Squares and Square Roots
Exercise 3A

Q1

Answer :

A perfect square can always be expressed as a product of equal factors.

(i)
Resolving into prime factors:
$441 = 49 \times 9 = 7 \times 7 \times 3 \times 3 = 7 \times 3 \times 7 \times 3 = 21 \times 21 = (21)^2$

Thus, 441 is a perfect square.

(ii)
Resolving into prime factors:
$576 = 64 \times 9 = 8 \times 8 \times 3 \times 3 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 = 24 \times 24 = (24)^2$

Thus, 576 is a perfect square.

(iii)
Resolving into prime factors:
$11025 = 441 \times 25 = 49 \times 9 \times 5 \times 5 = 7 \times 7 \times 3 \times 3 \times 5 \times 5 = 7 \times 5 \times 3 \times 7 \times 5 \times 3$
$= 105 \times 105 = (105)^2$

Thus, 11025 is a perfect square.

(iv)
Resolving into prime factors:
$1176 = 7 \times 168 = 7 \times 21 \times 8 = 7 \times 7 \times 3 \times 2 \times 2 \times 2$

1176 cannot be expressed as a product of two equal numbers. Thus, 1176 is not a perfect square.

(v)
Resolving into prime factors:
$5625 = 225 \times 25 = 9 \times 25 \times 25 = 3 \times 3 \times 5 \times 5 \times 5 \times 5 = 3 \times 5 \times 5 \times 3 \times 5 \times 5 = 75 \times 75 = (75)^2$

Thus, 5625 is a perfect square.

(vi)
Resolving into prime factors:
$9075 = 25 \times 363 = 5 \times 5 \times 3 \times 11 \times 11 = 55 \times 55 \times 3$

9075 is not a product of two equal numbers. Thus, 9075 is not a perfect square.

(vii)
Resolving into prime factors:
$4225 = 25 \times 169 = 5 \times 5 \times 13 \times 13 = 5 \times 13 \times 5 \times 13 = 65 \times 65 = (65)^2$

Thus, 4225 is a perfect square.

(viii)
Resolving into prime factors:
$1089 = 9 \times 121 = 3 \times 3 \times 11 \times 11 = 3 \times 11 \times 3 \times 11 = 33 \times 33 = (33)^2$

Thus, 1089 is a perfect square.

Q2

Answer :

A perfect square is a product of two perfectly equal numbers.

(i)
Resolving into prime factors:

$1225 = 25 \times 49 = 5 \times 5 \times 7 \times 7 = 5 \times 7 \times 5 \times 7 = 35 \times 35 = (35)^2$

Thus, 1225 is the perfect square of 35.

(ii)
Resolving into prime factors:
$2601 = 9 \times 289 = 3 \times 3 \times 17 \times 17 = 3 \times 17 \times 3 \times 17 = 51 \times 51 = (51)^2$

Thus, 2601 is the perfect square of 51.

(iii)
Resolving into prime factors:

$5929 = 11 \times 539 = 11 \times 7 \times 77 = 11 \times 7 \times 11 \times 7 = 77 \times 77 = (77)^2$

Thus, 5929 is the perfect square of 77.

(iv)
Resolving into prime factors:
$7056 = 12 \times 588 = 12 \times 7 \times 84 = 12 \times 7 \times 12 \times 7 = (12 \times 7)^2 = (84)^2$

Thus, 7056 is the perfect square of 84.

(v)
Resolving into prime factors:

$8281 = 49 \times 169 = 7 \times 7 \times 13 \times 13 = 7 \times 13 \times 7 \times 13 = (7 \times 13)^2 = (91)^2$

Thus, 8281 is the perfect square of 91.

Q3

Answer :

1. Resolving 3675 into prime factors:

$3675 = 3 \times 5 \times 5 \times 7 \times 7$

Thus, to get a perfect square, the given number should be multiplied by 3.

New number= $\left(3^2 \times 5^2 \times 7^2\right) = \left(3 \times 5 \times 7\right)^2 = \left(105\right)^2$

Hence, the new number is the square of 105.

2. Resolving 2156 into prime factors:

$2156 = 2 \times 2 \times 7 \times 7 \times 11 = \left(2^2 \times 7^2 \times 11\right)$

Thus to get a perfect square, the given number should be multiplied by 11.

New number = $\left(2^2 \times 7^2 \times 11^2\right) = \left(2 \times 7 \times 11\right)^2 = \left(154\right)^2$

Hence, the new number is the square of 154.

3. Resolving 3332 into prime factors:

$3332 = 2 \times 2 \times 7 \times 7 \times 17 = 2^2 \times 7^2 \times 17$

Thus, to get a perfect square, the given number should be multiplied by 17.

New number = $\left(2^2 \times 7^2 \times 17^2\right) = \left(2 \times 7 \times 17\right)^2 = \left(238\right)^2$

Hence, the new number is the square of 238.

4. Resolving 2925 into prime factors:

$2925 = 3 \times 3 \times 5 \times 5 \times 13 = 3^2 \times 5^2 \times 13$

Thus, to get a perfect square, the given number should be multiplied by 13.

New number = $\left(3^2 \times 5^2 \times 13^2\right) = \left(3 \times 5 \times 13\right)^2 = \left(195\right)^2$

Hence, the number whose square is the new number is 195.

5. Resolving 9075 into prime factors:

$9075 = 3 \times 5 \times 5 \times 11 \times 11 = 3 \times 5^2 \times 11^2$

Thus, to get a perfect square, the given number should be multiplied by 3.

New number $= \left(3^2 \times 5^2 \times 11^2\right) = \left(3 \times 5 \times 11\right)^2 = \left(165\right)^2$

Hence, the new number is the square of 165.

