

EXERCISE 3.5

1. Find the square root of each of the following by long division method:

(i) 12544 (ii) 97344

(iii) 286225 (iv) 390625

(v) 363609 (vi) 974169

(vii) 120409 (viii) 1471369

(ix) 291600 (x) 9653449

(xi) 1745041 (xii) 4008004

(xiii) 20657025 (xiv) 152547201

(xv) 20421361 (xvi) 62504836

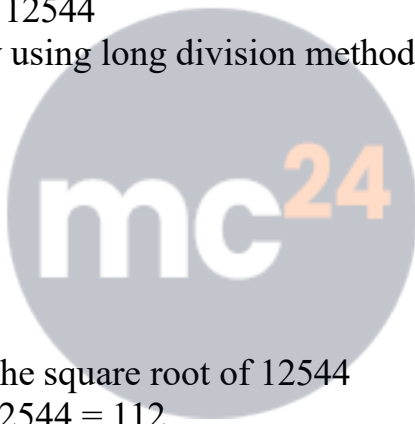
(xvii) 82264900 (xviii) 3226694416

(xix) 6407522209 (xx) 3915380329

Solution:

(i) 12544

By using long division method



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∴ the square root of 12544

$$\sqrt{12544} = 112$$

(ii) 97344

By using long division method

∴ the square root of 97344

$$\sqrt{97344} = 312$$

(iii) 286225

By using long division method

$$\begin{array}{r}
 535 \\
 5 \overline{) 286225} \\
 \underline{25} \\
 103 \\
 \underline{362} \\
 309 \\
 1065 \\
 \underline{5325} \\
 5325 \\
 \underline{0}
 \end{array}$$

\therefore the square root of 286225
 $\sqrt{286225} = 535$

(iv) 390625

By using long division method

$$\begin{array}{r}
 625 \\
 6 \overline{) 390625} \\
 \underline{36} \\
 122 \\
 \underline{306} \\
 244 \\
 1245 \\
 \underline{6225} \\
 6225 \\
 \underline{0}
 \end{array}$$

\therefore the square root of 390625
 $\sqrt{390625} = 625$

(v) 363609

By using long division method

$$\begin{array}{r}
 603 \\
 6 \overline{) 363609} \\
 \underline{36} \\
 1203 \\
 \underline{3609} \\
 3609 \\
 \underline{0}
 \end{array}$$

\therefore the square root of 363609
 $\sqrt{36369} = 603$

(vi) 974169

By using long division method

$$\begin{array}{r}
 987 \\
 9 \overline{) 974169} \\
 \underline{81} \\
 188 \\
 \underline{1504} \\
 1967 \\
 \underline{13769} \\
 0
 \end{array}$$

∴ the square root of 974169

$$\sqrt{974169} = 987$$

(vii) 120409

By using long division method

$$\begin{array}{r}
 347 \\
 3 \overline{) 120409} \\
 \underline{9} \\
 64 \\
 \underline{256} \\
 687 \\
 \underline{4809} \\
 0
 \end{array}$$

∴ the square root of 120409

$$\sqrt{120409} = 347$$

(viii) 1471369

By using long division method

$$\begin{array}{r}
 1213 \\
 1 \overline{) 1471369} \\
 \underline{1} \\
 22 \\
 \underline{44} \\
 241 \\
 \underline{241} \\
 2423 \\
 \underline{7269} \\
 0
 \end{array}$$

∴ the square root of 1471369

$$\sqrt{1471369} = 1213$$

(ix) 291600

By using long division method

$$\begin{array}{r}
 540 \\
 5 \overline{) 291600} \\
 \underline{25} \\
 416 \\
 \underline{416} \\
 00 \\
 \underline{00} \\
 0
 \end{array}$$

∴ the square root of 291600
 $\sqrt{291600} = 540$

(x) 9653449

By using long division method

$$\begin{array}{r}
 3107 \\
 3 \overline{) 9653449} \\
 \underline{9} \\
 65 \\
 \underline{61} \\
 43449 \\
 \underline{43449} \\
 0
 \end{array}$$

∴ the square root of 9653449
 $\sqrt{9653449} = 3107$



(xi) 1745041

By using long division method

$$\begin{array}{r}
 1321 \\
 1 \overline{) 1745041} \\
 \underline{1} \\
 74 \\
 \underline{69} \\
 550 \\
 \underline{524} \\
 2641 \\
 \underline{2641} \\
 0
 \end{array}$$

∴ the square root of 1745041
 $\sqrt{1745041} = 1321$

(xii) 4008004

By using long division method

$$\begin{array}{r}
 2002 \\
 2 \overline{) 4008004} \\
 \underline{4} \\
 40 \\
 \underline{000} \\
 400 \\
 \underline{080} \\
 4002 \\
 \underline{8004} \\
 8004 \\
 \underline{0}
 \end{array}$$

