#355487

Topic: Square of a Number

The square of an odd integer must be of the form:

A $6n + 1$

B $6n + 3$

C $8n + 1$

D $4n + 1$ but may not be $8n + 1$

Solution

Any odd number is of the form $2n + 1$.

$2n + 1 \times 2n + 1 \rightarrow 4n^2 + 4n + 1$

$(n^2 + n)$ is always a even number when $n \rightarrow$ even, odd.

so, it can ce written as $4(2k) \rightarrow 8k$

so, $4n^2 + 4n + 1 \rightarrow 8k + 1$

Hence, Option C is correct.

#427512

Topic: Square Root of a Perfect Square

Find the square root of 390625 using repeated subtraction.

Solution

The procedure to find square root of 390625 is shown in figure.

In this first a group of two numbers has been done first like

1^{st} group: 39, 2^{nd} group: 06 and 3^{rd} group: 25.

At first, we need to take a number whose square comes near to or equal to 39. That would be 36 square of 6. It is written as shown.

After subtraction, the remainder is 3.

Now bring another group down. Here the number becomes 306.

Again repeat the same process to make the remainder zero.

	6 2 5
6	39 0625
+ 6	36
122	3 06
+ 2	2 44
1245	062 25
+ 5	62 25
1250	00 00

#427555

Topic: Square Root of a Perfect Square

Find the square root of 100 using repeated subtraction.

Solution

We need to find square root of 100 by repeated subtraction method.

It is done as follows:

100 − 1 = 99

99 − 3 = 96

96 − 5 = 91

91 − 7 = 84

84 − 9 = 75

75 − 11 = 64

64 − 13 = 51

51 − 15 = 36

36 − 17 = 19

19 − 19 = 0

We have subtract odd numbers from the given number.

So, we start with subtracting 1 form 100 which gives us 99.

Now, subtract 3 from 99 which is 96.

The process continues till we get the final answer as 0.

The number of steps for which this operation has been performed will give the square root of the number.

In this case, we had to subtract in 10 steps to get to 0. Hence, root of 100 is 10.

#427559

Topic: Square Root of a Perfect Square

Find the square root of 121 using repeated subtraction.

Solution

We need to find square root of 121 by repeated subtraction method.

121 − 1 = 120

120 − 3 = 117

117 − 5 = 112

112 − 7 = 105

105 − 9 = 96

96 − 11 = 85

85 − 13 = 72

72 − 15 = 57

57 − 17 = 40

40 − 19 = 21

21 − 21 = 0

We have subtract odd numbers from the given number.

So, we start with subtracting 1 form 121 which gives us 120.

Now, subtract 3 from 120 which is 117.

The process continues till we get the final answer as 0.

The number of steps for which this operation has been performed will give the square root of the number.

In this case, we had to subtract in 11 steps to get to 0. Hence, root of 121 is 11.

#427565

Topic: Square Root of a Perfect Square

Find the square root of 1331 using repeated subtraction.

Solution

1331 − 1 = 1330

1330 − 3 = 1327

1327 − 5 = 1322

1322 − 7 = 1315

1315 − 9 = 1306

1306 − 11 = 1295

1295 − 13 = 1282

1282 − 15 = 1267

1267 − 17 = 1250

1250 − 19 = 1231

1231 − 21 = 1210

1210 − 23 = 1187

1187 − 25 = 1162

1162 − 27 = 1135

1135 − 29 = 1106

1106 − 31 = 1075

1075 − 33 = 1042

1042 − 35 = 1007

1007 − 37 = 970

970 − 39 = 931

931 − 41 = 890

890 − 43 = 847

847 − 45 = 802

802 − 47 = 755

755 − 49 = 706

706 − 51 = 655

655 − 53 = 602

602 − 55 = 547

547 − 57 = 490

490 − 59 = 431

431 − 61 = 370

370 − 63 = 307

307 − 65 = 242

242 − 67 = 175

175 − 69 = 106

106 − 71 = 35

35 − 73 = − 38

Since, after repeated subration method we did not get the answer as 0 after the 36th step, we can say that it is not a perfect quare number.

The square root of 1331 is somewhere between 36 and 37.

#427572

Topic: Square Root of a Perfect Square

Find the square root of 625 using repeated subtraction.

Solution

We need to find square root of 625 by repeated subtraction method.

625 − 1 = 624

624 − 3 = 621

621 − 5 = 616

616 − 7 = 609

609 − 9 = 600

600 − 11 = 589

589 − 13 = 576

576 − 15 = 561

561 − 17 = 544

544 − 19 = 525

525 − 21 = 504

504 − 23 = 481

481 − 25 = 456

456 − 27 = 429

429 − 29 = 400

400 − 31 = 369

369 − 33 = 336

336 − 35 = 301

301 − 37 = 264

264 − 39 = 225

225 − 41 = 184

184 − 43 = 141

141 − 45 = 96

96 − 47 = 49

49 − 49 = 0

At last the answer comes out to be 0.

Here number of steps to find this is 25.

Thus square root of 635 is 25.

#427579

Topic: Square Root of a Perfect Square

Find the square root of 484 using repeated subtraction.

Solution

We have subtract odd numbers from the given number.

So, we start with subtracting 1 from 484 which gives us 483.

Now, subtract 3 from 483 which is 480.

The process continues till we get the final answer as 0.

The number of steps for which this operation has been performed will give the square root of the number.

484 − 1 = 483

483 − 3 = 480

480 − 5 = 475

468 − 9 = 459

459 − 11 = 448

448 − 13 = 435

435 − 15 = 420

420 − 17 = 403

403 − 19 = 384

384 − 21 = 363

363 − 23 = 340

340 − 25 = 315

315 − 27 = 288

288 − 29 = 259

259 − 31 = 228

228 − 33 = 195

195 − 35 = 160

160 − 37 = 123

123 − 39 = 84

84 − 41 = 43

43 − 43 = 0

In this case, we had to subtract in 22 steps to get to 0. Hence, root of 484 is 22.