6. Resolving 7623 into prime factors:

$7623 = 3 \times 3 \times 7 \times 11 \times 11 = 3^2 \times 7 \times 11^2$

Thus, to get a perfect square, the given number should be multiplied by 7.

New number $= \left(3^2 \times 7^2 \times 11^2\right) = \left(3 \times 7 \times 11\right)^2 = \left(231\right)^2$

Hence, the number whose square is the new number is 231.

7. Resolving 3380 into prime factors:

$3380 = 2 \times 2 \times 5 \times 13 \times 13 = 2^2 \times 5 \times 13^2$

Thus, to get a perfect square, the given number should be multiplied by 5.

New number $= \left(2^2 \times 5^2 \times 13^2\right) = \left(2 \times 5 \times 13\right)^2 = \left(130\right)^2$

8. Resolving 2475 into prime factors:

$2475 = 3 \times 3 \times 5 \times 5 \times 11 = 3^2 \times 5^2 \times 11$

Thus, to get a perfect square, the given number should be multiplied by 11.

New number $= \left(3^2 \times 5^2 \times 11^2\right) = \left(3 \times 5 \times 11\right)^2 = \left(165\right)^2$

Hence, the new number is the square of 165.

Q4

Answer :

(i) Resolving 1575 into prime factors:

$1575 = 3 \times 3 \times 5 \times 5 \times 7 = 3^2 \times 5^2 \times 7$

Thus, to get a perfect square, the given number should be divided by 7

New number obtained$= \left(3^2 \times 5^2\right) = \left(3 \times 5\right)^2 = \left(15\right)^2$

Hence, the new number is the square of 15

(ii) Resolving 9075 into prime factors:

$9075 = 3 \times 5 \times 5 \times 11 \times 11 = 3 \times 5^2 \times 11^2$

Thus, to get a perfect square, the given number should be divided by 3

New number obtained$= \left(5^2 \times 11^2\right) = \left(5 \times 11\right)^2 = \left(55\right)^2$

Hence, the new number is the square of 55

(iii) Resolving 4851 into prime factors:

$4851 = 3 \times 3 \times 7 \times 7 \times 11 = 3^2 \times 7^2 \times 11$

Thus, to get a perfect square, the given number should be divided by 11

New number obtained= $\left(3^2 \times 7^2\right) = \left(3 \times 7\right)^2 = \left(21\right)^2$

Hence, the new number is the square of 21

(iv) Resolving 3380 into prime factors:

$3380 = 2 \times 2 \times 5 \times 13 \times 13 = 2^2 \times 5 \times 13^2$

Thus, to get a perfect square, the given number should be divided by 5

New number obtained= $\left(2^2 \times 13^2\right) = \left(2 \times 13\right)^2 = \left(26\right)^2$

Hence, the new number is the square of 26

(v) Resolving 4500 into prime factors:

$4500 = 2 \times 2 \times 3 \times 3 \times 5 \times 5 \times 5 = 2^2 \times 3^2 \times 5^2 \times 5$

Thus, to get a perfect square, the given number should be divided by 5

New number obtained= $\left(2^2 \times 3^2 \times 5^2\right) = \left(2 \times 3 \times 5\right)^2 = \left(30\right)^2$

Hence, the new number is the square of 30

(vi) Resolving 7776 into prime factors:

$7776 = 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 3 = 2^2 \times 2^2 \times 2 \times 3^2 \times 3^2 \times 3$

Thus, to get a perfect square, the given number should be divided by 6 whish is a product of 2 and 3

New number obtained= $\left(2^2 \times 2^2 \times 3^2 \times 3^2\right) = \left(2 \times 2 \times 3 \times 3\right)^2 = \left(36\right)^2$

Hence, the new number is the square of 36

(vii) Resolving 8820 into prime factors:

$8820 = 2 \times 2 \times 3 \times 3 \times 5 \times 7 \times 7 = 2^2 \times 3^2 \times 5 \times 7^2$

Thus, to get a perfect square, the given number should be divided by 5

New number obtained= $\left(2^2 \times 3^2 \times 7^2\right) = \left(2 \times 3 \times 7\right)^2 = \left(42\right)^2$

Hence, the new number is the square of 42

(viii) Resolving 4056 into prime factors:

$4056 = 2 \times 2 \times 2 \times 3 \times 13 \times 13 = 2^2 \times 2 \times 3 \times 13^2$

Thus, to get a perfect square, the given number should be divided by 6, which is a product of 2 and 3

New number obtained= $\left(2^2 \times 13^2\right) = \left(2 \times 13\right)^2 = \left(26\right)^2$

Hence, the new number is the square of 26

Q5

Answer :

The first three digit number (100) is a perfect square. Its square root is 10.
The number before 10 is 9.
Square of 9 = $(9)^2 = 81$
Thus, the largest 2 digit number that is a perfect square is 81.

Q6

Answer :

The largest 3 digit number is 999.

The number whose square is 999 is 31.61.

Thus, the square of any number greater than 31.61 will be a 4 digit number.
Therefore, the square of 31 will be the greatest 3 digit perfect square.

$31^2 = 31 \times 31 = 961$

Squares and Square Roots
Exercise 3B

Q1

Answer :

By observing the properties of square numbers, we can determine whether a given number is a square or not.

(i) 5372
A number that ends with 2 is not a perfect square.
Thus, the given number is not a perfect square.

(ii) 5963
A number that ends with 3 is not a perfect square.
Thus, the given number is not a perfect square.

(iii) 8457
A number that ends with 7 is not a perfect square.
Thus, the given number is not a perfect square.

(iv) 9468
A number ending with 8 is not a perfect square.
Thus, the given number is not a perfect square.

(v) 360
Any number ending with an odd number of zeroes is not a perfect square.
Hence, the given number is not a perfect square.