∴ the square root of 4008004
 $\sqrt{4008004} = 2002$

(xiii) 20657025

By using long division method

$$\begin{array}{r}
 4545 \\
 4 \overline{) 20657025} \\
 \underline{16} \\
 85 \\
 \underline{465} \\
 904 \\
 \underline{425} \\
 904 \\
 \underline{4070} \\
 9085 \\
 \underline{3616} \\
 9085 \\
 \underline{45425} \\
 45425 \\
 \underline{0}
 \end{array}$$

∴ the square root of 20657025
 $\sqrt{20657025} = 4545$

(xiv) 152547201

By using long division method

$$\begin{array}{r}
 12351 \\
 1 \overline{) 152547201} \\
 \underline{1} \\
 22 \\
 \underline{52} \\
 243 \\
 \underline{44} \\
 243 \\
 \underline{854} \\
 2465 \\
 \underline{729} \\
 2465 \\
 \underline{12572} \\
 27701 \\
 \underline{12325} \\
 27701 \\
 \underline{24701} \\
 24701 \\
 \underline{0}
 \end{array}$$

∴ the square root of 152547201
 $\sqrt{152547201} = 12351$

(xv) 20421361

By using long division method

$$\begin{array}{r}
 4519 \\
 4 \overline{) 20421361} \\
 \underline{16} \\
 85 \\
 \underline{442} \\
 901 \\
 \underline{425} \\
 901 \\
 \underline{1713} \\
 9029 \\
 \underline{901} \\
 81261 \\
 \underline{81261} \\
 0
 \end{array}$$

∴ the square root of 20421361

$$\sqrt{20421361} = 4519$$

(xvi) 62504836

By using long division method

$$\begin{array}{r}
 7906 \\
 7 \overline{) 62504836} \\
 \underline{49} \\
 149 \\
 \underline{1350} \\
 1580 \\
 \underline{1341} \\
 1580 \\
 \underline{948} \\
 15806 \\
 \underline{94836} \\
 15806 \\
 \underline{94836} \\
 0
 \end{array}$$

∴ the square root of 62504836

$$\sqrt{62504836} = 7906$$

(xvii) 82264900

By using long division method

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$$\begin{array}{r}
 9070 \\
 9 \overline{) 82264900} \\
 \underline{81} \\
 180 \\
 \underline{1807} \\
 12649 \\
 \underline{12649} \\
 14140 \\
 00 \\
 0 \\
 \times
 \end{array}$$

\therefore the square root of 82264900
 $\sqrt{82264900} = 9070$

(xviii) 3226694416

By using long division method

$$\begin{array}{r}
 56804 \\
 5 \overline{) 3226694416} \\
 \underline{25} \\
 106 \\
 \underline{106} \\
 1128 \\
 \underline{1128} \\
 11360 \\
 \underline{11360} \\
 113604 \\
 \underline{113604} \\
 \times
 \end{array}$$

\therefore the square root of 3226694416
 $\sqrt{3226694416} = 56804$

(xix) 6407522209

By using long division method

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$$\begin{array}{r}
 80047 \\
 8 \overline{) 6407522209} \\
 \underline{64} \\
 160 \\
 \underline{160} \\
 1600 \\
 \underline{1600} \\
 16004 \\
 \underline{16004} \\
 160087 \\
 \underline{160087} \\
 \times
 \end{array}$$

∴ the square root of 6407522209
 $\sqrt{6407522209} = 80047$

(xx) 3915380329

By using long division method

$$\begin{array}{r}
 62573 \\
 6 \overline{) 3915380329} \\
 \underline{36} \\
 122 \\
 \underline{12} \\
 1245 \\
 \underline{1250} \\
 12507 \\
 \underline{12507} \\
 125143 \\
 \underline{125143} \\
 \times
 \end{array}$$

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∴ the square root of 3915380329
 $\sqrt{3915380329} = 62573$

2. Find the least number which must be subtracted from the following numbers to make them a perfect square:

(i) 2361

(ii) 194491

(iii) 26535

(iv) 161605

(v) 4401624

Solution:

(i) 2361

By using long division method

$$\begin{array}{r}
 48 \\
 4 \overline{) 2361} \\
 \underline{16} \\
 88 \quad 761 \\
 \underline{704} \\
 57
 \end{array}$$

- ∴ 57 has to be subtracted from 2361 to get a perfect square.
 ∴ 291 has to be subtracted from 26535 to get a perfect square.

(ii) 194491

By using long division method

$$\begin{array}{r}
 441 \\
 4 \overline{) 194491} \\
 \underline{16} \\
 84 \quad 344 \\
 \underline{336} \\
 881 \quad 891 \\
 \underline{881} \\
 10
 \end{array}$$

- ∴ 10 has to be subtracted from 194491 to get a perfect square.

