CHAPTER-5
SQUARE ROOT OF POSITIVE NUMBER

Students Learning Outcomes

After studying this chapter, students will be able to:

- Define a perfect square.
- Test whether a number is a perfect square or not.
- Identify and apply the following properties of the perfect square of a number.
  - The square of an even number is even.
  - The square of an odd number is odd.
  - The square of a proper fraction is less than itself.
  - The square of a decimal less than 1 is smaller than the decimal.
- Define the square root of a natural number and recognize its notation.
- Find square root, by division method and factorization method, of a
  - Natural number,
  - Fraction,
  - Decimal,

Which are perfect squares.

- Solve real life problems involving square roots.

SOLVED EXERCISE 5.1

1. Find the square of the following numbers.

(i)	6	(ii)	5	(iii)	10	(iv)	7	(v)	13
(vi)	8	(vii)	41	(viii)	19	(ix)	100	(x)	9
(xi)	11	(xii)	25						

Solution:

(i) $(6)^2 = 6 \times 6 = 36$

(ii) $(5)^2 = 5 \times 5 = 25$

(iii) $(10)^2 = 10 \times 10 = 100$

(iv) $(7)^2 = 7 \times 7 = 49$

(v) $(13)^2 = 13 \times 13 = 169$

(vi) $(8)^2 = 8 \times 8 = 64$

(vii) $(41)^2 = 41 \times 41 = 1681$

(viii) $(19)^2 = 19 \times 19 = 361$

(ix) $(100)^2 = 100 \times 100 = 10000$

(x) $(9)^2 = 9 \times 9 = 81$

(xi) $(11)^2 = 11 \times 11 = 121$

(xii) $(25)^2 = 25 \times 25 = 625$

2. Test whether the following numbers are prefect square or not.

(i)	59	(ii)	625	(iii)	225	(iv)	196
(v)	425	(vi)	81	(vii)	121	(viii)	2500

Solution:

(ii),(iii),(iv),(vi),(vii) and (viii)	perfect square
(i) and (v)	not perfect square

3. Without solving separate the perfect square of even and odd numbers.

(i)	441	(ii)	144	(iii)	2401	(iv)	6561
(v)	2025	(vi)	11236	(vii)	7569	(viii)	12544

Solution:

(i), (iii), (iv), (v) and (vii) are perfect squares of odd numbers.
(ii) (vi) and (viii) are perfect squares of even numbers.

4. Find the squares of proper fractions. Also compare them with itself.

Solution:

(i) $\left(\frac{3}{4}\right)^2 = \frac{9}{16}, \frac{3}{4} > \frac{9}{16}$

(ii) $\left(\frac{5}{6}\right)^2 = \frac{25}{36}, \frac{5}{6} > \frac{25}{36}$

(iii) $\left(\frac{4}{11}\right)^2 = \frac{16}{121}, \frac{4}{11} > \frac{16}{121}$

(iv) $\left(\frac{1}{7}\right)^2 = \frac{1}{49}, \frac{1}{7} > \frac{1}{49}$

5. Find the square of decimals and compare them with itself.

Solution:

(i) $(0.4)^2 = 0.16, 0.16 < 0.4$
(ii) $(0.6)^2 = 0.36, 0.36 < 0.6$
(iii) $(0.12)^2 = 0.0144, 0.0144 < 0.12$
(iv) $(0.05)^2 = 0.0025, 0.0025 < 0.05$

SOLVED EXERCISE 5.2

1. Find the square roots.

Solution:

(i) $\sqrt{4} = = = 2$

(ii) $\sqrt{9^2} = 9$

(iii) $\sqrt{36} = \sqrt{6\times6} = \sqrt{6^2} = 6$

(iv) $\sqrt{(25)^2} = 25$

(v) $\sqrt{16} = \sqrt{4\times4} = \sqrt{4^2} = 4$

(vi) $\sqrt{c^2} = c$

(vii) $\sqrt{49} = \sqrt{7\times7} = \sqrt{7^2} = 7$

(viii) $\sqrt{a^2} = a$

(ix) $\sqrt{25} = \sqrt{5\times5} = \sqrt{5^2} = 5$

(x) $\sqrt{81} = \sqrt{9\times9} = \sqrt{9^2} = 9$

(xi) $\sqrt{y^2} = y$

(xii) $\sqrt{100} = \sqrt{10\times10} = \sqrt{10^2} = 10$

2. Find the square root of the following numbers of prime factorization.

Solution:

(i) $\sqrt{144} = \sqrt{2\times2\times2\times2\times3\times3} = \sqrt{2^2\times2^2\times3^2}$

$= \sqrt{2^2}\times\sqrt{2^2}\times\sqrt{3^2} = 2\times2\times3 = 12$

(ii) $\sqrt{256} = \sqrt{2\times2\times2\times2\times2\times2\times2\times2} = \sqrt{2^2\times2^2\times2^2\times2^2}$

$= \sqrt{2^2}\times\sqrt{2^2}\times\sqrt{2^2}\times\sqrt{2^2} = 2\times2\times2\times2 = 16$

