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Chapter

Real Numbers

Key Points

1. **Euclid's division Lemma:**
    For given positive integers 'a' and 'b' there exist unique whole numbers 'q' and 'r' satisfying the relation a = $bq + r$, o $\leq r < b$

2. **Euclid's division algorithm:**
    HCF of any two positive integers a and b with $a > b$ is obtained as follows:
    Step 1 : Apply Euclid's division lemma to a and b to find q and r such that $a = bq + r$, $0 \leq r < b$.
    Step 2 : If $r = 0$ then HCF $(a, b) = b$; if $r \neq 0$ then again apply Euclid's lemma to b and r.
    Repeat the steps till we get $r = 0$

3. **The fundamental Theorem of Arithmetic**
    Every composite number can be expressed (factorized) as a product of primes and this factorization is unique, apart from the order in which the prime factors occur.

4. Let $x=\dfrac{p}{q}$, $q \neq 0$ to be a rational number, such that the prime factorization of 'q' is of the form $2^m 5^n$, where m, n are non-negative integers. Then x has a decimal expansion which is terminating.

5. Let $x=\dfrac{p}{q}$, $q \neq 0$ be *a* rational number, such that the prime factorization of q is not of the form $2^m 5^n$, where m, n are non-negative integers. Then x has a decimal expansion which is non-terminating repeating.

VERY SHORT ANSWER TYPE QUESTIONS

1. Write the general form of an even integer
2. Write the form in which every odd integer can be written taking t as variable.
3. What would be the value of n for $n^2 - 1$ divisible by 8.

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4. State whether $7 \times 11 \times 13 + 7$ is a composite number or a prime number

5. Is 5.131131113… a rational number or irrational number?

6. Find the value of m if HCF of 65 and 117 is expressible in the form $65m - 117$.

7. What can you say about the product of a non-zero rational and irrational number?

8. After how many places the decimal expansion of $\dfrac{13497}{1250}$ will terminate?

9. Find the least number which is divisible by all numbers from 1 to 10 (both inclusive)

10. The numbers 525 and 3000 are divisible by 3, 5, 15, 25 and 75 what is the HCF of 525 and 3000?

SHORT ANSWER TYPE-1 QUESTIONS

11. Can two numbers have 18 as their HCF and 380 as their LCM? Give reasons.

12. If $a = 4q + r$ then what are the condition for a and q ? What are the values that r can take?

13. What is the digit at unit's place of 9^n ?

14. If n is an odd integer then show that $n^2 - 1$ is divisible by 8.

15. Use Euclid's division algorithm to find the HCF of 16 and 28.

16. Show that 12^n cannot end with the digit 0 or 5 for any natural number n.

17. Without actual performing the long division, find if $\dfrac{395}{10500}$ will have terminating or non terminating (repeating decimal expansion.)

18. A rational no in its decimal expansion is 327. 7081. What can you say about the prime factors of q, when this number is expressed in the form of $\dfrac{p}{q}$? Give reasons.

19. What is the smallest number by which $\sqrt{5} - \sqrt{2}$ is to be multiplied to make it a rational number? Also find the number so obtained?

20. Find one rational and one irrational no between $\sqrt{3}$ and $\sqrt{5}$

SHORT ANSWER TYPE-11 QUESTIONS

21. Show that square of any odd integer is of the form $4m + 1$, for some integer m.

22. Show that the square of any positive integer is either of the form $4q$ or $4q + 1$ for some integer q.

23. Show that the cube of any positive integer is of the form $4m$, $4m + 1$ or $4m + 3$ for some integer m.

24. Prove that $\sqrt{3}$ is an irrational number.

25. State fundamental theorem of Arithmetic and hence find the unique factorization of 120.

26. Prove that $\sqrt{3} + \sqrt{5}$ is irrational

27. Prove that $5 - \dfrac{3}{7}\sqrt{3}$ is an irrational number.

28. Prove that $\dfrac{1}{2 - \sqrt{5}}$ is an irrational number.

29. Find HCF and LCM of 56 and 112 by prime factorization method.

30. In factor tree find x.
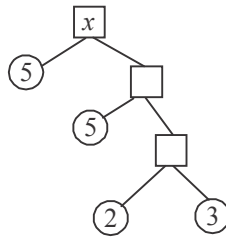
LONG ANSWER TYPE QUESTIONS

31. Solve $\sqrt{45} \times \sqrt{20}$ and state what type of number is this (Rational number or irrational number).

32. Find the HCF of 56, 96, 324 by Euclid's algorithm.

33. Show that any positive odd integer is of the form $6q + 1$, $6q + 3$ or $6q + 5$, where q is some integer.

34. Prove that the square of any positive integer is of the form $5q$, $5q + 1$, $5q + 4$ for some integer, q.

35. Prove that the product of three consecutive positive integers is divisible by 6.

36. For any positive integer n, prove that $n^3 - n$ is divisible by 6.

37. Show that one and only one of n, $n + 2$, $n + 4$ is divisible by 3.

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38. Show that one and only one out of n, $n + 4$, $n + 8$, $n + 12$ and $n + 16$ is divisible by 5, where n is any positive integer,

39. Three friends Salman, Hrithik and John were very good friends. They weed to go for morning walk together once, on a morning walk, they step off together and their steps measure 40 cm, 42 cm and 45 cm, respectively.

    (*a*) What is the minimum distance each should walk so that each can cover the same distance in complete steps?

    (*b*) What have you learnt (values/Lesson) from above activity of three friends.

40. Aakriti decided to distribute milk in an orphanage on her birthday. The supplier brought two milk containers which contain 398 *l* and 436 *l* of milk. The milk is to be transferred to another containers so 7 *l* and 11 *l* of milk is left in both the containers respectively

    (*a*) What will be the maximum capacity of the drum?

    (*b*) What qualities/values were shown by Aakriti?

ANSWERS

1. $2m$
2. $2t + 1$
3. An odd integer
4. Composite
5. Irrational
6. 2
7. Irrational
8. 4
9. 2520
10. 75
11. No, HCF is not a factor of LCM
12. a and q are positive integers $0 \leq r < 4$
13. Even Power $= 1$; odd power $= 9$
14. —
15. 4
16. —
17. Non terminating repeating
18. Denominator is the multiple of 2's and 5's
19. $\sqrt{5} + \sqrt{2}$, 3
20. —
21. —
22. —
23. —
24. —
25. $2 \times 2 \times 2 \times 3 \times 5$
26. —
27. —
28. —
29. HCF : 56 , LCM : 112
30. 150
31. 30, Rational number
32. 4
33. —
34. —
35. —
36. —
37. —
38. —
39. (*a*) 2520 cm or 25.2m
    (*b*) Morning walk good for health
        Religion doesn't matter in friendship
40. (*a*) 17
    (*b*) Charity, concern for others etc.