Class 8-Mathematics

Instructions for students: The notes provided must be copied to the Maths copy and then do the homework in the same copy.

Chapter 3

SQUARES AND SQUARE ROOTS

Square: Square of a number is the product of the number by itself.

e.g.: 4^2 $= 4\times4$ $=16$

5^2 $=5\times5$ $=25$

$\left(\frac{2}{3}\right)^2$ $=\frac{2}{3}\times\frac{2}{3}$ $=\frac{4}{9}$

Perfect Squares: They are natural numbers which are squares of some other natural numbers.

e.g.: 1, 4, 9, 16, 25, …….

Properties of Square numbers:

1) A number having 2, 3, 7 or 8 at its unit place is never a perfect square.
   Note: To find the unit digit of a square multiply the unit digit of the number by itself. The unit digit of this product will be the unit digit of the square.
   E.g.: Consider the number 17. $7\times7 = 4\underline{9}$. Unit digit of 17^2 will be 9
2) A number ending in an odd number of 0's is not a perfect square.
3) Squares of even natural numbers are even and squares of odd natural numbers are odd.
4) There are **2n** non square numbers between the squares of two consecutive numbers **n** and **n+1.**
   E.g.: Number of non-square numbers between 3^2 and $4^2 = 2\times3=6$ (10, 11, 12, 13, 14, 15)
5) Every perfect square $\mathbf{n^2}$ can be expressed as a sum of first **n** consecutive odd numbers.
   E.g.: $8^2 =64=1+3+5+7+9+11+13+15$.
6) We can obtain the square of any odd number as a sum of two consecutive natural numbers.
7) Square of numbers with unit digit 5 can be obtained by the formula
   $(a5)^2 = a(a+1)\times100+25$
   E.g.: $45^2 = 4(4+1)\times100+25$
   $=4\times5\times100+25$
   $2000+25 =2025$.

Pythagorean Triplets:

They are some triplets (collection of three numbers) such that the sum of squares of any two will be the square of the third number.

E.g.: (3, 4, 5), (5, 12, 13) etc..

For any natural number m>1, we have

$(2m)^2 + (m^2-1)^2 = (m^2+1)^2$

$2m$, m^2-1 and m^2+1 is a general Pythagorean triplet.

Exercise 3.1(Page 47)

3. 1008

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

1008=2×2×2×2×3×3×7

The prime factor 7 is not in pair. ∴ We have to multiply the given number by 7 to make it a perfect square.

4. 5808

2	5808
2	2904
2	1452
2	726
3	363
11	121
11	11
	1

5808 = 2×2×2×2×3×11×11

The prime factor 3 is not in pair. ∴ We have to divide the given number to make it a perfect square.

The resulting number= 2×2×2×2×11×11 = 1936

Square root of 1936= 2×2×11 =44

Exercise 3.2 (Page no 52)

1. 23, 32, 47, 28, 12 (They are not perfect squares because their one's digit is 2,3,7 or 8).
2. i. 951 – unit digit of square is 1 because 1×1=1.
   ii. 502 - unit digit of square is 4 because 2×2=4.
   Iii. 329 - unit digit of square is 1 because 9×9=81.

5. i. 90 and 91

   Number of natural numbers between the squares of n and n+1 =2n
   Number of natural numbers between the squares of 90 and 91 =2×90=180

6. ii. Sum of first n odd numbers $=n^2$

   The given numbers are first 15 odd numbers.
   Their sum = 15^2 =225.

7. ii. Subtract the consecutive odd numbers successively from 121 until we get 0.

   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

∴ 121= 1+3+5+7+9+3111+13+15+17+19+21 (Sum of first 11 odd numbers)

8. iii. 47^2 =2209 $= \frac{2209+1}{2} + \frac{2209-1}{2}$

$= \frac{2210}{2} + \frac{2208}{2}$

47^2 = 1105+1104

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9. ii. $\underline{30}5^2$ = 30××100+25 [$(a5)^2 = a(a+1) \times 100+25$; a=30]

=93000+25

=93,025.

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10. iv. General Pythagorean triplet is 2m, m^2-1 and m^2+1.

If 2m = 80

m=40

$M^2- 1 = 40^2-1 = 1600 -1 = 1599$

$m^2+1 = 40^2 +1 = 1600 +1 = 1601$

If $m^2 -1 = 80$

$m^2 = 81$

m= 9

2m =18

$m^2+1 = 81+1 = 82$.

Required Pythagorean triplets are (80, 1599, and 1601)

Or (18, 80, 82)

Note: If the given term is matching with two terms of General Pythagorean triplet there will be two Pythagorean triplets obtained. Here 80 can be 2m or m^2-1

Home work:

Exercise 3.1 Questions 1 and 2

Exercise 3.2

Question 2: iv to x

Questions: 3,4, 5: i, 6 : i, 7 : i , 8 : i,ii, 9 i, iii, 10: i,ii,iii.