5. SQUARE ROOTS AND CUBE ROOTS

IMPORTANT FACTS AND FORMULAE

Square Root : If $x^2 = y$, we say that the square root of y is x and we write, $\sqrt{y} = x$.

Thus, $\sqrt{4} = 2$, $\sqrt{9} = 3$, $\sqrt{196} = 14$.

Cube Root : The cube root of a given number x is the number whose cube is x. We denote the cube root of x by $\sqrt[3]{x}$.

Thus, $\sqrt[3]{8} = \sqrt[3]{2\times2\times2} = 2$, $\sqrt[3]{343} = \sqrt[3]{7\times7\times7} = 7$ etc.

Note :

1. $\sqrt{xy} = \sqrt{x} \times \sqrt{y}$

2. $\sqrt{\frac{x}{y}} = \frac{\sqrt{x}}{\sqrt{y}} = \frac{\sqrt{x}}{\sqrt{y}} \times \frac{\sqrt{y}}{\sqrt{y}} = \frac{\sqrt{xy}}{y}$.

SOLVED EXAMPLES

Ex. 1. ***Evaluate $\sqrt{6084}$ by factorization method.***

Sol. **Method :** Express the given number as the product of prime factors. Now, take the product of these prime factors choosing one out of every pair of the same primes. This product gives the square root of the given number.

Thus, resolving 6084 into prime factors, we get :

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

$\therefore \quad \sqrt{6084} = (2\times3\times13) = 78.$

2	6084
2	3042
3	1521
3	507
13	169
	13

Ex. 2. ***Find the square root of 1471369.***

Sol. **Explanation :** In the given number, mark off the digits in pairs starting from the unit's digit. Each pair and the remaining one digit is called a period.

Now, $1^2 = 1$. On subtracting, we get 0 as remainder.

Now, bring down the next period *i.e.*, 47.

Now, trial divisor is $1 \times 2 = 2$ and trial dividend is 47.

So, we take 22 as divisor and put 2 as quotient.

The remainder is 3.

Next, we bring down the next period which is 13.

Now, trial divisor is $12 \times 2 = 24$ and trial dividend is 313. So, we take 241 as dividend and 1 as quotient.

The remainder is 72.

Bring down the next period *i.e.*, 69.

Now, the trial divisor is $121 \times 2 = 242$ and the trial dividend is 7269. So, we take 3 as quotient and 2423 as divisor. The remainder is then zero.

1	$\overline{14}\,\overline{71}\,\overline{36}\,\overline{9}$	(1213
	1	
22	47	
	44	
241	313	
	241	
2423	7269	
	7269	
	×	

Hence, $\sqrt{1471369} = 1213$.

Ex. 3. ***Evaluate*** $: \sqrt{248+\sqrt{51+\sqrt{169}}}$.

Sol. Given expression $= \sqrt{248+\sqrt{51+13}} = \sqrt{248+\sqrt{64}} = \sqrt{248+8} = \sqrt{256} = 16.$

Ex. 4. ***If*** $a*b*c = \dfrac{\sqrt{(a+2)(b+3)}}{c+1}$, ***then find the value of*** $6*15*3$.

Sol. $6*15*3 = \dfrac{\sqrt{(6+2)(15+3)}}{3+1} = \dfrac{\sqrt{8\times 18}}{4} = \dfrac{\sqrt{144}}{4} = \dfrac{12}{4} = 3.$

Ex. 5. ***Find the value of*** $\sqrt{1\dfrac{9}{16}}$.

Sol. $\sqrt{1\dfrac{9}{16}} = \sqrt{\dfrac{25}{16}} = \dfrac{\sqrt{25}}{\sqrt{16}} = \dfrac{5}{4} = 1\dfrac{1}{4}.$

Ex. 6. ***What is the square root of 0.0009 ?***

Sol. $\sqrt{0.0009} = \sqrt{\dfrac{9}{10000}} = \dfrac{\sqrt{9}}{\sqrt{10000}} = \dfrac{3}{100} = 0.03.$

Ex. 7. ***Evaluate*** $\sqrt{175.2976}$.

Sol. **Method :** We make even number of decimal places by affixing a zero, if necessary. Now, we mark off periods and extract the square root as shown.

