

CLASS 11 MATHEMATICS — FORMULA SHEET

Chapter 5 : Linear Inequalities (NCERT)

5.1 Basic Concepts

Concept	Detail
Inequality	A statement involving $<$, $>$, $\leq$, or $\geq$ between two expressions
Symbols	$<$ (less than), $>$ (greater than), $\leq$ (less than or equal), $\geq$ (greater than or equal)
Strict inequality	Uses $<$ or $>$ (endpoints NOT included)
Slack inequality	Uses $\leq$ or $\geq$ (endpoints included)
Linear inequality (1 variable)	$ax + b < 0$ (or $>$, $\leq$, $\geq$), $a \neq 0$
Linear inequality (2 variables)	$ax + by + c < 0$ (or $>$, $\leq$, $\geq$)
Solution	Any value of the variable that makes the inequality true

5.2 Rules for Solving Inequalities

Rule	Detail
Add / subtract	Add or subtract the same number on both sides — inequality unchanged
Multiply / divide by POSITIVE	Inequality sign stays the SAME
Multiply / divide by NEGATIVE	Inequality sign REVERSES ($<$ becomes $>$, $\leq$ becomes $\geq$)
Reciprocal (same sign terms)	Taking reciprocal reverses the inequality (for positive quantities)
Transposing	A term can shift sides with its sign changed

5.3 Solution on Number Line & Interval Notation

Inequality	Interval	Number Line
$x < a$	$(-\infty, a)$	Open circle at a , shade left
$x \leq a$	$(-\infty, a]$	Closed circle at a , shade left
$x > a$	(a, ∞)	Open circle at a , shade right
$x \geq a$	$[a, \infty)$	Closed circle at a , shade right
$a < x < b$	(a, b)	Open at both, shade between
$a \leq x \leq b$	$[a, b]$	Closed at both, shade between
$a \leq x < b$	$[a, b)$	Closed at a , open at b

5.4 Solving Steps (One Variable)

Step	Action
Step 1	Simplify both sides (remove brackets, fractions by LCM)
Step 2	Collect variable terms on one side, constants on the other (transpose)
Step 3	Divide/multiply by the coefficient of x

Step	Action
Step 4 (key)	If dividing by a negative number, REVERSE the inequality sign
Step 5	Write solution in interval form and/or on the number line
System of inequalities	Solve each separately; final solution = INTERSECTION (common region)

5.5 Graphing Inequalities in Two Variables

Concept	Detail
Boundary line	Replace inequality with '=' to draw the line $ax + by + c = 0$
Strict ($<$ or $>$)	Draw a DASHED line (boundary not included)
Slack ($\leq$ or $\geq$)	Draw a SOLID line (boundary included)
Choosing the region	Pick a test point (usually origin); if it satisfies, shade that side
Origin test	If line does not pass through origin, test $(0, 0)$ — easiest point
System / feasible region	Common shaded area satisfying ALL inequalities

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Golden rule	Multiplying or dividing by a NEGATIVE number FLIPS the inequality sign.
Brackets	Open () excludes endpoint (use with $<$ $>$); closed [] includes it (use with $\leq$ $\geq$).
Number line circles	Open (hollow) circle = strict ; closed (filled) circle = slack.
System = intersection	For 'and' systems, the answer is the OVERLAP of all solutions.
Dashed vs solid line	Strict $\rightarrow$ dashed boundary ; slack $\rightarrow$ solid boundary.
Origin test	Test $(0,0)$ to decide which side to shade — unless the line passes through it.
Transposing	Move a term across with its sign changed — same as add/subtract both sides.
Word problems	Convert 'at least' $\rightarrow \geq$, 'at most' $\rightarrow \leq$, 'more than' $\rightarrow >$, 'less than' $\rightarrow <$.