FREE NOTES · NCERT + JEE LEVEL

Mathematical Reasoning

Extra chapter (purana CBSE Class 11, pehle JEE Main me aata tha): statements, negation, compound statements, connectives, truth tables, implications, converse, contrapositive, tautology aur contradiction.

01 Statements aur negation
02 Connectives aur truth tables
03 Implications aur laws
04 Statements ko check karna
05 Solved examples
06 Common mistakes
07 Practice (JEE style)
08 Quick revision

01 Statements aur negation

- **Statement** = vaakya jo ya to sahi ya galat ho, dono nahi. Sawaal, aadesh, vismay aur raay statements nahi.
- **Negation** ~p: "Aisa nahi hai ki p". ~(~p) = p.
- Quantifiers ka negation: ~(har x ke liye p(x)) = koi x hai jiske liye ~p(x); ~(koi x hai, p(x)) = har x ke liye ~p(x).

02 Connectives aur truth tables

p	q	$p \wedge q$	$p \vee q$	$p \rightarrow q$	$p \leftrightarrow q$
T	T	T	T	T	T
T	F	F	T	F	F
F	T	F	T	T	F
F	F	F	F	T	T

- p → q **sirf** tab galat jab p sahi aur q galat.
- n statements ki truth table me rows = 2^n.

03 Implications aur laws

- p → q ke liye: **converse** q → p; **inverse** ~p → ~q; **contrapositive** ~q → ~p (original ke barabar).
- $p \rightarrow q \equiv \sim p \vee q$; $\sim(p \rightarrow q) \equiv p \wedge \sim q$.
- **De Morgan**: $\sim(p \wedge q) \equiv \sim p \vee \sim q$; $\sim(p \vee q) \equiv \sim p \wedge \sim q$.
- $p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p)$.
- **Tautology**: hamesha sahi ($p \vee \sim p$); **contradiction**: hamesha galat ($p \wedge \sim p$).

04 Statements ko check karna

- Direct method: p sahi maano, q sahi dikhao.
- Contrapositive method: ~q maano, ~p dikhao.
- Contradiction: p aur ~q maano, asambhav nateeja.
- "Har ek ke liye" statement ko ek counter-example galat saabit karta.
- JEE MCQ trick: statements me T/F daalkar options jaldi check karo; ya → ko ∨ me badalkar saral karo.

05 Solved examples

Q1. "Agar number 6 se divisible hai to 3 se bhi" ka contrapositive?

Agar number 3 se divisible nahi, to 6 se bhi nahi.

Q2. $(p \wedge q) \to p$ tautology hai dikhao.

$(p \wedge q) \to p \equiv \sim(p \wedge q) \vee p \equiv \sim p \vee \sim q \vee p \equiv T$.

Q3. Negation: "Saare students intelligent hain."

Koi student intelligent nahi hai (aisa ek student hai).

06 Common mistakes

- Sochna ki converse original ke barabar (contrapositive hai).
- "Sab" ka negation "koi nahi" (sahi: "koi ... nahi hai").
- p galat ho to $p \to q$ ko galat maanna.
- Sawaal ya aadesh ko statement kehna.

07 Practice (JEE style)

1. $\sim(p \vee q) \equiv$?
2. $p \to q \equiv$?
3. 3 statements ki truth table me rows?
4. $p \vee \sim p$ kya hai?
5. $p \to q$ ka contrapositive?

ANSWERS

1) $\sim p \wedge \sim q$ · 2) $\sim p \vee q$ · 3) 8 · 4) Tautology · 5) $\sim q \to \sim p$

08 Quick revision: exam se 5 minute pehle

BASICS

- Statement: T ya F
- $\sim(\sim p) = p$

CONNECTIVES

- $\wedge$ dono sahi
- $\vee$ kam se kam ek
- $\to$ sirf T→F galat

LAWS

- De Morgan
- $p \rightarrow q \equiv \sim p \vee q$
- Contrapositive barabar

SPECIAL

- Tautology $p \vee \sim p$
- Contradiction $p \wedge \sim p$

Koi doubt? padhaiadda.netlify.app pe AI Doubt Solver se poocho, ya is chapter ka mock test do.