Squares And Square Roots Ex 3.1

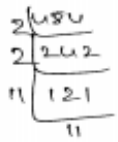
EXERCISE – 3.1

1 Which of the following numbers are perfect squares?

(i) 484

Resolving 484 into prime factors, we get

$484 = 2 \times 2 \times 11 \times 11$



Now grouping the factors into pairs of equal factors, we get

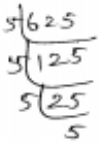
$484 = (2 \times 2) \times (11 \times 11)$

we observe that all are paired, so 484 is a perfect square.

(ii) 625

Resolving 625 into prime factors, we get

$625 = 5 \times 5 \times 5 \times 5$



Now grouping the factors into pairs of equal factors, we get.

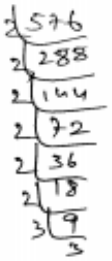
$625 = (5 \times 5) \times (11 \times 11)$

we observe that all are paired, so 625 is a perfect square

(iii) 576

Resolving 576 into prime factors, we get

$576 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$



Now grouping the factors into pairs of equal factors, we get

$576 = (2\times2)\times(2\times2)\times(2\times2)\times(3\times3)$

we observe that all are paired, so 576 is a perfect square.

iv) 941

Resolving 941 into prime factors, we get

941 | 941
1

As 941 itself a prime number

It does not have a perfect square

v) 961

Resolving 961 into prime factors, we get.

$961 = (31\times31) = 31^2$

31 | 961
31

$\therefore$ 961 is a perfect square.

vi) 2500

Resolving 2500 into prime factors, we get

$2500 = 5\times5\times5\times5\times2\times2.$

5 | 2500
5 | 500
5 | 100
5 | 20
2 | 4
2

Now grouping the factors into pairs of- equal factors, we get.

$2500 = (5\times5)\times(5\times5)\times(2\times2)$

we observe that all are paired, so 2500 is a perfect square.

(12) Show that each number is a perfect square. Also, find the number whose square is given number.

(i) 1156

Resolving 1156 into prime factors, we get.

$1156 = 2 \times 2 \times 17 \times 17$.

2	1156
2	578
17	289
	17

Now, grouping factors into pairs of equal factors, we get.

$1156 = (2 \times 2) \times (17 \times 17)$

As all factors are paired, 1156 is a perfect square

Again, $1156 = (2 \times 17) \times (2 \times 17)$

$= 34 \times 34 = 34^2$

Thus, 1156 is the square of 34.

(ii) 2025

Resolving 2025 into prime factors, we get

5	2025
5	405
3	81
3	27
3	9
	3

$2025 = 5 \times 5 \times 3 \times 3 \times 3 \times 3$.

Now, grouping factors into pairs of equal factors, we get

$2025 = (5 \times 5) \times (3 \times 3) \times (3 \times 3)$

As all factors are paired, 2025 is a perfect square

Again, $2025 = (3 \times 3 \times 5) \times (3 \times 3 \times 5)$

$= 45^2$

Thus 2025 is the square of 45.

(iii) 14641

Resolving 14641 into prime factors, we get

$14641 = (11 \times 11) \times (11 \times 11)$

11	14641
11	1331
11	121
	11

As the factors can be paired into equal factors, we get to know that 14641 is a perfect square

Again $14641 = (121) \times (121) = 121^2$

∴ 14641 is the square of 121

(iv) 4761

Resolving 4761 into prime factors, we get

$4761 = (3 \times 3) \times (23 \times 23)$

3	4761
3	1587
23	529
	23

As the factors can be paired into equal factors, 4761 is a perfect square.

Again $4761 = 69 \times 69 = 69^2$

∴ 4761 is the square of 69.

(ii) Find the smallest number by which given number must be multiplied so that product is a perfect square.

(i) 23805.

Resolving 23805 into prime factors, we get

$23805 = (3 \times 3) \times (23 \times 23) \times 5$

5	23805
3	4761
3	1587
23	529
	23

Given obtained factors can be paired into equal factors, except for 5.

To pair it equally multiply the number 5 with 5.

$23805 \times 5 = (3\times3)(23\times23)\times(5\times5)$

Again $23805\times5 = (3\times23\times5)\times(3\times23\times5)$

$= 345^2$.

∴ Product is the square of 345.

(ii) 12150

Resolving 12150 into prime factors, we get

$12150 = (5\times5)\times(3\times3)\times(2\times2)\times(2\times2)\times2$

Obtained factors can be paired into equal factors, 12150 is a except for 2. So multiply given number with 2 to pair it.

$12150\times2 = (5\times5)\times(3\times3)\times(2\times2)\times(2\times2)\times(2\times2)$

Again $12150\times2 = (5\times3\times2\times2\times2)\times(5\times3\times2\times2\times2)$

$= 120^2$

∴ Product is the square of 120

5	12150
5	2430
3	486
3	192
2	64
2	32
2	16
2	8
2	4
	2

(iii) 7688

Resolving 7688 into prime factors, we get

$7688 = (2\times2)\times(31\times31)\times2$

Obtained factors can be paired into equal factors except for 2.

2	7688
2	3844
2	1922
31	961
	31

So multiply given number with 2 to to pair it.

$7688 \times 2 = (2\times2) \times (31\times31) \times (2\times2)$

Again $7688\times2 = (2\times31\times2) \times (2\times31\times2)$

$= 124^2$

∴ The product is the square of 124.

(3) Find the smallest number by which given number must be divided so that resulting number is perfect square

(1) 14283

Resolving 14283 into prime factors, we get

$14283 = (3\times3) \times (23\times23) \times 3$.

Obtained factors can be paired into equal factrs, except for 3

so eliminate 3 by dividing the number with 3.

$\frac{14283}{3} = (3\times3) \times (23\times23)$

Again $\frac{14283}{3} = (3\times23) \times (3\times23)$

$= (69)^2$

∴ The resultant is square of 69.

(2) 1800

Resolving 1800 into prime factors, we get

$1800 = (2\times2) \times (5\times5) \times (3\times3) \times 2$

Obtained factors can be paired into equal factors except for 2.

So, eliminate 2 by dividing the number with 2.

$\frac{1800}{2} = (2\times2)\times(5\times5)\times(3\times3)$

Again $\frac{1800}{2} = (2\times5\times3)\times(2\times5\times3)$

$= 30^2$

∴ The resultant is square of 30

(iii) 2904.

Resolving 2904 into prime factors, we get

$2904 = (2\times2)\times(11\times11)\times2\times3$.

2	2904
2	1452
2	726
3	363
11	121
	11

Obtained factors can be paired into equal factors except for 2 and 3,

So eliminate it by dividing the number with 6.

$\frac{2904}{6} = (2\times2)\times(11\times11)$

Again $\frac{2904}{6} = (2\times11)\times(2\times11)$

$= 22^2$.

∴ Resultant is square of 22

(5) Which of the following numbers are perfect squares

11 → Prime number, not a perfect square

12 → Ending with 2, not a perfect square

16 → 4^2 → perfect square

32 → Ending with 2, not a perfect square

36 → 6^2 → Perfect square

50 → $5^2 \times 2$ → Not a perfect square

64 → 8^2 → perfect square

79 → Prime number, cannot be a perfect square

81 → 9^2 → Perfect square

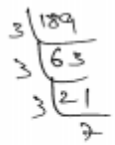
111 → Prime number, Cannot be a perfect square

121 → 11^2 → Perfect square

(6) Using prime factorization method, find which of the following numbers are perfect squares.