#427584

Topic: Square Root of a Perfect Square

Find the square root of 125 using repeated subtraction.

Solution

125 − 1 = 124

124 − 3 = 121

121 − 5 = 116

116 − 7 = 109

109 − 9 = 100

100 − 11 = 89

89 − 13 = 76

76 − 15 = 61

61 − 17 = 44

44 − 19 = 25

25 − 21 = 4

4 − 23 = − 21

Since by repeated subtraction, we do not get the answer as zero at any point, 125 is not a prefect square.

#427593

Topic: Square Root of Non Perfect Squares

Find the square root of 1057.

Solution

We will first group the digits into two from the right. In this case, it would be group 57 first and then 10.

Now, find a number whose square is less than or equal to 10. That would be 3.

So, the remainder we get after division is 1.

Bring the next group as it is.

So, now the dividend becomes 157.

Next, we will multiply the existing quotient by 2 to get the first digit of the divisor in the second step.

Here, we need to fill in the blank of the divisor in the second step and the second digit of the quotient with the same digit such that the product is $\leq$ 157.

So, we have $62 \times 2 = 124$.

The remainder would then be 33. Now, we shall place a decimal point in the quotient and add 2 zeroes, which will make the dividend in third step as 3300.

Repeating the above steps will result in a remainder of 999 and the quotient as 32.51.

Hence the quotient is 32.51 and is the root of 1057.

```
     32. 51
   ┌─────────
 3 │ 10̄57        √1057 = 32. 51
   │  -9
   │  ---
62 │  157
   │ -124
   │ ----
645│  3300
   │ -3225
   │ -----
6501│  07500
   │   -6501
   │   -----
   │    999
```

#427602

Topic: Square Root of Non Perfect Squares

State whether 23453 is a perfect square or not.

Solution

We need to find square root of 23453

But the unit digit in this number is 3.

In any case, we does not get 3 in any square number at unit's place.

Thus 23453 is not a perfect square.

#427608

Topic: Square Root of Non Perfect Squares

Find the square root of 7928.

Solution

The unit digit of number 7928 is 8. 7928 is not a perfect square since no square number ends is the digit 8.

#427634

Topic: Square Root of Non Perfect Squares

State whether 7927 is a perfect square or not.

Solution

We need to find square root of 7927.

The unit's place in this number is 7.

In any case, when we take square, we does not get 7 at uni'ts place.

Thus 7927 is not a perfect square.

#427642

Topic: Square Root of Non Perfect Squares

Estimate square root of 110

Solution

We can factorize 110 as

110 − 1 = 109

109 − 3 = 106

106 − 5 = 101

101 − 7 = 94

91 − 9 = 82

82 − 11 = 71

71 − 13 = 58

58 − 15 = 43

43 − 17 = 26

26 − 19 = 7

7 − 21 = − 14

As the remainder after solving is not zero. Thus 110 is not a perfect square.

#427652

Topic: Square Root of Non Perfect Squares

State whether 1335 is a perfect square or not.

Solution

We need to find square root of 1335.

Lets use prime factorization method:

$\sqrt{1335} = \sqrt{5 \times 3 \times 89}$

We does not get pair of any of these numbers.

Hence, 1335 is not a perfect square.

#427653

Topic: Square Root of Non Perfect Squares

Estimate the square root of 630.

Solution

Th square root of 630 by long division method is shown in figure.

It comes out to be 25.09.

	2 5. 0 9
2	6 30
+ 2	4
4 5	2 30
+ 5	2 25
50 0	5 00
+ 0	4 50
5009	49

#427655

Topic: Square Root of Non Perfect Squares

Estimate square root of 447.

Solution

The square root of 447 is shown in figure by division method.

Its square root comes out to be 21.14.

	2 1. 1 4
2	4 47
+ 2	4
4 1	0 47
+ 1	41
42 1	06 00
+ 1	4 21
4224	179 00
+ 4	168 96
4228	011 04

#427659

Topic: Square Root of Non Perfect Squares

Find the square root of 22222

Solution

The square root of 22222 is shown in figure by long division method.

It comes out to be 149.06.

	149. 06
1	2 22 22
+ 1	1
2 2	1 22
+ 4	96
289	26 22
+ 9	26 01
2980	00 21 00 00
+ 0	17 88 36
29806	03 11 64

#427661

Topic: Square Root of Non Perfect Squares

Find the square root of 33453.

Solution

In order to find square root of 33453, we need to split this into groups.

The first group will be 3, second 34 and third one is 53.

At first, we need to take square of a number close to equal to 3 i.e., 1.

After subtracting 1 from 3, we get 2. Then take next group of digits down.

Then the number will become 234.

The further division is shown in figure.

Thus the square root of 33453 is 182.9

	182.9	
1	33453	$\sqrt{33453} = 182.9$
	-1 ↓ |	
28	234	
	-224 ↓	
362	1053	
	-724	
3649	32900	
	-32841	
	59	

#427667

Topic: Square Root of Non Perfect Squares

Find the square root of 1058.

Solution

The unit digit of number 1058 is 8. 1058 is not a perfect square since no square number ends is the digit 8.

#427672

Topic: Square Root of a Perfect Square

Find the square root of 0.02.

Solution

We need to find square root of 0.02 by long division method.

Lets take $0.02 = \frac{2}{100}$

We have divided first 2 by 1.

Now $\frac{1.41}{100} = 0.0141$

This is the correct answer.

	1. 41
1	2 00
+ 1	1
24	1 00
+ 4	96
281	4 00
+ 1	2 81
282	1 19

#427674

Topic: Square Root of a Perfect Square

Find the square root of 13.31 using long division method.

Solution

We need to find square root of 13.31 by long division method.

