LEARNING HORIZON

✅ 1. Types of Real Numbers

Real numbers include **all numbers on the number line**. These are divided into:

Set	Symbol	Examples
Natural Numbers	N	1, 2, 3, 4, ...
Whole Numbers	W	0, 1, 2, 3, ...
Integers	Z	-3, -2, 0, 1, 2, ...
Rational Numbers	Q	3/4,−5,0.25
Irrational Numbers	'Q’	2,π,3,$\sqrt{2}$.,$\sqrt{2\ 3}$
Real Numbers	R	All of the above

✅ 2. Rational vs Irrational Numbers

Property	Rational Numbers R	Irrational Numbers Q’
Can be written as p/q	Yes (q ≠ 0)	No
Decimal form	Terminating or repeating	Non-terminating, non-repeating
Examples	½ ,2/ 4 , 0.25	π, $\sqrt{2}$.,$\sqrt{3}$

✅ 3. Simplifying Surds

🔹 What is a surd?

A **surd** is an **irrational root** (not a perfect square/cube).

🔹 Rules to simplify:

Rules to simplify:

$$\sqrt{a \cdot b} = \sqrt{a} \cdot \sqrt{b}$$

$$\sqrt{50} = \sqrt{25 \cdot 2} = 5\sqrt{2}$$

$$\sqrt{72} = \sqrt{36 \cdot 2} = 6\sqrt{2}$$

🔹 Addition of surds:

Only **like surds** can be added:

$$2\sqrt{3} + 5\sqrt{3} = 7\sqrt{3}, \quad \text{but} \quad \sqrt{2} + \sqrt{3} = \text{cannot be simplified}$$

✅ 4. Laws of Exponents for Real Numbers

Law	Formula	Example
Product rule	$a^m \cdot a^n = a^{m+n}$	$2^3 \cdot 2^2 = 2^5$
Quotient rule	$\frac{a^m}{a^n} = a^{m-n}$	$\frac{5^4}{5^2} = 5^2$
Power of a power	$(a^m)^n = a^{mn}$	$(3^2)^4 = 3^8$
Zero exponent	$a^0 = 1$ (a ≠ 0)	$7^0 = 1$
Negative exponent	$a^{-m} = \frac{1}{a^m}$	$2^{-3} = \frac{1}{8}$

✅ 5. Prime Factorization and Euclid's Division Algorithm

🔸 Prime Factorization Method

- Break the number into a product of **prime numbers**.
- Example:

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

🔸 LCM and HCF using Prime Factorization

- Find prime factors of each number.
- **HCF**: Product of common prime factors with lowest power.
- **LCM**: Product of all prime factors with highest power.
  - 🔹 Example:

Let $60 = 2^2 \cdot 3 \cdot 5$, and $48 = 2^4 \cdot 3$

  - HCF = $2^2 \cdot 3 = 12$
  - LCM = $2^4 \cdot 3 \cdot 5 = 240$
-

🔸 Euclid's Division Algorithm

Used to find **HCF of two numbers**.

Step-by-step process:

- Divide the larger number by the smaller.
- Replace: larger = smaller, smaller = remainder.
- Repeat until remainder = 0.
- The last non-zero remainder is the **HCF**.

🔹 Example: Find HCF of 56 and 72

1. $72 = 56 \cdot 1 + 16$
2. $56 = 16 \cdot 3 + 8$
3. $16 = 8 \cdot 2 + 0$

🔹 ✉️ HCF = 8

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SELF NOTES