(iii) $\sqrt{576} = \sqrt{2\times2\times2\times2\times2\times2\times3\times3} = \sqrt{2^2\times2^2\times2^2\times3^2}$

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

$= 2\times2\times2\times3 = 24$

(iv) $\sqrt{324} = \sqrt{2\times2\times3\times3\times3\times3} = \sqrt{2^2\times3^2\times3^2}$

$= \sqrt{2^2}\times\sqrt{3^2}\times\sqrt{3^2} = 2\times3\times3 = 18$

(v) $\sqrt{441} = \sqrt{3\times3\times7\times7} = \sqrt{3^2\times7^2} = \sqrt{3^2}\times\sqrt{7^2} = 3\times7 = 21$

(vi) $\sqrt{729} = \sqrt{3\times3\times3\times3\times3\times3}$

$= \sqrt{3^2\times3^2\times3^2} = \sqrt{3^2}\times\sqrt{3^2}\times\sqrt{3^2} = 3\times3\times3 = 27$

(vii) $\sqrt{196} = \sqrt{2\times2\times7\times7}$

$= \sqrt{2^2 \times 7^2} = \sqrt{2^2} \times \sqrt{7^2} = 2 \times 7 = 14$

(viii) $\sqrt{1225} = \sqrt{5 \times 5 \times 7 \times 7}$

$= \sqrt{5^2 \times 7^2} = \sqrt{5^2} \times \sqrt{7^2} = 5 \times 7 = 35$

(ix) $\sqrt{10000} = \sqrt{2 \times 2 \times 2 \times 2 \times 5 \times 5 \times 5 \times 5}$

$= \sqrt{2^2 \times 2^2 \times 5^2 \times 5^2} = \sqrt{2^2} \times \sqrt{2^2} \times \sqrt{5^2} \times \sqrt{5^2} = 2 \times 2 \times 5 \times 5 = 100$

(x) $\sqrt{1764} = \sqrt{2 \times 2 \times 3 \times 3 \times 7 \times 7}$

$= \sqrt{2^2 \times 3^2 \times 7^2} = \sqrt{2^2} \times \sqrt{3^2} \times \sqrt{7^2} = 2 \times 3 \times 7 = 42$

(xi) $\sqrt{4356} = \sqrt{2 \times 2 \times 3 \times 3 \times 11 \times 11}$

$= \sqrt{2^2 \times 3^2 \times 11^2} = \sqrt{2^2} \times \sqrt{3^2} \times \sqrt{11^2} = 2 \times 3 \times 11 = 66$

3. Find the square roots of the following fractions.

Solution:

(i) $\sqrt{\frac{49}{81}} = \sqrt{\frac{7 \times 7}{9 \times 9}} = \frac{\sqrt{7^2}}{\sqrt{9^2}} = \frac{7}{9}$

(ii) $\sqrt{2.25} = \sqrt{\frac{225}{100}} = \sqrt{\frac{15 \times 15}{10 \times 10}} = \frac{\sqrt{(15)^2}}{\sqrt{(10)^2}} = \frac{15}{10} = \frac{3}{2} = 1.5$

(iii) $\sqrt{\frac{144}{196}} = \sqrt{\frac{12 \times 12}{14 \times 14}} = \sqrt{\frac{12^2}{14^2}} = \frac{\sqrt{12^2}}{\sqrt{14^2}} = \frac{12}{14} = \frac{6}{7}$

(iv) $0.0196 = \sqrt{\frac{196}{10000}} = \sqrt{\frac{14 \times 14}{100 \times 100}} = \frac{\sqrt{14^2}}{\sqrt{(100)^2}} = \frac{14}{100} = \frac{7}{50} = 0.14$

(v) $\sqrt{\frac{784}{441}} = \sqrt{\frac{28 \times 28}{21 \times 21}} = \sqrt{\frac{(28)^2}{(21)^2}} = \frac{\sqrt{(28)^2}}{\sqrt{(21)^2}} = \frac{28}{21} = \frac{4}{3}$

(vi) $\sqrt{1\frac{13}{36}} = \sqrt{\frac{49}{36}} = \sqrt{\frac{7 \times 7}{6 \times 6}} = \sqrt{\frac{7^2}{6^2}} = \frac{\sqrt{7^2}}{\sqrt{6^2}} = \frac{7}{6} = 1\frac{1}{6}$

(vii) $\sqrt{3.24} = \sqrt{\frac{324}{100}} = \sqrt{\frac{18 \times 18}{10 \times 10}} = \sqrt{\frac{(18)^2}{(10)^2}} = \frac{\sqrt{18^2}}{\sqrt{10^2}} = \frac{18}{10} = 1.8$

(viii) $\sqrt{12.25} = \sqrt{\frac{1225}{100}} = \sqrt{\frac{35 \times 35}{10 \times 10}} = \sqrt{\frac{35^2}{10^2}} = \frac{\sqrt{35^2}}{\sqrt{10^2}} = \frac{35}{10} = 3.5$