(i) 189

$\therefore 189 = 3^2 \times 3 \times 7$.



Cannot be written as pair of two equal factors, so 189 is not a perfect square

225

$\therefore 225 = (3 \times 5)^2 \times (3^0 \times 3)$

Can be written as pair of two equal factors, so 225 is a perfect square

2048

$2048 = (2\times2)\times(2\times2)\times(2\times2)\times(2\times2)\times(2\times2)\times2$

All the factors can not be written as pair of equal factors, so 2048 is not a perfect square

2048
2 | 1024
2 | 512
2 | 256
2 | 128
2 | 64
2 | 32
2 | 16
2 | 8
2 | 4
2

343

$343 = (7\times7)\times7$

All the factors cannot be written as pair of equal factors, so 343 is not perfect square

343
7 | 49
7

441

$441 = (7\times7)\times(3\times3)$

All the prime factors can be written as pair of equal factors, so 441 is a perfect square

441
7 | 63
3 | 9
3

2916

$2916 = (3\times3)\times(3\times3)\times(3\times3)\times(2\times2)$

All the prime factors can be written as pair of equal factors, so 2916 is a perfect square.

2916
3 | 972
3 | 324
3 | 108
3 | 36
3 | 12
2 | 4
2

11025

$11025 = (5\times5)\times(3\times3)\times(7\times7)$

All the prime factors can be written as pair of two equal factors so 11025 is a perfect square.

5	11025
5	2205
3	441
3	147
7	49
	7

3549

$3549 = (13\times13)\times3\times7$

All the factors obtained cannot be written as pair of two equal numbers, so 3549 is not a perfect square.

3	3549
7	1183
13	169
	13

(7) By what number should each of the following numbers be multiplied to get a perfect square in each case? Also, find the number whose square is new number.

(i) (a) 8820

$8820 = (2\times2)\times(3\times3)\times(7\times7)\times5$

only 5 in obtained factors is unpaired, so multiply the number with 5, to make it paired.

Again $(8820\times5) = (2\times3\times7\times5)\times(2\times3\times7\times5)$

$= (210)^2$

so the product is the square of 210.

2	8820
2	4410
5	2205
3	441
3	147
7	49
	7

(ii) 3675

$3675 = (5\times5)\times(7\times7)\times3$

5	3675
5	735
3	147
7	49
	7

only 3 in obtained factor is unpaired, so multiply the number with 3, to make it paired.

Again $(3675\times3) = (5\times5)\times(7\times7)\times(3\times3)$

$= (5\times7\times3)\times(5\times7\times3)$

$= (105)^2$

Product is square of 105.

(iii) 605

$605 = 5\times(11\times11)$

5	605
11	121
	11

$5\times(605) = (5\times5)\times(11\times11)$

$= (5\times11)\times(5\times11)$

$5\times605 = 55^2$

Product is the square of 55.

(iv) 2880

$2880 = 5\times(3\times3)\times(2\times2)\times(2\times2)\times(2\times2)$

$2880\times5 = (5\times5)\times(3\times3)\times(2\times2)\times(2\times2)\times(2\times2)$

$= (5\times3\times2\times2\times2)\times(5\times3\times2\times2\times2)$

$= 120^2$

5	2880
3	576
3	192
2	64
2	32
2	16
2	8
2	4
	2

Product is square of 120.

(v) (iii) 4056

$4056 = (2\times2)\times(13\times13)\times2\times3$

$(4056)\times2\times3 = (2\times2)\times(13\times13)\times(2\times2)\times(3\times3)$

$4056\times6 = (2\times13\times2\times3)\times(2\times13\times2\times3)$

$= 156^2$.

Product is square of 156.

2	4056
2	2028
2	1014
3	507
13	169
	13

(vi) 7776

$7776 = (2\times2)\times(3\times2)\times(3\times3)\times(3\times3)\times2\times3$.

$(7776)\times2\times3 = (2\times2)\times(3\times2)\times(3\times3)\times(3\times3)\times(2\times2)\times(3\times3)$

$(7776)\times6 = (2\times2\times3\times3\times2\times3)\times(2\times2\times3\times3\times2\times3)$

216^2.

Product is the square of 216

2	7776
3	3888
3	1296
3	432
2	144
2	72
2	36
3	18
3	6
	2

(8) By what number should each of the following numbers be divided to get a perfect square, find the numb

(i) 16562.

$16562 = (7\times7)\times(13\times13)\times2$

$\frac{16562}{2} = (7\times7)\times(13\times13)$

$\frac{16562}{2} = (7\times13)\times(7\times13)$

$= 91^2$

Resultant is the square of the 91.

2	16562
7	8281
7	1183
13	169
	13

(ii) 3698

$3698 = 2 \times (43 \times 43)$

$\frac{3698}{2} = 43^2$.

2	3698
43	1849
	43

number must be divided by 2 and Resultant is square of 43.

(iii) 5103

$5103 = (3 \times 3) \times (3 \times 3) \times (3 \times 3) \times 7$.

$\frac{5103}{7} = (3 \times 3 \times 3) \times (3 \times 3 \times 3)$

$= 27^2$.

3	5103
3	1701
3	567
3	189
3	63
3	21
	7

number must be divided by 7 and resultant is square of 27.

(iv) 3174.

$3174 = 2 \times 3 \times (23 \times 23)$

$\frac{3174}{6} = 23 \times 23 = 23^2$.

2	3174
3	1587
23	529
	23

number must be divided by 6 and the resultant is square of 23

Squares And Square Roots Ex 3.2

EXERCISE – 3.2. 14

(1) The following numbers are not perfect squares Give reason.

Numbers ending with 2, 3, 7 or 8 are not perfect squares, so

(i) 1547
(ii) 45743
(iii) 8948
(iv) 333333

are not perfect squares.

(2) Show that following numbers are not perfect squares.

As the numbers

(1) 9327 (2) 4058 (3) 22453 (4) 743522

have 7, 8, 3, 2 as ending numbers respectively As mentioned above, numbers ending with 2, 3, 7, 8 are not perfect squares, These the given numbers are also not perfect squares.

(3) The square of which of the following numbers would be an odd number.

Square of an odd number is an odd number

square of an even number is an even number

(i) 731 → odd number → square is odd number.

(iii) 3456 → Even number → so square is even number.

(iv) 5559 → odd number → so square is odd number

(v) 42008 → Even number → so square is even number.

(4) What will be the units digit of squares of the following numbers.

(i) 52

units digit of $(52)^2$ = units digit of $(2)^2$ = 4.

(ii) 977

units digit of $(977)^2$ = units digit of $(7)^2$ = 9.

(iii) 4583

units digit of $(4583)^2$ = units digit of $(3)^2$ = 9.

(iv) 78367

units digit of $(78367)^2$ = units digit of $(7)^2$ = 9.

(v) 52698

units digit of $(52698)^2$ = units digit of $(8)^2$ = 4

(vi) 99880

units digit of $(99880)^2$ = units digit of $(0)^2$ = 0

(vii) 12796

units digit of $(12796)^2$ = units digit of 6^2 = 6

(viii) 55555

units digit of $(55555)^2$ = units digit of $(5)^2$ = 5

(ix) 53924

units digit of $(53924)^2$ = units digit of 4^2 = 6.