(vi) 64000
Any number ending with an odd number of zeroes is not a perfect square.
Hence, the given number is not a perfect square.

(vii) 2500000
Any number ending with an odd number of zeroes is not a perfect square.
Hence, the given number is not a perfect square.

Q2

Answer :

The square of an even number is always even.
Thus, even numbers in the given list of squares will be squares of even numbers.

(i) 196
This is an even number. Thus, it must be a square of an even number.

(ii) 441
This is an odd number. Thus, it is not a square of an even number.

(iii) 900
This is an even number. Thus, it must be a square of an even number.

(iv) 625
This is an odd number. Thus, it is not a square of an even number.

(v) 324
This is an even number. Thus, it is a square of an even number.

Q3

Answer :

According to the property of squares, the square of an odd number is also an odd number.
Using this property, we will determine which of the numbers in the given list of squares is a square of an odd number.

(i) 484.
This is an even number. Thus, it is not a square of an odd number.

(ii) 961
This is an odd number. Thus, it is a square of an odd number.

(iii) 7396
This is an even number. Thus, it is not a square of an odd number.

(iv) 8649
This is an odd number. Thus, it is a square of an odd number.

(v) 4225
This is an odd number. Thus, it is a square of an odd number.

Q4

Answer :

Sum of first n odd numbers $= n^2$

(i) $\left(1+3+5+7+9+11+13\right) = 7^2 = 49$

(ii) $\left(1+3+5+7+9+11+13+15+17+19\right) = 10^2 = 100$

(iii) $\left(1+3+5+7+9+11+13+15+17+19+21+23\right) = 12^2 = 144$

Q5

Answer :

Sum of first n odd natural numbers $= n^2$

(i) Expressing 81 as a sum of 9 odd numbers:

$81 = (9)^2$

$n = 9$

$81 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17$

(ii) Expressing 100 as a sum of 10 odd numbers:

$100 = (10)^2$

$n = 10$

$100 = 1 + 3 + 5 + 7 + 9 + 11 + 13 + 15 + 17 + 19$

Q6

Answer :

For every number m > 1, the Pythagorean triplet is $(2m,\ m^2 - 1,\ m^2 + 1)$.

Using the above result:

(i)

$2m = 6$

$m = 3,\ m^2 = 9$

$m^2 - 1 = 9 - 1 = 8$

$m^2 + 1 = 9 + 1 = 10$

Thus, the Pythagorean triplet is $[6, 8, 10]$.

(ii)

$2m = 14$

$m = 7,\ m^2 = 49$

$m^2 - 1 = 49 - 1 = 48$

$m^2 + 1 = 49 + 1 = 50$

Thus, the Pythagorean triplet is $[14, 48, 50]$.

(iii)

$2m = 16$

$m = 8,\ m^2 = 64$

$m^2 - 1 = 64 - 1 = 63$

$m^2 + 1 = 64 + 1 = 65$

Thus, the Pythagorean triplet is: $[16, 63, 65]$

(iv)

$2m = 20$

$m = 10,\ m^2 = 100$

$m^2 - 1 = 100 - 1 = 99$

$m^2 + 1 = 100 + 1 = 101$

Thus, the Pythagorean triplet is $[20, 99, 101]$.

Q7

Answer :

Given: $\left[(n+1)^2 - n^2\right] = (n+1) + n$

(i) $(38)^2 - (37)^2 = 38 + 37 = 75$

(ii) $(75)^2 - (74)^2 = 75 + 74 = 149$

(iii) $(92)^2 - (91)^2 = 92 + 91 = 183$

(iv) $(105)^2 - (104)^2 = 105 + 104 = 209$

(v) $(141)^2 - (140)^2 = 141 + 140 = 281$

(vi) $(218)^2 - (217)^2 = 218 + 217 = 435$

Q8

Answer :

(i) $310^2 = (300+10)^2 = \left(300^2 + 2(300 \times 10) + 10^2\right) = 90000 + 6000 + 100 = 96100$

(ii) $508^2 = (500+8)^2 = \left(500^2 + 2(500 \times 8) + 8^2\right) = 250000 + 8000 + 64 = 258064$

(iii) $630^2 = (600+30)^2 = \left(600^2 + 2(600 \times 30) + 30^2\right) = 360000 + 36000 + 900 = 396900$

Q9

Answer :

(i) $(196)^2 = (200-4)^2 = 200^2 - 2(200 \times 4) + 4^2 = 40000 - 1600 + 16 = 38416$

(ii) $(689)^2 = (700-11)^2 = 700^2 - 2(700 \times 11) + 11^2 = 490000 - 15400 + 121 = 474721$

(iii) $(891)^2 = (900-9)^2 = 900^2 - 2(900 \times 9) + 9^2 = 810000 - 16200 + 81 = 793881$

Q10

Answer :

(i) $69 \times 71 = (70-1) \times (70+1) = \left(70^2 - 1^2\right) = 4900 - 1 = 4899$

(ii) $94 \times 106 = (100-6) \times (100+6) = \left(100^2 - 6^2\right) = 10000 - 36 = 9964$

Q11

Answer :

(i) $88 \times 92 = (90-2) \times (90+2) = \left(90^2 - 2^2\right) = 8100 - 4 = 8096$

(ii) $78 \times 82 = (80-2) \times (80+2) = \left(80^2 - 2^2\right) = 6400 - 4 = 6396$

Q12

Answer :

(i) The square of an even number is even.

(ii) The square of an odd number is odd.

(iii) The square of a proper fraction is smaller than the given fraction.

(iv) n^2 =the sum of first n odd natural numbers.

Q13

Answer :

(i) F

The number of digits in a square can also be odd. For example: 121

(ii) F

A prime number is one that is not divisible by any other number, except by itself and 1. Thus, square of any number cannot be a prime number.