It comes out to be 3.64.

It is as shown in figure.

	3. 64
3	13. 31
+ 3	9
66	4 31
+ 6	3 96
724	0 35 00
+ 4	28 96
728	07 04

#427677

Topic: Square Root of a Perfect Square

Find the square root of 0.09 using long division method.

Solution

We need to find square root of 0.09 by long division method.

It is as shown in figure.

square root of 9 is 3.

Further we can do $\frac{3}{10} = 0.3$

Thus square root of 0.09 is 0.3.

	3
3	9
+ 3	9
6	3

#427678

Topic: Square Root of a Perfect Square

Find the square root of 4.41 using long division method.

Solution

___2.21_____

2 | 4.41

| 4

_____

41 | 41

| 41

_____

0

Then square root of 4.41 is 2.1.

#427679

Topic: Square Root of a Perfect Square

Find the square root of 390.625

Solution

We will group 390.625 into groups of 2 starting from the right

So, it will be 39, 06 and 25 will be the three groups.

Now, we will find a number whose square is <= 39, which is 6.

The remainder would be 3 in the first step.

Next, bring the next group down. The second dividend would be 306.

We will now double the quotient which will become 6.

The second divisor would be a 2 digit number starting with 6 also having the unit digit and the second digit of the quotient as the same digit.

In this case, it would be 62 × 2 = 244 < 304. The remainder in the second step is 62.

Place a decimal point after 62 and before the third digit of the quotient.

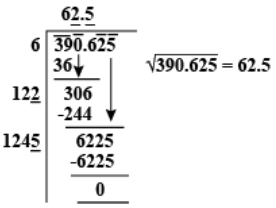
Bringing in the next group down, the third dividend is 6225.

Twice of the existing quotient is 124.

We need to find a digit which will be same as the unit digit of 124___ such that their product is <= 6225.

That digit as we see in the image is 5.

So, the quotient is 62.5 and is the root of 390.625.



#427680

Topic: Square Root of a Perfect Square

Find the square root of $\frac{144}{100}$.

Solution

We can factorise $\frac{144}{100}$ as follows:

$$\therefore \frac{144}{100} = \frac{2 \times 2 \times 3 \times 2 \times 2 \times 3}{2 \times 5 \times 2 \times 5}$$

$$\therefore \sqrt{\frac{144}{100}} = \sqrt{\frac{2 \times 2 \times 3 \times 2 \times 2 \times 3}{2 \times 5 \times 2 \times 5}} = \frac{2 \times 2 \times 3}{2 \times 5} = \frac{12}{10}$$

#427681

Topic: Square Root of a Perfect Square

Find the square root of $\frac{1331}{144}$

Solution

$\frac{1331}{144} = 9.24$

First group 9.24 into 2 groups from the right. The groups would be 24 and 9.

Find a number whose square is ≤ 9, which is 3. The remainder in the first step is 0. Bring the next group down.

The dividend in the second step is 24 and then double divisor existing divisor to get the divisor in the second step which is 6.

Now, $6\_^*\_$ should be ≤ 24. This is not possible.

Hence, we add a zero making the second divisor 60 and also a decimal point and a zero in the quotient.

Now the final dividend becomes 2400.

So, $60\_^*\_ \leq 2400$. So, _ is 3.

The quotient is 3.03 and is the root of 9.24.

```
    3.03
  ------
3 | 9.24
  | 9
  |---
603 | 0 2400
    | -1809
    |------
    |  591
```

$\sqrt{9.24} = 3.03$

#427682

Topic: Square Root of a Perfect Square

Find the square root of $\frac{44100}{441}$

Solution

The square root of $\frac{44100}{441}$ is

$\sqrt{\frac{44100}{441}} = \frac{210}{21}$

On further solving, we get

$\frac{210}{21} = 10$

#427683

Topic: Square Root of a Perfect Square

Using prime factorization method, find the square root of the following:

(i) 390625 (ii) 119025 (iii) 193600

Solution

(i) 390625 can be factorized as

$\sqrt{5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5 \times 5}$

$= 5 \times 5 \times \times 5 \times 5$

$= 625$

(ii) 119025 can be factorized as

$\sqrt{5 \times 5 \times 3 \times 3 \times 23 \times 23}$

$= 5 \times 3 \times 23$

$= 345$

(iii) 193600 can be factorized as

$\sqrt{5 \times 5 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 11 \times 11}$

$= 5 \times 2 \times 2 \times 2 \times 11$

$= 440$

#427684

Topic: Square Root of a Perfect Square

Find the square root of the following numbers:

(i) 1444 (ii) 1849 (iii) 5776 (iv) 7921

Solution

(i) 1444 can be factorized as

$\sqrt{2 \times 2 \times 19 \times 19}$

$= 2 \times 19$

$= 38$

(ii) 1849 can be factorized as

$\sqrt{43 \times 43}$

$= 43$

(iii) 5776 can be factorized as

$\sqrt{2 \times 2 \times 2 \times 2 \times 19 \times 19}$

$= 2 \times 2 \times 19$

$= 76$

(iv) 7921 can be factorized as

$\sqrt{89 \times 89}$

$= 89$

#427685

Topic: Square Root of Non Perfect Squares

Find the least numbers which must be subtracted from the following numbers so as to leave a perfect square:

(i) 2361 (ii) 4931 (iii) 18265 (iv) 390700

Solution

(i) $2361 < 2500$

$\therefore \sqrt{2361} < 50$

$1600 < 2361$

$\therefore 40 < \sqrt{2361}$

$\Rightarrow 40 < \sqrt{2361} < 50$

$2025 < 2361$

$\Rightarrow 45 < \sqrt{2361}$

$2116 < 2361$

$\Rightarrow 46 < \sqrt{2361}$

$2209 < 2361$

$\Rightarrow 47 < \sqrt{2361}$

$2304 < 2361$

$\Rightarrow 48 < \sqrt{2361}$

$\therefore 2401 > 2361$

$\Rightarrow 48 < \sqrt{2361} < 49$

$\Rightarrow$ The nearest square number lesser than 2361 is 2304.

