:

(a) 1 (b) 2
(c) 4 (d) 16

[SSC (GL) Prel. Examination, 2000]

35. A number when divided by 68 gives the quotient 269 and remainder zero. If the same number is divided by 67, the remainder is:

(a) 0 (b) 1
(c) 2 (d) 3

[SSC (GL) Prel. Examination, 2000]

36. Find the value of * in the following:

$$1\frac{2}{3}+\frac{2}{7}\times\frac{*}{7}=1\frac{1}{4}\times\frac{2}{3}\div\frac{1}{6}$$

(a) $\frac{1}{6}$ (b) 0.6
(c) 0.006 (d) 6

[SSC (GL) Prel. Examination, 2002]

37. A certain amount of money is distributed among A, B and C. A gets $\frac{3}{16}$ and B gets $\frac{1}{4}$ of the whole amount. If C gets ₹.81, then *B* gets:

(a) ₹30 (b) ₹36
(c) ₹32 (d) ₹40

[SSC (GL) Prel. Examination, 2002]

38. If * means adding 6 times the second number to the first number, then (3 * 2) * 3 equals:

(a) 121 (b) 31
(c) 93 (d) 91

[SSC (GL) Prel. Examination, 2003]

39. Find the value of $\frac{2}{1+\frac{1}{1-\frac{1}{2}}}\times\frac{3}{\frac{5}{6}\text{ of }\frac{3}{2}\div 1\frac{1}{4}}$

(a) 6 (b) 8
(c) 4 (d) 2

[SSC (GL) Prel. Examination, 2003]

40. A man spends $\frac{1}{3}$ of his income on food, $\frac{2}{5}$ of his income on house rent and $\frac{1}{5}$ of his income on clothes. If he still has ₹400 left with him, his income is:

(a) ₹4000 (b) ₹5000
(c) ₹6000 (d) ₹7000

[SSC (GL) Prel. Examination, 2003]

41. If $a * b = 2a + 3b$, then the value of 2 * 3 + 3 * 4 is:

(a) 24 (b) 31
(c) 32 (d) 34

[SSC (GL) Prel. Examination, 2002]

42. The simplified value of $\left[\sqrt[3]{\sqrt[6]{2^9}}\right]^4 \times \left[\sqrt[6]{\sqrt[3]{2^9}}\right]^4$ is:

(a) 2^{16} (b) 2^{12}
(c) 2^8 (d) 2^4

[SBI PO Examination, 2000]

43. The value of the following is:

$$\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+\sqrt{225}}}}}$$

(a) 10 (b) 8
(c) 6 (d) 4

[Bank of Baroda PO, 1999]

44. $\frac{2}{5}$ of $\frac{1}{3}$ for $\frac{3}{7}$ of a number is 15. What is 40 per cent of that number?

(a) 136 (b) 140
(c) 72 (d) None of these

[IBPS Jr. Executive Examination, 2002]

45. By how much is $\frac{2}{5}$ of 200 greater than $\frac{3}{5}$ of 125?

(a) 15 (b) 3
(c) 5 (d) 30

[Canara Bank PO, 2003]

46. Which of the following has fractions in ascending order?

(a) $\frac{2}{3},\frac{3}{5},\frac{7}{9},\frac{9}{11},\frac{8}{9}$ (b) $\frac{3}{5},\frac{2}{3},\frac{7}{9},\frac{9}{11},\frac{8}{9}$

(c) $\frac{8}{9},\frac{9}{11},\frac{7}{9},\frac{3}{5},\frac{2}{3}$ (d) $\frac{3}{5},\frac{2}{3},\frac{9}{11},\frac{7}{9},\frac{8}{9}$

[NABARD Asst. Manager Examination, 2002]

47. What should come in place of the question mark (?) in the following equation

$$47^{7.5} \div 47^{3/2} \times 47^{-3} = \left(\sqrt{47}\right)?$$

(a) 3 (b) $2\frac{1}{2}$
(c) 6 (d) 3.5

[BSRB Patana PO, 2001]

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48. $\frac{(10008.99)^2}{10009.001} \times \sqrt{3589} \times 0.4987 = ?$

(a) 3000 (b) 300000
(c) 3000000 (d) 5000

[BSRB Bhopal PO, 2000]

49. Multiply the difference between the two lowest numbers with the difference between the two highest numbers in the following sequences:

89, 7, 91, 72, 31, 25, 18, 89, 16, 58, 38, 42, 86

(a) 18 (b) 77
(c) 81 (d) 16

[NABARD, 1999]

50. $\frac{1}{5}$ of a number is equal to $\frac{5}{8}$ of the second number. If 35 is added to the first number it becomes four times of second number. What is the value of the second number?

(a) 125 (b) 70
(c) 40 (d) 25

[NABARD, 1999]

51. $9^3 \times 81^2 \div 27^3 = (3)^{?}$

(a) 3 (b) 4
(c) 5 (d) 6

[Punjab and Sind Bank PO, 2010]

52. $(35)^2 \div \sqrt[3]{125} + (25)^2 \div 125 = ?$

(a) 200 (b) 250
(c) 150 (d) 100

[Punjab National Bank PO, 2010]

53. $(?)^2 \times (12)^2 \div (48)^2 = 81$

(a) 26 (b) 32
(c) 9 (d) None of these

[Punjab National Bank PO, 2010]

54. $\sqrt{1225} = ?$

(a) 25 (b) 45
(c) 55 (d) None of these

[Haryana Grameen Bank PO, 2009]

55. Which number should replace both the question marks in the following equation

$$\frac{?}{49} = \frac{16}{?}$$

(a) 48 (b) 18
(c) 38 (d) 28

[Haryana Grameen Bank PO, 2009]

56. $\sqrt{898} \times (12.005)^2 + ? = 5000$

(a) 680 (b) 720
(c) 750 (d) 620

[RBI (Grade 'B') PO, 2009]

57. $\sqrt{\sqrt{44944} + \sqrt{52441}} = ?$

(a) 312 (b) 441
(c) 485 (d) None of these

[Andhra Bank PO, 2008]

58. Which number should replace both the question marks in the following equation?

$$\frac{?}{171} = \frac{76}{?}$$

(a) 114 (b) 116
(c) 57 (d) 176

[Andhra Bank PO, 2008]

59. $(72)^2 + (61)^2 = (199)^2 - (?) - 420$

(a) 165 (b) 198
(c) 182 (d) 174

[Uttrakhand GBO PO, 2007]

60. Which number should replace both the question marks in the following equation?

$$\frac{?}{944} = \frac{59}{?}$$

(a) 218 (b) 236
(c) 244 (d) 264

[Uttrakhand GBO PO, 2007]

61. $\sqrt[3]{4663} + 349 = ? \div 21.003$

(a) 7600 (b) 7650
(c) 7860 (d) 7680

[IBPS Bank PO, 2011]

62. $\sqrt{6354} \times 34.993 = ?$

(a) 3000 (b) 2800
(c) 2500 (d) 3300

[IBPS Bank PO, 2011]

63. $\sqrt[3]{1331} = ?$

(a) 27 (b) 21
(c) 17 (d) None of these

[OBC PO Examination, 2009]

64. $\sqrt{24^4} + 224 = ? \times 20^2$

(a) 20 (b) 4
(c) 2 (d) 16

[United Bank of India PO Examination, 2009]

65. Which number should replace both the question marks (?) in the following equation?

$$\frac{?}{576} = \frac{256}{?}$$

(a) 384 (b) 398
(c) 404 (d) 416

[IOB PO Examination, 2009]

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66. Which number should replace both the question marks in the following equation?

$$\frac{?}{432} = \frac{243}{?}$$

(a) 308 (b) 312
(c) 324 (d) 316

[SBI PO Examination, 2008]

67. What is the least number that can be added to the number 1020 to make it a perfect square?

(a) 65 (b) 12
(c) 59 (d) 4

[Indian Bank PO Examination, 2011]

68. $(?)^3 = 4913$

(a) 27 (b) 19
(c) 17 (d) 29

[Indian Bank PO, 2011]

69. $348 \div 29 \times 15 + 156 = (?)^3 + 120$

(a) 12 (b) 6
(c) 36 (d) 9

[Corporation Bank PO Examination, 2011]

70. $(4 \times 4)^3 \div (512 \div 8)^4 \times (32 \times 8)^4 = (2 \times 2)^? + 4$

(a) 8 (b) 12
(c) 6 (d) 14

[Corporation Bank PO Examination, 2011]

71. $\left(2\sqrt{392} - 21\right) + \left(\sqrt{8} - 7\right)^2 = (?)^2$

(a) 4 (b) – 4
(c) 12 (d) 6

[Corporation Bank PO Examination, 2011]

72. $(\sqrt{8} \times \sqrt{8})^{1/2} + (9)^{1/2} = (?)^3 + \sqrt{8} - 340$

(a) 7 (b) 19
(c) 18 (d) 9

[Bank of Baroda PO Examination, 2011]

73. Sum of square of the first number and cube of the second number is 568 together. Also square of the second number is 15 less than the square of 8. What is the value of $\frac{3}{5}$ of the first number? (assuming both the numbers are positive)

(a) 18 (b) 8
(c) 9 (d) 16

[Bank of Baroda PO Examination, 2011]

74. $(?)^3 = 729$

(a) 14 (b) 7
(c) 19 (d) None of these.