(iii) F

Example: $4 + 9 = 13$

4 and 9 are perfect squares of 2 and 3, respectively. Their sum (13) is not a perfect square.

(iv) F

Example: $36 - 25 = 11$

36 and 25 are perfect squares. Their difference is 11, which is not a perfect square.

(v) T

Squares and Square Roots
Exercise 3C

Q1

Answer :

Using the column method:

$\therefore$ a = 2

b = 3

a^2	2ab	b^2
04 + 1= 5	12+0 = 12	9

$\therefore 23^2 = 529$

Q2

Answer :

Using the column method:

Here, a = 3 and b = 5

a^2	2ab	b^2
09 +3 = 12	30 +2 = 32	25

$\therefore 35^2 = 1225$

Q3

Answer :

Using the column method:

Here, a = 5
b = 2

a^2	2ab	b^2
25 +2 =27	20	4

$\therefore 52^2 = 2704$

Q4

Answer :

Using column method:

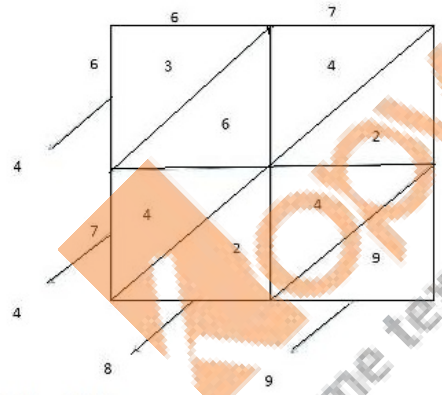
Here, $a = 9$
$b = 6$

a^2	2ab	b^2
81 +11 =92	108 +3 =111	36

$\therefore 96^2 = 9216$

Q5

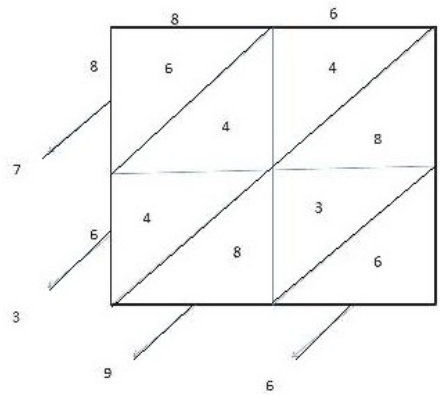
Answer :



$67^2 = 4489$

Q6

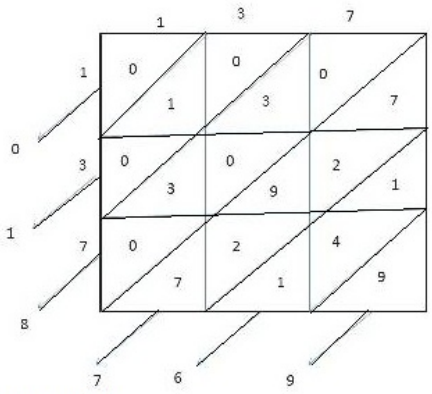
Answer :



$86^2 = 7396$

Q7

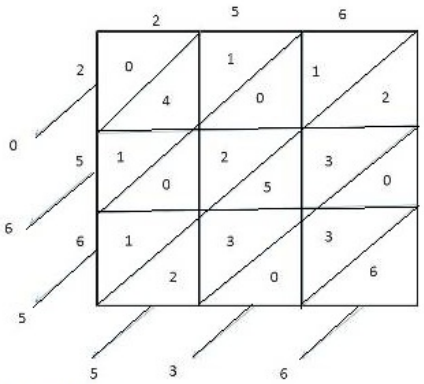
Answer :



$137^2 = 18769$

Q8

Answer :



$256^2 = 65536$

Squares and Square Roots
Exercise 3D

Q1

Answer :

By prime factorisation method:

$225 = 3 \times 3 \times 5 \times 5$
$\sqrt{225} = 3 \times 5 = 15$

Q2

Answer :

By prime factorisation:

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

Q3

Answer :

Resolving into prime factors:

$729 = 3 \times 3 \times 3 \times 3 \times 3 \times 3$

$\therefore \sqrt{729} = 3 \times 3 \times 3 = 27$

Q4

Answer :

Resolving into prime factors:

$1296 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 3 \times 3$

$\therefore \sqrt{1296} = 2 \times 2 \times 3 \times 3 = 36$

Q5

Answer :

Resolving into prime factors:

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

$\therefore \sqrt{2025} = 3 \times 3 \times 5 = 45$

Q6

Answer :

Resolving into prime factors:

$4096 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2$

$\therefore \sqrt{4096} = 2 \times 2 \times 2 \times 2 \times 2 \times 2 = 64$

Q7

Answer :

Resolving into prime factors:

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

$\therefore \sqrt{7056} = 2 \times 2 \times 3 \times 7 = 84$

Q8

Answer :

Resolving into prime factors:

$8100 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 5 \times 5$

$\therefore \sqrt{8100} = 2 \times 3 \times 3 \times 5 = 90$

Q9

Answer :

Resolving into prime factors:

$9216 = 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 2 \times 3 \times 3$

$\therefore \sqrt{9216} = 2 \times 2 \times 2 \times 2 \times 2 \times 3 = 96$

Q10

Answer :

Resolving into prime factors:

$11025 = 3 \times 3 \times 5 \times 5 \times 7 \times 7$

$\therefore \sqrt{11025} = 3 \times 5 \times 7 = 105$

Q11

Answer :

Resolving into prime factors:

$15876 = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 7 \times 7$

$\therefore \sqrt{15876} = 2 \times 3 \times 3 \times 7 = 126$

Q12

Answer :

Resolving into prime factors:

$17424 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 11 \times 11$

$\therefore \sqrt{17424} = 2 \times 2 \times 3 \times 11 = 132$

Q13

Answer :

Resolving into prime factors:

$252 = 2 \times 2 \times 3 \times 3 \times 7$

Thus, the given number must be multiplied by 7 to get a perfect square.