(ix) $\sqrt{3\frac{325}{900}} = \sqrt{\frac{3025}{900}} = \sqrt{\frac{55 \times 55}{30 \times 30}} = \sqrt{\frac{(55)^2}{(30)^2}} = \frac{\sqrt{(55)^2}}{\sqrt{(30)^2}} = \frac{55}{30} = \frac{11}{6} = 1\frac{5}{6}$

(x) $\sqrt{59.29}=\sqrt{\frac{5929}{100}}=\sqrt{\frac{77\times77}{10\times10}}=\sqrt{\frac{77^2}{10^2}}=\frac{\sqrt{77^2}}{\sqrt{10}^2}=\frac{77}{10}=7.7$

(xi) $\sqrt{1\frac{252}{324}}=\sqrt{\frac{576}{324}}=\sqrt{\frac{24\times24}{18\times18}}=\sqrt{\frac{24^2}{18^2}}=\frac{\sqrt{24^2}}{\sqrt{18^2}}=\frac{24}{18}=\frac{4}{3}=1\frac{1}{3}$

(xii) $\sqrt{1.5625}=\sqrt{\frac{15625}{10000}}=\sqrt{\frac{125\times125}{100\times100}}=\sqrt{\frac{(125)^2}{(100)^2}}=\frac{\sqrt{(125)^2}}{\sqrt{(100)^2}}=\frac{125}{100}=1.25$

4. Prove each of the following by prime factorization.

Solution:

(i) $\sqrt{9\times36}=\sqrt{9}\times\sqrt{36}$

$\sqrt{3\times3\times2\times2\times3\times3}=\sqrt{3\times3}\times\sqrt{2\times2\times3\times3}$

$\sqrt{3^2\times2^2\times3^2}=\sqrt{3^2}\times\sqrt{2^2\times3^2}$

$3\times2\times3=3\times2\times3$

$18=18$

(ii) $\sqrt{144\times4}=\sqrt{144}\times\sqrt{4}$

$\sqrt{2\times2\times2\times2\times3\times3\times2\times2}=\sqrt{2\times2\times2\times2\times3\times3}\times\sqrt{2\times2}$ $\sqrt{2^2\times2^2\times3^2\times2^2}=\sqrt{2^2\times2^2\times3^2}\times\sqrt{2^2}$

$2\times2\times3\times2=2\times2\times3\times2$

$24=24$

(iii) $\sqrt{64\times25}=\sqrt{64}\times\sqrt{25}$

$\sqrt{2\times2\times2\times2\times2\times2\times5\times5}=\sqrt{2\times2\times2\times2\times2\times2}\times\sqrt{5\times5}$

$\sqrt{2^2\times2^2\times2^2\times5^2}=\sqrt{2^2\times2^2\times2^2}\times\sqrt{5^2}$

$2\times2\times2\times5=2\times2\times2\times5$

$40=40$

(iv) $\sqrt{81\times100}=\sqrt{81}\times\sqrt{100}$

$\sqrt{3\times3\times3\times3\times2\times2\times5\times5}=\sqrt{3\times3\times3\times3}\times\sqrt{2\times2\times5\times5}$

$\sqrt{3^2\times3^2\times2^2\times5^2}=\sqrt{3^2\times3^2}\times\sqrt{2^2\times5^2}$

$3\times3\times2\times5=3\times3\times2\times5$

$90=90$

(v) $\sqrt{\frac{144}{9}}=\frac{\sqrt{144}}{\sqrt{9}}$

$\sqrt{\frac{2\times2\times2\times2\times3\times3}{3\times3}}=\frac{\sqrt{2\times2\times2\times2\times3\times3}}{\sqrt{3\times3}}$

$\frac{\sqrt{2^2\times2^2\times3^2}}{\sqrt{3^2}}=\frac{\sqrt{2^2\times2^2\times3^2}}{\sqrt{3^2}}\Rightarrow\frac{2\times2\times3}{3}=\frac{2\times2\times3}{3}$

$4=4$

(vi) $\sqrt{\frac{256}{4}}=\frac{\sqrt{256}}{\sqrt{4}}$

$\sqrt{\frac{2\times2\times2\times2\times2\times2\times2\times2}{2\times2}}=\frac{\sqrt{2\times2\times2\times2\times3\times3}}{\sqrt{2\times2}}$

$\sqrt{\frac{2^2\times2^2\times2^2\times2^2}{2^2}}=\frac{\sqrt{2^2\times2^2\times2^2\times2^2}}{\sqrt{2^2}}$

$\frac{\sqrt{2^2\times2^2\times2^2\times2^2}}{\sqrt{2^2}}=\frac{\sqrt{2^2\times2^2\times2^2\times2^2}}{\sqrt{2^2}}\Rightarrow\frac{2\times2\times2\times2}{2}=\frac{2\times2\times2\times2}{2}$

$8=8$

(vii) $\sqrt{\frac{484}{121}}=\frac{\sqrt{484}}{\sqrt{121}}$

$\sqrt{\frac{2\times2\times11\times11}{11\times11}}=\frac{\sqrt{2\times2\times11\times11}}{\sqrt{11\times11}}$

$\frac{\sqrt{2^2\times11^2}}{\sqrt{11^2}}=\frac{\sqrt{2^2\times11^2}}{\sqrt{11^2}}$