[Bank of India PO Examination, 2010]

75. $\sqrt{2809} = ?$

(a) 43 (b) 47
(c) 57 (d) 53

[IDBI PO Examination, 2009]

76. The expression $(2+\sqrt{2}) + \frac{1}{(2+\sqrt{2})} + \frac{1}{(2-\sqrt{2})}$ equals:

(a) $4+\sqrt{2}$ (b) $2\sqrt{2}$
(c) $4-\sqrt{2}$ (d) $2+\sqrt{2}$

[UPPCS Examination, 2012]

77. The square root of 0.09 is:

(a) 0.30 (b) 0.03
(c) 0.81 (d) 0.081

[SSC (GL) Examination, 2010]

78. If $\sqrt{1+\frac{x}{961}} = \frac{32}{31}$, then the value of x is:

(a) 63 (b) 61
(c) 65 (d) 64

[SSC (GL) Examination, 2011]

79. If $\sqrt{1+\frac{x}{9}} = \frac{13}{3}$, then the value of x is:

(a) $\frac{1439}{9}$ (b) 160
(c) $\frac{1443}{9}$ (d) 169

[SSC (GL) Examination, 2011]

80. If $\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}} = a + b\sqrt{6}$, then the values of a and b are, respectively:

(a) $\frac{9}{5}, \frac{4}{15}$ (b) $\frac{3}{11}, \frac{4}{33}$
(c) $\frac{9}{10}, \frac{2}{5}$ (d) $\frac{3}{5}, \frac{4}{15}$

[SSC (GL) Examination, 2011]

81. If $a = 64$ and $b = 289$, then the value of $\left(\sqrt{\sqrt{a}+\sqrt{b}} - \sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}}$ is:

(a) $2^{1/2}$ (b) 2
(c) 4 (d) –2

[SSC, 2014]

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82. If $\sqrt{x} = \sqrt{3} - \sqrt{5}$, then the value of $x^2 - 16x + 6$ is:
(a) 0 (b) –2
(c) 2 (d) 4
[SSC, 2013]

83. $2\sqrt[3]{40} - 4\sqrt[3]{320} + 3\sqrt[3]{635} - 3\sqrt[3]{5}$ is equal to:
(a) $-2\sqrt[3]{340}$ (b) 0
(c) $\sqrt[3]{340}$ (d) $\sqrt[3]{660}$
[SSC, 2012]

84. The square root of $\frac{(0.75)^3}{1-0.75} + (0.75 + (0.75)^2 + 1)$ is:
(a) 1 (b) 2
(c) 3 (d) 4
[SSC, 2011]

85. Given that $\sqrt{4096} = 64$, the value of $\sqrt{4096} + \sqrt{40.96} + \sqrt{0.004096}$ is:
(a) 70.4 (b) 70.464
(c) 71.104 (d) 71.4
[SSC, 2011]

86. If $a2 = 2$, then $(a + 1)$ is equal to:
(a) $a - 1$ (b) $\frac{2}{a-1}$
(c) $\frac{a+1}{3-2a}$ (d) $\frac{a-1}{3-2a}$
[SSC, 2010]

87. The square root of $\frac{(0.75)^3}{1-0.75} + [0.75 + (0.75)^2 + 1]$ is:
(a) 1 (b) 2
(c) 3 (d) 4
[SSC, 2010]

88. $\sqrt[3]{(13.608)^2 - (13.392)^2}$ is equal to:
(a) 0.6 (b) 0.06
(c) 1.8 (d) 2.6
[SSC, 2010]

89. The square root of $\frac{9.5 \times 0.0085 \times 18.9}{0.0017 \times 1.9 \times 2.1}$ is:
(a) 15 (b) 45
(c) 75 (d) 225
[SSC, 2010]

90. The largest among the numbers $\sqrt{7} - \sqrt{5}$, $\sqrt{5} - \sqrt{3}$, $\sqrt{9} - \sqrt{7}$, $\sqrt{11} - \sqrt{9}$ is:
(a) $\sqrt{7} - \sqrt{5}$ (b) $\sqrt{5} - \sqrt{3}$
(c) $\sqrt{9} - \sqrt{7}$ (d) $\sqrt{11} - \sqrt{9}$
[SSC, 2010]

91. $\sqrt{1000000.000001} = ?$
(a) l000 (b) 100
(c) 1000.001 (d) 10000
(e) 999
[IBPS PO/MT, 2013]

92. $\left[\left(5\sqrt{7} + \sqrt{7}\right) \times \left(4\sqrt{7} + 8\sqrt{7}\right)\right] - (19)^2 = ?$
(a) 143 (b) $72\sqrt{7}$
(c) 134 (d) $70\sqrt{7}$
(e) None of these
[IBPS PO/MT, 2012]

93. $\sqrt{33124} \times \sqrt{2601} - (83)^2 = (?)^2 + (37)^2$
(a) 37 (b) 33
(c) 34 (d) 28
(e) None of these
[IBPS PO/MT, 2012]

Directions (Q. 94–101): What approximate value should come in place of the question mark (?) in the following questions? (Note: You are not expected to calculate the exact value.)

94. $8787 \div 343 \times \sqrt{50} = ?$
(a) 250 (b) 140
(c) 180 (d) 100
(e) 280
[IBPS PO/MT, 2012]

95. $\sqrt[3]{54821} \times (303 \div 8) = (?)^2$
(a) 48 (b) 38
(c) 28 (d) 18
(e) 58
[IBPS PO/MT, 2012]

96. $[(3\sqrt{8} + \sqrt{8}) \times (8\sqrt{8} + 7\sqrt{8})] - 98 = ?$
(a) $2\sqrt{8}$ (b) $8\sqrt{8}$
(c) 382 (d) 386
(e) None of these
[IBPS PO/MT, 2011]

97. $\sqrt{11449} \times \sqrt{6241} - (54)^2 = \sqrt{?} + (74)^2$
(a) 3844 (b) 3721
(c) 3481 (d) 3638
(e) None of these
[IBPS PO/MT, 2011]

98. $\sqrt{6354} \times 34.993 = ?$
(a) 3000 (b) 2800
(c) 2500 (d) 3300
(e) 2600
[IBPS PO/MT, 2011]

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99. $\sqrt[3]{4663} + 349 = ? \div 21.003$

(a) 7600 (b) 7650
(c) 7860 (d) 7560
(e) 7680

[IBPS PO/MT, 2011]

100. $(15.01)^2 \times \sqrt{730} = ?$

(a) 6125 (b) 6225
(c) 6200 (d) 6075
(e) 6250

[SBI Associates Banks PO, 2011]

101. $\sqrt{54} \times \sqrt{2120} \div \sqrt{460} = ?$

(a) 120 (b) 140
(c) 160 (d) 180
(e) 200

[IOB PO, 2011]

Directions (Q. 102–107): In the following questions two equations numbered I and II are given. You have to solve both the equations and

Give answer If

(a) $x > y$
(b) $x \geq y$
(c) $x < y$
(d) $x \leq y$
(e) $x = y$ or the relationship cannot be established.

102. I. $\sqrt{25x^2} - 125 = 0$

II. $\sqrt{361}y + 95 = 0$

[Allahabad Bank PO, 2011]

103. I. $\frac{5}{7} - \frac{5}{21} = \frac{\sqrt{x}}{42}$

II. $\frac{\sqrt{y}}{4} + \frac{\sqrt{y}}{16} = \frac{250}{\sqrt{y}}$

[Allahabad Bank PO, 2011]

104. I. $(625)^{\frac{1}{4}}x + \sqrt{1225} = 155$

II. $\sqrt{196}y + 13 = 279$

[Allahabad Bank PO, 2011]

105. I. $5x^2 - 18x + 9 = 0$

II. $3y^2 + 5y - 2 = 0$

[Allahabad Bank PO, 2011]

106. I. $\frac{13}{\sqrt{x}} + \frac{9}{\sqrt{x}} = \sqrt{x}$

II. $y^4 - \frac{(13 \times 2)^{\frac{9}{2}}}{\sqrt{y}} = 0$

[Allahabad Bank PO, 2011]

107. $\sqrt{5^2 \times 14 - 6 \times 7 + (4)^?} = 18$

(a) 1 (b) 3
(c) 4 (d) 5
(e) None of these

[Indian Bank PO, 2010]