New number = $252 \times 7 = 1764$

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

Q14

Answer :

Resolving into prime factors:

$2925 = 3 \times 3 \times 5 \times 5 \times 13$

13 is the smallest number by which the given number must be divided to make it a perfect square.

New number = $2925 \div 13 = 225$

$\sqrt{225} = 3 \times 5 = 15$

Q15

Answer :

Let the number of rows be *x*.
Therefore, the number of plants in each row is also *x*.
Total number of plants = $(x \times x) = x^2 = 1225$
$x^2 = 1225 = 5 \times 5 \times 7 \times 7$
$x = \sqrt{1225} = 5 \times 7 = 35$

Thus, the number of rows is 35 and the number of plants in each row is 35.

Q16

Answer :

Let the number of students be x.
Hence, the amount contributed by each student is Rs x.

Total amount contributed = $x \times x = x^2 = 1156$

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

Thus, the strength of the class is 34.

Q17

Answer :

The smallest number divisible by each of these numbers is their L.C.M.
L.C.M. of 6, 9, 15, 20 = 180

Resolving into prime factors:
$180 = 2 \times 2 \times 3 \times 3 \times 5$
To make it a perfect square, we multiply it with 5.

Required number = $180 \times 5 = 900$

Q18

Answer :

The smallest number divisible by each of these numbers is their L.C.M.
L.C.M. of 8, 12, 15, 20 = 120

Resolving into prime factors:
$120 = 2 \times 2 \times 2 \times 3 \times 5$

To make this into a perfect square, we need to multiply the number with $2 \times 3 \times 5 = 30$.

Required number = $120 \times 30 = 3600$

Squares and Square Roots
Exercise 3E

Q1

Answer :

Using the long division method:

$$\begin{array}{r|l} & 24 \\ \hline 2 & \overline{5}\ \overline{76} \\ 2 & 4 \\ \hline 44 & 1\ 76 \\ 4 & 1\ 76 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{576} = 24$

Q2

Answer :

Using the long division method:

$$\begin{array}{r|l} & 38 \\ \hline 3 & \overline{14}\ \overline{44} \\ 3 & 9 \\ \hline 68 & 5\ 44 \\ 8 & 5\ 44 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{1444} = 38$

Q3

Answer :

Using the long division method:

$$\begin{array}{r|l} & 67 \\ \hline 6 & \overline{44}\ \overline{89} \\ 6 & 36 \\ \hline 127 & 8\,89 \\ 7 & 8\,89 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{4489} = 67$

Q4

Answer :

Using the long division method:

$$\begin{array}{r|l} & 79 \\ \hline 7 & \overline{62}\ \overline{41} \\ 7 & 49 \\ \hline 149 & 13\,41 \\ 9 & 13\,41 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{6241} = 79$

Q5

Answer :

Using the long division method:

$$\begin{array}{r|l} & 84 \\ \hline 8 & \overline{70}\ \overline{56} \\ 8 & 64 \\ \hline 164 & 6\,56 \\ 4 & 6\,56 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{7056} = 84$

Q6

Answer :

Using the long division method:

$$\begin{array}{r|l} & 95 \\ \hline 9 & \overline{90}\ \overline{25} \\ 9 & 81 \\ \hline 185 & 9\,25 \\ 5 & 9\,25 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{9025} = 95$

Q7

Answer :

Using the long division method:

$$\begin{array}{r|l} & 107 \\ \hline 1 & \overline{1}\ \overline{14}\ \overline{49} \\ 1 & 1 \\ \hline 207 & 14\,49 \\ 7 & 14\,49 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{11449} = 107$

Q8

Answer :

Using the long division method:

$$\begin{array}{r|l} & 119 \\ \hline 1 & \overline{1}\ \overline{41}\ \overline{61} \\ 1 & 1 \\ \hline 21 & 41 \\ 1 & 21 \\ \hline 229 & 20\,61 \\ 9 & 20\,61 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{14161} = 119$

Q9

Answer :

Using the long division method:

$$\begin{array}{r|l} & 102 \\ \hline 1 & \overline{1}\ \overline{04}\ \overline{04} \\ 1 & 1 \\ \hline 202 & 04\,04 \\ 2 & 04\,04 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{10404} = 102$

Q10

Answer :

Using the long division method:

$$\begin{array}{r|l} & 134 \\ \hline 1 & \overline{1}\ \overline{79}\ \overline{56} \\ 1 & 1 \\ \hline 23 & 79 \\ 3 & 69 \\ \hline 264 & 10\,56 \\ 4 & 10\,56 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{17956} = 134$

Q11

Answer :

Using the long division method:

$$\begin{array}{r|l} & 140 \\ \hline 1 & \overline{1}\ \overline{96}\ \overline{00} \\ 1 & 1 \\ \hline 24 & 96 \\ 4 & 96 \\ \hline 280 & 00 \\ 0 & 00 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{19600} = 140$

Q12

Answer :

Using the long division method:

$$\begin{array}{r|l} & 304 \\ \hline 3 & \overline{9}\ \overline{24}\ \overline{16} \\ 3 & 1 \\ \hline 604 & 24\ 16 \\ 4 & 24\ 16 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{92416} = 304$

Q13

Answer :

Using the long division method:

$$\begin{array}{r|l} & 50 \\ \hline 5 & \overline{25}\ \overline{09} \\ 5 & 25 \\ \hline 100 & 09 \\ 0 & 0 \\ \hline & 9 \end{array}$$

Therefore, the number that should be subtracted from the given number to make it a perfect square is 9.