$\frac{2\times11}{11}=\frac{2\times11}{11}$

$2=2$

(viii) $\sqrt{\frac{576}{144}}=\frac{\sqrt{576}}{\sqrt{144}}$

$\sqrt{\frac{2\times2\times2\times2\times2\times2\times3\times3}{2\times2\times2\times2\times3\times3}}=\frac{\sqrt{2\times2\times2\times2\times2\times2\times3\times3}}{\sqrt{2\times2\times2\times2\times3\times3}}$

$\frac{\sqrt{2^2\times2^2\times2^2\times3^2}}{\sqrt{2^2\times2^2\times3^2}}=\frac{\sqrt{2^2\times2^2\times2^2\times3^2}}{\sqrt{2^2\times2^2\times3^2}}$

$\frac{2\times2\times2\times3}{2\times2\times3}=\frac{2\times2\times2\times3}{2\times2\times3}$

$2=2$

SOLVED EXERCISE 5.3

1. Find the square roots of the following by division method.

Solution:

(i)

	27
	$\overline{729}$
2	4
47	329
	329
	0

The square root is 27

(ii)

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

The square root is 48

(iii)

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

The square root is 67

(iv)

	84
	$\overline{7056}$
8	64
164	656
	656
	0

The square root is 84

(v)

	99
	$\overline{9801}$
9	81
189	1701
	1701
	0

The square root is 99

(vi)

	120
	$\overline{14400}$
1	1
22	44
	44
	0

The square root is 120

(vii)

	125
	$\overline{1}\,\overline{5}\,\overline{6}\,\overline{2}\overline{5}$
1	1
22	56 44
245	1225 1225
	0

The square root is 125

(viii)

	136
	$\overline{1}\,\overline{8}\,\overline{4}\,\overline{9}\overline{6}$
1	1
23	84 69
266	1596 1596
	0

The square root is 136

(ix)

	456
	$\overline{2}\,\overline{0}\,\overline{7}\,\overline{9}\overline{3}\overline{6}$
4	16
85	479 425
906	5436 5436
	0

The square root is 456

(x)

	567
	$\overline{3}\,\overline{2}\,\overline{1}\,\overline{4}\overline{8}\overline{9}$
5	25
106	714 636
1127	7889 7889
	0

The square root is 567

(xi)

	2345
	$\overline{5}\,\overline{4}\,\overline{9}\,\overline{9}\overline{0}\overline{2}\overline{5}$
2	4
43	149 129
464	2090 1856
4685	23425 23425
	0

The square root is 2345

(xii)

	2233
	$\overline{4}\,\overline{9}\,\overline{8}\,\overline{6}\overline{2}\overline{8}\overline{9}$
2	4
42	98 84
443	1462 1329
4463	13389 13389
	0

The square root is 2233

2. Find the square root of the following common fractions by division method. Solution:

(i) $\sqrt{\frac{39}{49}} = \frac{\sqrt{36}}{\sqrt{49}} = \frac{6}{7}$

6		7	
	$\overline{3}\overline{6}$		$\overline{4}\overline{9}$
6	36	7	49
	36		49
	0		0

The square root is $\frac{6}{7}$.

(ii) $\sqrt{\frac{225}{482}} = \frac{\sqrt{225}}{\sqrt{484}} = \frac{15}{22}$

15		22	
	$\overline{2}\overline{2}\overline{5}$		$\overline{4}\overline{8}\overline{4}$
1	1	2	4
25	125 125	42	84 84
	0		0

The square root is

(iii) $\sqrt{\frac{81}{196}} = \frac{\sqrt{81}}{\sqrt{196}} = \frac{9}{14}$

9	81
9	81
	0

14	196
1	1
24	96
	96
	0

The square root is

(iv) $\sqrt{\frac{729}{1024}} = \frac{\sqrt{729}}{\sqrt{1024}} = \frac{27}{32}$

27	729
2	4
47	329
	329
	0

32	1024
3	9
62	124
	124
	0

The square root is

(v) $\sqrt{2\frac{14}{25}} = \sqrt{\frac{64}{25}} = \frac{\sqrt{64}}{\sqrt{25}} = \frac{8}{5} = 1\frac{3}{5}$

8	64
8	64
	0

5	25
5	25
	0

The square root is $= 1\frac{3}{5}$

(vi) $\sqrt{\frac{1296}{725}} = \frac{\sqrt{1296}}{\sqrt{225}} = \frac{36}{15} = \frac{12}{5} = 2\frac{2}{5}$

36	1296
3	9
66	396
	396
	0

15	225
1	1
25	125
	125
	0

The square root is 2

(vii) $\sqrt{3\frac{526}{625}} = \sqrt{\frac{2401}{625}} = \frac{\sqrt{2401}}{\sqrt{625}} = \frac{49}{25} = 1\frac{24}{25}$

49	2401
4	16
89	801
	801
	0

25	625
2	4
45	225
	225
	0

The square root is = 1

(viii) $\sqrt{\frac{3025}{4096}} = \frac{\sqrt{3025}}{\sqrt{4096}} = \frac{55}{64}$

55	3025
5	25
105	525
	525
	0

64	4096
6	36
124	496
	496
	0

The square root is

(ix) $\sqrt{2\frac{175}{225}} = \sqrt{\frac{625}{225}} = \frac{25}{15} = \frac{5}{3} = 1\frac{2}{3}$

25	625
2	4
45	225
	225
	0

15	225
1	1
25	125
	125
	0

The square root is 1 .