$\therefore \sqrt{175.2976} = 13.24.$

```
 1   | 1̄75.2̄9̄76 ( 13.24
     | 1
-----+-----------
 23  | 75
     | 69
-----+-----------
 262 | 629
     | 524
-----+-----------
 2644| 10576
     | 10576
-----+-----------
     | ×
-----+-----------
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Ex. 8. ***What will come in place of question mark in each of the following questions?***

(*i*) $\sqrt{\dfrac{32.4}{?}} = 2$ (*ii*) $\sqrt{86.49}+\sqrt{5+(?)^2} = 12.3.$ **(R.R.B. 2002)**

Sol. (*i*) Let $\sqrt{\dfrac{32.4}{x}} = 2$. Then, $\dfrac{32.4}{x} = 4 \Leftrightarrow 4x = 32.4 \Leftrightarrow x = 8.1.$

(*ii*) Let $\sqrt{86.49}+\sqrt{5+x^2} = 12.3.$

Then, $9.3+\sqrt{5+x^2} = 12.3 \Leftrightarrow \sqrt{5+x^2} = 12.3-9.3 = 3$

$\Leftrightarrow 5+x^2 = 9 \Leftrightarrow x^2 = 9-5 = 4 \Leftrightarrow x = \sqrt{4} = 2.$

Ex. 9. ***Find the value of*** $\sqrt{\dfrac{0.289}{0.00121}}$. **(IGNOU, 2003)**

Sol. $\sqrt{\dfrac{0.289}{0.00121}} = \sqrt{\dfrac{0.28900}{0.00121}} = \sqrt{\dfrac{28900}{121}} = \dfrac{170}{11}.$

Ex. 10. ***If*** $\sqrt{1+\dfrac{x}{144}} = \dfrac{13}{12}$, ***then find the value of*** x.

Sol. $\sqrt{1+\frac{x}{144}} = \frac{13}{12} \Rightarrow \left(1+\frac{x}{144}\right) = \left(\frac{13}{12}\right)^2 = \frac{169}{144} \Rightarrow \frac{x}{144} = \frac{169}{144} - 1$

$\Rightarrow \frac{x}{144} = \frac{25}{144} \Rightarrow x = 25.$

Ex. 11. ***Find the value of $\sqrt{3}$ upto three places of decimal.***

Sol.

1	$\overline{3.00}\,\overline{00}\,\overline{00}$ (1.732
	1
27	200
	189
343	1100
	1029
3462	7100
	6924

$\therefore \sqrt{3} = 1.732.$

Ex. 12. ***If $\sqrt{3} = 1.732$, find the value of $\sqrt{192} - \frac{1}{2}\sqrt{48} - \sqrt{75}$ correct to 3 places of decimal.*** **(S.S.C. 2004)**

Sol. $\sqrt{192} - \frac{1}{2}\sqrt{48} - \sqrt{75} = \sqrt{64\times 3} - \frac{1}{2}\sqrt{16\times 3} - \sqrt{25\times 3} = 8\sqrt{3} - \frac{1}{2}\times 4\sqrt{3} - 5\sqrt{3}$

$= 3\sqrt{3} - 2\sqrt{3} = \sqrt{3} = 1.732.$

Ex. 13. ***Evaluate :*** $\sqrt{\frac{9.5\times .0085\times 18.9}{.0017\times 1.9\times 0.021}}$.

Sol. Given exp. $= \sqrt{\frac{9.5\times .0085\times 18.900}{.0017\times 1.9\times 0.021}}$.

Now, since the sum of decimal places in the numerator and denominator under the radical sign is the same, we remove the decimal.

$\therefore$ Given exp. $= \sqrt{\frac{95\times 85\times 18900}{17\times 19\times 21}} = \sqrt{5\times 5\times 900} = 5\times 30 = 150.$

Ex. 14. ***Simplify :*** $\sqrt{[(12.1)^2 - (8.1)^2] \div [(0.25)^2 + (0.25)(19.95)]}$. **(C.B.I. 2003)**

Sol. Given exp. $= \sqrt{\frac{(12.1+8.1)(12.1-8.1)}{(0.25)(0.25+19.95)}} = \sqrt{\frac{20.2\times 4}{0.25\times 20.2}}$

$= \sqrt{\frac{4}{0.25}} = \sqrt{\frac{400}{25}} = \sqrt{16} = 4.$

Ex. 15. ***If $x = 1+\sqrt{2}$ and $y = 1-\sqrt{2}$, find the value of (x^2+y^2).***

Sol. $x^2 + y^2 = (1+\sqrt{2})^2 + (1-\sqrt{2})^2 = 2[(1)^2 + (\sqrt{2})^2] = 2\times 3 = 6.$

Ex. 16. ***Evaluate $\sqrt{0.9}$ upto 3 places of decimal.*** **(R.R.B. 2003)**

Sol.

9	$0.\overline{90}\,\overline{00}\,\overline{00}$ (.948
	81
184	900
	736
1888	16400
	15104

$\therefore \sqrt{0.9} = 0.948.$

Ex. 17. *If $\sqrt{15} = 3.88$, find the value of $\sqrt{\frac{5}{3}}$.* (S.S.C. 2003)

Sol. $\sqrt{\frac{5}{3}} = \sqrt{\frac{5\times 3}{3\times 3}} = \frac{\sqrt{15}}{3} = \frac{3.88}{3} = 1.2933..... = 1.29\overline{3}.$

Ex. 18. *Find the least square number which is exactly divisible by 10, 12, 15 and 18.*

Sol. L.C.M. of 10, 12, 15, 18 = 180. Now, $180 = 2 \times 2 \times 3 \times 3 \times 5 = 2^2 \times 3^2 \times 5$.

To make it a perfect square, it must be multiplied by 5.

$\therefore$ Required number $= (2^2 \times 3^2 \times 5^2) = 900$.

Ex. 19. *Find the greatest number of five digits which is a perfect square.* (R.R.B. 1998)

Sol. Greatest number of 5 digits is 99999.

3	$\overline{9}\,\overline{99}\,\overline{99}$	(316
	9	
61	99	
	61	
626	3899	
	3756	
	143	

$\therefore$ Required number $= (99999 - 143) = 99856$.

Ex. 20. *Find the smallest number that must be added to 1780 to make it a perfect square.*

Sol.

4	$\overline{17}\,\overline{80}$	(42
	16	
82	180	
	164	
	16	

$\therefore$ Number to be added $= (43)^2 - 1780 = 1849 - 1780 = 69$.

Ex. 21. *If $\sqrt{2} = 1.4142$, find the value of $\frac{\sqrt{2}}{(2+\sqrt{2})}$.*

Sol. $\frac{\sqrt{2}}{(2+\sqrt{2})} = \frac{\sqrt{2}}{(2+\sqrt{2})} \times \frac{(2-\sqrt{2})}{(2-\sqrt{2})} = \frac{2\sqrt{2}-2}{(4-2)} = \frac{2(\sqrt{2}-1)}{2} = (\sqrt{2}-1) = (1.4142 - 1) = 0.4142.$

Ex. 22. *If $x = \left(\frac{\sqrt{5}+\sqrt{3}}{\sqrt{5}-\sqrt{3}}\right)$ and $y = \left(\frac{\sqrt{5}-\sqrt{3}}{\sqrt{5}+\sqrt{3}}\right)$, find the value of $(x^2 + y^2)$.*

Sol. $x = \frac{(\sqrt{5}+\sqrt{3})}{(\sqrt{5}-\sqrt{3})} \times \frac{(\sqrt{5}+\sqrt{3})}{(\sqrt{5}+\sqrt{3})} = \frac{(\sqrt{5}+\sqrt{3})^2}{(5-3)} = \frac{5+3+2\sqrt{15}}{2} = 4 + \sqrt{15}.$

$y = \frac{(\sqrt{5}-\sqrt{3})}{(\sqrt{5}+\sqrt{3})} \times \frac{(\sqrt{5}-\sqrt{3})}{(\sqrt{5}-\sqrt{3})} = \frac{(\sqrt{5}-\sqrt{3})^2}{(5-3)} = \frac{5+3-2\sqrt{15}}{2} = 4 - \sqrt{15}.$

$\therefore$ $x^2 + y^2 = (4+\sqrt{15})^2 + (4-\sqrt{15})^2 = 2[(4)^2 + (\sqrt{15})^2] = 2 \times 31 = 62.$

Ex. 23. ***Find the cube root of 2744.***

Sol. **Method :** Resolve the given number as the product of prime factors and take the product of prime factors, choosing one out of three of the same prime factors. Resolving 2744 as the product of prime factors, we get :

$2744 = 2^3 \times 7^3$.

$\therefore \quad \sqrt[3]{2744} = 2 \times 7 = 14.$

2	2744
2	1372
2	686
7	343
7	49
	7

Ex. 24. ***By what least number 4320 be multiplied to obtain a number which is a perfect cube ?***

Sol. Clearly, $4320 = 2^3 \times 3^3 \times 2^2 \times 5$.

To make it a perfect cube, it must be multiplied by 2×5^2 *i.e.*, 50.

EXERCISE 5

(OBJECTIVE TYPE QUESTIONS)

Directions : ***Mark (✓) against the correct answer :***

1. $\sqrt{53824} = ?$ **(Bank P.O. 2003)**
   (a) 202 (b) 232 (c) 242 (d) 332

2. The square root of 64009 is : **(R.R.B. 2003)**
   (a) 253 (b) 347 (c) 363 (d) 803

3. The value of $\sqrt{10 + \sqrt{25 + \sqrt{108 + \sqrt{154 + \sqrt{225}}}}}$ is : **(S.S.C. 1998)**