(5) In every line value of R.H.S is the square of number of terms in L.H.S

$\therefore 1+3+5+\cdots n$ terms $= n^2$. [$\because$ As there are n terms]

(6) (i) $100^2 - 99^2$

$= 100+99 = 199$

(ii) $111^2 - 109^2$

$= 111^2 - 110^2 + 110^2 - 109^2$

$= (111+110) + (110+109)$

$= 440$

(iii) $99^2 - 96^2$

$= 99^2 - 98^2 + 98^2 - 97^2 + 97^2 - 96^2$

$= (99+98) + (98+97) + (97+96)$

$= 585$.

(7) which of the following triplets are pythagorean?

(Y) (8, 15,) If (m, n, p) form tripythagorean, then $m^2+n^2=p^2$.

(i) (8, 15, 17)

L.H.S $= 8^2 + 15^2 = 289$.

R.H.S $= 17^2 = 289$.

L.H.S = R.H.S, so it is pythagorean.

(ii) 18, 80, 82.

L·H·S = $18^2 + 80^2 = 6724$

R·H·S = $82^2 = 6724$.

L·H·S = R·H·S, It is Pythagorean

(iii) 14, 48, 51

L·H·S = $14^2 + 48^2 = 2500$

R·H·S = $51^2 = 2601$

L·H·S ≠ R·H·S, It is not pythagorean.

(iv) (10, 24, 26)

L·H·S = $10^2 + 24^2 = 676$

R·H·S = $26^2 = 676$

L·H·S = R·H·S It is pythagorean

(v) (16, 63, 65)

L·H·S = $16^2 + 63^2 = 4225$

R·H·S = $65^2 = 4225$

L·H·S = R·H·S. It is Pythagorean.

(vi) (12, 35, 38)

L·H·S = $12^2 + 35^2 = 1369$

R·H·S = $38^2 = 1444$

L·H·S ≠ R·H·S, It is not pythagorean.

(8) From observation

$(1\times2)+(2\times3)+(3\times4)+(4\times5)+(5\times6) = \frac{5\times6\times7}{3}$

$= 70.$

(9) R.H.S $= \frac{1}{2}\left[\text{no. of terms in L.H.S} \times (\text{no. of terms} + 1)\right]$

[$\because$ only when L.H.S starts with 1]

$\therefore$ (i) $1+2+3+\cdots 50 = \frac{1}{2}\left[50\times(50+1)\right]$

(ii) $= \frac{1}{2}\, 25\times51 = 1275$

(iii) $3+4+32+\cdots+50$

$= (1+2+3+\cdots 50) - (1+2+\cdots 30)$

$= 1275 - \left(\frac{1}{2}(30\times(30+1)\right)$

$= 1275 - 465 = 810.$

(10) R.H.S $= \frac{1}{6}\left[(\text{no. of terms in L.H.S})\times(\text{no.}+1)\times(2\times\text{no.}+1)\right]$

(i) $1^2+2^2+3^2+4^2+\cdots+10^2 = \frac{1}{6}\left[10\times(10+1)\times(2\times10+1)\right]$

$= \frac{1}{6}\left[2310\right] = 385$

(ii) $5^2+6^2+\cdots 12^2 = 1+2^2+\cdots 12^2 - (1^2+2^2+3^2+4^2)$

$= \frac{1}{6}\left(12\times(12+1)\times(2\times12+1)\right) - \frac{1}{6}\left(4\times(4+1)\times(2\times4+1)\right)$

$= 650 - 30 = 620$.

(11) Which of the following numbers are squares of even numbers.

only even numbers be the squares of even numbers

So, 256, 324, 1296, 5476, 373758 Can be are squares of even numbers, but 373758 is not a perfect square

So, 256, 324, 1296, 5476 are answers.

(12) Numbers ending with 2, 3, 7, 8 can not be perfect squares, so

i) 1028, iv) 1022, v) 1023, vi) 1027 cannot be whole square

(13) (i) F, because 169 is square number with odd digits

(ii) F, Square of 3(Prime) is 9(not Prime)

(iii) F, sum of 2^2 and 3^2 is 13 which is not square no.

(iv) F, Difference of 3^2 and 2^2 is 5, which is not square number.

(v) All remaining (Trues) are Verified.

Squares And Square Roots Ex 3.3

EXERCISE - 3.3.

I Find squares of following numbers using column method. verify it by multiplication.

(i) 25.

Here $a=2$, $b=5$.

Column I	Column II	Column III
a^2	$2ab$	b^2
4	20	25
+2	+2	
6	22	
6	2	5

$25^2 = 625$.

and $25^2 = 25 \times 25 = 625$

(ii) 37.

Here $a=3$, $b=7$.

Column I	Column II	Column III
a^2	$2ab$	b^2
9	42	49
+4	+4	
13	46	
13	6	9

$37^2 = 1369$

and $37^2 = 37 \times 37 = 1369$.

(iii) 54.

Here $a=5, b=4$.

Column I	Column II	Column III
a^2	$2ab$	b^2
25	40	16
4	1	
29	41	
29	1	6

$54^2 = 2916$

$54^2 = 54 \times 54 = 2916$

(iv) 71

Here $a=7, b=1$

Column I	Column II	Column III
a^2	$2ab$	b^2
49	14	01
1	0	
49	14	1
49	4	

$71^2 = 4941$

$71^2 = 71 \times 71 = 4941$

(v) 96.

Here $a=9$, $b=6$.

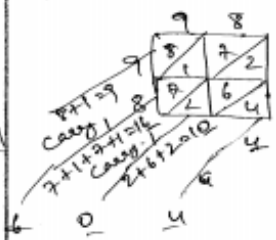
Column I	Column II	Column III
a^2	$2ab$	b^2
81	108	36
11	3	
92	111	
92	1	6

$96^2 = 9216$

and $96 \times 96 = 9216$.

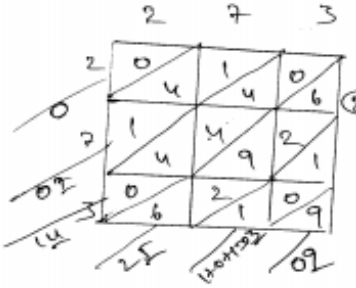
(2) find squares of following numbers using diagonal method.

(i) 98.



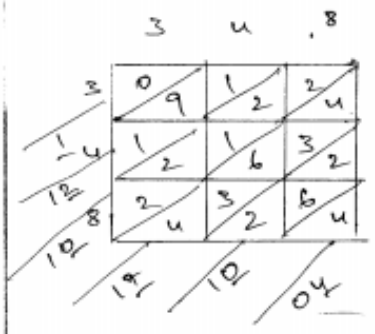
$\therefore 98^2 = 9604$.

(ii) 273



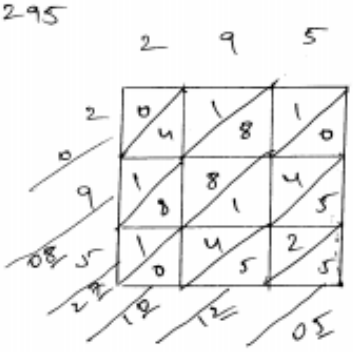
$(273)^2 = 74529$.

(iii) 348



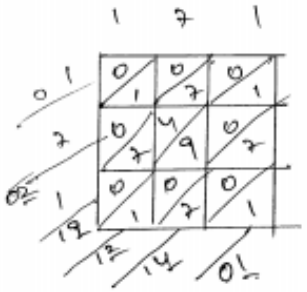
$348^2 = 120704$.

