NCERT - GRADE 10 CHEAT SHEET

Pumpa

REAL NUMBERS

(1. FUNDAMENTAL THEOREM OF ARITHMETIC, HCF & LCM, AND APPLICATIONS OF HCF & LCM)

1 CHAPTER SNAPSHOT

This chapter covers:

- Fundamental Theorem of Arithmetic (Prime factorisation of natural numbers).
- HCF and LCM of two or more numbers.
- Applications of HCF and LCM in real life.

Every composite number can be expressed uniquely as a product of prime factors (ignoring the order).

2 KEY CONCEPTS

★ **Prime Numbers**
A number greater than 1 with exactly two factors (1 and itself).
Examples: 2, 3, 5, 7, 11, ...

★ **Composite Numbers**
A number greater than 1 with more than two factors.
Examples: 4, 6, 8, 9, 10, 12, ...

★ **Prime Factorisation**
Expressing a number as a product of prime factors.

3 FUNDAMENTAL THEOREM OF ARITHMETIC

Every composite number can be written uniquely as a product of prime factors (ignoring the order).

Example:
$72 = 2 \times 2 \times 2 \times 3 \times 3 = 2^3 \times 3^2$

72	2
36	2
18	2
9	3
3	3
1	

Prime factorisation of 72:
$72 = 2^3 \times 3^2$

The prime factorisation of a number is unique (except for the order of the factors).

4 HCF AND LCM

HCF (Highest Common Factor)

- Largest number that divides two or more numbers exactly.
- For prime factorisation method: Take the lowest power of each common prime factor.

Example:
Fin the HCF of 18 and 24.
$18 = 2 \times 3^2$
$24 = 2^3 \times 3$
Common prime factors:
2^1 and 3^1
$HCF = 2 \times 3 = 6$

LCM (Lowest Common Multiple)

- Smallest number that is divisible by two or more numbers.
- For prime factorisation method: Take the highest power of each prime factor.

Example:
Find the LCM of 18 and 24.
$18 = 2 \times 3^2$
$24 = 2^3 \times 3$
Highest power of $2 = 2^3$,
Highest power of $3 = 3^2$
$LCM = 2^3 \times 3^2 = 72$

5 FORMULAE & PROPERTIES

1. If a and b are two positive integers, then $\mathrm{HCF}(a, b) \times \mathrm{LCM}(a, b) = a \times b$.
2. HCF and LCM of two numbers are always positive integers.
3. If p is a prime and $p \mid a$, then $p \mid \mathrm{HCF}(a, b)$ (if p divides both a and b).
4. If a and b are co-prime, then $\mathrm{HCF}(a, b) = 1$ and $\mathrm{LCM}(a, b) = a \times b$.

6 BOARD EXAM FOCUS & HOTSPOTS

Common Question Types:

- Find HCF / LCM using prime factorisation.
- Find HCF / LCM using division method (short division / common factors).
- Use HCF and LCM in real-life situations (e.g., lengths, time, grouping).
- True/False & Assertion–Reason type questions on properties.

Example (HCF & LCM):
Find the HCF and LCM of 12 and 18.
$12 = 2^2 \times 3^2$, $18 = 2 \times 3^2$
$HCF = 2 \times 3 = 6$, $LCM = 2^2 \times 3^2 = 36$

7 APPLICATIONS OF HCF & LCM

1. HCF in Real Life

- Finding largest possible length for planks, ropes, tiles, etc.
- Arranging objects in equal groups.
- Sharing items equally.

2. LCM in Real Life

- Finding the smallest common multiple (time, bells, buses, etc.).
- Determining when events coincide (e.g., buses, lights, cycles).
- Solving problems involving repeated activities (e.g., packets, cycles).

8 VISUAL MEMORY AID

Prime Factorisation Tree

60	2
30	2
15	3
5	5
1	

$60 = 2^2 \times 3 \times 5$

HCF & LCM (Using Factors)

HCF	LCM
(common factors → lowest powers)	(common factors → highest powers)

HCF × LCM = Product of the numbers

9 30-SECOND RAPID REVISION

- Prime factors → unique.
- HCF → largest common factor.
- LCM → smallest common multiple.
- $HCF \times LCM = a \times b$.
- Use prime factorisation or division method.
- Apply HCF/LCM in real-life situations.

10 KEY TAKEAWAY

Prime factorisation is the key to finding HCF and LCM, and their applications help us solve real-life problems with ease.

★ **Remember:** Always find the prime factorisation first, and then use the concepts of HCF and LCM in both calculation and real-life situations.