Q14

Answer :

Using the long division method:

$$\begin{array}{r|l} & 87 \\ \hline 8 & \overline{75}\ \overline{81} \\ 8 & 64 \\ \hline 167 & 11\ 81 \\ 7 & 11\ 69 \\ \hline & 12 \end{array}$$

Therefore, the number that should be subtracted from the given number to make it a perfect square is 12.

Perfect square = 7581-12

= 7569

Its square root is 87.

Q15

Answer :

Using the long division method:

$$\begin{array}{r|l} & 78 \\ \hline 7 & \overline{62}\ \overline{03} \\ 7 & 49 \\ \hline 148 & 13\ 03 \\ 8 & 11\ 84 \\ \hline & 1\ 19 \end{array}$$

Thus, to get a perfect square greater than the given number, we take the square of the next natural number of the quotient, i.e. 78.

792=6241

Number that should be added to the given number to make it a perfect square =6241-6203=38

The perfect square thus obtained is 6241 and its square root is 79.

Q16

Answer :

Using the long division method:

$$\begin{array}{r|l} & 91 \\ \hline 9 & \overline{84}\ \overline{00} \\ 9 & 81 \\ \hline 181 & 3\,00 \\ 1 & 1\,81 \\ \hline & 1\,19 \end{array}$$

The next natural number that is a perfect square can be obtained by squaring the next natural number of the obtained quotient, i.e. 91.
Therefore square of (91+1) = $92^2 = 8464$
Number that should be added to the given number to make it a perfect square $= 8464 - 8400 = 64$
The perfect square thus obtained is 8464 and its square root is 92.

Q17

Answer :

Smallest number of four digits $= 1000$

Using the long division method:

$$\begin{array}{r|l} & 31 \\ \hline 3 & \overline{10}\ \overline{00} \\ 3 & 9\,00 \\ \hline 61 & 1\,00 \\ 1 & 61 \\ \hline & 39 \end{array}$$

1000 is not a perfect square.
By the long division method, the obtained square root is between 31 and 32.
Squaring the next integer (32) will give us the next perfect square.

$32^2 = 1024$

Thus, 1024 is the smallest four digit perfect square.

Also, $\sqrt{1024} = 32$

Q18

Answer :

Greatest number of five digits $= 99999$

Using the long division method:

$$\begin{array}{r|l} & 316 \\ \hline 1 & \overline{9}\ \overline{99}\ \overline{99} \\ 1 & 9 \\ \hline 61 & 99 \\ 1 & 61 \\ \hline 626 & 38\,99 \\ 6 & 37\,56 \\ \hline & 1\,43 \end{array}$$

99999 is not a perfect square.
According to the long division method, the obtained square root is between 316 and 317.
Squaring the smaller number, i.e. 316, will give us the perfect square that would be less than 99999.

$316^2 = 99856$

99856 is the required number.
Its square root is 316.

Q19

Answer :

Area of the square field $= 60025\ m^2$
Length of each side of the square field $= \sqrt{60025} = 245m$
Perimeter of the field $= 4 \times 245 = 980\ m$

$$= \frac{980}{1000}\ \text{km}$$

The man is cycling at a speed of 18 km/h.

$$\text{Time} = \frac{\text{Distance travelled}}{\text{Speed}}$$
$$= \frac{{}^{980}/_{1000}}{18}$$
$$= \frac{980}{1000 \times 18}\ \text{hr}$$
$$= \frac{980 \times 60 \times 60}{18000}\ \text{sec}$$
$$= 98\ \times\ 2\ \text{sec}$$
$$= 196\ \text{sec}$$
$$= 3\ \text{min}\ 16\ \text{sec}$$

Squares and Square Roots
Exercise 3F

Q1

Answer :

Using long division method:

$$\begin{array}{r|l} & 1.3 \\ \hline 1 & \overline{1}\,\overline{69} \\ 1 & 1 \\ \hline 23 & 69 \\ 3 & 69 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{1.69} = 1.3$

Q2

Answer :

Using long division method:

$$\begin{array}{r|l} & 5.8 \\ \hline 5 & \overline{33}.\overline{64} \\ 5 & 25 \\ \hline 108 & 864 \\ 8 & 864 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{33.64} = 5.8$

Q3

Answer :

Using long division method:

$$\begin{array}{r|l} & 12.5 \\ \hline 1 & \overline{1}\ \overline{56.25} \\ 1 & 1 \\ \hline 22 & 56 \\ 2 & 44 \\ \hline 245 & 1225 \\ 5 & 1225 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{156.25} = 12.5$

Q4

Answer :

Using long division method:

$$\begin{array}{r|l} & 8.7 \\ \hline 8 & \overline{75.69} \\ 8 & 64 \\ \hline 167 & 1169 \\ 7 & 1169 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{75.69} = 8.7$

Q5

Answer :

Using long division method:

$$\begin{array}{r|l} & 3.14 \\ \hline 3 & \overline{9.85}\ \overline{96} \\ 3 & 9 \\ \hline 61 & 85 \\ 1 & 61 \\ \hline 624 & 2496 \\ 4 & 2496 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{9.8596} = 3.14$

Q6

Answer :

Using long division method:

$$\begin{array}{r|l} & 3.17 \\ \hline 3 & \overline{10.04}\ \overline{89} \\ 3 & 9 \\ \hline 61 & 104 \\ 1 & 61 \\ \hline 627 & 4389 \\ 7 & 4389 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{10.0489} = 3.17$

Q7

Answer :

Using long division method:

$$\begin{array}{r|l} & 1.04 \\ \hline 1 & \overline{1.08}\ \overline{16} \\ 1 & 1 \\ \hline 204 & 0816 \\ 4 & 0816 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{1.0816} = 1.04$

Q8

Answer :