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ANSWER KEYS

EXERCISE-I

1. (c)	**2.** (a)	**3.** (a)	**4.** (c)	**5.** (a)	**6.** (d)	**7.** (a)	**8.** (c)	**9.** (a)	**10.** (c)	**11.** (c)	**12.** (c)
13. (a)	**14.** (a)	**15.** (c)	**16.** (a)	**17.** (c)	**18.** (a)	**19.** (b)	**20.** (d)	**21.** (b)	**22.** (a)	**23.** (a)	**24.** (b)
25. (b)	**26.** (d)	**27.** (b)	**28.** (b)	**29.** (d)	**30.** (c)	**31.** (c)	**32.** (a)	**33.** (b)	**34.** (b)	**35.** (a)	**36.** (c)
37. (c)	**38.** (a)	**39.** (b)	**40.** (c)	**41.** (a)	**42.** (c)	**43.** (b)	**44.** (c)	**45.** (c)	**46.** (b)	**47.** (c)	**48.** (b)
49. (b)	**50.** (c)	**51.** (d)	**52.** (a)	**53.** (c)	**54.** (b)	**55.** (c)	**56.** (c)	**57.** (c)	**58.** (c)	**59.** (d)	**60.** (b)

EXERCISE-2

1. (c)	**2.** (e)	**3.** (e)	**4.** (b)	**5.** (a)	**6.** (b)	**7.** (b)	**8.** (c)	**9.** (c)	**10.** (b)	**11.** (c)	**12.** (b)
13. (c)	**14.** (a)	**15.** (b)	**16.** (a)	**17.** (b)	**18.** (e)	**19.** (c)	**20.** (a)	**21.** (b)	**22.** (c)	**23.** (a)	**24.** (a)
25. (c)	**26.** (d)	**27.** (c)	**28.** (d)	**29.** (d)	**30.** (a)	**31.** (b)	**32.** (d)	**33.** (d)	**34.** (b)	**35.** (b)	**36.** (d)
37. (b)	**38.** (b)	**39.** (d)	**40.** (c)	**41.** (b)	**42.** (d)	**43.** (d)	**44.** (d)	**45.** (c)	**46.** (b)	**47.** (c)	**48.** (b)
49. (a)	**50.** (c)	**51.** (c)	**52.** (b)	**53.** (d)	**54.** (d)	**55.** (d)	**56.** (a)	**57.** (d)	**58.** (a)	**59.** (d)	**60.** (b)
61. (d)	**62.** (b)	**63.** (d)	**64.** (c)	**65.** (a)	**66.** (c)	**67.** (d)	**68.** (c)	**69.** (b)	**70.** (c)	**71.** (d)	**72.** (a)
73. (c)	**74.** (d)	**75.** (d)	**76.** (a)	**77.** (a)	**78.** (a)	**79.** (b)	**80.** (d)	**81.** (a)	**82.** (c)	**83.** (b)	**84.** (b)
85. (b)	**86.** (d)	**87.** (b)	**88.** (c)	**89.** (a)	**90.** (b)	**91.** (a)	**92.** (a)	**93.** (e)	**94.** (c)	**95.** (b)	**96.** (c)
97. (b)	**98.** (b)	**99.** (e)	**100.** (d)	**101.** (c)	**102.** (e)	**103.** (c)	**104.** (a)	**105.** (a)	**106.** (c)	**107.** (e)	

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EXPLANATORY ANSWERS

EXERCISE-I

1. **(c)** The prime factors of 4356 are

$2 \times 2 \times 3 \times 3 \times 11 \times 11$

$4356 = 2 \times 2 \times 3 \times 3 \times 11 \times 11$

2	4356
2	2178
3	1089
3	363
11	121
11	11
	1

$\sqrt{4356} = \sqrt{2^2 \times 3^2 \times 11^2}$

$= 2 \times 3 \times 11 = 66.$

2. **(a)**

			324
3	10	49	76
	9		
62	149		
	124		
644	2576		
	2576		
	×		

∴ Square root of 104976 is 324.

3. **(a)**

			460
4	21	16	00
	16		
86	516		
	516		
	×		

∴ Square root of 211600 is 460.

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4. (c)

	2548
2	6 $\overline{49}$ $\overline{23}$ $\overline{04}$
	4
45	249
	225
644	2423
	2016
5088	40704
	40704
	×

$\therefore \sqrt{6492304} = 2548.$

5. (a) $74088 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 7 \times 7 \times 7$

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

Therefore, required number $= 2 \times 3 \times 7 = 42.$

2	74088
2	37044
2	18522
3	6261
3	3087
3	1029
7	343
7	49
7	7
	1

6. (d) $\sqrt{10} \times \sqrt{250} = \sqrt{2500} = 50.$

7. (a) $\sqrt{80} + 3\sqrt{245} - \sqrt{125} = 4\sqrt{5} + 21\sqrt{5} - 5\sqrt{5}.$

$= 20\sqrt{5}.$

8. (c) Let, $\frac{250}{\sqrt{x}} = 10$. Then, $\sqrt{x} = \frac{250}{10} = 25$

$\therefore \quad x = (25)^2 = 625.$

9. (a) $\frac{\sqrt{256}}{\sqrt{x}} = 2 \quad$ or, $\quad \frac{16}{\sqrt{x}} = 2$

$\therefore \quad 16 = 2\sqrt{x} \Rightarrow \quad \sqrt{x} = 8$ or, $x = 64.$

10. (c) We know that

$216 = 2 \times 2 \times 2 \times 3 \times 3 \times 3 = 2^2 \times 3^2 \times 6$

Thus, $\frac{216}{6} = 2^2 \times 3^2 = 6^2.$

Therefore, 216 should be divided by 6, so that the result is a perfect square.

11. (c) Let, $\frac{\sqrt{x}}{200} = 0.02$. Then,

$\sqrt{x} = 200 \times 0.02$ or, $\sqrt{x} = 4$

So, $x = 16.$

12. (c) $\frac{\sqrt{6727}}{\sqrt{7}} = \frac{\sqrt{6727}}{\sqrt{7}} = \sqrt{961} = 31.$

13. (a) $\sqrt{0.09} = \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3.$

14. (a) $\frac{14}{3+\sqrt{2}} = \frac{14(3-\sqrt{2})}{(3-\sqrt{2})(3+\sqrt{2})} = \frac{14(3-\sqrt{2})}{9-2}$

$= 2(3 - \sqrt{2}) = 2(3 - 1.414)$

$= 2 \times 1.586 = 3.172.$

15. (c) The number nearest to 3579 which is a perfect square is 3600.

$\therefore$ Required number $= 60^2 - 3579 = 21.$

16. (a) $\sqrt{\left(1 + \frac{27}{169}\right)} = 1 + \frac{x}{13}$

$\therefore \quad \sqrt{\frac{196}{169}} = 1 + \frac{x}{13}$

or, $\quad \frac{14}{13} = 1 + \frac{x}{13} \quad$ or, $\quad \frac{x}{13} = \frac{14}{13} - 1$

or, $\quad \frac{x}{13} = \frac{1}{13} \quad$ or, $\quad x = 1$

17. (c) $\frac{\sqrt{4375}}{\sqrt{7}} = \frac{\sqrt{4375}}{\sqrt{7}} = \sqrt{625} = 25.$

18. (a) $\sqrt{0.016a} = 0.016 \times \sqrt{b}$

$\Rightarrow \sqrt{\frac{a}{b}} = \frac{0.016}{\sqrt{0.016}} \Rightarrow \sqrt{\frac{a}{b}} = \sqrt{0.016} \Rightarrow \frac{a}{b} = 0.016.$

19. (b) $\sqrt{\sqrt{\sqrt{\sqrt{3.3^{1/2}}}}} = \sqrt{\sqrt{\sqrt{3.3^{3/4}}}} = \sqrt{\sqrt{3.3^{7/8}}}$

$= \sqrt{3.3^{15/16}} = 3^{31/32}.$

20. (d) Let, $\frac{\sqrt{1296}}{x} = \frac{x}{2.25}$

Then, $\frac{36}{x} = \frac{x}{2.25}$

or, $x^2 = 36 \times \frac{225}{100}$

$\therefore \quad x = \sqrt{\frac{36 \times 225}{100}} = \frac{6 \times 15}{10} = 9.$

21. (b) $\sqrt{176 + \sqrt{2401}} = \sqrt{176 + 49} = \sqrt{225} = 15.$

22. (a) $\sqrt{10} \times \sqrt{15} = \sqrt{150} = \sqrt{25 \times 6}$

$= \sqrt{25} \times \sqrt{6} = 5\sqrt{6}.$

23. (a) $\frac{\sqrt{4}}{\sqrt{3}} - \frac{\sqrt{3}}{\sqrt{4}} = \frac{2}{\sqrt{3}} - \frac{\sqrt{3}}{2} = \frac{4-3}{2\sqrt{3}} = \frac{1}{2\sqrt{3}}.$

24. (b) $\sqrt{248 + \sqrt{52 + \sqrt{144}}} = \sqrt{248 + \sqrt{52 + 12}}$

$= \sqrt{248 + \sqrt{64}}$

$= \sqrt{248 + 8}$

$= \sqrt{256} = 16.$

25. (b) Given expression $= \frac{\sqrt{0.0009}}{\sqrt{0.01}} = \sqrt{\frac{0.0009}{0.0100}}$

$= \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3.$

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26. (d) $\frac{1}{\sqrt{9}-\sqrt{8}} = \frac{1}{\sqrt{9}-\sqrt{8}} \times \frac{\sqrt{9}+\sqrt{8}}{\sqrt{9}+\sqrt{8}} = \frac{3+2\sqrt{2}}{9-8}$

$= 3 + 2\sqrt{2}.$

27. (b) $\sqrt{\frac{x}{169}} = \frac{54}{39} \Rightarrow \frac{x}{169} = \frac{54}{39} \times \frac{54}{39}$

$\therefore \quad x = \frac{54}{39} \times \frac{54}{39} \times 169 = 324.$

28. (b) Let, given expression = x

Then, $\sqrt{12+x} = x \quad \Rightarrow \quad 12 + x = x^2$

$\therefore \quad x^2 - x - 12 = 0 \quad$ or, $\quad (x - 4)(x + 3) = 0$

So, $x = 4$ (neglecting $x = -3$).