   (a) 4 (b) 6 (c) 8 (d) 10

4. Evaluate : $\sqrt{41 - \sqrt{21 + \sqrt{19 - \sqrt{9}}}}$. **(C.B.I. 1997)**
   (a) 3 (b) 5 (c) 6 (d) 6.4

5. $\sqrt{176 + \sqrt{2401}}$ is equal to :
   (a) 14 (b) 15 (c) 18 (d) 24

6. $\left(\frac{\sqrt{625}}{11} \times \frac{14}{\sqrt{25}} \times \frac{11}{\sqrt{196}}\right)$ is equal to : **(S.S.C. 2000)**
   (a) 5 (b) 6 (c) 8 (d) 11

7. $\left(\sqrt{\frac{225}{729}} - \sqrt{\frac{25}{144}}\right) \div \sqrt{\frac{16}{81}} = ?$
   (a) $\frac{1}{48}$ (b) $\frac{5}{48}$ (c) $\frac{5}{16}$ (d) None of these

8. The square root of $(272^2 - 128^2)$ is : **(S.S.C. 2000)**
   (a) 144 (b) 200 (c) 240 (d) 256

9. If $x * y = x + y + \sqrt{xy}$, the value of $6 * 24$ is : **(C.B.I. 1998)**
   (a) 41 (b) 42 (c) 43 (d) 44

10. If $y = 5$, then what is the value of $10y\sqrt{y^3 - y^2}$? **(R.R.B. 1998)**
    (a) $50\sqrt{2}$ (b) 100 (c) $200\sqrt{5}$ (d) 500

11. $\sqrt{110\frac{1}{4}} = ?$
(a) 10.25 (b) 10.5 (c) 11.5 (d) 19.5

12. $\sqrt{\frac{25}{81} - \frac{1}{9}} = ?$ (Hotel Management, 2002)
(a) $\frac{2}{3}$ (b) $\frac{4}{9}$ (c) $\frac{16}{81}$ (d) $\frac{25}{81}$

13. The digit in the unit's place in the square root of 15876 is : (S.S.C. 2000)
(a) 2 (b) 4 (c) 6 (d) 8

14. How many two-digit numbers satisfy this property : The last digit (unit's digit) of the square of the two-digit number is 8 ? (R.R.B. 2001)
(a) 1 (b) 2 (c) 3 (d) None of these

15. What is the square root of 0.16 ? (P.C.S. 1998)
(a) 0.004 (b) 0.04 (c) 0.4 (d) 4

16. The value of $\sqrt{0.000441}$ is : (S.S.C. 2002)
(a) 0.00021 (b) 0.0021 (c) 0.021 (d) 0.21

17. $\sqrt{0.00004761}$ equals : (C.B.I. 2003)
(a) 0.00069 (b) 0.0069 (c) 0.0609 (d) 0.069

18. $1.5^2 \times \sqrt{0.0225} = ?$ (Bank P.O. 2002)
(a) 0.0375 (b) 0.3375 (c) 3.275 (d) 32.75

19. $\sqrt{0.01 + \sqrt{0.0064}} = ?$
(a) 0.03 (b) 0.3 (c) 0.42 (d) None of these

20. The value of $\sqrt{0.01} + \sqrt{0.81} + \sqrt{1.21} + \sqrt{0.0009}$ is : (S.S.C. 2002)
(a) 2.03 (b) 2.1 (c) 2.11 (d) 2.13

21. $\sqrt{.0025} \times \sqrt{2.25} \times \sqrt{.0001} = ?$ (Hotel Management, 1998)
(a) .000075 (b) .0075 (c) .075 (d) None of these

22. $\sqrt{1.5625} = ?$ (S.B.I.P.O. 2003)
(a) 1.05 (b) 1.25 (c) 1.45 (d) 1.55

23. If $\sqrt{.00000676} = .0026$, the square root of 67,60,000 is :
(a) $\frac{1}{26}$ (b) 26 (c) 260 (d) 2600

24. If $\sqrt{18225} = 135$, then the value of
$(\sqrt{182.25} + \sqrt{1.8225} + \sqrt{0.018225} + \sqrt{0.00018225})$ is :
(a) 1.49985 (b) 14.9985 (c) 149.985 (d) 1499.85

25. Given that $\sqrt{13} = 3.605$ and $\sqrt{130} = 11.40$, find the value of $\sqrt{1.3} + \sqrt{1300} + \sqrt{0.013}$.
(a) 36.164 (b) 36.304 (c) 37.164 (d) 37.304 (S.S.C. 1999)

26. If $\frac{52}{x} = \sqrt{\frac{169}{289}}$, the value of x is : (C.B.I. 1998)
(a) 52 (b) 58 (c) 62 (d) 68

27. For what value of * the statement $\left(\frac{*}{15}\right)\left(\frac{*}{135}\right) = 1$ is true ? (S.S.C. 2002)

(a) 15 (b) 25 (c) 35 (d) 45

28. Which number can replace both the question marks in the equation $\frac{4\frac{1}{2}}{?} = \frac{?}{32}$.

(a) 1 (b) 7 (c) $7\frac{1}{2}$ (d) None of these

(Hotel Management, 2000)

29. What should come in place of both the question marks in the equation $\frac{?}{\sqrt{128}} = \frac{\sqrt{162}}{?}$.

(a) 12 (b) 14 (c) 144 (d) 196

(Bank P.O. 1999)

30. If $0.13 \div p^2 = 13$, then p equals : (S.S.C. 2000)

(a) 0.01 (b) 0.1 (c) 10 (d) 100

31. What number should be divided by $\sqrt{0.25}$ to give the result as 25 ?

(a) 12.5 (b) 25 (c) 50 (d) 125

(C.B.I. 2003)

32. If $\sqrt{3^n} = 729$, then the value of n is : (Section Officers', 2003)

(a) 6 (b) 8 (c) 10 (d) 12

33. If $\sqrt{18 \times 14 \times x} = 84$, then x equals :

(a) 22 (b) 24 (c) 28 (d) 32

34. $28\sqrt{?} + 1426 - \frac{3}{4}$ of 2872 (B.S.R.B. 1998)

(a) 576 (b) 676 (c) 1296 (d) 1444

35. $\sqrt{\frac{?}{169}} = \frac{54}{39}$

(a) 108 (b) 324 (c) 2916 (d) 4800

36. If $\sqrt{x} \div \sqrt{441} = 0.02$, then the value of x is : (S.S.C. 1999)

(a) 0.1764 (b) 1.764 (c) 1.64 (d) 2.64

37. $\sqrt{\frac{.0196}{?}} = 0.2$ (Hotel Management, 1999)

(a) 0.49 (b) 0.7 (c) 4.9 (d) None of these

38. $\sqrt{0.0169 \times ?} = 1.3$ (Hotel Management, 2001)

(a) 10 (b) 100 (c) 1000 (d) None of these

39. If $\sqrt{1369} + \sqrt{.0615 + x} = 37.25$, then x is equal to : (Hotel Management, 1998)

(a) 10^{-1} (b) 10^{-2} (c) 10^{-3} (d) None of these

40. If $\sqrt{(x-1)(y+2)} = 7$, x and y being positive whole numbers, then the values of x and y respectively are :

(a) 8, 5 (b) 15, 12 (c) 22, 19 (d) None of these

41. If $\sqrt{.04 \times .4 \times a} = .004 \times .4 \times \sqrt{b}$, then $\frac{a}{b}$ is :

(a) 16×10^{-3} (b) 16×10^{-4} (c) 16×10^{-5} (d) None of these

42. Three-fifth of the square of a certain number is 126.15. What is the number ?
(a) 14.5 (b) 75.69 (c) 145 (d) 210.25
(S.S.C. 2002)

43. $\sqrt{\frac{0.361}{0.00169}} = ?$
(a) $\frac{1.9}{13}$ (b) $\frac{19}{13}$ (c) $\frac{1.9}{130}$ (d) $\frac{190}{13}$

44. $\sqrt{\frac{48.4}{0.289}}$ is equal to : **(S.S.C. 2004)**
(a) $1\frac{5}{17}$ (b) $12\frac{1}{17}$ (c) $12\frac{16}{17}$ (d) $129\frac{7}{17}$

45. If $\sqrt{1+\frac{x}{169}} = \frac{14}{13}$, then x is equal to :
(a) 1 (b) 13 (c) 27 (d) None of these

46. If $\sqrt{1+\frac{55}{729}} = 1+\frac{x}{27}$, then the value of x is : **(C.D.S. 2003)**
(a) 1 (b) 3 (c) 5 (d) 7

47. The value of $\sqrt{2}$ upto three places of decimal is :
(a) 1.410 (b) 1.412 (c) 1.413 (d) 1.414

48. $(2\sqrt{27} - \sqrt{75} + \sqrt{12})$ is equal to :
(a) $\sqrt{3}$ (b) $2\sqrt{3}$ (c) $3\sqrt{3}$ (d) $4\sqrt{3}$

49. By how much does $\sqrt{12} + \sqrt{18}$ exceed $\sqrt{3} + \sqrt{2}$? **(S.S.C. 1999)**
(a) $\sqrt{2} - 4\sqrt{3}$ (b) $\sqrt{3} + 2\sqrt{2}$ (c) $2(\sqrt{3} - \sqrt{2})$ (d) $3(\sqrt{3} - \sqrt{2})$

50. $\frac{\sqrt{24} + \sqrt{216}}{\sqrt{96}} = ?$
(a) $2\sqrt{6}$ (b) 2 (c) $6\sqrt{2}$ (d) $\frac{2}{\sqrt{6}}$

51. The value of $\frac{\sqrt{80} - \sqrt{112}}{\sqrt{45} - \sqrt{63}}$ is : **(S.S.C. 2000)**
(a) $\frac{3}{4}$ (b) $1\frac{1}{3}$ (c) $1\frac{7}{9}$ (d) $1\frac{3}{4}$

