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1. What could be the possible 'one's' digits of the square root of each of the following numbers?

i. 9801

ii. 99856

iii. 998001

iv. 657666025

Solution:

i. We know that the unit's digit of the square of a number having digit as unit's place 1 is 1 and also 9 is 1[9^2=81 whose unit place is 1].

∴ Unit's digit of the square root of number 9801 is equal to 1 or 9.

ii. We know that the unit's digit of the square of a number having digit as unit's place 6 is 6 and also 4 is 6 [6^2=36 and 4^2=16, both the squares have unit digit 6].

∴ Unit's digit of the square root of number 99856 is equal to 6.

iii. We know that the unit's digit of the square of a number having digit as unit's place 1 is 1 and also 9 is 1[9^2=81 whose unit place is 1].

∴ Unit's digit of the square root of number 998001 is equal to 1 or 9.

iv. We know that the unit's digit of the square of a number having digit as unit's place 5 is 5.

∴ Unit's digit of the square root of number 657666025 is equal to 5.

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

i. 153

ii. 257

iii. 408

iv. 441

Solution:

We know that natural numbers ending with the digits 0, 2, 3, 7 and 8 are not perfect square.

i. 153⟹ Ends with 3.

∴, 153 is not a perfect square

ii. 257⟹ Ends with 7

∴, 257 is not a perfect square

iii. 408⟹ Ends with 8

∴, 408 is not a perfect square

iv. 441⟹ Ends with 1

∴, 441 is a perfect square.

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

Solution:

100

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

Here, we have performed subtraction ten times.

∴ √100 = 10

169

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

Here, we have performed subtraction thirteen times.

∴ √169 = 13

4. Find the square roots of the following numbers by the 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.

3	729
3	243
3	81
3	27
3	9
3	3
	1

729 = 3×3×3×3×3×3×1

⇒ 729 = (3×3)×(3×3)×(3×3)

⇒ 729 = (3×3×3)×(3×3×3)

⇒ 729 = $(3×3×3)^2$

⇒ √729 = 3×3×3 = 27

ii.

2	400
2	200
2	100
2	50
5	25
5	5
	1

400 = 2×2×2×2×5×5×1

⇒ 400 = (2×2)×(2×2)×(5×5)

⇒ 400 = (2×2×5)×(2×2×5)

⇒ 400 = $(2×2×5)^2$

⇒ √400 = 2×2×5 = 20

iii.

2	1764
2	882
3	441
3	147
7	49
7	7
	1

1764 = 2×2×3×3×7×7

⇒ 1764 = (2×2)×(3×3)×(7×7)

⇒ 1764 = (2×3×7)×(2×3×7)

⇒ 1764 = $(2×3×7)^2$

⇒ √1764 = 2 ×3×7 = 42

iv.

2	4096
2	2048
2	1024
2	512
2	256
2	128
2	64
2	32
2	16
2	8
2	4
2	2
	1

$4096 = 2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2\times2$

$\Rightarrow 4096 = (2\times2)\times(2\times2)\times(2\times2)\times(2\times2)\times(2\times2)\times(2\times2)$

$\Rightarrow 4096 = (2\times2\times2\times2\times2\times2)\times(2\times2\times2\times2\times2\times2)$

$\Rightarrow 4096 = (2\times2\times2\times2\times2\times2)^2$

$\Rightarrow \sqrt{4096} = 2\times2\times2\times2\times2\times2 = 64$

v.

2	7744
2	3872
2	1936
2	968
2	484
2	242
11	121
11	11
	1

$7744 = 2\times2\times2\times2\times2\times2\times11\times11\times1$

$\Rightarrow 7744 = (2\times2)\times(2\times2)\times(2\times2)\times(11\times11)$

$\Rightarrow 7744 = (2\times2\times2\times11)\times(2\times2\times2\times11)$

$\Rightarrow 7744 = (2\times2\times2\times11)^2$

$\Rightarrow \sqrt{7744} = 2\times2\times2\times11 = 88$

vi.