(iv) 295



$(295)^2 = 87025$

(v) 171



$(171)^2 = 29241$.

(3) Find the squares of following numbers.

(1) $(127)^2 = 127 \times 127 = 16129$

(2) $(503)^2 = 503 \times 503 = 253009$

(3) $(451)^2 = 451 \times 451 = 203401$

(4) $(862)^2 = 862 \times 862 = 743044$

(5) $(265)^2 = 265 \times 265 = 70225$.

(4) Find squares of following numbers using Identity $(a+b)^2 = a^2 + 2ab + b^2$.

(1) 405.

We have $(405)^2 = (400+5)^2 = (400)^2 + 5^2 + 2(400)(5)$

$= 160000 + 25 + 4000$

164025.

(2) 510

We have $(510)^2 = (500+10)^2 = (500)^2 + 10^2 + 2(500)(10)$

$= 250000 + 100 + 10000$

260100.

(3) 1001

We have $(1000+1)^2 = (1000)^2 + 1 + 2(1000)$

$= 1000000 + 1 + 2000$

$= 1002001$.

(iv) 209.

$(209)^2 = (200+9)^2 = (200)^2 + 9^2 + 2(200)(9)$

$= 40000 + 81 + 3600$

$= 43681.$

(v) 605

$(605)^2 = (600+5)^2 = (600)^2 + 5^2 + 2(600)(5)$

$= 360000 + 25 + 6000$

$= 366025.$

(6) Find squares of following using $(a-b)^2 = a^2 - 2ab + b^2$.

(1) $395 = (400-5)^2 = (400)^2 + 5^2 - 2(400)(5)$

$= 160000 + 25 - 4000$

$= 156025.$

(2) $995 = (1000-5)^2 = (1000)^2 + 5^2 - 2(1000)(5)$

$= 1000000 + 25 - 10000$

$= 990025.$

(3) $495 = (500-5)^2 = (500)^2 + 5^2 - 2(500)(5)$

$= 250000 + 25 - 5000$

$= 245025$

(4) $498 = (500-2)^2 = (500)^2 + 2^2 - 2(500)(2)$

$= 250000 + 4 - 2000$

$= 248004.$

⑤ 99

$99^2 = (100-1)^2 = (100)^2 - 1^2 - 2(100)$

$= 10000 - 1 - 200$

$= 9799.$

7. Find squares of following numbers by visual method.

① 52, $(52)^2 = (50+2)^2 = 50^2 + 2^2 + 4(2 \times 50 \times 2)$

$= 2500 + 4 + 200$

$= 2704.$

② 95, $(95)^2 = (100-5)^2 = 100^2 + 5^2 - 2(5)(100)$

$= 10000 + 25 - 1000$

$= 9025.$

③ 505, $(505)^2 = (500+5)^2 = (500)^2 + 5^2 + 2(500)(5)$

$= 250000 + 25 + 5000$

$= 255025.$

④ 702, $(702)^2 = (700+2)^2 = (700)^2 + 2^2 + 2(700)(2)$

$= 140000 + 4 + 4(700)$

$= 142804.$

⑤ 99, $(99)^2 = (100-1)^2 = (100)^2 + 1 - 2(100)$

$= 10000 + 1 - 200$

$= 9801.$

Squares And Square Roots Ex 3.4

EXERCISE 3.4.

(1) write the possible units digits of square root of following numbers. which of these are odd square roots.

(i) 9801

units digit = 1

units digit of square root = 1 or 9.

As no. is odd, square root is also odd.

(ii) 99856.

units digit = 6

units digit of square root = 4 or 6

As no. is even, square root is also even.

(iii) 998001

units digit = 1

units digit of square root is 1 or 9.

As no. is odd, square root is also odd.

(iv) 657666025.

units digit = 5.

units digit of square root = 5.

As no. is odd, square root is also odd.

(2) Find square root of each of the following by prime factorization

(i) 441

$441 = 3^2 \times 7^2$.

$\sqrt{441} = 3 \times 7 = 21$

3 | 441
3 | 147
7 | 49
7

(ii) 196

$196 = 2^2 \times 7^2$.

$\sqrt{196} = 2 \times 7 = 14$.

2 | 196
2 | 98
7 | 49
7

(iii) 529.

$529 = 23^2$.

$\sqrt{529} = 23$

23 | 529
23

(iv) 1764

$1764 = 2^2 \times 3^2 \times 7^2$.

$\sqrt{1764} = 2 \times 3 \times 7 = 42$.

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

(v) 1156

$1156 = 2^2 \times 17^2$

$\sqrt{1156} = 2 \times 17 = 34$.

2 | 1156
2 | 578
17 | 289
17

(vi) 4096

$4096 = 2^{12}$

$\sqrt{4096} = 2^6 = 64.$

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

(vii) 7056

$7056 = 2^2 \times 2^2 \times 21^2$

$\sqrt{7056} = 2 \times 2 \times 21 = 84.$

2 | 7056
2 | 3528
2 | 1764
2 | 882
21 | 441
21

(viii) 8281

$8281 = 91^2$

$\sqrt{8281} = 91$

91 | 8281
91

(ix) 11664

$11664 = 2^2 \times 2^2 \times 3^2 \times 3^2 \times 3^2$

$\sqrt{11664} = 2 \times 2 \times 3 \times 3 \times 3$

$= 108.$

2 | 11664
2 | 5832
2 | 2916
2 | 1458
3 | 729
3 | 243
3 | 81
3 | 27
3 | 9
3

(x) 47089

$47089 = (217)^2$

$\sqrt{47089} = 217.$

217 | 47089

(xi) 24336

$24336 = 2^2 \times 2^2 \times 3^2 \times 13^2.$

$\sqrt{24336} = 2 \times 2 \times 3 \times 13$

$= 156.$

2 | 24336
2 | 12168
2 | 6084
2 | 3042
3 | 1521
3 | 507
13 | 169
15

(xii) 190969

$190969 = 23^2 \times 19^2.$

$\sqrt{190969} = 23 \times 19$

$= 437.$

23 | 190969
23 | 8303
19 | 361
19

(xiii) 586756

$586756 = 2^2 \times 383^2.$

$\sqrt{586756} = 2 \times 383$

$= 766.$

2 | 586756
2 | 293378
383 | 146689
383

(xiv) 3013696

$3013696 = 2^2 \times 2^2 \times 2^2 \times 217^2$

$\sqrt{3013696} = 1736.$

2 | 3013696
2 | 1506848
2 | 753424
2 | 376712
2 | 188356
2 | 94178
217 | 47089
217

(3) $180 = 2^2 \times 3^2 \times 5$.

$= (2\times2) \times (3\times3) \times (5)$

2 | 180
2 | 90
3 | 45
3 | 9
3

To make the unpaired 5 into paired, multiply the number with 5.

$\therefore 180 \times 5 = 2^2 \times 3^2 \times 5^2$.

$\therefore$ square root of number $= \sqrt{180\times5} = 2\times3\times5$
$= 30$.

(4) 147

$147 = 7^2 \times 3$.

3 | 147
7 | 49
7

To make the unpaired 3 into paired, multiply the number with 3.

$\therefore 147\times3 = 7^2 \times 3^2$.