52. If $3\sqrt{5} + \sqrt{125} = 17.88$, then what will be the value of $\sqrt{80} + 6\sqrt{5}$?
(a) 13.41 (b) 20.46 (c) 21.66 (d) 22.35
(Bank P.O. 2000)

53. $\sqrt{50} \times \sqrt{98}$ is equal to :
(a) 63.75 (b) 65.95 (c) 70 (d) 70.25

54. Given $\sqrt{2} = 1.414$. The value of $\sqrt{8} + 2\sqrt{32} - 3\sqrt{128} + 4\sqrt{50}$ is : **(S.S.C. 2003)**
(a) 8.426 (b) 8.484 (c) 8.526 (d) 8.876

55. The approximate value of $\frac{3\sqrt{12}}{2\sqrt{28}} \div \frac{2\sqrt{21}}{\sqrt{98}}$ is : **(Section Officers', 2003)**
(a) 1.0605 (b) 1.0727 (c) 1.6007 (d) 1.6026

56. $\sqrt{\frac{.081 \times .484}{.0064 \times 6.25}}$ is equal to : **(N.I.F.T. 1997)**

(a) 0.9 (b) 0.99 (c) 9 (d) 99

57. $\sqrt{\frac{0.204 \times 42}{0.07 \times 3.4}}$ is equal to :

(a) $\frac{1}{6}$ (b) 0.06 (c) 0.6 (d) 6

58. $\sqrt{\frac{0.081 \times 0.324 \times 4.624}{1.5625 \times 0.0289 \times 72.9 \times 64}}$ is equal to :

(a) 0.024 (b) 0.24 (c) 2.4 (d) 24

59. $\sqrt{\frac{9.5 \times .085}{.0017 \times .19}}$ equals :

(a) .05 (b) 5 (c) 50 (d) 500

60. The value of $\sqrt{\frac{(0.03)^2 + (0.21)^2 + (0.065)^2}{(0.003)^2 + (0.021)^2 + (0.0065)^2}}$ is : **(S.S.C. 2002)**

(a) 0.1 (b) 10 (c) 10^2 (d) 10^3

61. The square root of $(7 + 3\sqrt{5})(7 - 3\sqrt{5})$ is : **(S.S.C. 2004)**

(a) $\sqrt{5}$ (b) 2 (c) 4 (d) $3\sqrt{5}$

62. $\left(\sqrt{3} - \frac{1}{\sqrt{3}}\right)^2$ simplifies to : **(R.R.B. 2000)**

(a) $\frac{3}{4}$ (b) $\frac{4}{\sqrt{3}}$ (c) $\frac{4}{3}$ (d) None of these

63. $\left(\sqrt{2} + \frac{1}{\sqrt{2}}\right)^2$ is equal to :

(a) $2\frac{1}{2}$ (b) $3\frac{1}{2}$ (c) $4\frac{1}{2}$ (d) $5\frac{1}{2}$

64. If $a = 0.1039$, then the value of $\sqrt{4a^2 - 4a + 1} + 3a$ is : **(C.B.I. 2003)**

(a) 0.1039 (b) 0.2078 (c) 1.1039 (d) 2.1039

65. The square root of $\frac{(0.75)^3}{1 - 0.75} + [0.75 + (0.75)^2 + 1]$ is : **(S.S.C. 1999)**

(a) 1 (b) 2 (c) 3 (d) 4

66. If $3a = 4b = 6c$ and $a + b + c = 27\sqrt{29}$, then $\sqrt{a^2 + b^2 + c^2}$ is :

(a) $3\sqrt{29}$ (b) 81 (c) 87 (d) None of these
(Hotel Management, 1999)

67. The square root of $0.\overline{4}$ is : **(S.S.C. 2004)**

(a) $0.\overline{6}$ (b) $0.\overline{7}$ (c) $0.\overline{8}$ (d) $0.\overline{9}$

68. Which one of the following numbers has rational square root ?

(a) 0.4 (b) 0.09 (c) 0.9 (d) 0.025

69. The value of $\sqrt{0.4}$ is :

(a) 0.02 (b) 0.2 (c) 0.51 (d) 0.63

70. The value of $\sqrt{0.121}$ is :
(a) 0.011 (b) 0.11 (c) 0.347 (d) 1.1

71. The value of $\sqrt{0.064}$ is :
(a) 0.008 (b) 0.08 (c) 0.252 (d) 0.8

72. The value of $\sqrt{\frac{0.16}{0.4}}$ is : **(IGNOU, 2003)**
(a) 0.02 (b) 0.2 (c) 0.63 (d) None of these

73. The value of $\frac{1+\sqrt{0.01}}{1-\sqrt{0.1}}$ is close to : **(C.B.I. 1997)**
(a) 0.6 (b) 1.1 (c) 1.6 (d) 1.7

74. If $\sqrt{5} = 2.236$, then the value of $\frac{1}{\sqrt{5}}$ is :
(a) .367 (b) .447 (c) .745 (d) None of these

75. If $\sqrt{24} = 4.899$, the value of $\sqrt{\frac{8}{3}}$ is :
(a) 0.544 (b) 1.333 (c) 1.633 (d) 2.666

76. If $\sqrt{6} = 2.449$, then the value of $\frac{3\sqrt{2}}{2\sqrt{3}}$ is :
(a) 0.6122 (b) 0.8163 (c) 1.223 (d) 1.2245

77. If $\sqrt{5} = 2.236$, then the value of $\frac{\sqrt{5}}{2} - \frac{10}{\sqrt{5}} + \sqrt{125}$ is equal to : **(M.B.A. 1998)**
(a) 5.59 (b) 7.826 (c) 8.944 (d) 10.062

78. If $2*3 = \sqrt{13}$ and $3*4 = 5$, then the value of $5*12$ is :
(a) $\sqrt{17}$ (b) $\sqrt{29}$ (c) 12 (d) 13

79. The least perfect square number divisible by 3, 4, 5, 6 and 8 is :
(a) 900 (b) 1200 (c) 2500 (d) 3600

80. The least perfect square, which is divisible by each of 21, 36 and 66, is :
(a) 213444 (b) 214344 (c) 214434 (d) 231444
(C.B.I. 2003)

81. The least number by which 294 must be multiplied to make it a perfect square, is :
(a) 2 (b) 3 (c) 6 (d) 24

82. Find the smallest number by which 5808 should be multiplied so that the product becomes a perfect square. **(S.S.C. 1999)**
(a) 2 (b) 3 (c) 7 (d) 11

83. The least number by which 1470 must be divided to get a number which is a perfect square, is :
(a) 5 (b) 6 (c) 15 (d) 30

84. What is the smallest number to be subtracted from 549162 in order to make it a perfect square ?
(a) 28 (b) 36 (c) 62 (d) 81

85. What is the least number which should be subtracted from 0.000326 to make it a perfect square ? **(S.S.C. 2003)**
(a) 0.000002 (b) 0.000004 (c) 0.02 (d) 0.04

86. The smallest number added to 680621 to make the sum a perfect square is :
(a) 4 (b) 5 (c) 6 (d) 8 (S.S.C. 2002)

87. The greatest four-digit perfect square number is : (Hotel Management, 2003)
(a) 9000 (b) 9801 (c) 9900 (d) 9981

88. The least number of 4 digits which is a perfect square, is :
(a) 1000 (b) 1016 (c) 1024 (d) 1036

89. Given $\sqrt{5} = 2.2361$, $\sqrt{3} = 1.7321$, then $\frac{1}{\sqrt{5}-\sqrt{3}}$ is equal to : (S.S.C. 2000)
(a) 1.98 (b) 1.984 (c) 1.9841 (d) 2

90. $\frac{1}{(\sqrt{9}-\sqrt{8})} - \frac{1}{(\sqrt{8}-\sqrt{7})} + \frac{1}{(\sqrt{7}-\sqrt{6})} - \frac{1}{(\sqrt{6}-\sqrt{5})} + \frac{1}{(\sqrt{5}-\sqrt{4})}$ is equal to :
(a) 0 (b) $\frac{1}{3}$ (c) 1 (d) 5

91. $\left(2+\sqrt{2}+\frac{1}{2+\sqrt{2}}+\frac{1}{\sqrt{2}-2}\right)$ simplifies to : (S.S.C. 2000)
(a) $2-\sqrt{2}$ (b) 2 (c) $2+\sqrt{2}$ (d) $2\sqrt{2}$

92. If $\sqrt{2} = 1.4142$, the value of $\frac{7}{(3+\sqrt{2})}$ is :
(a) 1.5858 (b) 3.4852 (c) 3.5858 (d) 4.4142

93. $\left[\frac{3\sqrt{2}}{\sqrt{6}-\sqrt{3}} - \frac{4\sqrt{3}}{\sqrt{6}-\sqrt{2}} - \frac{6}{\sqrt{8}-\sqrt{12}}\right] = ?$ (R.R.B. 2001)
(a) $\sqrt{3}-\sqrt{2}$ (b) $\sqrt{3}+\sqrt{2}$ (c) $5\sqrt{3}$ (d) 1

94. $\frac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}}$ is equal to : (Section Officers', 2001)
(a) 1 (b) 2 (c) $6-\sqrt{35}$ (d) $6+\sqrt{35}$

95. If $\frac{5+2\sqrt{3}}{7+4\sqrt{3}} = a+b\sqrt{3}$, then : (R.R.B. 2001)
(a) $a = -11$, $b = -6$ (b) $a = -11$, $b = 6$ (c) $a = 11$, $b = -6$ (d) $a = 6$, $b = 11$

96. If $\sqrt{2} = 1.414$, the square root of $\frac{\sqrt{2}-1}{\sqrt{2}+1}$ is nearest to : (C.B.I. 2003)
(a) 0.172 (b) 0.414 (c) 0.586 (d) 1.414

97. $\frac{3+\sqrt{6}}{5\sqrt{3}-2\sqrt{12}-\sqrt{32}+\sqrt{50}} = ?$ (I.A.F. 2002)
(a) 3 (b) $3\sqrt{2}$ (c) 6 (d) None of these