$\Rightarrow$ The number to be subtracted from 2361 to make it a perfect square is $2361 - 2304 = 57$.

$\therefore 57$ is the least number to be subtracted from 2361 to make it a perfect square.

(ii) 4931

$4900 < 4931$

$\Rightarrow 70 < \sqrt{4931}$

$5041 > 4931$

$\Rightarrow 71 > \sqrt{4931}$

$\Rightarrow$ The nearest square number lesser than 4931 is 4900.

$\Rightarrow$ The number to be subtracted from 4931 to make it a perfect square is $4931 - 4900 = 31$.

$\therefore 31$ is the least number to be subtracted from 4931 to make it a perfect square.

(iii) 18265

$16900 < 18265$

$\Rightarrow 130 < \sqrt{18265}$

$17161 < 18265$

$\Rightarrow 131 < \sqrt{18265}$

$17424 < 18265$

$\Rightarrow 132 < \sqrt{18265}$

$17689 < 18265$

$\Rightarrow 133 < \sqrt{18265}$

$17956 < 18265$

$\Rightarrow 134 < \sqrt{18265}$

$18225 < 18265$

$\Rightarrow 135 < \sqrt{18265}$

$18496 < 18265$

$\Rightarrow 136 > \sqrt{18265}$

$\Rightarrow$ The nearest square number lesser than 18265 is 18225.

$\Rightarrow$ The number to be subtracted from 18225 to make it a perfect square is $18265 - 18225 = 40$.

$\therefore 40$ is the least number to be subtracted from 18265 to make it a perfect square.

(iv) 390700

$390625 < 390700$

$\Rightarrow 625 < \sqrt{390700}$

$391876 < 390700$

$\Rightarrow 625 > \sqrt{390700}$

$\Rightarrow$ The nearest square which is lesser than 390700 is 390625.

$\Rightarrow$ The number to be subtracted from 390700 to make it a perfect square is $390700 - 390625 = 75$.

$\therefore 75$ is the least number to be subtracted from 390700 to make it a perfect square.

#427692

Topic: Square Root of Non Perfect Squares

Find the smallest number that must be added to get a perfect square.

(i) 2361 (ii) 4931 (iii) 18265 (iv) 390700

Solution

(i) 2361

$2500 > 2361$

$\Rightarrow 50 > \sqrt{2361}$

$2401 > 2361$

$\Rightarrow 49 > \sqrt{2361}$

$2304 < 2361$

$\Rightarrow 48 < \sqrt{2361}$

$\therefore$ 2401 is the perfect square nearest to 2361.

$\therefore 2401 - 2361 = 40$ is the number to be added.

$\therefore$ 40 is the least number to be added to 2361 to make it a perfect square.

(ii) 4931

$4900 < 4931$

$\Rightarrow 70 < \sqrt{4931}$

$5041 > 4931$

$\Rightarrow 71 > \sqrt{4931}$

$\Rightarrow$ 5041 is the perfect square nearest to 4931.

$\Rightarrow 5041 - 4931 = 110$ is the number to be added.

$\therefore$ 110 is the least number to be added to 4931 to make it a perfect square.

(iii) 18265

$18225 < 18265$

$\Rightarrow 135 < \sqrt{18265}$

$18496 > 18265$

$\Rightarrow 136 > \sqrt{18265}$

$\Rightarrow$ 18496 is the perfect square nearest to 18265.

$\Rightarrow 18496 - 18265 = 231$ is the number to be added to 18265.

$\therefore$ 231 is the least number to be added to 18265 to make it a perfect square.

(iv) 390700

$390625 < 390700$

$\Rightarrow 625 < \sqrt{390700}$

$391876 > 390700$

$\Rightarrow 626 > \sqrt{390700}$

$\Rightarrow$ 391876 is the perfect square nearest to 390700.

$\Rightarrow 391876 - 390700 = 1176$ is the number to be added to 390700.

$\therefore$ 1176 is the least number to be added to 390700 to make it a perfect square.

#427693

Topic: Square Root of a Perfect Square

Find the square roots of the following decimal numbers:

(i) 7.29 (ii) 16.81 (iii) 9.3025 (iv) 84.8241

Solution

(i) $7.29 = \frac{729}{100}$

$= \sqrt{\frac{3 \times 3 \times 3 \times 3 \times 3 \times 3}{10 \times 10}}$

$= \frac{3 \times 3 \times 3}{10}$

$= 2.7$

(ii) $16.81 = \frac{1681}{100}$

$= \sqrt{\frac{41 \times 41}{10 \times 10}}$

$= 4.1$

(iii) $9.3025 = \frac{93025}{10000}$

$= \sqrt{\frac{5 \times 5 \times 61 \times 61}{10 \times 10 \times 10 \times 10}}$

$= 3.05$

(iv) $84.8241 = \frac{848241}{10000}$

$= \sqrt{\frac{3 \times 3 \times 307 \times 307}{10 \times 10 \times 10 \times 10}}$

$= 9.21$

#427699

Topic: Square Root of Non Perfect Squares

Find the square roots of the following numbers correct to two places of decimal:

(i) 1.7 (ii) 23.1 (iii) 5 (iv) 20 (v) 0.1

Solution

(i) 1.7

$\sqrt{1.7} = 1.303$ to three decimal places.

$= 1.30$ correct to two decimal places.

(ii) 23.1

$\sqrt{23.1} = 4.806$ to three decimal places.

$= 4.81$ correct to two decimal places.

(i) 5

$\sqrt{5} = 2.236$ to three decimal places.

$= 2.24$ correct to two decimal places.