(iii) 26535

By using long division method

$$\begin{array}{r}
 162 \\
 1 \overline{) 26535} \\
 \underline{1} \\
 26 \quad 165 \\
 \underline{156} \\
 322 \quad 935 \\
 \underline{644} \\
 291
 \end{array}$$

(iv) 161605

By using long division method

$$\begin{array}{r}
 402 \\
 9 \overline{) 161605} \\
 \underline{16} \\
 802 \quad 1605 \\
 \underline{1604} \\
 1
 \end{array}$$

∴ 1 has to be subtracted from 161605 to get a perfect square.

(v) 4401624

By using long division method

$$\begin{array}{r}
 2098 \\
 2 \overline{) 4401624} \\
 \underline{4} \\
 40 \quad 40 \\
 \underline{0} \\
 409 \quad 4016 \\
 \underline{3681} \\
 4188 \quad 33524 \\
 \underline{33504} \\
 20
 \end{array}$$

∴ 20 has to be subtracted from 4401624 to get a perfect square.

3. Find the least number which must be added to the following numbers to make them a perfect square:

(i) 5607

(ii) 4931

(iii) 4515600

(iv) 37460

(v) 506900

Solution:

(i) 5607

By using long division method

$$\begin{array}{r}
 74 \\
 7 \overline{) 5607} \\
 \underline{49} \\
 144 \\
 \underline{140} \\
 707 \\
 \underline{576} \\
 131
 \end{array}$$

The remainder is 131

Since, $(74)^2 < 5607$

We take, the next perfect square number i.e., $(75)^2$

$(75)^2 = 5625 > 5607$

So, the number to be added = $5625 - 5607 = 18$

(ii) 4931

By using long division method

$$\begin{array}{r}
 70 \\
 7 \overline{) 4931} \\
 \underline{49} \\
 140 \\
 \underline{140} \\
 31 \\
 \underline{0} \\
 31
 \end{array}$$

The remainder is 31

Since, $(70)^2 < 4931$

We take, the next perfect square number i.e., $(71)^2$

$(71)^2 = 5041 > 4931$

So, the number to be added = $5041 - 4931 = 110$

(iii) 4515600

By using long division method

$$\begin{array}{r}
 2124 \\
 2 \overline{) 4515600} \\
 \underline{4} \\
 41 \\
 \underline{41} \\
 422 \\
 \underline{422} \\
 4244 \\
 \underline{4244} \\
 1056 \\
 \underline{844} \\
 21200 \\
 \underline{16976} \\
 4224
 \end{array}$$

The remainder is 4224

Since, $(2124)^2 < 4515600$

We take, the next perfect square number i.e., $(2125)^2$

$(2125)^2 = 4515625 > 4515600$

So, the number to be added = $4515625 - 4515600 = 25$

(iv) 37460

By using long division method

$$\begin{array}{r}
 193 \\
 1 \overline{) 37460} \\
 \underline{1} \\
 29 \\
 29 \\
 \underline{261} \\
 383 \\
 383 \\
 \underline{1360} \\
 1149 \\
 \underline{1149} \\
 211
 \end{array}$$

The remainder is 211

Since, $(193)^2 < 37460$

We take, the next perfect square number i.e., $(194)^2$

$(194)^2 = 37636 > 37460$

So, the number to be added = $37636 - 37460 = 176$

(v) 506900

By using long division method

$$\begin{array}{r}
 711 \\
 7 \overline{) 506900} \\
 \underline{49} \\
 141 \\
 141 \\
 \underline{169} \\
 1421 \\
 1421 \\
 \underline{2800} \\
 1379
 \end{array}$$

The remainder is 1379

Since, $(711)^2 < 506900$

We take, the next perfect square number i.e., $(712)^2$

$(712)^2 = 506944 > 506900$

So, the number to be added = $506944 - 506900 = 44$

4. Find the greatest number of 5 digits which is a perfect square.

Solution:

We know that the greatest 5 digit number is 99999

By using long division method

$$\begin{array}{r}
 316 \\
 3 \overline{) 99999} \\
 \underline{9} \\
 61 \\
 \underline{61} \\
 626 \\
 \underline{3899} \\
 3766 \\
 \underline{143}
 \end{array}$$

The remainder is 143

So, the greatest 5 digit perfect square number is:

$$99999 - 143 = 99856$$

∴ 99856 is the required greatest 5 digit perfect square number.