98. $\left(\frac{2+\sqrt{3}}{2-\sqrt{3}}+\frac{2-\sqrt{3}}{2+\sqrt{3}}+\frac{\sqrt{3}-1}{\sqrt{3}+1}\right)$ simplifies to : (S.S.C. 2000)
(a) $16-\sqrt{3}$ (b) $4-\sqrt{3}$ (c) $2-\sqrt{3}$ (d) $2+\sqrt{3}$

99. If $x = (7 - 4\sqrt{3})$, then the value of $\left(x + \frac{1}{x}\right)$ is : (S.S.C. 2000)

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

100. If $x = \frac{\sqrt{3}+1}{\sqrt{3}-1}$ and $y = \frac{\sqrt{3}-1}{\sqrt{3}+1}$, then the value of $(x^2 + y^2)$ is : (S.S.C. 2003)

(a) 10 (b) 13 (c) 14 (d) 15

101. If $a = \frac{\sqrt{5}+1}{\sqrt{5}-1}$ and $b = \frac{\sqrt{5}-1}{\sqrt{5}+1}$, the value of $\left(\frac{a^2 + ab + b^2}{a^2 - ab + b^2}\right)$ is :

(a) $\frac{3}{4}$ (b) $\frac{4}{3}$ (c) $\frac{3}{5}$ (d) $\frac{5}{3}$

102. A man plants 15376 apple trees in his garden and arranges them so that there are as many rows as there are apples trees in each row. The number of rows is :

(a) 124 (b) 126 (c) 134 (d) 144

103. A General wishes to draw up his 36581 soldiers in the form of a solid square. After arranging them, he found that some of them are left over. How many are left ?

(a) 65 (b) 81 (c) 100 (d) None of these

104. A group of students decided to collect as many paise from each member of the group as is the number of members. If the total collection amounts to Rs. 59.29, the number of members in the group is :

(a) 57 (b) 67 (c) 77 (d) 87

105. The cube root of .000216 is :

(a) .6 (b) .06 (c) .006 (d) None of these

106. $\sqrt[3]{4\frac{12}{125}} = ?$

(a) $1\frac{2}{5}$ (b) $1\frac{3}{5}$ (c) $1\frac{4}{5}$ (d) $2\frac{2}{5}$

107. $\sqrt[3]{.000064} = ?$

(a) .02 (b) .2 (c) 2 (d) None of these

108. The largest four-digit number which is a perfect cube, is :

(a) 8000 (b) 9261 (c) 9999 (d) None of these

109. By what least number 675 be multiplied to obtain a number which is a perfect cube ?

(a) 5 (b) 6 (c) 7 (d) 8

110. What is the smallest number by which 3500 be divided to make it a perfect cube ?

(a) 9 (b) 50 (c) 300 (d) 450.

ANSWERS

1. (b)	2. (a)	3. (a)	4. (c)	5. (b)	6. (a)	7. (c)	8. (c)	9. (b)
10. (d)	11. (b)	12. (b)	13. (c)	14. (d)	15. (c)	16. (c)	17. (b)	18. (b)
19. (b)	20. (d)	21. (d)	22. (b)	23. (d)	24. (b)	25. (d)	26. (d)	27. (d)
28. (d)	29. (a)	30. (b)	31. (a)	32. (d)	33. (c)	34. (b)	35. (b)	36. (a)

37. (a)	38. (b)	39. (c)	40. (a)	41. (c)	42. (a)	43. (d)	44. (c)	45. (c)
46. (a)	47. (d)	48. (c)	49. (b)	50. (b)	51. (b)	52. (d)	53. (c)	54. (b)
55. (a)	56. (b)	57. (d)	58. (a)	59. (c)	60. (b)	61. (b)	62. (c)	63. (c)
64. (c)	65. (b)	66. (c)	67. (a)	68. (b)	69. (d)	70. (c)	71. (c)	72. (c)
73. (c)	74. (b)	75. (c)	76. (d)	77. (b)	78. (d)	79. (d)	80. (a)	81. (c)
82. (b)	83. (d)	84. (d)	85. (a)	86. (a)	87. (b)	88. (c)	89. (c)	90. (d)
91. (b)	92. (a)	93. (c)	94. (d)	95. (c)	96. (b)	97. (d)	98. (a)	99. (c)
100. (c)	101. (b)	102. (a)	103. (c)	104. (c)	105. (b)	106. (b)	107. (b)	108. (b)
109. (a)	110. (d)							

SOLUTIONS

1.

2	$\overline{53}\,\overline{824}$	(232
	4	
43	138	
	129	
462	924	
	924	
	×	

$\therefore \sqrt{53824} = 232.$

2.

2	$\overline{64}\,\overline{09}$	(253
	4	
45	240	
	225	
503	1509	
	1509	
	×	

$\therefore \sqrt{64009} = 253.$

3. Given exp. $= \sqrt{10+\sqrt{25+\sqrt{108+\sqrt{154+15}}}} = \sqrt{10+\sqrt{25+\sqrt{108+\sqrt{169}}}}$

$= \sqrt{10+\sqrt{25+\sqrt{108+13}}} = \sqrt{10+\sqrt{25+\sqrt{121}}}$

$= \sqrt{10+\sqrt{25+11}} = \sqrt{10+\sqrt{36}} = \sqrt{10+6} = \sqrt{16} = 4.$

4. Given exp. $= \sqrt{41-\sqrt{21+\sqrt{19-3}}} = \sqrt{41-\sqrt{21+\sqrt{16}}} = \sqrt{41-\sqrt{21+4}}$

$= \sqrt{41-\sqrt{25}} = \sqrt{41-5} = \sqrt{36} = 6.$

5. Given exp. $= \sqrt{176+49} = \sqrt{225} = 15.$

4	$\overline{24}\,\overline{01}$	(49
	16	
89	801	
	801	
	×	

6. Given exp. $= \frac{25}{11} \times \frac{14}{5} \times \frac{11}{14} = 5.$

7. Given exp. $= \left(\frac{\sqrt{225}}{\sqrt{729}} - \frac{\sqrt{25}}{\sqrt{144}}\right) \div \frac{\sqrt{16}}{\sqrt{81}} = \left(\frac{15}{27} - \frac{5}{12}\right) \div \frac{4}{9} = \left(\frac{15}{108} \times \frac{9}{4}\right) = \frac{5}{16}.$

8. $\sqrt{(272)^2-(128)^2} = \sqrt{(272+128)(272-128)} = \sqrt{400 \times 144} = \sqrt{57600} = 240.$

9. $6*24 = 6+24+\sqrt{6 \times 24} = 30+\sqrt{144} = 30+12 = 42.$

10. $10y\sqrt{y^3-y^2} = 10 \times 5\sqrt{5^3-5^2} = 50 \times \sqrt{125-25} = 50 \times \sqrt{100} = 50 \times 10 = 500.$

11. $\sqrt{110\frac{1}{4}} = \sqrt{\frac{441}{4}} = \frac{\sqrt{441}}{\sqrt{4}} = \frac{21}{2} = 10.5.$

12. $\sqrt{\frac{25}{81} - \frac{1}{9}} = \sqrt{\frac{25-9}{81}} = \sqrt{\frac{16}{81}} = \frac{\sqrt{16}}{\sqrt{81}} = \frac{4}{9}.$

13.

1	$\overline{1}\,\overline{58}\,\overline{76}$	(126
	1	
22	58	
	44	
246	1476	
	1476	
	×	

$\therefore \sqrt{15876} = 126.$

14. A number ending in 8 can never be a perfect square.

15. $\sqrt{0.16} = \sqrt{\frac{16}{100}} = \frac{\sqrt{16}}{\sqrt{100}} = \frac{4}{10} = 0.4.$

16. $\sqrt{0.000441} = \sqrt{\frac{441}{10^6}} = \frac{\sqrt{441}}{\sqrt{10^6}} = \frac{21}{10^3} = \frac{21}{1000} = 0.021.$

17. $\sqrt{0.00004761} = \sqrt{\frac{4761}{10^8}} = \frac{\sqrt{4761}}{\sqrt{10^8}} = \frac{69}{10^4} = \frac{69}{10000} = 0.0069.$

18. $1.5^2 \times \sqrt{0.0225} = 1.5^2 \times \sqrt{\frac{225}{10000}} = 2.25 \times \frac{15}{100} = 2.25 \times 0.15 = 0.3375.$

19. $\sqrt{0.01 + \sqrt{0.0064}} = \sqrt{0.01 + \sqrt{\frac{64}{10000}}} = \sqrt{0.01 + \frac{8}{100}} = \sqrt{0.01 + 0.08} = \sqrt{0.09} = 0.3.$

20. Given exp. $= \sqrt{\frac{1}{100}} + \sqrt{\frac{81}{100}} + \sqrt{\frac{121}{100}} + \sqrt{\frac{9}{10000}} = \frac{1}{10} + \frac{9}{10} + \frac{11}{10} + \frac{3}{100}$

$= 0.1 + 0.9 + 1.1 + 0.03 = 2.13.$

21. Given exp. $= \sqrt{\frac{25}{10000}} \times \sqrt{\frac{225}{100}} \times \sqrt{\frac{1}{10000}} = \frac{5}{100} \times \frac{15}{10} \times \frac{1}{100} = \frac{75}{100000} = 0.00075.$

22.

1	$\overline{1}.\overline{56}\,\overline{25}$	(1.25
	1	
22	56	
	44	
245	1225	
	1225	
	×	

$\therefore \sqrt{1.5625} = 1.25.$

23. $\sqrt{6760000} = \sqrt{0.00000676 \times 10^{12}} = \sqrt{0.00000676} \times \sqrt{10^{12}} = .0026 \times 10^6 = 2600.$