(x) $\sqrt{\frac{324}{576}} = \frac{\sqrt{324}}{\sqrt{576}} = \frac{18}{24} = \frac{3}{4}$

$$\begin{array}{r|l} & 18 \\ \hline 1 & \overline{324} \\ & 1 \\ \hline 28 & 224 \\ & 224 \\ \hline & 0 \end{array} \qquad \begin{array}{r|l} & 24 \\ \hline 2 & \overline{576} \\ & 4 \\ \hline 44 & 176 \\ & 176 \\ \hline & 0 \end{array}$$

The square root is .

(xi) $\sqrt{\frac{5625}{40000}} = \frac{\sqrt{5625}}{\sqrt{40000}} = \frac{75}{200} = \frac{3}{8}$

$$\begin{array}{r|l} & 75 \\ \hline 7 & \overline{56}\,\overline{25} \\ & 49 \\ \hline 145 & 725 \\ & 725 \\ \hline & 0 \end{array} \qquad \begin{array}{r|l} & 200 \\ \hline 2 & \overline{4}\,\overline{00}\,\overline{00} \\ & 4 \\ \hline 20 & 00 \\ & 00 \\ \hline 200 & 000 \\ & 000 \\ \hline & 0 \end{array}$$

The square root is .

(xii) $\sqrt{1\frac{295}{729}} = \sqrt{\frac{1024}{729}} = \frac{\sqrt{1024}}{\sqrt{729}} = \frac{32}{27} = 1\frac{5}{27}$

$$\begin{array}{r|l} & 32 \\ \hline 3 & \overline{10}\,\overline{24} \\ & 9 \\ \hline 62 & 124 \\ & 124 \\ \hline & 0 \end{array} \qquad \begin{array}{r|l} & 27 \\ \hline 2 & \overline{7}\,\overline{29} \\ & 4 \\ \hline 47 & 329 \\ & 329 \\ \hline & 0 \end{array}$$

The square root is 1.

3. Find the square roots of the following decimals.

Solution:

(i) $\sqrt{0.0529} = 0.23$

$$\begin{array}{r|l} & 0.23 \\ \hline 2 & \overline{0.05}\,\overline{29} \\ & 4 \\ \hline 43 & 129 \\ & 129 \\ \hline & 0 \end{array}$$

The square root is 0.23

(ii) $\sqrt{1.5625} = 1.25$

$$\begin{array}{r|l} & 1.25 \\ \hline 1 & \overline{1.56}\,\overline{25} \\ & 1 \\ \hline 22 & 56 \\ & 44 \\ \hline 245 & 1225 \\ & 1225 \\ \hline & 0 \end{array}$$

The square root is 1.25.

(iii) $\sqrt{9.7344} = 3.12$

$$\begin{array}{r|l} & 3.12 \\ \hline 3 & \overline{9.73}\,\overline{44} \\ & 9 \\ \hline 61 & 73 \\ & 61 \\ \hline 622 & 1244 \\ & 1244 \\ \hline & 0 \end{array}$$

The square root is 3.12

(iv) $\sqrt{0.4761} = 0.69$

$$\begin{array}{r|l} & 0.69 \\ \hline 6 & \overline{0.47}\,\overline{61} \\ & 36 \\ \hline 129 & 1161 \\ & 1161 \\ \hline & 0 \end{array}$$

The square root is 0.69.

(v) $\sqrt{0.001369} = 0.037$

$$\begin{array}{r|l} & 0.037 \\ \hline 3 & \overline{0.00}\,\overline{13}\,\overline{69} \\ & 9 \\ \hline 67 & 469 \\ & 469 \\ \hline & 0 \end{array}$$

The square root is 0.037.

(vi) $\sqrt{32.1489} = 5.67$

$$\begin{array}{r|l} & 5.67 \\ \hline 5 & \overline{32.}\,\overline{14}\,\overline{89} \\ & 25 \\ \hline 106 & 714 \\ & 636 \\ \hline 1127 & 7889 \\ & 7889 \\ \hline & 0 \end{array}$$

The square root is 5.67.

(vii) $\sqrt{0.002025} = 0.045$

$$\begin{array}{r|l} & 0.045 \\ \hline 4 & \overline{0.00}\,\overline{20}\,\overline{25} \\ & 16 \\ \hline 85 & 425 \\ & 425 \\ \hline & 0 \end{array}$$

The square root is 0.045.

(viii) $\sqrt{131.1025} = 11.45$

$$\begin{array}{r|l} & 11.45 \\ \hline 1 & \overline{1}\,\overline{31.}\,\overline{10}\,\overline{25} \\ & 1 \\ \hline 21 & 31 \\ & 21 \\ \hline 224 & 1010 \\ & 896 \\ \hline 2285 & 11425 \\ & 11425 \\ \hline & 0 \end{array}$$

The square root is 11.45.

