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## binary Relation Operators

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Binary relation operators are symbols that establish a relationship between two quantities, usually those before and after the operator. Binary operators seldom have attributes such as subscripts or superscripts.

## Standard Binary Symbols

Latex	Symbol	Description
<code>\in</code>	$\in$	element of, sideways cup with horizontal bar, opening right
<code>\ni</code>	$\ni$	contains as member, reverse of <code>\in</code>
<code>\leq</code>	$\leq$	less or equal, represented by $<$ over $=$ signs
<code>\geq</code>	$\geq$	greater or equal, represented by $>$ over $=$ signs
<code>\ll</code>	$\ll$	much less, represented by 2 $<$ in a row
<code>\gg</code>	$\gg$	much greater, represented by two $>$ in a row
<code>\prec</code>	$\prec$	precedes, $<$ with both lines curving outward
<code>\succ</code>	$\succ$	succeeds, reverse of <code>\prec</code>
<code>\preceq</code>	$\preceq$	precedes or equals, <code>\prec</code> with bottom line repeated below symbol
<code>\succeq</code>	$\succeq$	succeeds or equals, reverse of <code>\preceq</code>
<code>\sim</code>	$\sim$	similar, looks like $\sim$
<code>\cong</code>	$\cong$	congruent, a <code>\sim</code> over $=$
<code>\simeq</code>	$\simeq$	asymptotically equal, <code>\sim</code> over single horizontal bar
<code>\approx</code>	$\approx$	approximately equal, vertical stack of two <code>\sim</code> symbols
<code>\equiv</code>	$\equiv$	equivalent, represented by a stack of three horizontal bars
<code>\doteq</code>	$\doteq$	$=$ with a dot above it
	$\subset$	subset of, horizontal cup with opening

<code>\subset</code>	$\subset$	right
<code>\supset</code>	$\supset$	superset of, horizontal cup with opening left
<code>\subseteq</code>	$\subseteq$	subset of or equals, <code>\subset</code> over single horizontal bar
<code>\supseteq</code>	$\supseteq$	superset of or equals, reverse of <code>\subseteq</code> symbol
<code>\sqsubseteq</code>	$\sqsubseteq$	squared subset of or equals
<code>\sqsupseteq</code>	$\sqsupseteq$	squared superset of or equals
<code>\smile</code>	$\smile$	smile without any surrounding circle
<code>\frown</code>	$\frown$	frown, without any surrounding circle
<code>\perp</code>	$\perp$	perpendicular symbol, vertical bar above and touching horizontal bar
<code>\models</code>	$\models$	Models, represented by short vertical bar touching short = sign
<code>\mid</code>	$\mid$	middle, represented by vertical
<code>\parallel</code>	$\parallel$	parallel, represented by two vertical bars in a row
<code>\vdash</code>	$\vdash$	short vertical bar touching a single short horizontal bar
<code>\Vdash</code>	$\Vdash$	Forces, short double vertical bar touching a single short horizontal bar
<code>\vDash</code>	$\vDash$	Same symbol as <code>\models</code>
<code>\dashv</code>	$\dashv$	reverse <code>\vdash</code>
<code>\propto</code>	$\propto$	proportional
<code>\asymp</code>	$\asymp$	asymptotic smile on top of and touching frown
<code>\bowtie</code>	$\bowtie$	normal subgroup of, bow tie shape or right -pointing triangle on left touching left-pointing triangle on right
<code>\sqsubset</code>	$\sqsubset$	square subset of, squared <code>\subset</code>
<code>\sqsupset</code>	$\sqsupset$	square superset of, squared version of <code>\supset</code>
<code>\Join</code>	$\Join$	same symbol as <code>\bowtie</code>
<code>\pm</code>	$\pm$	plus or minus
<code>\mp</code>	$\mp$	minus or plus
<code>\times</code>	$\times$	times multiplication sign
<code>\cdot</code>	$\cdot$	dot multiplication symbol
<code>\circ</code>	$\circ$	ring operator
<code>\bigcirc</code>	$\bigcirc$	large circle
<code>\div</code>	$\div$	divide, represented by dots above and below horizontal bar
<code>\diamond</code>	$\diamond$	diamond operator
<code>\ast</code>	$\ast$	asterisk operator
<code>\star</code>	$\star$	white star