29. (d) Given expression

$= \frac{112}{14} \times \frac{24}{12} \times \frac{16}{8} = 32.$

30. (c) $\sqrt{\frac{3}{4}} + 2\sqrt{\frac{4}{3}} = \sqrt{12}\left(\frac{1}{4} + \frac{2}{3}\right)$

$= \frac{3.464 \times 11}{12} = 3.1753.$

31. (c) Given expression

$= \sqrt{15625} + \sqrt{\frac{15625}{100}} + \sqrt{\frac{15625}{10000}}$

$= 125 + \frac{125}{10} + \frac{125}{100}$

$= 125 + 12.5 + 1.25 = 138.75.$

32. (a) $\sqrt{0.03 \times 0.3 \times a} = 0.03 \times 0.3 \times \sqrt{b}$

$\Rightarrow \quad \sqrt{\frac{a}{b}} = \sqrt{0.03 \times 0.3}$

$\Rightarrow \quad \frac{a}{b} = 0.03 \times 0.3$

or, $\quad \frac{a}{b} = 0.009.$

33. (b) $\sqrt{4096} + \sqrt{40.96} + \sqrt{.004096}$

$= \sqrt{4096} + \sqrt{\frac{4096}{100}} + \sqrt{\frac{4096}{1000000}}$

$= 64 + \frac{64}{10} + \frac{64}{1000}$

$= 64 + 6.4 + 0.064 = 70.464.$

34. (b) $\sqrt{1+\sqrt{1-\frac{2176}{2401}}} = 1 + \frac{x}{7}$

$\Rightarrow \quad 1 + \frac{x}{7} = \sqrt{1+\sqrt{\frac{225}{2401}}} = \sqrt{1+\frac{15}{49}}$

$= \sqrt{\frac{64}{49}} = \frac{8}{7} = 1 + \frac{1}{7} \qquad \therefore \quad x = 1.$

35. (a) The square of an odd number cannot have 4 as the unit digit. The square of a 3-digit number will have at least 5 digits and at the most 6 digits.

36. (c) Given expression

$= \sqrt{\frac{324 \times 81 \times 4624}{15625 \times 289 \times 729 \times 64}}$

(Sum of decimal places being equal in numerator and denominator)

$= \frac{18 \times 9 \times 68}{125 \times 17 \times 27 \times 8} = \frac{3}{125} = 0.024.$

37. (c) $\sqrt[3]{\frac{512}{3375}} = \sqrt[3]{\frac{2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2}{3 \times 3 \times 3 \times 5 \times 5 \times 5}}$

$= \frac{2 \times 2 \times 2}{3 \times 5} = \frac{8}{15}.$

38. (a) Given expression

$= \sqrt{0.01 + 0.08} = \sqrt{0.09}$

$= \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3.$

39. (b) $\sqrt[3]{15.625} = \sqrt[3]{\frac{15625}{1000}} = \sqrt[3]{\frac{5 \times 5 \times 5 \times 5 \times 5 \times 5}{2 \times 2 \times 2 \times 5 \times 5 \times 5}}$

$= \frac{5 \times 5}{2 \times 5} = \frac{5}{2} = 2.5.$

40. (c) $\sqrt[3]{0.000064} = \sqrt[3]{\frac{64}{1000000}}$

$= \sqrt[3]{\frac{4 \times 4 \times 4}{100 \times 100 \times 100}}$

$= \frac{4}{100} = 0.04.$

41. (a) $\sqrt[3]{\sqrt{441} + \sqrt{16} + \sqrt{4}}$

$= \sqrt[3]{21 + 4 + 2} = \sqrt[3]{27}$

$= \sqrt[3]{3 \times 3 \times 3} = 3.$

42. (c) $14175 = 5 \times 5 \times 3 \times 3 \times 3 \times 3 \times 7$

$= 5^2 \times 3^4 \times 7$

It must be multiplied by 7.

43. (b) $\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}} \times \frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}-\sqrt{3}}$

$= \frac{(\sqrt{5}-\sqrt{3})^2}{5-3} = \frac{5+3-2\sqrt{15}}{2}$

$= \frac{2(4-\sqrt{15})}{2} = 4 - \sqrt{15}.$

44. (c) $\frac{\sqrt{24}+\sqrt{216}}{\sqrt{96}} = \frac{\sqrt{4 \times 6} + \sqrt{36 \times 6}}{\sqrt{16 \times 6}}$

$= \frac{2\sqrt{6} + 6\sqrt{6}}{4\sqrt{6}} = \frac{8\sqrt{6}}{4\sqrt{6}} = 2.$

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45. **(c)** $\sqrt{2\frac{2}{9}} = \frac{\sqrt{20}}{\sqrt{9}} = \frac{\sqrt{20}}{3} = \frac{4.472}{3} = 1.491 \approx 1.49.$

46. **(b)** $a = \frac{\sqrt{5}+1}{\sqrt{5}-1} \times \frac{\sqrt{5}+1}{\sqrt{5}+1} = \frac{(\sqrt{5}+1)^2}{(\sqrt{5})^2-(1)^2}$

$= \frac{5+1+2\sqrt{5}}{5-1}$

$= \frac{6+2\sqrt{5}}{4} = \frac{3+\sqrt{5}}{2}$

$b = \frac{\sqrt{5}-1}{\sqrt{5}+1} \times \frac{\sqrt{5}-1}{\sqrt{5}-1} = \frac{(\sqrt{5}-1)^2}{(\sqrt{5})^2-(1)^2}$

$= \frac{5+1-2\sqrt{5}}{5-1} = \frac{6+2\sqrt{5}}{4} = \frac{3-\sqrt{5}}{2}$

$a^2 + b^2 = \frac{(3+\sqrt{5})^2 + (3-\sqrt{5})^2}{4}$

$= \frac{9+5+6\sqrt{5}+9+5-6\sqrt{5}}{5} = \frac{28}{4} = 7$

$ab = 1$

$\therefore \quad \frac{a^2+ab+b^2}{a^2-ab+b^2} = \frac{7+1}{7-1} = \frac{8}{6} = \frac{4}{3}$

47. **(c)** $10584 = 4 \times 9 \times 2 \times 7 \times 7 \times 3$

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

This must be multiplied by 6.

48. **(b)** $7936 = 4 \times 4 \times 4 \times 4 \times 31$

To make it a perfect square, we multiply it by 31

$\therefore$ The required T smallest number

$= 7936 \times 31 = 246016.$

49. **(b)** $\sqrt{.00059049} = \sqrt{\frac{59049}{100000000}}$

$= \frac{\sqrt{59049}}{\sqrt{100000000}}$

$= \frac{243}{10000} = 0.0243.$

50. **(c)** $\sqrt{\frac{4}{12.1}} = \sqrt{\frac{4 \times 10}{12.1 \times 10}} = \frac{\sqrt{4} \times \sqrt{10}}{\sqrt{121}}$

$= \frac{2}{11} \times \sqrt{10} = \frac{2}{11} \times 3.16$

$= \frac{6.32}{11} = 0.57 \approx 0.6.$

51. **(d)** Given expression

$= \sqrt{\frac{256 \times 81 \times 4356}{15625 \times 121 \times 1296 \times 64}}$

$= \frac{16 \times 9 \times 66}{125 \times 11 \times 36 \times 8} = 0.024.$

52. **(a)** The number of men in the front row is the square root of 16160 − 31, that is 16129, which is 127.

53. **(c)** Ratio of their sides is the ratio of their square roots

$= \sqrt{420.25} : \sqrt{441}$

$= 20.5:21 = 41:42.$

54. **(b)** The number of men in the front row is the square root of 5180 + 4, that is 5184, which is 72.

55. **(c)** The largest number of three digits is 999,

	31
3	999
	9
61	99
	61
	38

$\therefore$ Required number is $(31)^2 = 961.$

56. **(c)** $21\frac{15}{289} = \frac{6084}{289} = \left(\frac{78}{17}\right)^2$

$\therefore$ Square root $= \frac{78}{17} = 4\frac{10}{17}.$

$\therefore$ Least fraction to be subtracted $= \frac{10}{17}.$

57. **(c)**

	250
2	$6\overline{2}$ 5 $\overline{12}$
	4
45	225
	225
50	12

So, 12 is the smallest number, which, when subtracted from 62512 makes it a perfect square.