24. Given exp. $= \sqrt{\frac{18225}{10^2}} + \sqrt{\frac{18225}{10^4}} + \sqrt{\frac{18225}{10^6}} + \sqrt{\frac{18225}{10^8}}$

$= \frac{\sqrt{18225}}{10} + \frac{\sqrt{18225}}{10^2} + \frac{\sqrt{18225}}{10^3} + \frac{\sqrt{18225}}{10^4} = \frac{135}{10} + \frac{135}{100} + \frac{135}{1000} + \frac{135}{10000}$

$= 13.5 + 1.35 + 0.135 + 0.0135 = 14.9985.$

25. Given exp. $= \sqrt{1.30} + \sqrt{1300} + \sqrt{0.0130} = \sqrt{\frac{130}{100}} + \sqrt{13 \times 100} + \sqrt{\frac{130}{10000}}$

$= \frac{\sqrt{130}}{10} + \sqrt{13} \times 10 + \frac{\sqrt{130}}{100} = \frac{11.40}{10} + 3.605 \times 10 + \frac{11.40}{100}$

$= 1.14 + 36.05 + 0.114 = 37.304.$

26. $\frac{52}{x} = \sqrt{\frac{169}{289}} \Leftrightarrow \frac{52}{x} = \frac{13}{17} \Leftrightarrow x = \left(\frac{52 \times 17}{13}\right) = 68.$

27. Let the missing number be x.

Then, $x^2 = 15 \times 135 \Leftrightarrow x = \sqrt{15 \times 135} = \sqrt{15^2 \times 3^2} = 15 \times 3 = 45.$

28. Let $\frac{4\frac{1}{2}}{x} = \frac{x}{32}$. Then, $x^2 = 32 \times \frac{9}{2} = 144 \Leftrightarrow x = \sqrt{144} = 12.$

29. Let $\frac{x}{\sqrt{128}} = \frac{\sqrt{162}}{x}$.

Then, $x^2 = \sqrt{128 \times 162} = \sqrt{64 \times 2 \times 18 \times 9} = \sqrt{8^2 \times 6^2 \times 3^2} = 8 \times 6 \times 3 = 144.$

$\therefore \quad x = \sqrt{144} = 12.$

30. $\frac{0.13}{p^2} = 13 \Leftrightarrow p^2 = \frac{0.13}{13} = \frac{1}{100} \Leftrightarrow p = \sqrt{\frac{1}{100}} = \frac{1}{100} = \frac{1}{10} = 0.1.$

31. Let the required number be x. Then, $\frac{x}{\sqrt{0.25}} = 25 \Leftrightarrow \frac{x}{0.5} = 25 \Leftrightarrow x = 25 \times 0.5 = 12.5.$

32. $\sqrt{3^n} = 729 = 3^6 \Leftrightarrow (\sqrt{3^n})^2 = (3^6)^2 \Leftrightarrow 3^n = 3^{12} \Leftrightarrow n = 12.$

33. $\sqrt{18 \times 14 \times x} = 84 \Leftrightarrow 18 \times 14 \times x = 84 \times 84 \Leftrightarrow x = \frac{84 \times 84}{18 \times 14} = 28.$

34. Let $28\sqrt{x} + 1426 = 3 \times 718.$

Then, $28\sqrt{x} = 2154 - 1426 \Leftrightarrow 28\sqrt{x} = 728 \Leftrightarrow \sqrt{x} = 26 \Leftrightarrow x = (26)^2 = 676.$

35. Let $\sqrt{\frac{x}{169}} = \frac{54}{39}$. Then, $\frac{\sqrt{x}}{13} = \frac{54}{39} \Leftrightarrow \sqrt{x} = \left(\frac{54}{39} \times 13\right) = 18 \Leftrightarrow x = (18)^2 = 324.$

36. $\frac{\sqrt{x}}{\sqrt{441}} = 0.02 \Leftrightarrow \frac{\sqrt{x}}{21} = 0.02 \Leftrightarrow \sqrt{x} = 0.02 \times 21 = 0.42 \Leftrightarrow x = (0.42)^2 = 0.1764.$

37. Let $\sqrt{\frac{.0196}{x}} = 0.2$. Then, $\frac{.0196}{x} = 0.04 \Leftrightarrow x = \frac{.0196}{.04} = \frac{1.96}{4} = .49.$

38. Let $\sqrt{0.0169 \times x} = 1.3$. Then, $0.0169x = (1.3)^2 = 1.69 \Leftrightarrow x = \frac{1.69}{0.0169} = 100.$

39. $37 + \sqrt{.0615 + x} = 37.25 \Leftrightarrow \sqrt{.0615 + x} = 0.25$

$\Leftrightarrow .0615 + x = (0.25)^2 = 0.0625 \Leftrightarrow x = .001 = \frac{1}{10^3} = 10^{-3}.$

40. $\sqrt{(x-1)(y+2)} = 7 \Rightarrow (x-1)(y+2) = (7)^2 \Rightarrow (x-1) = 7$ and $(y+2) = 7$

$\Rightarrow x = 8$ and $y = 5$.

41. $\dfrac{\sqrt{a}}{\sqrt{b}} = \dfrac{.004 \times .4}{\sqrt{.04 \times .4}} \Rightarrow \dfrac{a}{b} = \dfrac{.004 \times .4 \times .004 \times .4}{.04 \times .4} = \dfrac{.0000064}{.04}$

$\therefore \dfrac{a}{b} = \dfrac{.00064}{4} = .00016 = \dfrac{16}{10^5} = 16 \times 10^{-5}$.

42. Let the number be x. Then,

$\dfrac{3}{5}x^2 = 126.15 \Leftrightarrow x^2 = \left(126.15 \times \dfrac{5}{3}\right) = 210.25 \Leftrightarrow x = \sqrt{210.25} = 14.5$.

43. $\sqrt{\dfrac{0.361}{0.00169}} = \sqrt{\dfrac{0.36100}{0.00169}} = \sqrt{\dfrac{36100}{169}} = \dfrac{190}{13}$.

44. $\sqrt{\dfrac{48.4}{0.289}} = \sqrt{\dfrac{48.400}{0.289}} = \sqrt{\dfrac{48400}{289}} = \dfrac{220}{17} = 12\dfrac{16}{17}$.

45. $\sqrt{1+\dfrac{x}{169}} = \dfrac{14}{13} \Rightarrow 1+\dfrac{x}{169} = \dfrac{196}{169} \Rightarrow \dfrac{x}{169} = \left(\dfrac{196}{169} - 1\right) = \dfrac{27}{169} \Rightarrow x = 27$.

46. $\sqrt{1+\dfrac{55}{729}} = 1+\dfrac{x}{27} \Rightarrow \sqrt{\dfrac{784}{729}} = \dfrac{27+x}{27} \Rightarrow \dfrac{28}{27} = \dfrac{27+x}{27} \Rightarrow 27+x = 28 \Rightarrow x = 1$.

47.

1	$\overline{2.00}\,\overline{00}\,\overline{00}$ (1.414
	1
24	100
	96
281	400
	281
2824	11900
	11296

$\therefore \sqrt{2} = 1.414$.

48. $2\sqrt{27} - \sqrt{75} + \sqrt{12} = 2\sqrt{9 \times 3} - \sqrt{25 \times 3} + \sqrt{4 \times 3} = 6\sqrt{3} - 5\sqrt{3} + 2\sqrt{3} = 3\sqrt{3}$.

49. $(\sqrt{12} + \sqrt{18}) - (\sqrt{3} + \sqrt{2}) = (\sqrt{4 \times 3} + \sqrt{9 \times 2}) - (\sqrt{3} + \sqrt{2}) = (2\sqrt{3} + 3\sqrt{2}) - (\sqrt{3} + \sqrt{2})$

$= (2\sqrt{3} - \sqrt{3}) + (3\sqrt{2} - \sqrt{2}) = \sqrt{3} + 2\sqrt{2}$.

50. $\dfrac{\sqrt{24} + \sqrt{216}}{\sqrt{96}} = \dfrac{\sqrt{4 \times 6} + \sqrt{36 \times 6}}{\sqrt{16 \times 6}} = \dfrac{2\sqrt{6} + 6\sqrt{6}}{4\sqrt{6}} = \dfrac{8\sqrt{6}}{4\sqrt{6}} = 2$.

51. $\dfrac{\sqrt{80} - \sqrt{112}}{\sqrt{45} - \sqrt{63}} = \dfrac{\sqrt{16 \times 5} - \sqrt{16 \times 7}}{\sqrt{9 \times 5} - \sqrt{9 \times 7}} = \dfrac{4\sqrt{5} - 4\sqrt{7}}{3\sqrt{5} - 3\sqrt{7}} = \dfrac{4(\sqrt{5} - \sqrt{7})}{3(\sqrt{5} - \sqrt{7})} = \dfrac{4}{3} = 1\dfrac{1}{3}$.

52. $3\sqrt{5} + \sqrt{125} = 17.88 \Rightarrow 3\sqrt{5} + \sqrt{25 \times 5} = 17.88$

$\Rightarrow 3\sqrt{5} + 5\sqrt{5} = 17.88 \Rightarrow 8\sqrt{5} = 17.88 \Rightarrow \sqrt{5} = 2.235$.

$\therefore \sqrt{80} + 6\sqrt{5} = \sqrt{16 \times 5} + 6\sqrt{5} = 4\sqrt{5} + 6\sqrt{5} = 10\sqrt{5} = (10 \times 2.235) = 22.35$.

53. $\sqrt{50} \times \sqrt{98} = \sqrt{50 \times 98} = \sqrt{4900} = 70$.

54. Given exp. $= \sqrt{4\times2} + 2\sqrt{16\times2} - 3\sqrt{64\times2} + 4\sqrt{25\times2}$

$= 2\sqrt{2} + 8\sqrt{2} - 24\sqrt{2} + 20\sqrt{2} = 6\sqrt{2} = 6\times1.414 = 8.484.$

55. Given exp. $= \dfrac{3\sqrt{12}}{2\sqrt{28}} \times \dfrac{\sqrt{98}}{2\sqrt{21}} = \dfrac{3\sqrt{4\times3}}{2\sqrt{4\times7}} \times \dfrac{\sqrt{49\times2}}{2\sqrt{21}} = \dfrac{6\sqrt{3}}{4\sqrt{7}} \times \dfrac{7\sqrt{2}}{2\sqrt{21}} = \dfrac{21\sqrt{6}}{4\sqrt{7\times21}} = \dfrac{21\sqrt{6}}{28\sqrt{3}}$

$= \dfrac{3}{4}\sqrt{2} = \dfrac{3}{4}\times1.414 = 3\times0.3535 = 1.0605.$