Using long division method:

$$\begin{array}{r|l} & 0.54 \\ \hline 5 & \overline{0.29}\ \overline{16} \\ 5 & 25 \\ \hline 104 & 416 \\ 4 & 416 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{0.2916} = 0.54$

Q9

Answer :

Using long division method:

$$\begin{array}{r|l} & 1.732 \\ \hline 1 & \overline{3.00}\ \overline{00}\ \overline{00} \\ 1 & 1 \\ \hline 27 & 200 \\ 7 & 189 \\ \hline 343 & 1100 \\ 3 & 1029 \\ \hline 3462 & 7100 \\ 2 & 6924 \\ \hline & 176 \end{array}$$

$\sqrt{3} = 1.732$

$\Rightarrow \sqrt{3} = 1.73$ (correct up to two decimal places)

Q10

Answer :

Using long division method:

$$\begin{array}{r|l} & 1.673 \\ \hline 1 & \overline{2.80}\ \overline{00}\ \overline{00} \\ 1 & 1 \\ \hline 26 & 180 \\ 6 & 156 \\ \hline 327 & 2400 \\ 7 & 2289 \\ \hline 3343 & 11100 \\ 3 & 10029 \\ \hline & 1071 \end{array}$$

$\therefore \sqrt{2.8} = 1.673$

$\Rightarrow \sqrt{2.8} = 1.67$ (correct up to two decimal places)

Q11

Answer :

Using long division method:

$$\begin{array}{r|l} & 0.948 \\ \hline 9 & \overline{0}\ \overline{90}\ \overline{00}\ \overline{00}\ \overline{00} \\ 9 & 81 \\ \hline 184 & 900 \\ 4 & 736 \\ \hline 1888 & 16400 \\ 8 & 15104 \\ \hline & 1296 \end{array}$$

$\therefore \sqrt{0.9} = 0.948$

$\Rightarrow \sqrt{0.9} = 0.95$ (correct up to two decimal places)

Q12

Answer :

Area of the rectangle $= (13.6 \times 3.4) = 46.24$ sq m
Thus, area of the square is 46.24 sq m.

Length of each side of the square $= \sqrt{46.24}$ m

Using long division method:

$$\begin{array}{r|l} & 6.8 \\ \hline 6 & \overline{46.24} \\ 6 & 36 \\ \hline 128 & 1024 \\ 8 & 1024 \\ \hline & 0 \end{array}$$

$\sqrt{46.24} = 6.8$

Thus, the length of a side of the square is 6.8 metres.

Squares and Square Roots
Exercise 3G

Q1

Answer :

$\sqrt{\frac{16}{81}} = \frac{\sqrt{16}}{\sqrt{81}}$

$\sqrt{16} = 4$ and $\sqrt{81} = 9$

$\therefore \sqrt{\frac{16}{81}} = \frac{\sqrt{16}}{\sqrt{81}} = \frac{4}{9}$

Q2

Answer :

$\sqrt{\frac{64}{225}} = \frac{\sqrt{64}}{\sqrt{225}}$

Using long division method:

$\sqrt{64} = 8$

$$\begin{array}{r|l} & 8 \\ \hline 8 & \overline{64} \\ 8 & 64 \\ \hline & 0 \end{array}$$

$\sqrt{225} = 15$

$$\begin{array}{r|l} & 15 \\ \hline 1 & \overline{2}\,\overline{25} \\ 1 & 1 \\ \hline 25 & 1\,25 \\ 5 & 1\,25 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{\frac{64}{225}} = \frac{\sqrt{64}}{\sqrt{225}} = \frac{8}{15}$

Q3

$\sqrt{\frac{121}{256}} = \frac{\sqrt{121}}{\sqrt{256}}$

Using division method:

$\sqrt{121} = 11$

$$\begin{array}{r|l} & 11 \\ \hline 1 & \overline{1}\,\overline{21} \\ 1 & 1 \\ \hline 21 & 21 \\ 1 & 21 \\ \hline & 0 \end{array}$$

$$\begin{array}{r|l} & 16 \\ \hline 1 & \overline{2}\,\overline{56} \\ 1 & 1 \\ \hline 26 & 1\,56 \\ 6 & 1\,56 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{\frac{121}{256}} = \frac{\sqrt{121}}{\sqrt{256}} = \frac{11}{16}$

Q4

$\sqrt{\frac{625}{729}} = \frac{\sqrt{625}}{\sqrt{729}}$

Using long division method:

$$\begin{array}{r|l} & 25 \\ \hline 2 & \overline{6}\,\overline{25} \\ 2 & 4 \\ \hline 45 & 2\,25 \\ 5 & 2\,25 \\ \hline & 0 \end{array}$$

$\sqrt{625} = 25$

$$\begin{array}{r|l} & 27 \\ \hline 2 & \overline{7}\,\overline{29} \\ 2 & 4 \\ \hline 47 & 3\,29 \\ 7 & 3\,29 \\ \hline & 0 \end{array}$$

$\sqrt{729} = 27$

$\therefore \sqrt{\frac{625}{729}} = \frac{\sqrt{625}}{\sqrt{729}} = \frac{25}{27}$

Q5

Answer :

$\sqrt{3\frac{13}{36}}$

$= \sqrt{\frac{121}{36}}$

$= \frac{\sqrt{121}}{\sqrt{36}}$

$= \frac{\sqrt{11 \times 11}}{\sqrt{6 \times 6}}$

$= \frac{11}{6}$

$= 1\frac{5}{11}$

Q6

Answer :

$\sqrt{4\frac{73}{324}} = \sqrt{\frac{1369}{324}} = \frac{\sqrt{1369}}{\sqrt{324}}$

Using long division method:

$\sqrt{1369} = 37$

$$\begin{array}{r|l} & 37 \\ \hline 3 & \overline{13}\,\overline{69} \\ 3 & 9 \\ \hline 67 & 4\,69 \\ 7 & 4\,69 \\ \hline & 0 \end{array}$$