$\sqrt{62500} = 250.$

58. **(c)** Largest number of 5 digits = 99999.

	316
3	9 $\overline{99}$ $\overline{99}$
	9
61	99
	61
625	3899
	3756
	143

The required number $= (316)^2 = 99856.$

59. **(d)** $2450 = 5 \times 5 \times 7 \times 7 \times 2$

$\therefore$ 2450 must be multiplied by 2.

60. **(b)** $3600 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5 \times 5$

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

$\therefore$ 3600 should be multiplied by $2 \times 2 \times 3 \times 5$, that is 60, to make it a perfect cube.

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EXERCISE-2
(BASED ON MEMORY)

1. (c) Given expression = 6.4 + 0.64 + 0.064 + 0.0064
= 7.1104 = 7.11

2. (e) $\sqrt[3]{19683} = ?\times 3 \quad \therefore\ ? = \frac{\sqrt[3]{19683}}{3} = \frac{27}{3} = 9$

3. (e) $\sqrt{\sqrt{1024}+\sqrt{7921}}\times 48.5 = \sqrt{32+89}\times 48.5$

$= \sqrt{121}\times 48.5 = 11\times 48.5 = 533.5$

4. (b) $\sqrt{\sqrt{2500}+\sqrt{961}} = \sqrt{50+31} = \sqrt{81} = 9$

Now, $(?)^2 = 9 \quad \therefore\ ? = 3$

5. (a) $21952 = 4\times 4\times 4\times 7\times 7\times 7$

$\therefore\ \sqrt[3]{21952} = 4\times 7 = 28.$

6. (b) $\frac{1}{\sqrt{5}-\sqrt{3}} = \frac{1}{\sqrt{5}-\sqrt{3}}\times\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}+\sqrt{3}}$

$= \frac{\sqrt{5}+\sqrt{3}}{5-3} = \frac{2.2361+1.7321}{2}$

$= \frac{3.9682}{2} = 1.9841.$

7. (b) $\frac{\sqrt{625}}{11}\times\frac{14}{\sqrt{25}}\times\frac{11}{\sqrt{196}} = \frac{25}{11}\times\frac{14}{5}\times\frac{11}{14} = 5.$

8. (c) $\sqrt{272^2-128^2} = \sqrt{(272+128)(272-128)}$

$= \sqrt{400\times 144}$

$= 20\times 12 = 240.$

9. (c) $\sqrt{0.9} = \sqrt{\frac{9}{10}} = \frac{3}{10}\times\frac{\sqrt{10}}{\sqrt{10}}$

$= \frac{3\times 3.16}{10} = \frac{9.48}{10} = 0.94.$

10. (b) $\frac{\sqrt{0.441}}{\sqrt{0.625}} = \frac{\sqrt{441}}{\sqrt{625}} = \frac{21}{25} = 0.84.$

11. (c) $\frac{0.342\times 0.684}{0.000342\times 0.000171} = \frac{342\times 684\times 10^6}{342\times 171}$

$= 4\times 10^6$

Square root of $4\times 10^6 = 2\times 10^3 = 2000.$

12. (b) $\sqrt{0.01}+\sqrt{0.81}+\sqrt{1.21}+\sqrt{0.0009}$

= 0.1 + 0.9 + 1.1 + 0.03 = 2.13.

13. (c) $\sqrt[3]{175.616} = \sqrt[3]{\frac{175616}{10000}} = \frac{56}{10} = 5.6$

$\sqrt[3]{0.175616} = \sqrt[3]{\frac{175616}{1000000}} = \frac{56}{100} = 0.56$

$\sqrt[3]{0.000175616} = \sqrt[3]{\frac{175616}{1000000000}} = \frac{56}{1000} = 0.056$

$\therefore$ Required answer = 5.6 + 0.56 + 0.056 = 6.216.

14. (a) $\sqrt{8}+2\sqrt{32}-\sqrt[3]{128}+\sqrt[4]{50}$

$= 2\sqrt{2}+2\times 4\sqrt{2}-3\times 8\sqrt{2}+4\times 5\sqrt{2}$

$= 2\sqrt{2}+8\sqrt{2}-24\sqrt{2}+20\sqrt{2}$

$= 6\sqrt{2} = 6\times 1.414 = 8.484.$

15. (b) $\sqrt{\sqrt[3]{0.004096}} = \sqrt{((0.16)^3)^{1/3}} = \sqrt{0.16} = 0.4.$

16. (a) $\sqrt{\frac{5}{3}} = \sqrt{\frac{5\times 3}{3\times 3}} = \sqrt{\frac{15}{3}} = \frac{3.88}{3} = 1.29\overline{3}.$

17. (b) $\sqrt{5625}+\sqrt{56.25}+\sqrt{0.5625}$

$= \sqrt{5625}+\sqrt{\frac{5625}{100}}+\sqrt{\frac{5625}{1000}} = 75+\frac{75}{10}+\frac{75}{100}$

= 75 + 7.5 + 0.75 = 83.25.

18. (e) $\frac{36}{6}\times\sqrt{?} = 108$

or, $\sqrt{?} = \frac{108}{6}$ or, $\sqrt{?} = 18$ or, $? = 324 \approx 325.$

19. (c) $? = \sqrt{1223.9975} \approx 34.$

20. (a) $? = \sqrt{\sqrt{20800}} = \sqrt{144} = 12.$

21. (b) $\sqrt{10000}+\frac{3.001}{4.987}$ of 1891.992 = ?

or, $? \approx 100 + \frac{3}{5}$ of 1900 = 100 + 1140 $\approx$ 1230.

22. (e) $\sqrt{?} = \pm 75$

Squaring on both sides, we get

$? = 75\times 75 = 5625.$

23. (a) $2.25\times 0.15 = 0.3375.$

24. (a) $\left(\frac{8}{125}\right)^{-4/3} = \left(\frac{2}{5}\right)^{-4} = \left(\frac{5}{2}\right)^4 = \frac{625}{16}.$

25. (c) $\frac{(1+\sqrt{2})(\sqrt{5}-\sqrt{3})+(1-\sqrt{2})(\sqrt{5}+\sqrt{3})}{5-3}$

$= \frac{\sqrt{5}-\sqrt{3}+\sqrt{10}-\sqrt{6}+\sqrt{5}+\sqrt{3}-\sqrt{10}-\sqrt{6}}{2}$

$= \frac{2\left(\sqrt{5}-\sqrt{6}\right)}{2} = \sqrt{5}-\sqrt{6}.$

26. (d) $x = 7 - 4\sqrt{3}$

$\frac{1}{x} = \frac{1}{7-4\sqrt{3}}\times\frac{7+4\sqrt{3}}{7+4\sqrt{3}}$

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$= 7 + 4\sqrt{3}$

$\therefore \quad x + \frac{1}{x} = 14.$

27. (c) $7^{1/4} \times (7^3)^{1/4} = 7.$

28. (d) $a^n - 1$ is always divisible by $a - 1$.

$\therefore$ $49^{15} - 1$ is divisible by 48, i.e., 8.

29. (d) $\left(1+\frac{1}{x}\right)\left(1+\frac{1}{x+1}\right)\left(1+\frac{1}{x+2}\right)\left(1+\frac{1}{x+3}\right)$

$=\left(\frac{x+1}{x}\right)\left(\frac{x+2}{x+1}\right)\left(\frac{x+3}{x+2}\right)\left(\frac{x+4}{x+3}\right)$

$=\frac{x+4}{x}.$

30. (a) $\frac{1}{2}-\frac{1}{4}+\frac{1}{5}-\frac{1}{6}=\frac{30-15+12-10}{60}=\frac{17}{60}$

$\frac{2}{5}-\frac{5}{9}+\frac{3}{5}-\frac{7}{18}=\frac{36-50+54-35}{90}=\frac{5}{90}$

As per the question $\frac{17/60}{5/90}=\frac{51}{10}=5\frac{1}{10}.$

31. (b) $\left[\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right]^2+\left[\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right]^2$

$=\left[\frac{(\sqrt{5}+\sqrt{3})(\sqrt{3}+\sqrt{3})}{(\sqrt{5}-\sqrt{3})(\sqrt{5}+\sqrt{3})}\right]^2+\left[\frac{(\sqrt{5}-\sqrt{3})(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})(\sqrt{5}-\sqrt{3})}\right]^2$

$=\left[\frac{5+3+2\sqrt{15}}{5-3}\right]^2+\left[\frac{5+3-2\sqrt{15}}{5-3}\right]^2$

$=\left[4+\sqrt{15}\right]^2+\left[4-\sqrt{15}\right]^2$

$= 16 + 15 + 8\sqrt{15} + 16 + 15 - 8\sqrt{15}$

$= 16 + 15 + 16 + 15$ or, 62.