$\therefore$ square root of number $= \sqrt{147\times3} = 7\times3 = 21$

(5) 3645

$3645 = 5\times(3\times3)\times(3\times3)\times(3)$

Here 5 and 3 are unpaired to eliminate them we have to divide 3645 with 5×3, i.e 15

5 | 3645
3 | 729
3 | 243
3 | 81
3 | 27
3 | 9
3

$\therefore \frac{3645}{15} = 3^2 \times 3^2$.

$\therefore$ square root of number $= \sqrt{\frac{3645}{15}} = 3\times3 = 9$.

(6) 1152

$1152 = (2\times2)\times(2\times2)\times(2\times2)\times2\times(3\times3)$

All factors are paired except 2, to eliminate it we have to divide the no. with 2.

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

$\therefore \frac{1152}{2} = 2\times2\times2\times2\times3^2$.

$\sqrt{\frac{1152}{2}} = 2\times2\times2\times3 = 24$.

(7) Let a and b be two numbers

$a\times b = 1296$

$a = 16b \Rightarrow 16b\times b = 1296$

$b^2 = 81$

$b = \sqrt{81}$

$b = 9$.

3	81
3	27
3	9
	3

$\therefore a = 144, b = 9$.

(8) Let total residents be a.

∴ Each paid a. Rs.

∴ Total collection $= a(a) = a^2 = 2025000$

$a = \sqrt{2025000}$

$a = 5\times5\times6 = 150$.

5	2025000
5	405000
5	81000
5	16200
6	3240
	540
	90
	15
	5

∴ Total residents = 150.

(9) Let there were a members.

∴ Each attributed a paise.

∴ $a(a)$, i.e. total cost collected = 9216 paise

$a^2 = 9216$

$a = \sqrt{9216}$

$a = 2\times2\times2\times12$

$= 96.$

2	9216
2	4608
2	2304
2	1152
2	576
2	288
12	144
	12

∴ There were 96 members, each contributed 96 paise.

(10) Let 'a' be number of school students

∴ each student contributed a paise,

total money obtained = a^2 paise = 230400 paise

$a = \sqrt{230400} = \sqrt{2304\times100} = 10\sqrt{2304}$

$a = 10\times2\times2\times12.$

$a = 480$

2	23040
2	11520
2	5760
2	2880
12	1440
	120

∴ there were 480 students.

(11) Let 'a' be side of square field.

$\therefore a^2 = 5184\ m^2$

$a = \sqrt{5184}\ m$

$a = 2\times2\times2\times9 = 72\ m$

Perimeter of Sq = $4a = 288\ m$

Perimeter of rectangle = $2(l+b) = 288\ m.$

2	5184
2	2592
2	1296
2	648
2	324
2	162
9	81
	9

$2(2b+b) = 288$

$b = 48$, $l = 96$.

area of rectangle $= 96 \times 48\ m^2$

$= 4608\ m^2$.

(12) (i) 6, 9, 15 and 20

LCM of given 4 numbers is 180

$180 = 2^2 \times 3^2 \times 5$

2 | 180
2 | 90
3 | 45
3 | 9
3

To make it a perfect square, we have to multiply the number with 5.

$\therefore 180 \times 5 = 2^2 \times 3^2 \times 5^2$

900 is the least square number, divisible by 6, 9, 15 and 20.

(ii) 8, 12, 15 and 20

LCM of given 4 numbers is 360.

$360 = 2^2 \times 3^2 \times 2 \times 5$.

2 | 360
2 | 180
2 | 90
5 | 45
3 | 9
3

To make it a perfect square, multiply it with 2×5, i.e 10

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

$\therefore$ 3600 is the least square number, divisible by 8, 12, 15 and 20.

(13)

$121 - 1 = 120$

$120 - 3 = 117$

$117 - 5 = 112$

$112 - 7 = 105$

$105 - 9 = 106$

$106 - 11 = 95$

$95 - 13 = 82$

$82 - 15 = 67$

$67 - 17 = 50$

$50 - 19 = 31$

$31 - 21 = 10$

clearly we have performed operation 11 times

$\therefore \sqrt{121} = 11$

$169 - 1 = 168$

$168 - 3 = 165$

$165 - 5 = 160$

$160 - 7 = 153$

$153 - 9 = 144$

$144 - 11 = 133$

$133 - 13 = 120$

$120 - 15 = 105$

$105 - 17 = 88$

$88 - 19 = 69$

$69 - 21 = 48$

$48 - 23 = 25$

$25 - 25 = 0$

clearly we have performed subtraction 13 times

$\therefore \sqrt{169} = 13.$

(14) (i) 7744

$7744 = 2^2 \times 2^2 \times 2^2 \times 11^2$.

$\sqrt{7744} = 2 \times 2 \times 2 \times 11$.

$= 88$.

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

(ii) 9604

$9604 = 2^2 \times 7^2 \times 7^2$.

$\sqrt{9604} = 2 \times 7 \times 7$

$= 98$.

2	9604
2	4802
7	2401
7	343
7	49
	7

(iii) ~~5292~~ 5929

$5929 = 11^2 \times 7^2$

$\sqrt{5929} = 11 \times 7$

$= 77$.

11	5929
11	539
7	49
	7

(iv) 7056

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

$\sqrt{7056} = 2 \times 2 \times 7 \times 3$

$= 84$.

2	7056
2	3528
2	1764
2	882
7	441
7	63
3	9
	3

(15) Let 'a' be number of students.

∴ each student donated a rupees.

∴ Total amount collected = axa rupees = 2401

$a^2 = 2401$

$a = \sqrt{2401}$

$a = 49$

7	2401
7	343
7	49
	7

∴ There are 49 students in the class.

(16) Let a be no. of rows

∴ no. of columns = a.

Total no. of students who sat in field = a^2

Total students = $a^2 + 71 = 6000$

$a^2 = 5928$

$a = \sqrt{5928}$

$a = 11 \times 7 = 77$.

11	5929
11	539
7	49
	7

2	5928
2	2964
2	1482
3	741
	247

∴ no. of rows = 77.

Squares And Square Roots Ex 3.6

EXERCISE – 3.6. 38

(1) Find the square root of

(i) $\frac{441}{961}$

$\Rightarrow \sqrt{\frac{441}{961}} = \frac{\sqrt{441}}{\sqrt{961}} = \frac{21}{31}$ $\left[\because \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}\right]$

(ii) $\sqrt{\frac{324}{841}} = \frac{\sqrt{324}}{\sqrt{841}} = \frac{18}{29}$

(iii) $4\frac{29}{49} = \frac{225}{49}$

$\sqrt{4\frac{29}{49}} = \sqrt{\frac{225}{49}} = \frac{\sqrt{225}}{\sqrt{49}} = \frac{15}{7}$

(iv) $2\frac{14}{25} = \frac{64}{25}$

$\sqrt{2\frac{14}{25}} = \sqrt{\frac{64}{25}} = \frac{\sqrt{64}}{\sqrt{25}} = \frac{8}{5}$

(v) $2\frac{137}{196} = \frac{529}{196}$

$\sqrt{2\frac{137}{196}} = \sqrt{\frac{529}{196}} = \frac{\sqrt{529}}{\sqrt{196}} = \frac{23}{14}$

(vi) $23\frac{26}{121} = \frac{2809}{121}$

$\sqrt{23\frac{26}{121}} = \sqrt{\frac{2809}{121}} = \frac{\sqrt{2809}}{\sqrt{121}} = \frac{53}{11}$