2	9604
2	4802
7	2401
7	343
7	49
7	7
	1

$9604 = 62 \times 2 \times 7 \times 7 \times 7 \times 7$

$\Rightarrow 9604 = (2 \times 2) \times (7 \times 7) \times (7 \times 7)$

$\Rightarrow 9604 = (2 \times 7 \times 7) \times (2 \times 7 \times 7)$

$\Rightarrow 9604 = (2\times7\times7)^2$

$\Rightarrow \sqrt{9604} = 2\times7\times7 = 98$

vii.

7	5929
7	847
11	121
11	11
	1

5929 = 7×7×11×11

⇒ 5929 = (7×7)×(11×11)

⇒ 5929 = (7×11)×(7×11)

⇒ 5929 = $(7×11)^2$

⇒ √5929 = 7×11 = 77

viii.

2	9216
2	4608
2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

9216 = 2×2×2×2×2×2×2×2×2×2×3×3×1

⇒ 9216 = (2×2)×(2×2) × (2 × 2) × (2 × 2) × (2 × 2) × (3 × 3)

⇒ 9216 = (2 × 2 × 2 × 2 × 2 × 3) × (2 × 2 × 2 × 2 × 2 × 3)

⇒ 9216 = 96 × 96

⇒ 9216 = $(96)^2$

⇒ √9216 = 96

ix.

23	529
23	23
	1

529 = 23×23

529 = $(23)^2$

√529 = 23

x.

2	8100
2	4050
3	2025
3	675
3	225
3	75
5	25
5	5
	1

8100 = 2×2×3×3×3×3×5×5×1

⇒ 8100 = (2×2) ×(3×3)×(3×3)×(5×5)

⇒ 8100 = (2×3×3×5)×(2×3×3×5)

⇒ 8100 = 90×90

⇒ 8100 = $(90)^2$

⇒ √8100 = 90

5. For each of the following numbers, 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.

2	252
2	126
3	63
3	21
7	7
	1

252 = 2×2×3×3×7

= (2×2)×(3×3)×7

Here, 7 cannot be paired.

∴ We will multiply 252 by 7 to get perfect square.

New number = 252 × 7 = 1764

2	1764
2	882
3	441
3	147
7	49
7	7
	1

1764 = 2×2×3×3×7×7

⇒ 1764 = (2×2)×(3×3)×(7×7)

⇒ 1764 = $2^2 \times 3^2 \times 7^2$

⇒ 1764 = $(2 \times 3 \times 7)^2$

⇒ √1764 = 2×3×7 = 42

ii.

2	180
2	90
3	45
3	15
5	5
	1

180 = 2×2×3×3×5

= (2×2)×(3×3)×5

Here, 5 cannot be paired.

∴ We will multiply 180 by 5 to get perfect square.

New number = 180 × 5 = 900

2	900
2	450
3	225
3	75
5	25
5	5
	1

900 = 2×2×3×3×5×5×1

⇒ 900 = (2×2)×(3×3)×(5×5)

⇒ 900 = $2^2 \times 3^2 \times 5^2$

⇒ 900 = $(2 \times 3 \times 5)^2$

⇒ √900 = 2×3×5 = 30

iii.

2	1008
2	504
2	252
2	126
3	63
3	21
7	7
	1

1008 = 2×2×2×2×3×3×7

= (2×2)×(2×2)×(3×3)×7

Here, 7 cannot be paired.

∴ We will multiply 1008 by 7 to get perfect square.

New number = 1008×7 = 7056

2	7056
2	3528
2	1764
2	882
3	441
3	147
7	49
7	7
	1

7056 = 2×2×2×2×3×3×7×7

⇒ 7056 = (2×2)×(2×2)×(3×3)×(7×7)

⇒ 7056 = $2^2 \times 2^2 \times 3^2 \times 7^2$

$\Rightarrow 7056 = (2\times2\times3\times7)^2$

$\Rightarrow \sqrt{7056} = 2\times2\times3\times7 = 84$

iv.