(i) 20

$\sqrt{20} = 4.472$ to three decimal places.

$= 4.47$ correct to two decimal places.

#427702

Topic: Square Root

Write true (T) or false (F) for the following statements:

(i) $\sqrt{0.9} = 0.3$

(ii) If a is a natural number, then $\sqrt{a}$ is a rational number.

(iii) If a is negative, then a^2 is also negative.

(iv) If p and q are perfect squares, then $\sqrt{\frac{p}{q}}$ is a rational number.

(v) The square root of a prime number may be obtained approximately, but never exactly.

Solution

(i) False, since the square of a number with one decimal will have two decimal places. Thus square of 0.3 is 0.09.

(ii) False, since square root of a natural numbers is not a rational numbers.

(iii) False, since the square of any negative number will be a positive number.

(iv) True. If p and q are perfect squares, then $\sqrt{\frac{p}{q}}$ is a rational number.

(v) True. The square root of a prime number may be obtained approximately, but never exactly.

#427755

Topic: Patterns in Square Numbers

$6^2 = 36$. Find the square of 16.

Observe the similarity between the two.

Solution

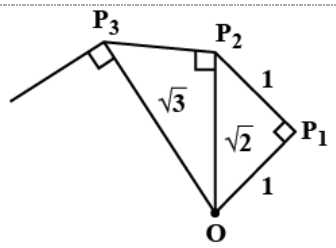
$6^2 = 6 \times 6 = 36$

$16^2 = 16 \times 16 = 256$

Similarity of both is one's digit of both is same.

#463539

Topic: Square Root



Classroom activity(Constructing the 'square root spiral'): Take a large sheet of paper and construct the 'square root spiral' in the following fashion. Start with a point O and draw a line segment OP_1 of unit length. Draw a line segment P_1P_2 perpendicular to OP_1 of unit length. Now draw a line segment P_2P_3 perpendicular to OP_2. Then draw a line segment P_3P_4 perpendicular to OP_3. Continuing in this manner, you can get the line segment $P_{n-1}P_n$ by drawing a line segment of unit length perpendicular to OP_{n-1}. In this manner, you will have created the points $P_2, P_3, \ldots\ldots, P_n, \ldots\ldots,$ and joined them to create a beautiful spiral depicting $\sqrt{2}, \sqrt{3}, \sqrt{4}, \ldots\ldots$

Solution

Starting with point O, draw a line segment OP_1 of unit length.

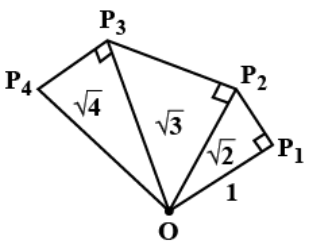
Now draw a line segment P_1P_2 perpendicular to OP_1 again of unit length.

Here always we need to keep in mind that the measure of the line segment would always be a constant, i.e., 1 unit.

Now again daw a line segment P_2P_3 perpendicular to OP_2 of unit length.

Again draw a line segment P_3P_4 perpendicular to OP_3.

In this way, we have formed a figure as shown in figure.



#464915

Topic: Patterns in Square Numbers

What will be the unit digit of the squares of the following number ?

(i) 81

(ii) 272

(iii) 799

(iv) 3853

(v) 1234

(vi) 26387

(vii) 52698

(viii) 99880

(ix) 12796

(x) 55555

Solution

(i) 81

$1^2 = 1$

So, unit digit will be 1

(ii) 272

$2^2 = 4$

So, unit digit will be 4

(iii) 799

$9^2 = 81$

So, unit digit will be 1

(iv) 3853

$3^2 = 9$

So, unit digit will be 9

(v) 1234

$4^2 = 16$

So, unit digit will be 6

(vi) 26387

$7^2 = 49$

So, unit digit will be 9

(vii) 52698

$8^2 = 64$

So, unit digit will be 4

(viii) 99880

$0^2 = 0$

So, unit digit will be 0

(ix) 12796

$6^2 = 36$

So, unit digit will be 6

(x) 55555

$5^2 = 25$

So, unit digit will be 5

#464916

Topic: Patterns in Square Numbers

The following numbers are obviously not perfect squares. Give reason.

(i) 1057

(ii) 23453

(iii) 7928

(iv) 222222

(v) 64000

(vi) 89722

(vii) 222000

(viii) 505050

Solution

No.s having $2, 3, 7, 8$ at unit place are not perfect squares,

so, (*i*), (*ii*), (*iii*), (*iv*), (*vi*) are not perfect squares.

#464917

Topic: Patterns in Square Numbers

The square of which of the following number will be odd numbers?

(i) 431

(ii) 2826

(iii) 7779

(iv) 82004

Solution

Square of (i) and (iii) will be odd numbers, because an odd number multiplied by another odd number always results in an odd number.

#464918

Topic: Patterns in Square Numbers

Observe the following pattern and find the missing digits.

$11^2 = 121$

$101^2 = 10201$

$1001^2 = 1002001$

$100001^2 = 1.....2.....1$

$10000001^2 =$ . . . . . .

Solution

$100001^2 = 10000200001$

$10000001^2 = 100000020000001$

Start with 1 followed as many zeroes as there are between the first and the last one, followed by 2 again followed by as many zeroes and end with 1.

#464919

Topic: Patterns in Square Numbers

Observe the following pattern and supply the missing number.

$11^2 = 121$

$101^2 = 10201$

$10101^2 = 102030201$

$1010101^2 =$ . . . . . .

. . . . . $^2 = 10203040504030201$

Solution

$1010101^2 = 1020304030201$

$101010101^2 = 10203040504030201$

Start with 1 followed by a zero and go up to as many number as there are number of 1s given, follow the same pattern in reverse order.

#464920

Topic: Patterns in Square Numbers

Using the given pattern, find the missing numbers.