5. Find the least number of 4 digits which is a perfect square.

Solution:

We know that the least 4 digit number is 1000

By using long division method

$$\begin{array}{r}
 31 \\
 3 \overline{) 1000} \\
 \underline{9} \\
 61 \\
 \underline{61} \\
 39
 \end{array}$$

The remainder is 39

Since, $(31)^2 < 1000$

We take, the next perfect square number i.e., $(32)^2$

$$(32)^2 = 1024 > 1000$$

∴ 1024 is the required least number 4 digit number which is a perfect square.

6. Find the least number of six digits which is a perfect square.

Solution:

We know that the least 6 digit number is 100000

By using long division method

$$\begin{array}{r}
 316 \\
 \hline
 3 \overline{) 100000} \\
 \underline{9} \\
 61 \\
 \underline{61} \\
 626 \\
 \underline{3900} \\
 3756 \\
 \underline{3756} \\
 144
 \end{array}$$

The remainder is 144

Since, $(316)^2 < 100000$

We take, the next perfect square number i.e., $(317)^2$

$(317)^2 = 100489 > 100000$

$\therefore 100489$ is the required least number 6 digit number which is a perfect square.

7. Find the greatest number of 4 digits which is a perfect square.

Solution:

We know that the greatest 4 digit number is 9999

By using long division method

$$\begin{array}{r}
 91 \\
 \hline
 9 \overline{) 9999} \\
 \underline{81} \\
 89 \\
 \underline{1899} \\
 1701 \\
 \underline{1701} \\
 198
 \end{array}$$

The remainder is 198

So, the greatest 4 digit perfect square number is:

$9999 - 198 = 9801$

$\therefore 9801$ is the required greatest 4 digit perfect square number.

8. A General arranges his soldiers in rows to form a perfect square. He finds that in doing so, 60 soldiers are left out. If the total number of soldiers be 8160, find the number of soldiers in each row

Solution:

We know that the total number of soldiers = 8160

Number of soldiers left out = 60

Number of soldiers arranged in rows to form a perfect square = $8160 - 60 = 8100$

$$\begin{aligned}\therefore \text{number of soldiers in each row} &= \sqrt{8100} \\ &= \sqrt{(9 \times 9 \times 10 \times 10)} \\ &= 9 \times 10 \\ &= 90\end{aligned}$$

9. The area of a square field is 60025m^2 . A man cycles along its boundary at 18 Km/hr. In how much time will he return at the starting point?

Solution:

We know that the area of square field = 60025 m^2

$$\begin{aligned}\text{Speed of cyclist} &= 18\text{ km/h} \\ &= 18 \times (1000/60 \times 60) \\ &= 5\text{ m/s}^2\end{aligned}$$

$$\text{Area} = 60025\text{ m}^2$$

$$\text{Side}^2 = 60025$$

$$\begin{aligned}\text{Side} &= \sqrt{60025} \\ &= 245\end{aligned}$$

$$\begin{aligned}\text{We know, Total length of boundary} &= 4 \times \text{Side} \\ &= 4 \times 245 \\ &= 980\text{ m}\end{aligned}$$

$$\begin{aligned}\therefore \text{Time taken to return to the starting point} &= 980/5 \\ &= 196\text{ seconds} \\ &= 3\text{ minutes } 16\text{ seconds}\end{aligned}$$

10. The cost of levelling and turning a square lawn at Rs 2.50 per m^2 is Rs13322.50 Find the cost of fencing it at Rs 5 per metre.

Solution:

We know that the cost of levelling and turning a square lawn = 2.50 per m^2

Total cost of levelling and turning = Rs. 13322.50

$$\begin{aligned}\text{Total area of square lawn} &= 13322.50/2.50 \\ &= 5329\text{ m}^2\end{aligned}$$

$$\text{Side}^2 = 5329$$

$$\begin{aligned}\text{Side of square lawn} &= \sqrt{5329} \\ &= 73\text{ m}\end{aligned}$$

$$\begin{aligned}\text{So, total length of lawn} &= 4 \times 73 \\ &= 292\text{ m}\end{aligned}$$

$$\begin{aligned}\therefore \text{Cost of fencing the lawn at Rs 5 per metre} &= 292 \times 5 \\ &= \text{Rs. } 1460\end{aligned}$$

11. Find the greatest number of three digits which is a perfect square.

Solution:

We know that the greatest 3 digit number is 999

By using long division method

The remainder is 38

So, the greatest 3 digit perfect square number is:

$$999 - 38 = 961$$

\therefore 961 is the required greatest 3 digit perfect square number.

12. Find the smallest number which must be added to 2300 so that it becomes a perfect square.

Solution:

By using long division method let's find the square root of 2300

The remainder is 91

Since, $(47)^2 < 2300$

We take, the next perfect square number i.e., $(48)^2$

$$(48)^2 = 2304 > 2300$$

\therefore The smallest number required to be added to 2300 to get a perfect square is

$$2304 - 2300 = 4$$