32. (d) $25^{25} = (26 - 1)^{25}$

$= 26^{25} + 25_{C_1} \times 26^{24} \times (-1)^1$

$+25_{C_2} \times 26^{23} \times (-1)^2 + \cdots + (-1)^{25}$

[using Binomial theorem]

Now, all the terms are divisible by 26 except the last term $(-1)^{25}$. So, the remainder is $26 - 1 = 25$.

33. (d) Let, $x = \sqrt{6+\sqrt{6+\sqrt{6+\cdots}}}$

On squaring, we get

$x^2 = 6 + x$ or $x^2 - x - 6 = 0$

or, $(x - 3)(x + 2) = 0$ or, $x = 3, -2$

But, –ve value cannot be accepted.

$\therefore \quad x = 3.$

34. (b) Given expression $= (2^4)^{0.16} \times (2^4)^{0.04} \times (2)^{0.2}$

$= 2^{0.64} \times 2^{0.16} \times 2^{0.2}$

$= 2^1 = 2.$

35. (b) Number $= 269 \times 68 = 18292$

$= 67 \times 273 + 1.$

36. (d) $\frac{5}{3} \div \frac{2}{7} \times \frac{*}{7} = \frac{5}{4} \times \frac{2}{3} \div \frac{1}{6}$

or $\frac{5}{3} \times \frac{7}{2} \times \frac{*}{7} = \frac{5}{4} \times \frac{2}{3} \times \frac{6}{1}$

or $* = \frac{5}{4} \times \frac{2}{3} \times \frac{6}{1} \times \frac{3}{5} \times \frac{2}{7}$

Hence, * = 6.

37. (b) Suppose certain amount is ₹x.

Then, $\left(x - \frac{3}{16}x - \frac{x}{4}\right)$ 81

or, $16x - 3x - 4x = 81 \times 16$

or, $x = \frac{81 \times 16}{9} = 144$

Hence B gets $= 144 \times \frac{1}{4} =$ ₹36.

38. (b) $1 * 2 = 1 + 2 \times 6 = 1 + 12 = 13$

$(1 * 2) * 3 = 13 * 3 = 13 + 3 \times 6 = 31.$

39. (d) The given expression

$=\frac{2}{1+\frac{2}{2-1}} \times \frac{3}{\frac{5}{4} \div \frac{5}{4}} = \frac{2}{3} \times 3 = 2.$

40. (c) The man has $1-\left(\frac{1}{3}+\frac{2}{3}+\frac{1}{5}\right)=\frac{1}{15}$

$\therefore$ man's income $= 400 \times 15 =$ ₹6000.

41. (b) $2 * 3 + 3 * 4$

$= [2 (2) + 3 (3)] + [2 (3) + 3 (4)]$

$= [4 + 9] + [6 + 12] = 31.$

42. (d) Given expression

$= \left[\left\{(2^9)^{1/6}\right\}^{1/3}\right]^4 \times \left[\left\{(2^9)^{1/3}\right\}^{1/6}\right]^4$

$= (2^{1/2})^4 \times (2^{1/2})^4 = 2^2 \times 2^2 = 2^4.$

43. (d) Given expression

$=\sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+15}}}} = \sqrt{10+\sqrt{25+\sqrt{108+13}}}$

$= \sqrt{10+\sqrt{25+11}} = \sqrt{10+6} = \sqrt{16} = 4.$

44. (d) Let the number be x

Then, $\frac{2}{5} \times \frac{1}{3} \times \frac{3}{7} \times x = 15$

or, $\frac{2x}{35} = 15$ or $x = \frac{15 \times 35}{2}$

$\therefore$ 40 % of $x = \frac{40}{100} \times \frac{15 \times 35}{2} = 105.$

45. (c) Required number $= \frac{2}{5} \times 200 - \frac{3}{5} \times 125$

$= 80 - 75 = 5.$

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46. (b) $\frac{2}{3}=\frac{2\times165}{3\times165}=\frac{330}{495}$

$\frac{3}{5}=\frac{3\times99}{5\times99}=\frac{297}{495}$

$\frac{7}{9}=\frac{7\times55}{9\times55}=\frac{385}{495}$

$\frac{9}{11}=\frac{9\times45}{11\times45}=\frac{405}{495}$

$\frac{8}{9}=\frac{8\times55}{9\times55}=\frac{440}{495}$

Ascending order $\frac{3}{5},\frac{2}{3},\frac{7}{9},\frac{9}{11},\frac{8}{9}$.

47. (c) $((47)^{1/2})^{15} \div ((47)^{1/2})^3 \times ((47)^{1/2})^{-6} = (\sqrt{47})^{?}$

$=(\sqrt{47})^{15} \div (\sqrt{47})^3 \times (\sqrt{47})^{-6}$

$=(\sqrt{47})^{?}$

$\Rightarrow \quad (\sqrt{47})^{15-3-6}=(\sqrt{47})^{?}$

$\therefore \quad ? = 6.$

48. (b) $? = \frac{(10008.99)^2}{10009.001}\times\sqrt{3589}\times 0.4987$

$\approx (10009) \times \sqrt{3600} \times 0.50$

$\approx (10009) \times 60 \times 0.50 \approx 300000.$

49. (a) Difference between two lowest numbers

$= 16 - 7 = 9$

Difference between two highest numbers

$= 91 - 89 = 2$

$\therefore$ Product of these two numbers $= 9 \times 2 = 18.$

50. (c) $\frac{1}{5}\ I=\frac{5}{8}\ II$

$\therefore \quad \frac{I}{II}=\frac{25}{8}$

$I + 35 = 4\ II$

or, $\frac{25}{8}\ II + 35 = 4\ II$

$\therefore \quad II = 40.$

51. (c) $9^3 \times 81^2 \div 27^3 = (3)^{?}$

$3^2\times^3 \times 3^4\times^2 \div 3^3\times^3 = (3)^{?}$

$3^6 \times 3^8 \div 3^9 = (3)^{?}$

$(3)^{6+8-9} = (3)^{?}$

$(3)^5 = (3)^{?}$

$? = 5$

52. (b) $(35)^2 \div \sqrt[3]{125} + (25)^2 \div 125 = ?$

$\frac{1225}{5}+\frac{625}{125}=? \quad (\because \sqrt[3]{125}=5)$

$245 + 5 = ?$

$250 = ?$

53. (d) $(?)^2 \times (12)^2 \div (48)^2 = 81$

$\frac{(?)^2\times12\times12}{48\times48}=81$

$(?)^2 = 81 \times 16 = (9 \times 4)^2$

$\therefore \quad ? = 36$

54. (d) $? = \sqrt{1225}$

$\Rightarrow \quad ? = \sqrt{5\times5\times7\times7}$

$\Rightarrow \quad ? = 5 \times 7$

$\Rightarrow \quad ? = 35$

55. (d) $\frac{?}{49}=\frac{16}{?}$

$\Rightarrow \quad ?^2 = 49 \times 16$

$\Rightarrow \quad ? = \sqrt{49\times16}$

$\Rightarrow \quad ? = \sqrt{7\times7\times4\times4}$

$\Rightarrow \quad ? = 7 \times 4$

$\Rightarrow \quad ? = 28$

56. (a) $\sqrt{898} \times (12.005)^2 + ? = 5000$

$\Rightarrow \quad \sqrt{900} \times (12)^2 + ? \approx 5000$

$[898 \approx 900;\ 12.005 \approx 12]$

$\Rightarrow \quad 30 \times 144 + ? \approx 5000$

$\Rightarrow \quad ? + 4320 \approx 5000$

$? = 5000 - 4320$

≈ 680

57. (d) $? = \sqrt{\sqrt{44944}+\sqrt{52441}}$

$\Rightarrow \quad ? = \sqrt{212+229}$

$\Rightarrow \quad ? = \sqrt{441}$

$\Rightarrow \quad ? = 21$

58. (a) $\frac{?}{171}=\frac{76}{?}$

$\therefore \quad (?)^2 = 171 \times 76$

$\Rightarrow \quad ? = \sqrt{171\times76}$

$\Rightarrow \quad ? = \sqrt{12996}$

$\Rightarrow \quad ? = 114$

59. (d) $(72)^2 + (61)^2 = (199)^2 - (?)^2 - 420$

$(?)^2 = (199)^2 - 420 - (72)^2 - (61)^2$

$(?)^2 = 39601 - 420 - 5184 - 3721$

$(?)^2 = 39601 - 9325$

$(?) = \sqrt{30276} = 174$

60. (b) $\frac{?}{944}=\frac{59}{?}$

$(?) = 944 \times 59 = 55696$

$? = \sqrt{55696} = 236$

61. (d) $\sqrt[3]{4913} + 349 = \frac{?}{21}$

$\Rightarrow \quad (17 + 349) \times 21 = ?$

$\Rightarrow \quad ? = 366 \times 21 = 7686 \approx 7680$

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62. (b) $\sqrt{6400} \times 35 = 80 \times 35 = 2800$