$1^2 + 2^2 + 2^2 = 3^2$

$2^2 + 3^2 + 6^2 = 7^2$

$3^2 + 4^2 + 12^2 = 13^2$

$4^2 + 5^2 + ..^2 = 21^2$

$5^2 + ..^2 + 30^2 = 31^2$

$6^2 + 7^2 + ...^2 = ...^2$.

Solution

$5^2 + 6^2 + 30^2 = 31^2$

$6^2 + 7^2 + 42^2 = 43^2$

Relation among first, second and third number - Third number is the product of first and second number.

The relation between the third and fright hand side number - the right-hand side number is 1 more than the third number.

#464921

Topic: Formation of Squares using Patterns

Without adding, find the sum

(i) 1 + 3 + 5 + 7 + 9

(ii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19

(iii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23

Solution

(i) 1 + 3 + 5 + 7 + 9

Since, there are 5 consecutive odd numbers, Thus, their sum = $5^2 = 25$

(ii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19

Since, there are 10 consecutive odd numbers, Thus, their sum = $10^2 = 100$

(iii) 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21 + 23

Since, there are 12 consecutive odd numbers, Thus, their sum = $12^2 = 144$.

#464922

Topic: Formation of Squares using Patterns

(i) Express 49 as sum of 7 odd numbers

(ii) Express 121 as sum of 11 odd numbers.

Solution

(i) $49 = 7^2$

So, it can be expressed as

49 = 1 + 3 + 5 + 7 + 9 + 11 + 13.

(ii) $121 = 11^2$

121 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19 + 21

#464923

Topic: Formation of Squares using Patterns

How many numbers lie between squares of the following numbers ?

(i) 12 and 13

(ii)25 and 26

(iii) 99 and 100

Solution

(i) $12^2 = 144$

$13^2 = 169$

$169 - 144 = 25$

So, there are $25 - 1 = 24$ numbers lying between 12^2 and 13^2

(ii) $25^2 = 625$

$26^2 = 676$

$676 - 625 = 51$

So, there are $51 - 1 = 50$ numbers lying between 25^2 and 26^2

(iii) $99^2 = 9801$

$100^2 = 10000$

$10000 - 9801 = 199$

So, there are $199 - 1 = 198$ numbers lying between 99^2 and 100^2

#464925

Topic: Formation of Squares using Patterns

Write a Pythagorean triplet whose one number is:

(i) 6

(ii) 14

(iii) 16

(iv) 18

Solution

$2m, m^2 + 1, m^2 - 1$ form a Pythagorean triplet for any number.

(i) $2m = 6$

$\Rightarrow m = 3$

So, Pythagorean triplets are $6, 10, 8$

(ii) $2m = 14$

$\Rightarrow m = 7$

So, Pythagorean triplets are $7, 48, 50$

(iii) $2m = 16$

$\Rightarrow m = 8$

So, Pythagorean triplets are $16, 63, 65$

(iv) $2m = 18$

$\Rightarrow m = 9$

So, Pythagorean triplets are $18, 80, 82$

#464930

Topic: Patterns in Square Numbers

What could be possible one's digit of the square root of each of the following numbers?

(i) 9801

(ii) 99856

(iii) 998001

(iv) 657666025

Solution

(i) $1^2 = 1$ and $9^2 = 81$

So, possible one's digit can be 1 or 9.

(ii) $4^2 = 16$ and $6^2 = 36$

So, possible one's digit can be 4 or 6.

(iii) $1^2 = 1$ and $9^2 = 81$

So, possible one's digit can be 1 or 9

(iv) $5^2 = 25$

So, possible one's digit can be 25.

#464931

Topic: Square of a Number

Without doing calculation, find the numbers which are surely not perfect squares.

(*i*)153 (*ii*)257 (*iii*)408 (*iv*)441

Solution

For any number to be perfect square,

It should have a number from {1, 4, 9, 6, 5} at their units place.

Here,

(i) 153 ending with 3, so it cannot be a perfect square.

(ii) 257 ending with 7, so it cannot be a perfect square.

(iii) 408 ending with 8, so it cannot be a perfect square.

(iv) 441 ending with 1, so it can be a perfect square.

#464932

Topic: Square Root of a Perfect Square

Find the square root of 100 and 169 by the method of repeated subtraction.

Solution

(i) 100 − 1 = 99

99 − 3 = 96

96 − 5 = 91

91 − 7 = 84

84 − 9 = 75

75 − 11 = 64

64 − 13 = 51

51 − 15 = 36

36 − 17 = 19

19 − 19 = 0

We get 0 in the 10^{th} step. So, $10^2 = 100$

(ii) 169 − 1 = 168

168 − 3 = 165

165 − 5 = 160

160 − 7 = 153

153 − 9 = 144

144 − 11 = 133

133 − 13 = 120

120 − 15 = 105

105 − 17 = 88

88 − 19 = 69

69 − 21 = 48

48 − 23 = 25

25 − 25 = 0

We get 0 in 13^{th} step. $13^2 = 169$.

#464933

Topic: Square Root of a Perfect Square

Find the square root of the following number by prime factorisation method

(i) 729

(ii) 400

(iii) 1764

(iv) 4096

(v) 7744

(vi) 9604

(vii) 5929

(viii) 9216

(ix) 529

(x) 8100

Solution

(i) $729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3 = 3^2 \times 3^2 \times 3^2$

$\sqrt{729} = 27$

(ii) $400 = 2^2 \times 2^2 \times 5^2$

$\sqrt{400} = 20$

(iii) $1764 = 2^2 \times 2^2 \times 7^2$

$\sqrt{1764} = 42$

(iv) $4096 = 2^2 \times 2^2 \times 2^2 \times 2^2 \times 2^2 \times 2^2$

$\sqrt{4096} = 64$

(v) $7744 = 2^2 \times 2^2 \times 2^2 \times 11^2$

$\sqrt{7744} = 88$

(vi) $9604 = 2^2 \times 7^2 \times 7^2$

$\sqrt{9604} = 98$

(vii) $5929 = 11^2 \times 7^2$

$\sqrt{5929} = 77$

(viii) $9216 = 96^2$

$\sqrt{9216} = 96$

(ix) $529 = 23 \times 23$

$\sqrt{529} = 23$

(x) $8100 = 90^2$

$\sqrt{8100} = 90$.