(vii) $25\frac{544}{729} = \frac{18769}{729}$

$\sqrt{25\frac{544}{729}} = \sqrt{\frac{18769}{729}} = \frac{\sqrt{18769}}{\sqrt{729}} = \frac{137}{27}$

(viii) $75.\frac{46}{49} = \frac{3721}{49}$

$\sqrt{75.\frac{46}{49}} = \sqrt{\frac{3721}{49}} = \frac{61}{7}$

(ix) $3.\frac{942}{2209} = \frac{7569}{2209}$

$\sqrt{3.\frac{942}{2209}} = \sqrt{\frac{7569}{2209}} = \frac{\sqrt{7569}}{\sqrt{2209}} = \frac{87}{47}$

(x) $3.\frac{334}{3025} = \frac{9409}{3025}$

$\sqrt{3.\frac{942}{2209}} = \sqrt{\frac{9409}{3025}} = \frac{\sqrt{9409}}{\sqrt{3025}} = \frac{97}{55}$

(xi) $21.\frac{2797}{3364} = \frac{73441}{3364}$

$\sqrt{21.\frac{2797}{3364}} = \sqrt{\frac{73441}{3364}} = \frac{\sqrt{73441}}{\sqrt{3364}} = \frac{271}{58}$

(xii) $38.\frac{11}{25} = \frac{961}{25}$

$\sqrt{38.\frac{11}{25}} = \sqrt{\frac{961}{25}} = \frac{\sqrt{961}}{\sqrt{25}} = \frac{31}{5}$

(xiii) $23.\frac{394}{729} = \frac{17161}{729}$

$\sqrt{23.\frac{394}{729}} = \sqrt{\frac{17161}{729}} = \frac{\sqrt{17161}}{\sqrt{729}} = \frac{131}{27}$

(xiv) $21.\frac{51}{169} = \frac{3600}{169}$

$\sqrt{21.\frac{851}{169}} = \sqrt{\frac{3600}{169}} = \frac{\sqrt{3600}}{\sqrt{169}} = \frac{60}{13}$

(xv) $10.\frac{151}{225} = \frac{2401}{225}$

$\sqrt{10.\frac{151}{225}} = \sqrt{\frac{2401}{225}} = \frac{\sqrt{2401}}{\sqrt{225}} = \frac{49}{15}$

(2) Find the value of

(i) $\frac{\sqrt{80}}{\sqrt{405}}$

we know that $\frac{\sqrt{a}}{\sqrt{b}} = \sqrt{\frac{a}{b}}$

$\Rightarrow \frac{\sqrt{80}}{\sqrt{405}} = \sqrt{\frac{80}{405}} = \sqrt{\frac{16}{81}}$ (∵ cancelling numerator and denominator with 5)

$= \frac{\sqrt{16}}{\sqrt{81}} = \frac{4}{9}$, $[\because \sqrt{16} = 4, \sqrt{81} = 9]$

(ii) $\frac{\sqrt{441}}{\sqrt{625}}$

$= \sqrt{\frac{441}{625}} = \frac{21}{25}$ $[\because \sqrt{441} = 21, \sqrt{625} = 25]$

(iii) $\frac{\sqrt{1587}}{\sqrt{1728}} = \sqrt{\frac{1587}{1728}} = \sqrt{\frac{529}{576}}$ (∵ cancelling numerator and denominator with 3)

$= \frac{\sqrt{529}}{\sqrt{576}} = \frac{23}{24}$ $[\because \sqrt{529} = 23, \sqrt{576} = 24]$

(iv) $\sqrt{72} \times \sqrt{338}$

$= \sqrt{2^3 \times 3^2} \times \sqrt{2 \times 13^2}$

we know that $\sqrt{a} \times \sqrt{b} = \sqrt{a \times b}$

$\Rightarrow \sqrt{2^4 \times 3^2 \times 13^2} = 2^2 \times 3 \times 13 = 156.$

(v) $\sqrt{45} \times \sqrt{20}$

$= \sqrt{5 \times 9^2} \times \sqrt{5 \times 2^2}$

$= \sqrt{5^2 \times 9^2 \times 2^2} = 5 \times 9 \times 2$

$= 90$

(3) Given area $= 80 \cdot \frac{244}{729}\ m^2$

$= \frac{58564}{729}\ m^2$

If L is length of each side

$\therefore L^2 = \frac{58564}{729}$

$L = \frac{\sqrt{58564}}{\sqrt{729}} \quad \left[\because \sqrt{\frac{a}{b}} = \frac{\sqrt{a}}{\sqrt{b}}\right]$

$= \frac{242}{27}$

(4) Given, area $= 30 \cdot \frac{1}{4}\ m^2$

$= \frac{121}{4}\ m^2$

If L is length of each side

then $L^2 = \frac{121}{4}$

$L = \sqrt{\frac{121}{4}} = \frac{\sqrt{121}}{\sqrt{4}} = \frac{11}{2} \quad \left[\because \sqrt{121} = 11,\ \sqrt{4} = 2\right]$

$\therefore$ length $= 11/2$

(5) Area of rectangular field $= l \times b$

$= 72 \times 338\ m^2$

$= 24336\ m^2$

Area of square $= L^2 = 24336\ m^2$

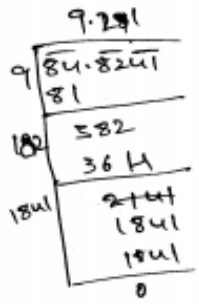
$L = \sqrt{24336} = 156$ m. is the length of side of square play ground.

Squares And Square Roots Ex 3.7

EXERCISE - 3.7

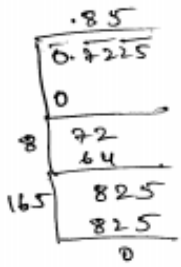
Find the square root of the following.

(1) 84.8241



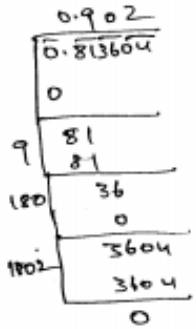
$\therefore \sqrt{84.8241} = 9.21.$

(2) 0.7225



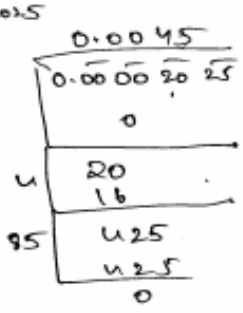
$\sqrt{0.7225} = 0.85$

(3) 0.813604



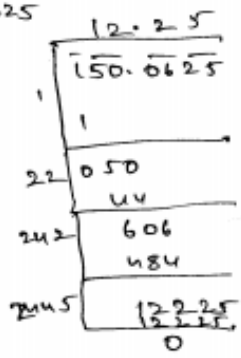
$\sqrt{0.813604} = 0.902.$

④ 0.00002025



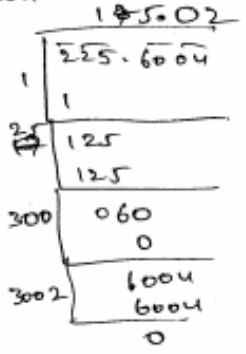
= 0.0045

⑤ 150.0625



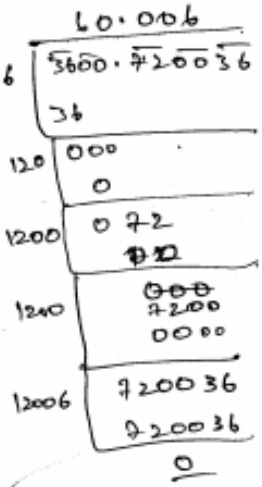
= 12.25

⑥ 225.6004



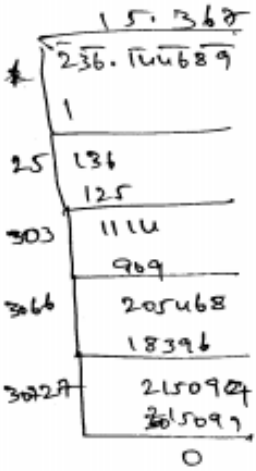
= 15.02

(7) 3600.720036



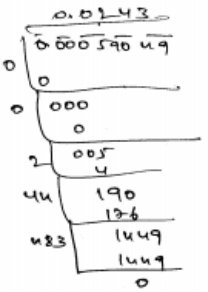
= 60.006.