56. Sum of decimal places in the numerator and denominator under the radical sign being the same, we remove the decimal.

$\therefore$ Given exp. $= \sqrt{\dfrac{81\times484}{64\times625}} = \dfrac{9\times22}{8\times25} = 0.99.$

57. Given exp. $= \sqrt{\dfrac{204\times42}{7\times34}} = \sqrt{36} = 6.$

58. Given exp. $= \sqrt{\dfrac{81\times324\times4624}{15625\times289\times729\times64}} = \dfrac{9\times18\times68}{125\times17\times27\times8} = \dfrac{3}{125} = 0.024.$

59. Given exp. $= \sqrt{\dfrac{9.5\times.08500}{.19\times.0017}} = \sqrt{\dfrac{95\times8500}{19\times17}} = \sqrt{5\times500} = \sqrt{2500} = 50.$

60. Given exp. $= \sqrt{\dfrac{(0.03)^2 + (0.21)^2 + (0.065)^2}{\left(\dfrac{0.03}{10}\right)^2 + \left(\dfrac{0.21}{10}\right)^2 + \left(\dfrac{0.065}{10}\right)^2}}$

$= \sqrt{\dfrac{100\,[(0.03)^2 + (0.21)^2 + (0.065)^2]}{(0.03)^2 + (0.21)^2 + (0.065)^2}} = \sqrt{100} = 10.$

61. $\sqrt{(7+3\sqrt{5})(7-3\sqrt{5})} = \sqrt{(7)^2 - (3\sqrt{5})^2} = \sqrt{49-45} = \sqrt{4} = 2.$

62. $\left(\sqrt{3} - \dfrac{1}{\sqrt{3}}\right)^2 = (\sqrt{3})^2 + \left(\dfrac{1}{\sqrt{3}}\right)^2 - 2\times\sqrt{3}\times\dfrac{1}{\sqrt{3}} = 3 + \dfrac{1}{3} - 2 = 1 + \dfrac{1}{3} = \dfrac{4}{3}.$

63. $\left(\sqrt{2} + \dfrac{1}{\sqrt{2}}\right)^2 = (\sqrt{2})^2 + \left(\dfrac{1}{\sqrt{2}}\right)^2 + 2\times\sqrt{2}\times\dfrac{1}{\sqrt{2}} = 2 + \dfrac{1}{2} + 2 = 4 + \dfrac{1}{2} = 4\dfrac{1}{2}.$

64. $\sqrt{4a^2 - 4a + 1} + 3a = \sqrt{(1)^2 + (2a)^2 - 2\times1\times2a} + 3a$

$= \sqrt{(1-2a)^2} + 3a = (1-2a) + 3a = (1+a) = (1 + 0.1039) = 1.1039.$

65. $\sqrt{\dfrac{(0.75)^3}{(1-0.75)} + [0.75 + (0.75)^2 + 1]} = \sqrt{\dfrac{(0.75)^3 + (1-0.75)\,[(1)^2 + (0.75)^2 + 1\times0.75]}{1-0.75}}$

$= \sqrt{\dfrac{(0.75)^3 + [(1)^3 - (0.75)^3]}{1-0.75}} = \sqrt{\dfrac{1}{0.25}} = \sqrt{\dfrac{100}{25}} = \sqrt{4} = 2.$

66. $4b = 6c \Rightarrow b = \dfrac{3}{2}c$ and $3a = 4b \Rightarrow a = \dfrac{4}{3}b = \dfrac{4}{3}\left(\dfrac{3}{2}c\right) = 2c.$

$a + b + c = 27\sqrt{29} \Rightarrow 2c + \dfrac{3}{2}c + c = 27\sqrt{29} \Rightarrow \dfrac{9}{2}c = 27\sqrt{29} \Rightarrow c = 6\sqrt{29}.$

$$\therefore \quad \sqrt{a^2+b^2+c^2} = \sqrt{(a+b+c)^2 - 2(ab+bc+ca)}$$

$$= \sqrt{(27\sqrt{29})^2 - 2\left(2c \times \frac{3}{2}c + \frac{3}{2}c \times c + c \times 2c\right)}$$

$$= \sqrt{(729 \times 29) - 2\left(3c^2 + \frac{3}{2}c^2 + 2c^2\right)} = \sqrt{(729 \times 29) - 2 \times \frac{13}{2}c^2}$$

$$= \sqrt{(729 \times 29) - 13 \times (6\sqrt{29})^2} = \sqrt{29(729 - 468)}$$

$$= \sqrt{29 \times 261} = \sqrt{29 \times 29 \times 9} = 29 \times 3 = 87.$$

67. $\sqrt{0.\overline{4}} = \sqrt{\frac{4}{9}} = \frac{2}{3} = 0.666..... = 0.\overline{6}.$

68. $\sqrt{0.09} = \sqrt{\frac{9}{100}} = \frac{3}{10} = 0.3$, which is rational.

$\therefore$ 0.09 has rational square root.

69.

6	$0.\overline{40}\,\overline{00}\,\overline{00}$	(.63
	36	
123	400	
	369	

70.

3	$0.\overline{12}\,\overline{10}\,\overline{00}$	(.347
	9	
64	310	
	256	
687	5400	
	4809	

71.

2	$0.\overline{06}\,\overline{40}\,\overline{00}$	(.252
	4	
45	240	
	225	
502	1500	
	1006	

72. $\sqrt{\frac{0.16}{0.4}} = \sqrt{\frac{0.16}{0.40}} = \sqrt{\frac{16}{40}} = \sqrt{\frac{4}{10}} = \sqrt{0.4} = 0.63.$

73. $\frac{1+\sqrt{0.01}}{1-\sqrt{0.1}} = \frac{1+0.1}{1-0.316} = \frac{1.1}{0.684}$

$= \frac{1100}{684} = 1.6.$

3	$0.\overline{10}\,\overline{00}\,\overline{00}$	(.316
	9	
61	100	
	61	
62	3900	
	3756	

74. $\frac{1}{\sqrt{5}} = \frac{1}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{\sqrt{5}}{5} = \frac{2.236}{5} = 0.447.$

75. $\sqrt{\frac{8}{3}} = \sqrt{\frac{8 \times 3}{3 \times 3}} = \frac{\sqrt{24}}{3} = \frac{4.899}{3} = 1.633.$

76. $\frac{3\sqrt{2}}{2\sqrt{3}} = \frac{3\sqrt{2}}{2\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{3\sqrt{6}}{2 \times 3} = \frac{\sqrt{6}}{2} = \frac{2.449}{2} = 1.2245.$

77. $\frac{\sqrt{5}}{2} - \frac{10}{\sqrt{5}} + \sqrt{125} = \frac{(\sqrt{5})^2 - 20 + 2\sqrt{5} \times 5\sqrt{5}}{2\sqrt{5}} = \frac{5 - 20 + 50}{2\sqrt{5}}$

$= \frac{35}{2\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}} = \frac{35\sqrt{5}}{10} = \frac{7}{2} \times 2.236 = 7 \times 1.118 = 7.826.$

78. Clearly, $a * b = \sqrt{a^2 + b^2}$.

$\therefore \quad 5 * 12 = \sqrt{5^2 + 12^2} = \sqrt{25 + 144} = \sqrt{169} = 13.$

79. L.C.M. of 3, 4, 5, 6, 8 is 120. Now, $120 = 2 \times 2 \times 2 \times 3 \times 5$.
To make it a perfect square, it must be multiplied by $2 \times 3 \times 5$.
So, required number $= 2^2 \times 2^2 \times 3^2 \times 5^2 = 3600$.

80. L.C.M. of 21, 36, 66 = 2772. Now, $2772 = 2 \times 2 \times 3 \times 3 \times 7 \times 11$.
To make it a perfect square, it must be multiplied by 7×11.
So, required number $= 2^2 \times 3^2 \times 7^2 \times 11^2 = 213444$.

81. $294 = 7 \times 7 \times 2 \times 3$.
To make it a perfect square, it must be multiplied by 2×3 *i.e.*, 6.
$\therefore$ Required number = 6.

82. $5808 = 2 \times 2 \times 2 \times 2 \times 3 \times 11 \times 11 = 2^2 \times 2^2 \times 3 \times 11^2$.
To make it a perfect square, it must be multiplied by 3.

83. $1470 = 7 \times 7 \times 5 \times 6$. To make it a perfect square, it must be divided by 5×6, *i.e.*, 30.

84.

7	$\overline{54}\,\overline{91}\,\overline{62}$ (741
	49
144	591
	576
1481	1562
	1481
	81

$\therefore$ Required number to be subtracted = 81.

85. $0.000326 = \frac{326}{10^6}$.

$\therefore$ Required number to be subtracted $= \frac{2}{10^6} = 0.000002$.

1	$\overline{3}\,\overline{26}$ (18
	1
28	226
	224
	2

86.

8	$\overline{68}\,\overline{06}\,\overline{21}$ (824
	64
162	406
	324
1644	8221
	6576
	1645

$\therefore$ Number to be added $= (825)^2 - 680621 = 680625 - 680621 = 4$.

87. Greatest number of four digits is 9999.

9	$\overline{99}\,\overline{99}$ (99
	81
189	1899
	1701
	198

$\therefore$ Required number $= (9999 - 198) = 9801$.

88. Least number of 4 digits is 1000.

$$\begin{array}{r|l} 3 & \overline{10}\,\overline{00}\ (31 \\ & 9 \\ \hline 61 & 100 \\ & 61 \\ \hline & 39 \end{array}$$

$\therefore\ (31)^2 < 1000 < (32)^2$. Hence, required number $= (32)^2 = 1024$.