#464934

Topic: Square Root of a Perfect Square

For each of the following number, find the smallest whole number by which it should be multiplied so as to get a perfect square number. Also find the square root of the square number so obtained.

(*i*) 252 (*ii*) 180 (*iii*) 1008 (*iv*) 2028 (*v*) 1458 (*vi*) 768

Solution

i) $252 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Therefore, we need to multiply 252 by 7 in order to make it a perfect square.

So, $252 \times 7 = 1764$

$\therefore \sqrt{1764} = 42$

ii) $180 = \underline{2 \times 2} \times \underline{3 \times 3} \times 5$

Therefore, we need to multiply 180 by 5 in order to make it a perfect square.

So, $180 \times 5 = 900$

$\therefore \sqrt{900} = 30$

iii) $1008 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Therefore, we need to multiply 1008 by 7 in order to make it a perfect square.

So, $1008 \times 7 = 7056$

$\therefore \sqrt{7056} = 84$

iv) $2028 = \underline{2 \times 2} \times \underline{13 \times 13} \times 3$

Therefore, we need to multiply 2028 by 3 in order to make it a perfect square.

So, $2028 \times 3 = 6084$

$\therefore \sqrt{6084} = 78$

v) $1458 = \underline{3 \times 3} \times \underline{3 \times 3} \times \underline{3 \times 3} \times 2$

Therefore, we need to multiply 1458 by 2 in order to make it a perfect square.

So, $1458 \times 2 = 2916$

$\therefore \sqrt{2916} = 54$

v) $768 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{2 \times 2} \times 3$

Therefore, we need to multiply 768 by 3 in order to make it a perfect square.

So, $768 \times 3 = 2304$

$\therefore \sqrt{2304} = 48$

#464935

Topic: Square Root of a Perfect Square

For each of the following number, find the smallest whole number by which it should be divided so as to get a perfect square number. Also find the square root of the square number so obtained.

(i) 252 (ii) 2925 (iii) 396 (iv) 2645 (v) 2800 (vi) 1620

Solution

i) $252 = \underline{2 \times 2} \times \underline{3 \times 3} \times 7$

Therefore, we need to divide 252 by 7 in order to make it a perfect square.

So, $\frac{252}{7} = 36$

$\therefore \sqrt{36} = 6$

ii) $2925 = \underline{3 \times 3} \times \underline{5 \times 5} \times 13$

Therefore, we need to divide 2925 by 13 in order to make it a perfect square.

So, $\frac{2925}{13} = 225$

$\therefore \sqrt{225} = 15$

iii) $396 = \underline{2 \times 2} \times \underline{3 \times 3} \times 11$

Therefore, we need to divide 396 by 11 in order to make it a perfect square.

So, $\frac{396}{11} = 36$

$\therefore \sqrt{36} = 6$

iv) $2645 = \underline{23 \times 23} \times 5$

Therefore, we need to divide 2645 by 5 in order to make it a perfect square.

So, $\frac{2645}{5} = 529$

$\therefore \sqrt{529} = 23$

v) $2800 = \underline{2 \times 2} \times \underline{2 \times 2} \times \underline{5 \times 5} \times 7$

Therefore, we need to divide 2800 by 7 in order to make it a perfect square.

So, $\frac{2800}{7} = 400$

$\therefore \sqrt{400} = 20$

vi) $1620 = \underline{2 \times 2} \times \underline{3 \times 3} \times \underline{3 \times 3} \times 5$

Therefore, we need to divide 1620 by 5 in order to make it a perfect square.

So, $\frac{1620}{5} = 324$

$\therefore \sqrt{324} = 18$

#464953

Topic: Square Root of Non Perfect Squares

The students of class 8 of a school donated Rs 2401 in all, for Prime Minister's National Relief Fund. Each student donated as many rupees as number of students in the class.

Find the number of student in the class.

Solution

Let no. of students $= x$

Total money $= x \times x$

$\Rightarrow x^2 = 2401$

$\Rightarrow x = \sqrt{2401} = 49$

So, no. of students $= 49$

#464956

Topic: Square Root of Non Perfect Squares

2025 plants are to be planted in a garden in a such a way that each contains as many plants as number of rows. Find the number of rows and number of plants in each row.

Solution

Let no. of rows $= x$

So, total no. of plants in garden $= 2025$

$\Rightarrow x \times x = 2025$

$\Rightarrow x^2 = 2025$

$\Rightarrow x = 45$

Hence, no. of rows = No. of plants in each row $= 45$

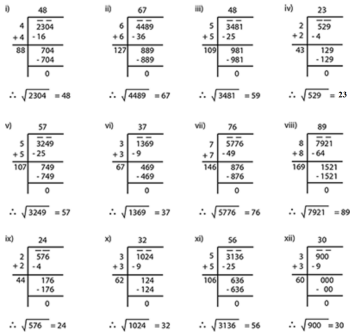
#464959

Topic: Square Root of a Perfect Square

Find square root of each of the following no. by division method

(*i*) 2304 (*ii*) 4489 (*iii*) 3481 (*iv*) 529 (*v*) 3249 (*vi*) 1369 (*vii*) 5776 (*viii*) 7921 (*ix*) 576 (*x*) 1024 (*xi*) 3136 (*xii*) 900

Solution



#464960

Topic: Square Root of a Perfect Square

Find the number of digits in the square root of each of the following number.