(ix) $\sqrt{508.5025} = 22.55$

$$\begin{array}{r|l} & 22.55 \\ \hline 2 & \overline{5}\,\overline{08.}\,\overline{50}\,\overline{25} \\ & 4 \\ \hline 42 & 108 \\ & 84 \\ \hline 445 & 2450 \\ & 2225 \\ \hline 4505 & 22525 \\ & 22525 \\ \hline & 0 \end{array}$$

The square root is 22.55

(x) $\sqrt{799.7584} = 28.28$

$$
\begin{array}{r|l}
 & \;\;28.28 \\
\hline
2 & \overline{7}\,\overline{99}.\overline{75}\,\overline{84} \\
 & 4 \\
\hline
48 & 399 \\
 & 384 \\
\hline
562 & \;\;1575 \\
 & \;\;1124 \\
\hline
5648 & \;\;\;45184 \\
 & \;\;\;45184 \\
\hline
 & \;\;\;\;\;\;0
\end{array}
$$

The square root is 28.28

(xi) $\sqrt{1082.41} = 32.9$

$$
\begin{array}{r|l}
 & \;32.9 \\
\hline
3 & \overline{10}\,\overline{82}.\overline{41} \\
 & 9 \\
\hline
62 & \;182 \\
 & \;124 \\
\hline
649 & \;\;5841 \\
 & \;\;5841 \\
\hline
 & \;\;\;\;0
\end{array}
$$

The square root is 32.9

(xii) $\sqrt{4596.84} = 67.8$

$$
\begin{array}{r|l}
 & \;67.8 \\
\hline
6 & \overline{45}\,\overline{96}.\overline{84} \\
 & 36 \\
\hline
127 & \;\;996 \\
 & \;\;889 \\
\hline
1348 & \;\;10784 \\
 & \;\;10784 \\
\hline
 & \;\;\;\;\;0
\end{array}
$$

The square root is 67.8

SOLVED EXERCISE 5.4

1. The area of a square is 73.96m². Calculate the length of its side.

Solution:

Area of square $= 73.96m^2$

length of its side $= \sqrt{73.96} \Rightarrow = \sqrt{\frac{7396}{100}} = \sqrt{\frac{2^2 \times 43^2}{10^2}} = \frac{2 \times 43}{10} = \frac{43}{5} = 8.6m$

The length of its side is

2. 324 soldiers queued up such that the number of queues is equal to the number of soldiers in each queue. Find the number of queues.

Solution:

Number of Soldiers $= 324$

Number of queues $= 3 \times 6 = 18$ queues(square root of 324)

3. By which smallest number can 275 be multiplied to get a perfect square?

Solution:

Let the smallest number is 'x' then $(275 \times x)$ should be a perfect square

$\Rightarrow$

$=$

$=$

x should be 11 for the perfect square.

If we multiply by 11 then 275 get a perfect square.

4. By which smallest number can 648 be divided to get a perfect square?

Solution:

Let x is the smallest number then according to the condition.

$\Rightarrow 648 \div x$ is a perfect square

$= \sqrt{2^2 \times 9^2 \times 2 \div x}$

It is divided by (2) if it becomes a perfect square.

5. The length and breadth of a rectangular swimming pool are 243m and 27m respectively. Find the length of a square shaped swimming pool which has the same area as a rectangular swimming pool.

Solution:

Area of Rectangular swimming pool = length × breath

$= 243 \times 27 = 6561m^2 \Leftarrow$ length of proof

Give that

Area of square shaped swimming pool = Area of rectangular swimming pool.

$= 6561m^2$

Length of square shaped swimming pool =

$= 3\times3\times9 = 81m$ (sq root of 6521)

6. The base and height of a triangle are 8cm and 4.5cm respectively. Find the length of the side of a square whose area is the double of the given triangle.

Solution:

Area of triangle = $\times$ base $\times$ height

$= \times 8 \times 4.5 = 18cm^2$

Area of square $= 2 \times 18 = 36cm^2$

Length of side of square =

$= 6cm$

The length of the side of square = 6cm

7. The area of a square field is $617796m^2$. Find the length of its side.

Solution:

Area of square field $= 617796m^2$

Length of square field = 786m (sq root of 617796)

8. A nursery owner tries to arrange 89500 plants into the shape of solid square. But he finds that he has 99 plants left over. Find how many plants did the owner arrange in a row. (Hint= 89500-99 = ?)

Solution:

No of plants arrange $= 89500 - 99 = 89401$

No of plants arranged in a row = 299 plants. (Sq root of 89401)

9. Which smallest number can be subtracted from 15198 to get a perfect square?

Solution:

Let the smallest number is 'x' then (15198-x) should be a perfect square.

$\Rightarrow \sqrt{15198-x}$

$= \sqrt{(123\times123)+69-x} = \sqrt{(123)^2+69-x}$

If we subtract 69 then 15198 gets a perfect square.