89. $\dfrac{1}{(\sqrt{5}-\sqrt{3})} = \dfrac{1}{(\sqrt{5}-\sqrt{3})} \times \dfrac{(\sqrt{5}+\sqrt{3})}{(\sqrt{5}+\sqrt{3})} = \dfrac{(\sqrt{5}+\sqrt{3})}{(5-3)} = \dfrac{(2.2361+1.7321)}{2} = \dfrac{3.9682}{2} = 1.9841.$

90. Given exp. $= \dfrac{1}{(\sqrt{9}-\sqrt{8})} \times \dfrac{(\sqrt{9}+\sqrt{8})}{(\sqrt{9}+\sqrt{8})} - \dfrac{1}{(\sqrt{8}-\sqrt{7})} \times \dfrac{(\sqrt{8}+\sqrt{7})}{(\sqrt{8}+\sqrt{7})} + \dfrac{1}{(\sqrt{7}-\sqrt{6})} \times \dfrac{(\sqrt{7}+\sqrt{6})}{(\sqrt{7}+\sqrt{6})}$

$$- \frac{1}{(\sqrt{6}-\sqrt{5})} \times \frac{(\sqrt{6}+\sqrt{5})}{(\sqrt{6}+\sqrt{5})} + \frac{1}{(\sqrt{5}-\sqrt{4})} \times \frac{(\sqrt{5}+\sqrt{4})}{(\sqrt{5}+\sqrt{4})}$$

$$= \frac{(\sqrt{9}+\sqrt{8})}{(9-8)} - \frac{(\sqrt{8}+\sqrt{7})}{(8-7)} + \frac{(\sqrt{7}+\sqrt{6})}{(7-6)} - \frac{(\sqrt{6}+\sqrt{5})}{(6-5)} + \frac{(\sqrt{5}+\sqrt{4})}{(5-4)}$$

$$= (\sqrt{9}+\sqrt{8}) - (\sqrt{8}+\sqrt{7}) + (\sqrt{7}+\sqrt{6}) - (\sqrt{6}+\sqrt{5}) + (\sqrt{5}+\sqrt{4}) = (\sqrt{9}+\sqrt{4}) = 3+2 = 5.$$

91. Given exp. $= (2+\sqrt{2}) + \dfrac{1}{(2+\sqrt{2})} \times \dfrac{(2-\sqrt{2})}{(2-\sqrt{2})} - \dfrac{1}{(2-\sqrt{2})} \times \dfrac{(2+\sqrt{2})}{(2+\sqrt{2})}$

$$= (2+\sqrt{2}) + \frac{(2-\sqrt{2})}{(4-2)} - \frac{(2+\sqrt{2})}{(4-2)} = (2+\sqrt{2}) + \frac{1}{2}(2-\sqrt{2}) - \frac{1}{2}(2+\sqrt{2}) = 2.$$

92. $\dfrac{7}{(3+\sqrt{2})} = \dfrac{7}{(3+\sqrt{2})} \times \dfrac{(3-\sqrt{2})}{(3-\sqrt{2})} = \dfrac{7(3-\sqrt{2})}{(9-2)} = (3-\sqrt{2}) = (3-1.4142) = 1.5858.$

93. Given exp. $= \dfrac{3\sqrt{2}}{(\sqrt{6}-\sqrt{3})} \times \dfrac{(\sqrt{6}+\sqrt{3})}{(\sqrt{6}+\sqrt{3})} - \dfrac{4\sqrt{3}}{(\sqrt{6}-\sqrt{2})} \times \dfrac{(\sqrt{6}+\sqrt{2})}{(\sqrt{6}+\sqrt{2})} - \dfrac{6}{2(\sqrt{2}-\sqrt{3})}$

$$= \frac{3\sqrt{2}(\sqrt{6}+\sqrt{3})}{(6-3)} - \frac{4\sqrt{3}(\sqrt{6}+\sqrt{2})}{(6-2)} + \frac{3}{(\sqrt{3}-\sqrt{2})} \times \frac{(\sqrt{3}+\sqrt{2})}{(\sqrt{3}+\sqrt{2})}$$

$$= \sqrt{2}(\sqrt{6}+\sqrt{3}) - \sqrt{3}(\sqrt{6}+\sqrt{2}) + 3(\sqrt{3}+\sqrt{2})$$

$$= \sqrt{12} + \sqrt{6} - \sqrt{18} - \sqrt{6} + 3\sqrt{3} + 3\sqrt{2}$$

$$= 2\sqrt{3} - 3\sqrt{2} + 3\sqrt{3} + 3\sqrt{2} = 5\sqrt{3}.$$

94. $\dfrac{\sqrt{7}+\sqrt{5}}{\sqrt{7}-\sqrt{5}} = \dfrac{(\sqrt{7}+\sqrt{5})}{(\sqrt{7}-\sqrt{5})} \times \dfrac{(\sqrt{7}+\sqrt{5})}{(\sqrt{7}+\sqrt{5})} = \dfrac{(\sqrt{7}+\sqrt{5})^2}{(7-5)} = \dfrac{7+5+2\sqrt{35}}{2} = \dfrac{12+2\sqrt{35}}{2} = 6+\sqrt{35}.$

95. $a+b\sqrt{3} = \dfrac{(5+2\sqrt{3})}{(7+4\sqrt{3})} \times \dfrac{(7-4\sqrt{3})}{(7-4\sqrt{3})} = \dfrac{35-20\sqrt{3}+14\sqrt{3}-24}{(7)^2-(4\sqrt{3})^2} = \dfrac{11-6\sqrt{3}}{49-48} = 11-6\sqrt{3}.$

$\therefore\ a = 11,\ b = -6.$

96. $\dfrac{\sqrt{2}-1}{\sqrt{2}+1} = \dfrac{(\sqrt{2}-1)}{(\sqrt{2}+1)} \times \dfrac{(\sqrt{2}-1)}{(\sqrt{2}-1)} = (\sqrt{2}-1)^2.$

$\therefore\ \sqrt{\dfrac{\sqrt{2}-1}{\sqrt{2}+1}} = (\sqrt{2}-1) = (1.414-1) = 0.414.$

97. Given exp. $= \dfrac{3+\sqrt{6}}{5\sqrt{3}-4\sqrt{3}-4\sqrt{2}+5\sqrt{2}} = \dfrac{(3+\sqrt{6})}{(\sqrt{3}+\sqrt{2})}$

$= \dfrac{(3+\sqrt{6})}{(\sqrt{3}+\sqrt{2})} \times \dfrac{(\sqrt{3}-\sqrt{2})}{(\sqrt{3}-\sqrt{2})} = \dfrac{3\sqrt{3}-3\sqrt{2}+3\sqrt{2}-2\sqrt{3}}{(3-2)} = \sqrt{3}.$

98. Given exp. $= \dfrac{(2+\sqrt{3})}{(2-\sqrt{3})} \times \dfrac{(2+\sqrt{3})}{(2+\sqrt{3})} + \dfrac{(2-\sqrt{3})}{(2+\sqrt{3})} \times \dfrac{(2-\sqrt{3})}{(2-\sqrt{3})} + \dfrac{(\sqrt{3}-1)}{(\sqrt{3}+1)} \times \dfrac{(\sqrt{3}-1)}{(\sqrt{3}-1)}$

$= \dfrac{(2+\sqrt{3})^2}{(4-3)} + \dfrac{(2-\sqrt{3})^2}{(4-3)} + \dfrac{(\sqrt{3}-1)^2}{(3-1)} = [(2+\sqrt{3})^2 + (2-\sqrt{3})^2] + \dfrac{4-2\sqrt{3}}{2}$

$= 2(4+3) + 2 - \sqrt{3} = 16 - \sqrt{3}.$

99. $x + \dfrac{1}{x} = (7-4\sqrt{3}) + \dfrac{1}{(7-4\sqrt{3})} \times \dfrac{(7+4\sqrt{3})}{(7+4\sqrt{3})} = (7-4\sqrt{3}) + \dfrac{(7+4\sqrt{3})}{(49-48)}$

$= (7-4\sqrt{3}) + (7+4\sqrt{3}) = 14.$

100. $x = \dfrac{(\sqrt{3}+1)}{(\sqrt{3}-1)} \times \dfrac{(\sqrt{3}+1)}{(\sqrt{3}+1)} = \dfrac{(\sqrt{3}+1)^2}{(3-1)} = \dfrac{3+1+2\sqrt{3}}{2} = 2+\sqrt{3}.$

$y = \dfrac{(\sqrt{3}-1)}{(\sqrt{3}+1)} \times \dfrac{(\sqrt{3}-1)}{(\sqrt{3}-1)} = \dfrac{(\sqrt{3}-1)^2}{(3-1)} = \dfrac{3+1-2\sqrt{3}}{2} = 2-\sqrt{3}.$

$\therefore \quad x^2 + y^2 = (2+\sqrt{3})^2 + (2-\sqrt{3})^2 = 2(4+3) = 2 \times 7 = 14.$

101. $a = \dfrac{(\sqrt{5}+1)}{(\sqrt{5}-1)} \times \dfrac{(\sqrt{5}+1)}{(\sqrt{5}+1)} = \dfrac{(\sqrt{5}+1)^2}{(5-1)} = \dfrac{5+1+2\sqrt{5}}{4} = \left(\dfrac{3+\sqrt{5}}{2}\right).$

$b = \dfrac{(\sqrt{5}-1)}{(\sqrt{5}+1)} \times \dfrac{(\sqrt{5}-1)}{(\sqrt{5}-1)} = \dfrac{(\sqrt{5}-1)^2}{(5-1)} = \dfrac{5+1-2\sqrt{5}}{4} = \left(\dfrac{3-\sqrt{5}}{2}\right).$

$\therefore \quad a^2 + b^2 = \dfrac{(3+\sqrt{5})^2}{4} + \dfrac{(3-\sqrt{5})^2}{4} = \dfrac{(3+\sqrt{5})^2 + (3-\sqrt{5})^2}{4} = \dfrac{2(9+5)}{4} = 7.$

Also, $ab = \dfrac{(3+\sqrt{5})}{2} \cdot \dfrac{(3-\sqrt{5})}{2} = \dfrac{(9-5)}{4} = 1.$

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

102.

1	$\overline{1}\,\overline{53}\,\overline{76}$	(124
	1	
22	53	
	44	
244	976	
	976	
	×	

$\therefore$ Number of rows = 124.

103.

1	$\overline{3}\,\overline{65}\,\overline{81}$	(191
	1	
29	265	
	261	
381	481	
	381	
	100	

$\therefore$ Number of men left = 100.

104. Money collected = (59.29 × 100) paise = 5929 paise.

$\therefore$ Number of members $= \sqrt{5929} = 77.$

105. $(.000216)^{1/3} = \left(\dfrac{216}{10^6}\right)^{1/3} = \left(\dfrac{6 \times 6 \times 6}{10^2 \times 10^2 \times 10^2}\right)^{1/3} = \dfrac{6}{10^2} = \dfrac{6}{100} = .06.$

106. $\sqrt[3]{4\frac{12}{125}} = \sqrt[3]{\frac{512}{125}} = \left(\frac{8\times8\times8}{5\times5\times5}\right)^{1/3} = \frac{8}{5} = 1\frac{3}{5}$.

107. $\sqrt{.000064} = \sqrt{\frac{64}{10^6}} = \frac{8}{10^3} = \frac{8}{1000} = .008$.

$\therefore \sqrt[3]{\sqrt{.000064}} = \sqrt[3]{.008} = \sqrt[3]{\frac{8}{1000}} = \frac{2}{10} = 0.2$.

108. Clearly, 9261 is a perfect cube satisfying the given property.

109. $675 = 5 \times 5 \times 3 \times 3 \times 3$.

To make it a perfect cube, it must be multiplied by 5.

110. $3600 = 2^3 \times 5^2 \times 3^2 \times 2$.

To make it a perfect cube, it must be divided by $5^2 \times 3^2 \times 2$ *i.e.*, 450.