(8) 236.144689



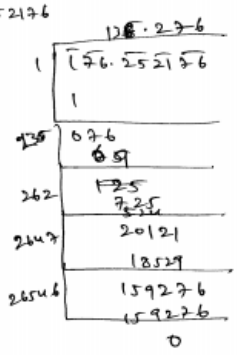
= 15.367.

(9) 0.00059049



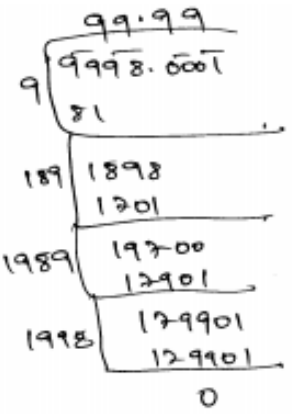
= 0.0243.

(10) 176.252176



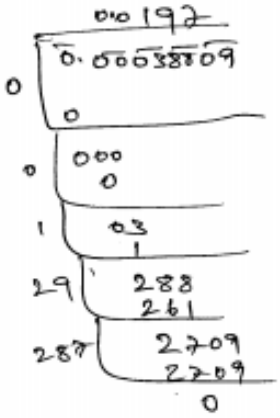
= 13.276

(11)



$= 99.99$

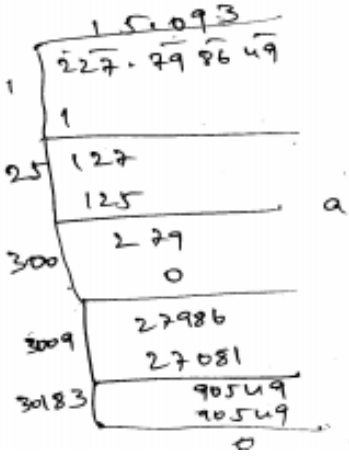
(13)



$= 0.0197$

(13) If 'a' the fraction, then given is $a^2 = 227.798649$

$$a = \sqrt{227.798649}$$



$a = 15.093$

(14) Given area $= L^2 = 256.6404\ m^2$.

$L = \sqrt{256.6404}$

$\therefore L = 16.02\ m$.

16.02
1 | 256.6404
  | 1
26 | 156
   | 156
320 | 064
    | 0
3202 | 6404
     | 6404
     | 0

(15) If 'a' is the fraction then given is

$a^2 = 0.00053361$

$\therefore a = 0.0231$

0.0231
0 | 0.00053361
  | 0
  | 000
  | 0
2 | 005
  | 4
43 | 133
   | 129
461 | 461
    | 461
    | 0

(16) (i) $\dfrac{\sqrt{59.29}-\sqrt{5.29}}{\sqrt{59.29}+\sqrt{5.29}}$

first we find $\sqrt{5929}$ and $\sqrt{529}$

$\sqrt{5929}$: 7 | 49 ; 147 | 1029, 1029, 0 → $=77$

$\sqrt{529}$: 2 | 4 ; 43 | 129, 129, 0 → $=23$.

$\therefore \sqrt{59.29} = \sqrt{\dfrac{5929}{100}} = \dfrac{77}{10}$, $\sqrt{529} = \sqrt{\dfrac{529}{100}} = \dfrac{23}{10}$

$\therefore \dfrac{\frac{77}{10}-\frac{23}{10}}{\frac{77}{10}+\frac{23}{10}} = 0.54$.

(ii) $\dfrac{\sqrt{0.2304}+\sqrt{0.1764}}{\sqrt{0.2304}-\sqrt{0.1764}}$

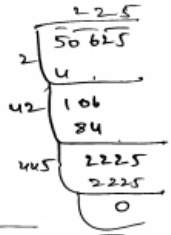
$\sqrt{2304}$: 4 | 16 ; 88 | 704, 704, 0 → $=48$

$\sqrt{1764}$: 4 | 16 ; 82 | 164, 164, 0 → $=42$

$\therefore$ Given $\dfrac{\sqrt{\frac{2304}{10000}}+\sqrt{\frac{1764}{10000}}}{\sqrt{\frac{2304}{10000}}-\sqrt{\frac{1764}{10000}}} = \dfrac{48+42}{48-42}$

$= \dfrac{90}{6} = 15$.

(12) $\sqrt{50625}$ =



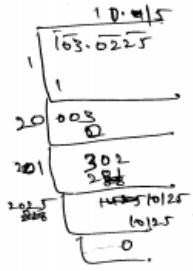
= 225.

$\sqrt{506.25} = \sqrt{\frac{50625}{100}} = \frac{\sqrt{50625}}{10} = \frac{225}{10}$

$\sqrt{5.0625} = \sqrt{\frac{50625}{10000}} = \frac{\sqrt{50625}}{100} = \frac{225}{100}$

$\sqrt{506.25} + \sqrt{5.0625} = \frac{225}{10} + \frac{225}{100} = \frac{2475}{100} = 24.75$

(13) $\sqrt{103.0225}$ =



= 10.15.

(i) $\sqrt{10302.25} = \sqrt{103.0225 \times 100}$ $= 10 \times 10.15$

$= 101.5$

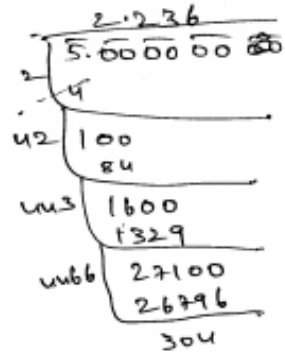
(ii) $\sqrt{1.030225} = \sqrt{\frac{103.0225}{100}} = \frac{10.15}{10} = 1.015$

Squares And Square Roots Ex 3.8

EXERCISE - 3.8

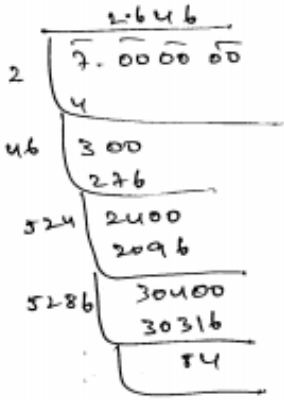
Q1 find the square root of following correct to three places of decimal.