10. Find the number that gives 992.8801 after multiplying itself.

Solution:

$$= \sqrt{\frac{9928801}{10000}} = \sqrt{\frac{3151\times3151}{100\times100}} = \sqrt{\frac{(3151)^2}{(100)^2}} = \frac{3151}{100} = 31.51$$

The number is 31.51.

11. Find the length of the sides of a rectangle whose length is four times of its width and area is $51.84cm^2$.

Solution:

If width = a then length = 4a $\Rightarrow$ As Area = L × W

$\Rightarrow$ $51.84 = a \times 4a$ $\Rightarrow$ $= a^2$

$12.96 = a^2$ $\Rightarrow$ $\sqrt{\frac{1296}{100}} = a$

$\sqrt{\frac{36\times36}{10\times10}} = a$ $\Rightarrow$ $\sqrt{\frac{(36)^2}{(10)^2}} = a$

$= a$ $\Rightarrow$ a = 3.6 cm width of side

Length of rectangle = 4 × 3.6 = 14.4cm

SOLVED REVIEW EXERCISE 5

1. Answer the following questions.

(i) What is meant by the square of a number?

Answer:

The product of a number with itself is called square.

(ii) Define a perfect square.

Answer:

A natural number is called a perfect square, if it is a square of any natural number.

(iii) Which smaller number can be subtracted from 50 to get a perfect square?

Answer:

1 (One)

(iv) Name the two methods for finding the square roots of large natural numbers.

Answer:

(i) Prime factorization method

(ii) Division method

2. Fill in the blanks.

(i) 4, 9, 16, 25, ... are called perfect square.

(ii) If $x = y^2$, then y is called the squared root of x.

(iii) While finding the square root by division method, the digits are paired from Right to left.

(iv) The number whose square root is non-terminating and non-recurring decimal is called the irrational number.

(v) $\sqrt{\frac{121}{144}} = \frac{\sqrt{121}}{\sqrt{144}} = \frac{11}{12}$

(vi) $\sqrt{\frac{169}{100}} = \frac{\sqrt{169}}{100} = \frac{13}{10}$

3. Tick (✓) the correct answer.

(i) Which of the following is not a perfect square?

(a) (b)

(c) (d)

(ii) If the perimeter of a square shaped garden is 40m then it area is:

(a) $160m^2$ (b) $400m^2$

(c) $100m^2$ (d) $1600m^2$

(iii) $\sqrt{2\frac{1}{4}} =$ _____.

(a) 0.15 (b) 1.5

(c) 10.5 (d) 0.015

Answers:

(i)	b	(ii)	c	(iii)	b

4. Find the square root of the following.

Solution:

(i) sqrt1024 =sqrt(32×32) = 32

(ii) sqrt484=sqrt(22x22) = 22

(iii) $\sqrt{\frac{196}{49}} = \sqrt{\frac{14\times14}{7\times7}} = \sqrt{\frac{(14)^2}{(7)^2}} = \frac{14}{7} = 2$

(iv) $= \sqrt{\frac{625}{100}} = \sqrt{\frac{25\times25}{10\times10}} = \sqrt{\frac{(25)^2}{(10)^2}} = \frac{25}{10} = 2.5$

(v) $= \sqrt{\frac{225}{10000}} = \sqrt{\frac{15\times15}{100\times100}} = \sqrt{\frac{(15)^2}{(100)^2}} = \frac{15}{100} = 0.15$

(vi) $\sqrt{\frac{1225}{3025}} = \sqrt{\frac{35\times35}{55\times55}} = \sqrt{\frac{(35)^2}{(55)^2}} = \frac{35}{55} = \frac{7}{11}$

(vii) $\sqrt{2\frac{15}{25}} = \sqrt{\frac{65}{25}} = \sqrt{\frac{8\times8}{5\times5}} = \sqrt{\frac{(8)^2}{(5)^2}} = \frac{8}{5} = 1\frac{3}{5}$

(viii) $\sqrt{1\frac{40}{81}} = \sqrt{\frac{121}{81}} = \sqrt{\frac{11\times11}{9\times9}} = \sqrt{\frac{(11)^2}{(9)^2}} = \frac{11}{9} = 1\frac{2}{9}$

(ix) $= \sqrt{\frac{1089}{100}} = \sqrt{\frac{33\times33}{10\times10}} = \sqrt{\frac{(33)^2}{(10)^2}} = \frac{33}{10} = 3.3$

(x) $\sqrt{1\frac{23}{121}} = \sqrt{\frac{144}{121}} = \sqrt{\frac{12\times12}{11\times11}} = \sqrt{\frac{12^2}{11^2}} = \frac{12}{11} = 1\frac{1}{11}$

(xi) $\sqrt{\frac{225}{324}} = \sqrt{\frac{15\times15}{18\times18}} = \sqrt{\frac{15^2}{18^2}} = \frac{15}{18} = \frac{5}{6}$

(xii) $= \sqrt{\frac{30625}{10000}} = \sqrt{\frac{175\times175}{100\times100}} = \sqrt{\frac{(175)^2}{(100)^2}} = \frac{175}{100} = 1.75$

