# CHAPTER 1

# 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 $a = bq + r$, $0 \le r < b$.

2. **Euclid's division algorithms :**

   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 $a = bq + r$ , $0 \le r < b$.

   **Step 2 :** If $r = 0$, HCF $(a, b) = b$ if $r \neq 0$, apply Euclid's lemma to $b$ and $r$.

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 $x = \frac{p}{q}$, $q \neq 0$ to be a rational number, such that the prime factorization of '$q$' is of the form $2^m5^n$, where $m, n$ are non-negative integers. Then $x$ has a decimal expansion which is terminating.

5. Let $x = \frac{p}{q}$, $q \neq 0$ be a rational number, such that the prime factorization of $q$ is not of the form $2^m5^n$, where $m, n$ are non-negative integers. Then $x$ has a decimal expansion which is non-terminating repeating.

6. $\sqrt{p}$ is irrational, which $p$ is a prime. A number is called irrational if it cannot be written in the form $\frac{p}{q}$ where $p$ and $q$ are integers and $q \neq 0$.

## MULTIPLE CHOICE QUESTIONS

1. $5 \times 11 \times 13 + 7$ is *a*

   (a) prime number (b) composite number

   (c) odd number (d) none

2. Which of these numbers always ends with the digit 6.

   (a) $4^n$ (b) $2^n$

   (c) $6^n$ (d) $8^n$

   where *n* is a natural number.

3. For *a, b* ($a \neq b$) positive rational numbers $\left(\sqrt{a} + \sqrt{b}\right)\left(\sqrt{a} - \sqrt{b}\right)$ is *a* _____

   (a) Rational number (b) irrational number

   (c) $\left(\sqrt{a} - \sqrt{b}\right)^2$ (d) 0

4. If *p* is a positive rational number which is not a perfect square then $-3\sqrt{p}$ is

   (a) integer (b) rational number

   (c) irrational number (d) none of the above.

5. All decimal numbers are–

   (a) rational numbers (b) irrational numbers

   (c) real numbers (d) integers

6. In Euclid Division Lemma, when $a = bq + r$, where *a, b* are positive integers which one is correct.

   (a) $0 < r \leq b$ (b) $0 \leq r < b$

   (c) $0 < r < b$ (d) $0 \leq r \leq b$

7. Which of the following numbers is irrational number

   (a) 3.131131113... (b) 4.46363636...

   (c) 2.35 (d) *b* and *c* both

8. The decimal expansion of the rational number $\frac{21}{7 \times 2^3 \times 5^4}$ will terminate after ___ decimal places.

   (a) 3 (b) 4

   (c) 5 (d) never

9. HCF is always

   (a) multiple of L.C.M. (b) Factor of L.C.M.

   (c) divisible by L.C.M. (d) *a* and *c* both

10. The product of two consecutive natural numbers is always.

   (a) an even number (b) an odd number

   (c) a prime number (d) none of these

11. Which of the following is an irrational number between 0 and 1

   (a) 0.11011011... (b) 0.90990999...

   (c) 1.010110111... (d) 0.3030303...

12. $p^n = (a \times 5)^n$. For $p^n$ to end with the digit zero $a$ = __ for natural no. $n$

   (a) any natural number (b) even number

   (c) odd number (d) none.

13. A terminating decimal when expressed in fractional form always has denominator in the form of —

   (a) $2^m3^n$, m, n > 0 (b) $3^m5^n$, m, n > 0

   (c) $5^n 7^m$, m, n > 0 (d) $2^m5^n$, m, n > 0

## SHORT ANSWER TYPE QUESTIONS

14. What will be the value of $0.\overline{3} + 0.\overline{4}$ ?

15. If unit's digit of $7^3$ is 3 then what will be the unit's digit of $7^{11}$.

16. Given that HCF (135, 225) = 45. Find LCM (135, 225).

17. Solve $\sqrt{18} \times \sqrt{50}$. What type of number is it, rational or irrational.

18. Find the H.C.F. of the smallest composite number and the smallest prime number.

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

20. What is the smallest number by which $\sqrt{5} - \sqrt{3}$ be multiplied to make it a rational no? Also find the no. so obtained.

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

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

23. State Euclid's Division Lemma and hence find HCF of 16 and 28.

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

25. Prove that $\frac{1}{2 - \sqrt{5}}$ is irrational number.

26. Prove that $5 - \frac{2}{7}\sqrt{3}$ is irrational number.

27. Prove that $\sqrt{2} + \sqrt{7}$ is not rational number.

28. Find HCF and LCM of 56 and 112 by prime factorisation method.

29. Why $17 + 11 \times 13 \times 17 \times 19$ is a composite number? Explain.

30. Check whether $5 \times 6 \times 2 \times 3 + 3$ is a composite number.

31. Check whether $14^n$ can end with the digit zero for any natural number, $n$.

32. If the HCF of 210 and 55 is expressible in the form $210 \times 5 + 55y$ then find $y$.

## LONG ANSWER TYPE QUESTIONS

33. Find HCF of 56, 96 and 324 by Euclid's algorithm.

34. Show that the square of any positive integer is either of the form $3m$ or $3m + 1$ for some integer $m$.

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

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

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

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

39. Two milk containers contains 398 $l$ and 436 $l$ of milk. The milk is to be transferred to another container with the help of a drum. While transferring to another container 7$l$ and 11$l$ of milk is left in both the containers respectively. What will be the maximum capacity of the drum.

## ANSWERS

1. *b*
2. *c*
3. *a*
4. *c*
5. *c*
6. *b*
7. *a*
8. *b*
9. *b*
10. *b*
11. *b*
12. *b*
13. *d*
14. $\frac{7}{9}$
15. 3
16. 675
17. 30, rational
18. 2
19. Opposite integer $r$, $q$ whole no. $0 \le r < 4$
20. $\left(\sqrt{5} + \sqrt{3}\right)$, 2
21. even power = 1

    odd power = 9
23. 4
24. $2 \times 2 \times 2 \times 3 \times 5$

28. HCF = 28, LCM = 336

30. Yes

31. No

32. Find HCF (210, 55) = 5,

$5 = 210 \times 5 + 55y \Rightarrow y = -19$

33. H

34. $9 = 3q + r$

35. $9 = 6q + r$

38. $n = 3q + r$

39. 17