63. (d) $? = \sqrt[3]{1331}$

$= \sqrt[3]{11 \times 11 \times 11}$

$= 11$

64. (c) $\sqrt{24^4} + 224 = ? \times 202$

$\Rightarrow 24^2 + 224 = ? \times 400$

$\Rightarrow 576 + 224 = ? \times 400$

$\Rightarrow 800 = ? \times 400$

$\Rightarrow ? = \frac{800}{400} = 2$

65. (a) $\frac{?}{576} = \frac{256}{?}$

$\Rightarrow ?^2 = 256 \times 576$

$\Rightarrow ? = \sqrt{256 \times 576}$

$= 16 \times 24 = 384$

66. (c) $\frac{?}{432} = \frac{243}{?}$

$\Rightarrow (?)^2 = 432 \times 243$

$? = \sqrt{104976} = 324.$

68. (c) $(?)^3 = 4913$

$(?)^3 = (17)^3$

$\therefore ? = 17$

69. (b) $348 \div 29 \times 15 \div 156 = (?)^3 + 120$

$\Rightarrow 12 \times 15 + 156 = (?)^3 + 120$

$\Rightarrow 180 + 156 - 120 = (?)^3$

$\Rightarrow 216 = (?)^3$

$\Rightarrow (6)^3 = (?)^3$

$\therefore ? = 6$

70. (c) $(4 \times 4)^3 \div (512 \div 8)^4 \times (32 \times 8)^4 = (2 \times 2)^{?+4}$

$\Rightarrow (16)^3 \div (64)^4 \times (256)^4 = (4)^{?+4}$

$\Rightarrow (4)^{2\times3} \div (4)^{3\times4} \times (4)^{4\times4} = (4)^{?+4}$

$\Rightarrow (4)^6 \div (4)^{12} \times (4)^{16} = (4)^{?+4}$

$\Rightarrow (4)^{6-2+16} = (4)^{?+4}$

$\Rightarrow (4)^{10} = (4)^{?+4}$

$\Rightarrow 10 = ? + 4$

$\therefore ? = 6$

71. (d) $\left(2\sqrt{392} - 21\right) + \left(\sqrt{8} - 7\right)^2 = (?)^2$

$\Rightarrow \left(2 \times 14\sqrt{2} - 21\right) + \left(\sqrt{8} - 7\right)^2 = (?)^2$

$\Rightarrow 28\sqrt{2} - 21 + \left(\sqrt{8}\right)^2 - 2 \times \sqrt{8} \times 7 + (7)^2 = (?)^2$

$\Rightarrow 28\sqrt{2} - 21 + 8 - 28\sqrt{2} + 49 = (?)^2$

$\Rightarrow -21 + 8 + 49 = (?)^2$

$\Rightarrow 36 = (?)^2$

$\therefore ? = 6$

72. (a) $(?)^3 + \sqrt{8} - 340 = (\sqrt{8} \times \sqrt{8})^{\frac{1}{2}} + (9)^{\frac{1}{2}}$

$\Rightarrow (?)^3 + \sqrt{8} - 340 = \sqrt{8} + 3$

$\Rightarrow (?)^3 = \sqrt{8} + 3 - \sqrt{8} + 340$

$\Rightarrow (?)^3 = 343$

$\Rightarrow ? = \sqrt[3]{343}$

$\Rightarrow ? = 7$

73. (c) Suppose, that first number = x

and the second number = y

Then,

$8^2 - y^2 = 15$

$\Rightarrow 64 - y^2 = 15$

$\Rightarrow y^2 = 49$

$\Rightarrow y = \sqrt{49} = 7$

Again,

$x^2 + y^3 = 568$

$\Rightarrow x^2 + 7^3 = 568$ (on putting value $y = 7$)

$\Rightarrow x^2 + 343 = 568$

$\Rightarrow x^2 = 225$

$\Rightarrow x = \sqrt{225} = 15$

Hence, $\frac{3}{5}$ of the first number

$= \frac{3}{5} \times 15$

$= 9$

74. (d) $(?)^3 = 729$

$(?)^3 = (9)^3$

$? = 9$

75. (d) $? = \sqrt{2809} = \sqrt{53 \times 53} = 53$

76. (a) $(2 + \sqrt{2}) + \frac{1}{(2 + \sqrt{2})} + \frac{1}{(2 - \sqrt{2})}$

$= \frac{2(2 + \sqrt{2}) + (2 - \sqrt{2}) + (2 + \sqrt{2})}{(2 + \sqrt{2})(2 - \sqrt{2})}$

$= \frac{2(2 + \sqrt{2}) + 4}{2}$

$= (2 + \sqrt{2}) + 2$

$= 4 + \sqrt{2}$

77. (a) $\sqrt{0.09} = 0.3$

78. (a) $\sqrt{1 + \frac{x}{961}} = \frac{31}{32}$

On squaring both the sides, we get

$\Rightarrow 1 + \frac{x}{961} = \left(\frac{32}{31}\right)^2$

$\Rightarrow 1 + \frac{x}{961} = \frac{1024}{961},$

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$$\Rightarrow \quad \frac{x}{961}=\frac{1024}{961}-1$$

$$\Rightarrow \quad \frac{x}{961}=\frac{1024}{961}-961$$

$$\Rightarrow \quad \frac{x}{961}=\frac{63}{961}$$

$$\Rightarrow \quad 961x = 63 \times 961$$

$$\Rightarrow \quad x=\frac{63\times 961}{961}=63$$

79. (b) $\sqrt{1+\frac{x}{9}}=\frac{13}{3}$

On squaring both the sides, we get

$$1+\frac{x}{9}=\frac{169}{9}$$

$$\Rightarrow \quad \frac{x}{9}=\frac{169-9}{9}=\frac{160}{9}$$

$$\Rightarrow \quad x=\frac{160}{9}\times 9 = 160$$

80. (d) L.H.S. $=\frac{4\sqrt{3}+5\sqrt{2}}{\sqrt{48}+\sqrt{18}}$

$$=\frac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}$$

On rationalizing the denominators,

$$=\frac{4\sqrt{3}+5\sqrt{2}}{4\sqrt{3}+3\sqrt{2}}\times\frac{4\sqrt{3}-3\sqrt{2}}{4\sqrt{3}-3\sqrt{2}}$$

$$=\frac{16\times 3-12\sqrt{6}+20\sqrt{6}-15\times 2}{(4\sqrt{3})^2-(3\sqrt{2})^2}$$

$$=\frac{48+8\sqrt{6}-30}{48-18}$$

$$=\frac{48+8\sqrt{6}}{30}=\frac{9}{15}+\frac{4\sqrt{6}}{15}$$

$$=\frac{3}{5}+\frac{4\sqrt{6}}{15}$$

Therefore,

$$=\frac{3}{5}+\frac{4\sqrt{6}}{15}$$

$$= a+b\sqrt{6}$$

$$\Rightarrow \quad a=\frac{3}{5} \quad \text{and} \quad b=\frac{4}{15}$$

81. (a) $a = 64$ and $b = 289$

$$\therefore \quad \sqrt{a}=\sqrt{64}=8 \text{ and } \sqrt{b}=\sqrt{289}=17$$

$$\therefore \quad \left(\sqrt{\sqrt{a}+\sqrt{b}}-\sqrt{\sqrt{b}-\sqrt{a}}\right)^{\frac{1}{2}}$$

$$=\left(\sqrt{8+17}-\sqrt{17-8}\right)^{\frac{1}{2}}$$

$$=\left(\sqrt{25}-\sqrt{9}\right)^{\frac{1}{2}}=(5-3)^{\frac{1}{2}}=(2)^{\frac{1}{2}}$$

82. (c) $\sqrt{x}=\sqrt{3}-\sqrt{5}$

On squaring both sides, we have

$$x=3+5-2\sqrt{15}$$

$$\Rightarrow x-8=-2\sqrt{15}$$

Squaring again, we have

$$x^2 - 16x + 64 = 60$$

$$\Rightarrow \quad x^2 - 16x + 4 = 0$$

$$\therefore \quad x^2 - 16x + 6 = 2$$

83. (b) $2.\sqrt[3]{40}=2.\sqrt[3]{2\times 2\times 2\times 5}=4\sqrt[3]{5}$

$$4.\sqrt[3]{320}=4.\sqrt[3]{2\times 2\times 2\times 2\times 2\times 2\times 5}$$

$$=16.\sqrt[3]{5}$$

$$3.\sqrt[3]{625}=3.\sqrt[3]{5\times 5\times 5\times 5}=15.\sqrt[3]{5}$$

$$\therefore \quad \text{Expression} = 4.\sqrt[3]{5}-15\sqrt[3]{5}+15.\sqrt[3]{5}-3.\sqrt[3]{5}$$

$$=19.\sqrt[3]{5}-19\sqrt[3]{5}=0$$

84. (b) Given expression

$$=\frac{(0.75)^3}{(1-0.75)}+[0.75+(0.75)^2+1]$$

$$=\frac{(0.75)^3+(1-0.75)[(0.75)^2+0.75\times 1+1^2]}{1-0.75}$$

$$=\frac{(0.75)^3+1^3-(0.75)^3}{0.25} \quad \left[\because \quad (a-b)(a^2+ab+b^2) = a^3-b^3\right]$$