(*i*) 64 (*ii*) 144 (*iii*) 4489 (*iv*) 27225 (*v*) 390625

Solution

If the number of digits of a number is even, then its square root will have half (whole number) of the number of digits.

If the number of digits of a number are odd, then its square root will have half (nearest greater whole number) of the number of digits.

i) $\sqrt{64}$

The number of digits is 2 i.e. even.

Therefore, there is only 1 digit in the square root of 64.

ii) $\sqrt{144}$

The number of digits is 3 i.e. odd.

Therefore, there are (1.5 =) 2 digits in the square root of 144.

iii) $\sqrt{4489}$

The number of digits is 4 i.e. even.

Therefore, there are 2 digits in the square root of 4489.

iv) $\sqrt{27225}$

The number of digits is 5 i.e. odd.

Therefore, there are (2.5=) 3 digits in the square root of 27225.

v) $\sqrt{390625}$

The number of digits is 6 i.e. even.

Therefore, there are 3 digits in the square root of 390625.

#464962

Topic: Square Root of a Perfect Square

Find the square root of the following decimal number

(*i*) 2.56 (*ii*) 7.29 (*iii*) 51.84 (*iv*) 42.25 (*v*) 31.36

Solution

i)

		1.6
1		$\overline{2.56}$
+1		- 1
26		156
		- 156
		0

$\therefore \sqrt{2.56} = 1.6$

ii)

		2.7
2		$\overline{7.29}$
+2		- 4
47		329
		- 329
		0

$\therefore \sqrt{7.29} = 2.7$

iii)

		7.2
7		$\overline{51.84}$
+7		- 49
142		284
		- 284
		0

$\therefore \sqrt{51.84} = 7.2$

iv)

		6.5
6		$\overline{42.25}$
+6		- 36
125		625
		- 625
		0

$\therefore \sqrt{42.25} = 6.5$

v)

		5.6
5		$\overline{31.36}$
+5		- 25
106		636
		- 636
		0

$\therefore \sqrt{31.36} = 5.6$

#464964

Topic: Square Root of Non Perfect Squares

Find the least number which must be subtracted from each of the following so as to get a perfect square. Also find the square root of the perfect square so obtained.

(*i*) 402 (*ii*) 1989 (*iii*) 3250 (*iv*) 825 (*v*) 4000

Solution

In order to find the least number to be subtracted from the given no.,

we must find a smaller perfect square number, closest to the given number.

i) 402

The closest smaller perfect square number is 400

Difference = 402 − 400 = 2

Hence, 2 must be subtracted from 402 in order to make it a perfect square.

$\therefore \sqrt{400} = 20$

ii) 1989

The closest smaller perfect square number is 1936.

Difference = 1989 − 1936 = 53

Hence, 53 must be subtracted from 1989 in order to make it a perfect square.

$\therefore \sqrt{1936} = 44$

iii) 3250

The closest smaller perfect square number is 3249.

Difference = 3250 − 3249 = 1

Hence, 1 must be subtracted from 3250 in order to make it a perfect square.

$\therefore \sqrt{3249} = 57$

iv) 825

The closest smaller perfect square number is 784.

Difference = 825 − 784 = 41

Hence, 41 must be subtracted from 825 in order to make it a perfect square.

$\therefore \sqrt{784} = 28$

v) 4000

The closest smaller perfect square number is 3969.

Difference = 4000 − 3969 = 31

Hence, 31 must be subtracted from 4000 in order to make it a perfect square.

$\therefore \sqrt{3969} = 63$

#464965

Topic: Square Root of Non Perfect Squares

Find the least number which must be added from each of the following so as to get a perfect square. Also find the square root of the perfect square so obtained.

(*i*) 525 (*ii*) 1750 (*iii*) 252 (*iv*) 1825 (*v*) 6412

Solution

In order to find the least number to be added to the given no.,

we must find a greater perfect square number, closest to the given number.

i) 525

The closest perfect square number is 576

Difference = 576 − 525 = 51

Hence, 51 must be added to 525 in order to make it a perfect square.

$\therefore \sqrt{576} = 24$

ii) 1750

The closest perfect square number is 1764

Difference = 1764 − 1750 = 14

Hence, 14 must be added to 1750 in order to make it a perfect square.

$\therefore \sqrt{1764} = 42$

iii) 252

The closest perfect square number is 256

Difference = 256 − 252 = 4

Hence, 4 must be added to 252 in order to make it a perfect square.

$\therefore \sqrt{256} = 16$

iv) 1825

The closest perfect square number is 1849

Difference = 1849 − 1825 = 24

Hence, 24 must be added to 1825 in order to make it a perfect square.

$\therefore \sqrt{1849} = 43$

v) 6412

The closest perfect square number is 6561

Difference = 6561 − 6412 = 149

Hence, 149 must be added to 6412 in order to make it a perfect square.

$\therefore \sqrt{6561} = 81$

#464967

Topic: Square Root of a Perfect Square

Find the length of side of a square whose area is $441 m^2$.

Solution

Let the side of square be a

Area of square $= a \times a$

$\Rightarrow a^2 = 441$

$\Rightarrow a = 21$

So, side of square = 21 m

#464972

Topic: Square Root of Non Perfect Squares

A gardener has 1000 plants. He wants to plant these in such a way that the number of rows and the number of columns remain same. Find the minimum number of plants he needs more for this.

Solution

1000 is not a perfect square.

$31^2 < 1000 < 32^2$

Required no. of trees = $32^2 - 1000$

= 1024 − 1000

= 24.

#464973

Topic: Square Root of Non Perfect Squares

There are 500 children in a school. For a P.T. drill they have to stand in such a manner that the number of rows is equal to number of columns. How many children would be left out in this arrangement.

Solution

500 is not a perfect square

$22^2 < 500 < 23^2$

No. of children left = $500 - 22^2$

= 500 − 484

= 16