2	2028
2	1014
3	507
13	169
13	13
	1

$2028 = 2\times2\times3\times13\times13$

$= (2\times2)\times(13\times13)\times3$

Here, 3 cannot be paired.

∴ We will multiply 2028 by 3 to get perfect square. New number = $2028\times3 = 6084$

2	6084
2	3042
3	1521
3	507
13	169
13	13
	1

$6084 = 2\times2\times3\times3\times13\times13$

$\Rightarrow 6084 = (2\times2)\times(3\times3)\times(13\times13)$

$\Rightarrow 6084 = 2^2\times3^2\times13^2$

$\Rightarrow 6084 = (2\times3\times13)^2$

$\Rightarrow \sqrt{6084} = 2\times3\times13 = 78$

v.

2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

1458 = 2×3×3×3×3×3×3

= (3×3)×(3×3)×(3×3)×2

Here, 2 cannot be paired.

∴ We will multiply 1458 by 2 to get perfect square. New number = 1458 × 2 = 2916

2	2916
2	1458
3	729
3	243
3	81
3	27
3	9
3	3
	1

2916 = 2×2×3×3×3×3×3×3

⇒ 2916 = (3×3)×(3×3)×(3×3)×(2×2)

⇒ 2916 = $3^2 \times 3^2 \times 3^2 \times 2^2$

⇒ 2916 = $(3 \times 3 \times 3 \times 2)^2$

⇒ √2916 = 3×3×3×2 = 54

vi.

2	768
2	384
2	192
2	96
2	48
2	24
2	12
2	6
3	3
	1

768 = 2×2×2×2×2×2×2×2×3

= (2×2)×(2×2)×(2×2)×(2×2)×3

Here, 3 cannot be paired.

∴ We will multiply 768 by 3 to get perfect square.

New number = 768×3 = 2304

2	2304
2	1152
2	576
2	288
2	144
2	72
2	36
2	18
3	9
3	3
	1

2304 = 2×2×2×2×2×2×2×2×3×3

⇒ 2304 = (2×2)×(2×2)×(2×2)×(2×2)×(3×3)

⇒ 2304 = $2^2 \times 2^2 \times 2^2 \times 2^2 \times 3^2$

⇒ 2304 = $(2 \times 2 \times 2 \times 2 \times 3)^2$

⇒ √2304 = 2×2×2×2×3 = 48

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

2	252
2	126
3	63
3	21
7	7
	1

252 = 2×2×3×3×7

= (2×2)×(3×3)×7

Here, 7 cannot be paired.

∴ We will divide 252 by 7 to get perfect square. New number = 252 ÷ 7 = 36

2	36
2	18
3	9
3	3
	1

36 = 2×2×3×3

⇒ 36 = (2×2)×(3×3)

⇒ 36 = $2^2 \times 3^2$

⇒ 36 = $(2\times3)^2$

⇒ √36 = 2×3 = 6

ii.

3	2925
3	975
5	325
5	65
13	13
	1

2925 = 3×3×5×5×13

= (3×3)×(5×5)×13

Here, 13 cannot be paired.

∴ We will divide 2925 by 13 to get perfect square. New number = 2925 ÷ 13 = 225

3	225
3	75
5	25
5	5
	1

225 = 3×3×5×5

⇒ 225 = (3×3)×(5×5)

⇒ 225 = $3^2 \times 5^2$

⇒ 225 = $(3\times5)^2$

⇒ √36 = 3×5 = 15

iii.

2	396
2	198
3	99
3	33
11	11
	1

396 = 2×2×3×3×11

= (2×2)×(3×3)×11

Here, 11 cannot be paired.

∴ We will divide 396 by 11 to get perfect square. New number = 396 ÷ 11 = 36

2	36
2	18
3	9
3	3
	1

36 = 2×2×3×3

⇒ 36 = (2×2)×(3×3)

⇒ 36 = $2^2 \times 3^2$

⇒ 36 = $(2\times3)^2$

⇒ √36 = 2×3 = 6

iv.