(xiii) $= \sqrt{\frac{2916}{100}} = \sqrt{\frac{54\times54}{10\times10}} = \sqrt{\frac{(54)^2}{(10)^2}} = \frac{54}{10} = 5.4$

(xiv) $\sqrt{1\frac{539}{1225}} = \sqrt{\frac{1764}{1225}} = \sqrt{\frac{42\times42}{35\times35}} = \sqrt{\frac{(42)^2}{(35)^2}} = \frac{42}{35} = \frac{6}{5} = 1\frac{1}{5}$

5. Prove each of the following by prime factorization.

Solution:

(i) $36 = 4 \times 9$

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

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

$36 = 36$

(ii) $= \times$

$$\sqrt{\frac{25}{100} \times \frac{4}{100}} = \sqrt{\frac{25}{100}} \times \sqrt{\frac{4}{100}}$$

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

$$\sqrt{\frac{5^2 \times 2^2}{2^2 \times 5^2 \times 2^2 \times 5^2}} = \sqrt{\frac{5^2}{2^2 \times 5^2}} \times \sqrt{\frac{2^2}{2^2 \times 5^2}}$$

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

$$\frac{1}{10} = \frac{1}{10}$$

(iii) $$\sqrt{\frac{5625}{625}} = \frac{\sqrt{5625}}{\sqrt{625}}$$

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

$$\sqrt{\frac{5^2 \times 5^2 \times 3^2}{5^2 \times 5^2}} = \frac{\sqrt{5^2 \times 5^2 \times 3^3}}{\sqrt{5^2 \times 5^2}}$$

=

$3 = 3$

(iv) $$\sqrt{\frac{5.76}{1.44}} = \frac{\sqrt{5.76}}{\sqrt{1.44}}$$

$$\sqrt{\frac{\frac{576}{100}}{\frac{144}{100}}} = \frac{\sqrt{\frac{576}{100}}}{\sqrt{\frac{144}{100}}}$$

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

$$\sqrt{\frac{\frac{2^2 \times 2^2 \times 2^2 \times 3^2}{2^2 \times 5^2}}{\frac{2^2 \times 2^2 \times 3^2}{2^2 \times 5^2}}} = \frac{\sqrt{\frac{2^2 \times 2^2 \times 2^2 \times 3^2}{2^2 \times 5^2}}}{\sqrt{\frac{2^2 \times 2^2 \times 3^2}{2^2 \times 5^2}}}$$

$$\frac{\frac{2\times2\times2\times3}{2\times5}}{\frac{2\times2\times3}{2\times5}} = \frac{\frac{2\times2\times2\times3}{2\times5}}{\frac{2\times2\times3}{2\times5}}$$

$$\frac{2\times\cancel{2}\times\cancel{2}\times\cancel{3}}{\cancel{2}\times\cancel{2}\times\cancel{3}} = \frac{2\times\cancel{2}\times\cancel{2}\times\cancel{3}}{\cancel{2}\times\cancel{2}\times\cancel{3}}$$

$$2 = 2$$

6. 10201 soldiers have queued up for an attack such that the number of queues is equal to the number of the soldiers in each queue. Find the number of queues.

Solution:

Number of Soldiers = 10201

Number of queues = = = = 101 queues (sq root of 10201)

7. A businessman bought a square shaped park whose area is 50625m^2. He wants to fix light poles after the distance of each metre on its surroundings. For this he calculated the perimeter of the park. So you know what perimeter he calculated?

Solution:

Area of square park = 50625m^2

Each side of square park = = = = 225 m(sq root)

Perimeter of square park = 4 × side = 4 × 225 = 900 m

8. The length and breadth of a rectangular swimming pool in a bungalow are 125m and 45m respectively. Find the length of another square shaped swimming pool which has the same area as a rectangular swimming pool.

Solution:

Length = 125m, Breadth = 45 m

Area of rectangular swimming pool = length × breadth = 125 × 45 = 5625m^2

Area of square shape = 5625

Length of square shaped swimming pool = = = 75 m

9. A teacher drew a triangle of 8cm height and 18cm base. Now he wants to draw a square whose area must be the twice that of the triangle. Calculate the length of each side of the square that he has to draw.

Solution:

Height = 8cm, Base = 18 cm

Area of triangle = × height × base = × 18 × 8 = 72 cm^2

Area of square = 2 × area of triangle = 2 × 72 = 144 cm^2

Length of each side of square = = = 12 cm

10. Solve:

(i) By which smallest number can 605 be multiplied to get a perfect square?

(ii) By which smallest number can 3675 be divided to get a perfect square?

(iii) The area of a square is 94.09 m^2. What is the length of its side?

(iv) The length of a side of a square is 55.5 m. What is the area of the square?

Solution:

(i) If we multiply 605 by 5, we get 3025. Which is a perfect square of 55.

(ii) If we divide 3675 by 3, we get 1225. Which is a perfect square of 35.

(iii) Area of square = 94.09 m^2

Length of each side of square = = 9.7 m

(iv) Length of each side of square = 55.5 m

Area of square = $55.5 \times 55.5 = 3080.25$ m^2