$$=\frac{1}{0.25}=\frac{100}{25}=4$$

$$\therefore \quad \text{Required square root} = \sqrt{4}=2$$

85. (b) $\sqrt{4096}=64$

$$\therefore \quad \sqrt{40.96}=\sqrt{\frac{4096}{100}}=\frac{64}{10}=6.4 \text{ and}$$

$$\sqrt{0.004096}=\sqrt{\frac{4096}{1000000}}=\frac{64}{1000}=0.064$$

$$\therefore \quad \text{expression} = 64 + 6.4 + 0.064 = 70.464$$

86. (d) $\because \quad a^2 = 2 \quad \Rightarrow \quad a=\sqrt{2}$

$$\therefore \quad a+1=\sqrt{2}+1$$

$$=(\sqrt{2}+1)\times\frac{(\sqrt{2}-1)^2}{(\sqrt{2}-1)^2}$$

$$=\frac{[(\sqrt{2}+1)\times(\sqrt{2}-1)](\sqrt{2}-1)}{2+1-2\sqrt{2}}$$

$$=\frac{\sqrt{2}-1}{3-2\sqrt{2}}=\frac{a-1}{3-2a}$$

87. (b) $\text{Expression}=\frac{(0.75)^3}{1-0.75}+[0.75+(0.75)^2+1]$

Let, $0.75 = a$

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Now, expression becomes $= \frac{a^3}{1-a} + (a + a^2 + 1)$

[Here, $1 - a^3 = (1 - a) = (a^2 + a + 1)$

and, $a^2 + a + 1 = \frac{1-a^3}{1-a}$]

$\therefore$ Expression $= \frac{a^3}{(1-a)} + \frac{1-a^3}{(1-a)} = \frac{1}{1-a}$

$= \frac{1}{1-0.75} = \frac{1}{1-3/4} = 4$

Again, required square root $= \sqrt{4} = 2$

88. (c) The given expression $= \sqrt[3]{(13.608)^2 - (13.392)^2}$

$= \sqrt[3]{(13.608 + 13.392) \times (13.608 - 13.392)}$

$= \sqrt[3]{27 \times (.216)} = \sqrt[3]{3^3 \times (0.6)^3}$

$= 3 \times 0.6 = 1.8$

89. (a) $\frac{9.5 \times 0.0085 \times 18.9}{0.0017 \times 1.9 \times 2.1} = \frac{95 \times 85 \times 189}{17 \times 19 \times 21}$

$= 5 \times 5 \times 9 = 225$

$\therefore$ Required square root $= \sqrt{225} = 15$

90. (b) Note that in these types of surds, the largest surd is $\left(\sqrt{5} - \sqrt{3}\right)$ because it has small numbers but biggest difference between them. (Always remember)

$\therefore \sqrt{3} - \sqrt{1} > \sqrt{5} - \sqrt{3} > \sqrt{7} - \sqrt{5} > \sqrt{9} - \sqrt{7} > \sqrt{11} - \sqrt{9}$

91. (a) $? = \sqrt{1000000.000001} \approx \sqrt{1000 \times 1000} = 1000$

92. (a) $? = \left[\left(5\sqrt{7} + \sqrt{7}\right) \times \left(4\sqrt{7} + 8\sqrt{7}\right)\right] - (19)^2$

$= [20 \times 7 + 4 \times 7 + 8 \times 7 + 40 \times 7] - 361$

$= [140 + 28 + 56 + 280] - 361$

$= 504 - 361 = 143$

93. (e) or, $38 \times 37.8 = (?)^2$ $(\because 37.8 \approx 38)$

or, $38 \times 38 = (?)^2$

$\therefore \quad ? = \sqrt{38 \times 38} = 38$

or, $(?)^2 + (37)^2 = 182 \times 51 - (83)^2$

or, $(?)^2 + 1369 = 9282 - 6889 = 2393$

or, $(?)^2 = 2393 - 1369 = 1024$

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

94. (c) $? = 8787 \div 343 \times \sqrt{50}$

$= 25.61 \times 7.07 = 181.09 \approx 180$

95. (b) $\sqrt[3]{54881} \times (303 \div 8) = (?)^2$

or, $38 \times 37.8 = (?)^2$ $(\because 37.8 \approx 38)$

or, $38 \times 38 = (?)^2$

$\therefore \quad ? = \sqrt{38 \times 38} = 38$

96. (c) $[\sqrt{8}(3+1) \times \sqrt{8}(8+7)] - 98$

$= [4\sqrt{8} \times 15 \times \sqrt{8}] - 98$

$= [60 \times 8] - 98 = 480 - 98 = 382$

97. (b) $\sqrt{11449} \times \sqrt{6241} - (54)^2 - (74)^2 = \sqrt{?}$

or, $\sqrt{?} = [107 \times 79] - 2916 - 5476$

$= 8453 - 2916 - 5476 = 61$

or, $? = (61)^2 = 3721$

98. (b) $\sqrt{6354} \times 34.993 = 80 \times 35 = 2800$

99. (e) $17 + 349 = ? \div 21$

or, $366 \times 21 = ?$

or, $? = 7686 \approx 7680.$

100. (d) $(15)^2 \times \sqrt{730} = 225 \times 27 = 6075$

101. (c) $? = 73.86 \times 46.04 \div 21.44$

$\Rightarrow \quad ? = 74 \times 46 \div 22$

$\Rightarrow \quad ? = 154.7 \approx 160$

102. (e)

I. $\sqrt{25x^2} - 125 = 0$

$\Rightarrow \quad \sqrt{25x^2} = 125$

$\Rightarrow \quad x^2 = \frac{125 \times 125}{25} = 625$

$\therefore \quad x = \sqrt{625} = \pm 25$

II. $\sqrt{361}y + 95 = 0$

$\Rightarrow \quad 19y = -95$

$\Rightarrow \quad y = -5$

Hence, relationship between x and y cannot be established.

103. (c)

I. $\frac{5}{7} - \frac{5}{21} = \frac{\sqrt{x}}{42}$

$\Rightarrow \quad \frac{15-5}{21} = \frac{\sqrt{x}}{42}$

$\Rightarrow \quad \sqrt{x} = \frac{10}{21} \times 42 = 20$

$\therefore \quad x = 20 \times 20 = 400$

II. $\frac{\sqrt{y}}{4} + \frac{\sqrt{y}}{16} = \frac{250}{\sqrt{y}}$

$\Rightarrow \quad \frac{4\sqrt{y} + \sqrt{y}}{16} = \frac{250}{\sqrt{y}}$

$\Rightarrow \quad 5\sqrt{y} \times \sqrt{y} = 250 \times 16$

$\Rightarrow \quad y = \frac{250 \times 16}{5} = 800$

Hence, $y > x$.

104. (a)

I. $(625)^{\frac{1}{4}}x + \sqrt{1225} = 155$

$\Rightarrow \quad (5^4)^{\frac{1}{4}}x + 35 = 155$

$\Rightarrow \quad 5x = 155 - 35$

$\Rightarrow \quad 5x = 120$

$\Rightarrow \quad x = \frac{120}{5} = 24$

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II. $\sqrt{196}y + 13 = 279$

$\Rightarrow \quad 14y = 279 - 13 = 266$

$\Rightarrow \quad y = \dfrac{266}{14} = 19$

Hence, $x > y$.

105. (a)

I. $5x^2 - 18x + 9 = 0$

$\Rightarrow \quad 5x^2 - 15x - 3x + 9 = 0$

$\Rightarrow \quad 5x(x-3) - 3(x-3) = 0$

$\Rightarrow \quad (5x-3)(x-3)$

$\Rightarrow \quad x = \dfrac{3}{5}$ or 3

II. $3y^2 + 5y - 2 = 0$

$\Rightarrow \quad 3y^2 + 6y - y - 2 = 0$

$\Rightarrow \quad 3y(y+2) - 1(y+2) = 0$

$\Rightarrow \quad (3y-1)(y+2) = 0$

$\Rightarrow \quad y = \dfrac{1}{3}$ or -2

Hence, $x > y$.

106. (c)

I. $\dfrac{13}{\sqrt{x}} + \dfrac{9}{\sqrt{x}} = \sqrt{x}$

$\Rightarrow \quad 13 + 9 = \sqrt{x} \times \sqrt{x} = x$

$\Rightarrow \quad x = 22$

II. $y^4 - \dfrac{(13 \times 2)^{\frac{9}{2}}}{\sqrt{y}} = 0$

$\Rightarrow \quad y^{\frac{9}{2}} = (26)^{\frac{9}{2}}$

$\Rightarrow \quad y = 26$

Hence, $x < y$.

107. (e) $\sqrt{25 \times 14 - 42 + (4)^{?}} = 18$

$\Rightarrow (4)^{?} = (18)^2 - 308$

$\Rightarrow (4)^{?} = 324 - 308 = 16$

$\Rightarrow ? = 2$

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