5	2645
23	529
23	23
	1

2645 = 5×23×23

⇒ 2645 = (23×23)×5

Here, 5 cannot be paired.

∴ We will divide 2645 by 5 to get perfect square.

New number = 2645 ÷ 5 = 529

23	529
23	23
	1

529 = 23×23

⇒ 529 = $(23)^2$

⇒ √529 = 23

v.

2	2800
2	1400
2	700
2	350
5	175
5	35
7	7
	1

2800 = 2×2×2×2×5×5×7

= (2×2)×(2×2)×(5×5)×7

Here, 7 cannot be paired.

∴ We will divide 2800 by 7 to get perfect square. New number = 2800 ÷ 7 = 400

2	400
2	200
2	100
2	50
5	25
5	5
	1

400 = 2×2×2×2×5×5

⇒ 400 = (2×2)×(2×2)×(5×5)

⇒ 400 = $(2×2×5)^2$

⇒ √400 = 20

vi.

2	1620
2	810
3	405
3	135
3	45
3	15
5	5
	1

1620 = 2×2×3×3×3×3×5

= (2×2)×(3×3)×(3×3)×5

Here, 5 cannot be paired.

∴ We will divide 1620 by 5 to get perfect square. New number = 1620 ÷ 5 = 324

2	324
2	162
3	81
3	27
3	9
3	3
	1

$324 = 2\times2\times3\times3\times3\times3$

$\Rightarrow 324 = (2\times2)\times(3\times3)\times(3\times3)$

$\Rightarrow 324 = (2\times3\times3)^2$

$\Rightarrow \sqrt{324} = 18$

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

Solution:

Let the number of students in the school be, x.

∴ Each student donate Rs.x .

Total amount contributed by all the students= $x\times x=x^2$ Given, x^2 = Rs.2401

7	2401
7	343
7	49
7	7
	1

$x^2 = 7\times7\times7\times7$

$\Rightarrow x^2 = (7\times7)\times(7\times7)$

$\Rightarrow x^2 = 49\times49$

$\Rightarrow x = \sqrt{(49\times49)}$

⇒ x = 49

∴ The number of students = 49

8. 2025 plants are to be planted in a garden in such a way that each row contains as many plants as the number of rows. Find the number of rows and the number of plants in each row.

Solution

Let the number of rows be, x.

∴ the number of plants in each rows = x.

Total plants to be planted in the garden = x × x = x^2

Given,

x_2 = Rs.2025

3	2025
3	675
3	225
3	75
5	25
5	5
	1

$x^2 = 3×3×3×3×5×5$

⇒ $x^2 = (3×3)×(3×3)×(5×5)$

⇒ x2 = (3×3×5)×(3×3×5)

⇒ x2 = 45×45

⇒ x = √45×45

⇒ x = 45

∴ The number of rows = 45 and the number of plants in each rows = 45.

9. Find the smallest square number that is divisible by each of the numbers 4, 9 and 10.

Solution:

2	4, 9, 10
	2, 9, 5

L.C.M of 4, 9 and 10 is (2×2×9×5) 180.

180 = 2×2×9×5

= (2×2)×3×3×5

= (2×2)×(3×3)×5

Here, 5 cannot be paired.

∴ we will multiply 180 by 5 to get perfect square.

Hence, the smallest square number divisible by 4, 9 and 10 = 180×5 = 900

10. Find the smallest square number that is divisible by each of the numbers 8, 15 and 20.

Solution:

2	8, 15, 20
2	4, 15, 10
5	2, 15, 5
	2, 3, 1

L.C.M of 8, 15 and 20 is (2×2×5×2×3) 120.

120 = 2×2×3×5×2

= (2×2)×3×5×2

Here, 3, 5 and 2 cannot be paired.

∴ We will multiply 120 by (3×5×2) 30 to get perfect square.

Hence, the smallest square number divisible by 8, 15 and 20 =120×30 = 3600