(i) 5



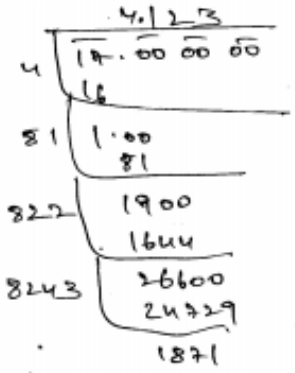
= 2.236

(ii) 7



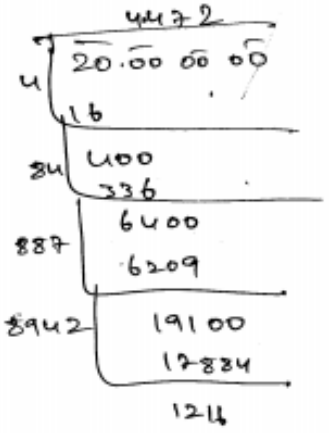
= 2.646

(iii) 17



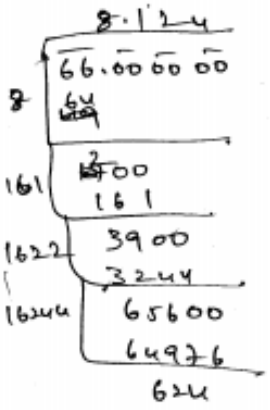
= 4.123

(iv) 20



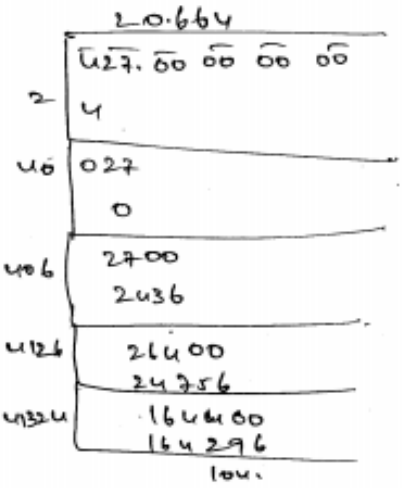
$= 4.472$

(v) 66



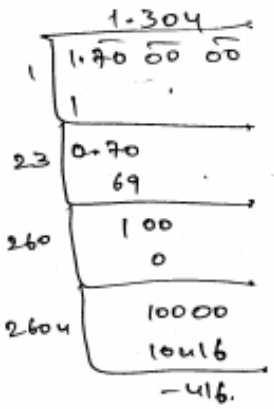
$= 8.124$

(vi) 427



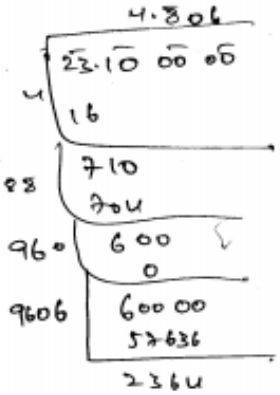
$= 20.664$

(VII) 1.7



= 1.304.

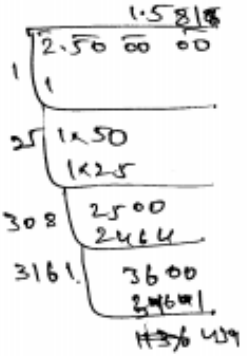
(VIII) 23.1



= 4.806.

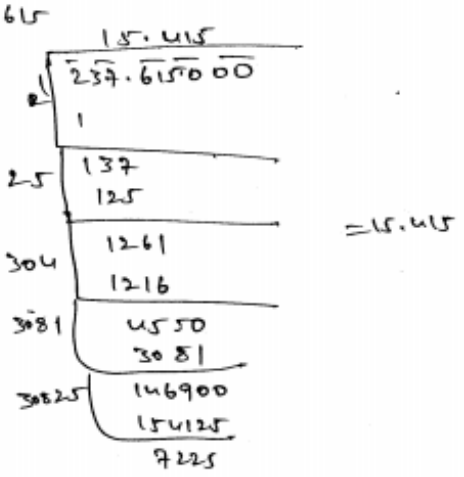
(IX) ~~2.5~~

(IX) 2.5



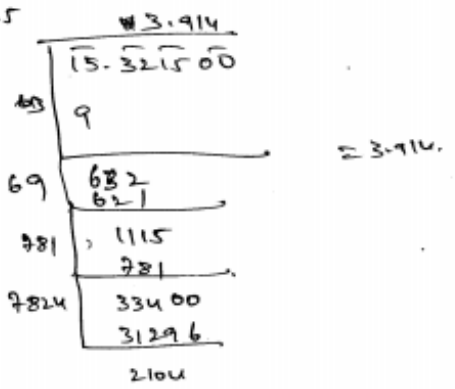
= 1.581

(x) 237.615



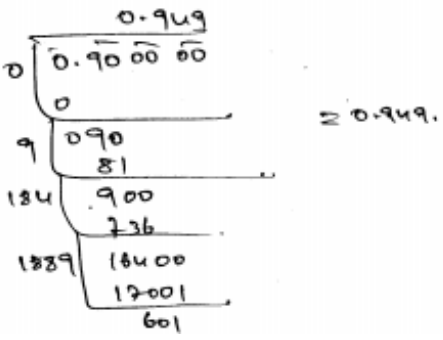
$= 15.415$

(xi) 15.3215



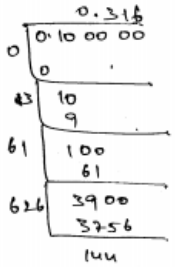
$\approx 3.914.$

(xii) 0.9



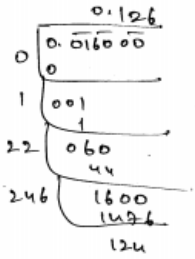
$\approx 0.949.$

(xiii) 0.1



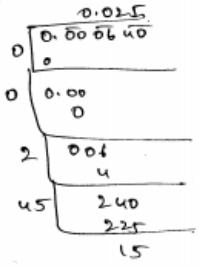
$= 0.316$

(xiv) 0.016



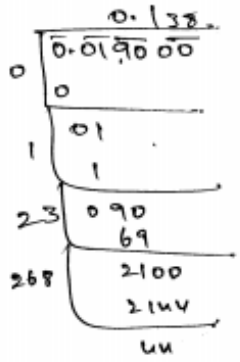
$= 0.126$

(xv) 0.00064



$= 0.025$

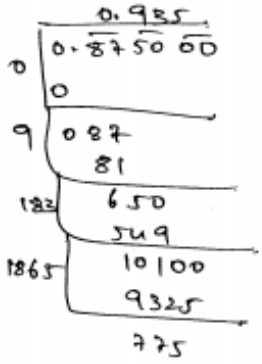
(xvi) 0.019



last digit is approximated.

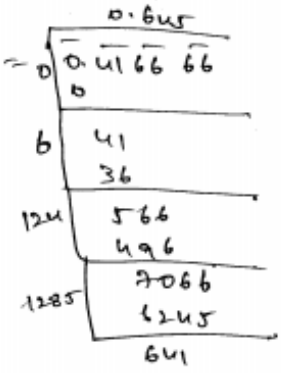
$= 0.138$

(xvii) $\frac{7}{8} = 0.875$



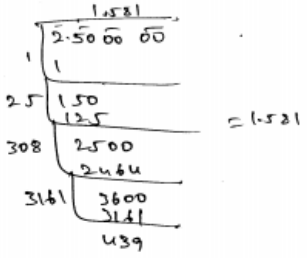
$= 0.935$

(xviii) $\frac{5}{12} =$



$= 0.645$

(xix) $2\frac{1}{2} = 2.5$



$= 1.581$