$\sqrt{324} = \sqrt{2 \times 2 \times 9 \times 9} = 2 \times 9 = 18$

$\therefore \sqrt{4\frac{73}{324}} = \frac{37}{18} = 2\frac{1}{18}$

Q7

Answer :

$\sqrt{3\frac{33}{289}} = \sqrt{\frac{900}{289}} = \frac{\sqrt{900}}{\sqrt{289}}$

Using long division method:

$$\begin{array}{r|l} & 17 \\ \hline 1 & \overline{2}\,\overline{89} \\ 1 & 1 \\ \hline 27 & 1\,89 \\ 7 & 1\,89 \\ \hline & 0 \end{array}$$

$\sqrt{289} = 17$

And

$\sqrt{900} = \sqrt{2 \times 2 \times 5 \times 5 \times 3 \times 3} = 2 \times 5 \times 3 = 30$

$\therefore \sqrt{3\frac{33}{289}} = \frac{30}{17} = 1\frac{13}{17}$

Q8

Answer :

We have:

$\frac{\sqrt{80}}{\sqrt{405}}$
$= \sqrt{\frac{80}{405}}$
$= \sqrt{\frac{16}{81}}$
$= \frac{\sqrt{16}}{\sqrt{81}}$
$= \frac{4}{9}$

Q9

Answer :

We have:

$\frac{\sqrt{1183}}{\sqrt{2023}}$
$= \sqrt{\frac{1183}{2023}}$
$= \sqrt{\frac{169}{289}}$
$= \frac{\sqrt{169}}{\sqrt{289}}$
$= \frac{\sqrt{13 \times 13}}{\sqrt{17 \times 17}}$
$= \frac{13}{17}$

Q10

Answer :

We have:

$\sqrt{98} \times \sqrt{162}$
$= \sqrt{98 \times 162}$
$= \sqrt{2 \times 7 \times 7 \times 2 \times 9 \times 9}$
$= 2 \times 7 \times 9$
$= 126$

Squares and Square Roots
Exercise 3H

Q1

Answer :

(c) 5478

According to the properties of squares, a number ending in 2, 3, 7 or 8 is not a perfect square.

Q2

Answer :

(d) 2222

According to the property of squares, a number ending in 2, 3, 7 or 8 is not a perfect square.

Q3

Answer :

(a) 1843

According to the property of squares, a number ending in 2, 3, 7 and 8 is not a perfect square.

Q4

Answer :

(b) 4787

By the property of squares, a number ending in 2, 3,7 or 8 is not a perfect square.

Q5

Answer :

(c) 81000

According to the property of squares, a number ending in odd number of zeroes is not a perfect square.

Q6

Answer :

(d) 8

According to the property of squares, a perfect square cannot have 2, 3, 7 or 8 as the unit digit.

Q7

Answer :

(b) smaller than the fraction

Q8

Answer :

(c) n^2

Q9

Answer :

(d) (8,15,17)

This can be understood from the property of Pythagorean triplets. According to this property, for a natural number m, $(2m,\ m^2-1,\ m^2+1)$ is a Pythagorean triplet.

Here, m = 4

$2m = 8$

$m^2 - 1 = 15$

and $m^2 + 1 = 17$

Q10

Answer :

(c) 7

$(176-7)=169$

$\sqrt{169}=13$

Q11

Answer :

(a) 3

$526+3=529$

$529=23^2$

Q12

Answer :

(b) 6

$15370+6=15376$

$\sqrt{15376}=124$

Q13

Answer :

(d) 0.94

$$\begin{array}{r|l} & 0.94 \\ \hline 9 & \overline{0.90}\ \overline{00} \\ 9 & 81 \\ \hline 184 & 9\,00 \\ 4 & 7\,36 \\ \hline & 1\,64 \end{array}$$

$\sqrt{0.9}=0.94$

Q14

Answer :

(c) 0.316

Using long division method:

$$\begin{array}{r|l} & 0.316 \\ \hline 3 & \overline{0.10}\ \overline{00}\ \overline{00} \\ 3 & 9 \\ \hline 61 & 1\ 00 \\ 1 & 61 \\ \hline 626 & 39\ 00 \\ 6 & 37\ 56 \\ \hline & 1\ 44 \end{array}$$

$\therefore \sqrt{0.1} = 0.316$

Q15

Answer :

(b) 1.2

$\sqrt{0.9} \times \sqrt{1.6} = \sqrt{1.44} = 1.2$

Q16

Answer :

(c) $\frac{3}{2}$

$\frac{\sqrt{288}}{\sqrt{128}} = \sqrt{\frac{288}{128}} = \sqrt{\frac{2\times2\times2\times2\times2\times3\times3}{2\times2\times2\times2\times2\times2\times2}} = \sqrt{\frac{3\times3}{2\times2}} = \frac{\sqrt{3\times3}}{\sqrt{2\times2}} = \frac{3}{2}$

Q17

Answer :

(b) $1\frac{1}{2}$

$\sqrt{2\frac{1}{4}} = \sqrt{\frac{9}{4}} = \frac{\sqrt{9}}{\sqrt{4}} = \frac{3}{2} = 1\frac{1}{2}$

Q18

Answer :

(a) 196

Square of an even number is always an even number.

Q19

Answer :

(c) 1369

Square of an odd number is always an odd number.

Q20

Answer :

$$\begin{array}{r|l} & 0.53 \\ \hline 5 & \overline{0.28}\ \overline{09} \\ 5 & 25 \\ \hline 103 & 3\ 09 \\ 3 & 3\ 09 \\ \hline & 0 \end{array}$$

$\therefore \sqrt{0.2809} = 0.53$