<code>\cap</code>	$\cap$	cap, intersection
<code>\cup</code>	$\cup$	cup, union
<code>\sqcap</code>	$\sqcap$	square cap, intersection
<code>\sqcup</code>	$\sqcup$	square cup, union
<code>\wedge</code>	$\wedge$	wedge, logical AND
<code>\vee</code>	$\vee$	V operator, logical OR
<code>\triangleleft</code>	$\triangleleft$	left pointing triangle
<code>\triangleright</code>	$\triangleright$	Right pointing triangle
<code>\bigtriangleup</code>	$\bigtriangleup$	wide up triangle
<code>\bigtriangledown</code>	$\bigtriangledown$	wide down triangle
<code>\oplus</code>	$\oplus$	circled plus
<code>\ominus</code>	$\ominus$	circled minus
<code>\otimes</code>	$\otimes$	circled times sign
<code>\oslash</code>	$\oslash$	circled slash
<code>\odot</code>	$\odot$	circled dot operator
<code>\bullet</code>	$\bullet$	bullet
<code>\dagger</code>	$\dagger$	dagger
<code>\ddagger</code>	$\ddagger$	double dagger
<code>\setminus</code>	$\setminus$	Set Minus
<code>\uplus</code>	$\uplus$	multiset union
<code>\wr</code>	$\wr$	wreath product
<code>\amalg</code>		Amalgamation or Co-product
<code>\lhd</code>	$\lhd$	Normal subgroup of
<code>\rhd</code>	$\rhd$	Contains as normal subgroup
<code>\unlhd</code>	$\unlhd$	Normal subgroup of or equals to
<code>\unrhd</code>	$\unrhd$	Contains as normal subgroup or equal to
<code>\dotplus</code>	$\dotplus$	dot plus
<code>\centerdot</code>	$\cdot$	centered dot
<code>\ltimes</code>	$\ltimes$	Left normal factor semi-direct product
<code>\rtimes</code>	$\rtimes$	Right normal factor semi-direct product
<code>\leftthreetimes</code>	$\leftthreetimes$	Left semi-direct product
<code>\rightthreetimes</code>	$\rightthreetimes$	Right semi-direct product
<code>\circleddash</code>	$\circleddash$	circled minus
<code>\smallsetminus</code>	$\setminus$	Same as <code>\setminus</code>
<code>\barwedge</code>	$\bar{\wedge}$	NAND
<code>\curlywedge</code>	$\curlywedge$	curly logical AND
<code>\curlyvee</code>	$\curlyvee$	curly logical OR
<code>\veebar</code>	$\veebar$	XOR
<code>\intercal</code>	$\intercal$	intercalate
<code>\Cup</code>	$\Cup$	double union
<code>\Cap</code>	$\Cap$	double intersection
<code>\circledast</code>	$\circledast$	circled asterisk operator
<code>\circledcirc</code>	$\circledcirc$	circled ring operator
<code>\boxminus</code>	$\boxminus$	squared minus

<code>\boxtimes</code>	$\boxtimes$	squared times
<code>\boxdot</code>	$\boxdot$	squared dot operator
<code>\boxplus</code>	$\boxplus$	squared plus
<code>\divideontimes</code>	$\div$	division times
<code>\And</code>	$\&$	AND

## Advanced AMS Binary Symbols

<code>\leqslant</code>		less than or slanted equals to
<code>\geqslant</code>		greater than or slanted equals
<code>\eqslantless</code>		slanted equal to or less than
<code>\eqslantgtr</code>		slanted equal to or greater than
<code>\lesssim</code>	$\lesssim$	less or equivalent
<code>\gtrsim</code>	$\gtrsim$	greater or equivalent
<code>\lessapprox</code>		less than or approximate
<code>\gtrapprox</code>		greater or approximate
<code>\approxeq</code>	$\approx$	approximately equal
<code>\lessdot</code>	$\lessdot$	less with dot
<code>\gtrdot</code>	$\gtrdot$	greater with dot
<code>\lll</code>	$\lll$	very much less
<code>\ggg</code>	$\ggg$	very much greater than
<code>\lessgtr</code>	$\lessgtr$	less or greater
<code>\gtrless</code>	$\gtrless$	greater or less than
<code>\lesseqgtr</code>	$\lesseqgtr$	less than equals to or greater than
<code>\gtreqless</code>	$\gtreqless$	Greater than equal to or less than
<code>\lesseqqgtr</code>		less than above equals to above greater than
<code>\gtreqqless</code>		greater than above equals to above less than
<code>\doteqdot</code>	$\doteqdot$	geometrically equal
<code>\eqcirc</code>	$\eqcirc$	equals with circle in middle
<code>\circeq</code>	$\circeq$	circled equals
<code>\fallingdotseq</code>	$\fallingdotseq$	Approximately equal to or the image of
<code>\risingdotseq</code>	$\risingdotseq$	Image of or approximately equal to
<code>\triangleq</code>	$\triangleq$	delta equals
<code>\backsim</code>	$\backsim$	reverse similar symbol
<code>\thicksim</code>	$\sim$	same as <code>\sim</code> (similar) symbol
<code>\backsimeq</code>	$\backsimeq$	reverse similar or equals
<code>\thickapprox</code>	$\thickapprox$	thick approximately equal
<code>\preccurlyeq</code>	$\preccurlyeq$	precedes or equals
<code>\succcurlyeq</code>	$\succcurlyeq$	succeeds or equals
<code>\curlyeqprec</code>	$\curlyeqprec$	equal or precedes
<code>\curlyeqsucc</code>	$\curlyeqsucc$	equal or succeeds

<code>\precsim</code>	$\preccurlyeq$	precedes or equivalent
<code>\succsim</code>	$\succcurlyeq$	succeeds or equivalent
<code>\precapprox</code>		precedes above almost equals to
<code>\succapprox</code>		succeeds above almost equals to
<code>\subseteqq</code>		subset of above equals
<code>\supseteqq</code>		superset of above equals
<code>\Subset</code>	$\Subset$	double subset
<code>\Supset</code>	$\Supset$	double superset
<code>\vartriangleleft</code>	$\triangleright$	normal subgroup of
<code>\vartriangleright</code>	$\triangleleft$	contains as normal subgroup of
<code>\trianglelefteq</code>	$\trianglelefteq$	normal subgroup of or equal
<code>\trianglerighteq</code>	$\trianglerighteq$	contains as normal subgroup or equal
<code>\VDash</code>	$\Vdash$	double vertical bar double right turnstile
<code>\Vdash</code>	$\Vdash$	Forces symbol
<code>\Vvdash</code>	$\Vdash$	Triple vertical bar, right turnstile
<code>\Bumpeq</code>	$\bumpeq$	geometrically equivalent
<code>\between</code>	$\between$	between
<code>\pitchfork</code>	$\pitchfork$	pitchfork
<code>\backepsilon</code>	$\epsilon$	reverse Greek epsilon symbol
<code>\blacktriangleleft</code>	$\blacktriangleleft$	black small left-pointing triangle
<code>\blacktriangleright</code>	$\blacktriangleright$	black small right-pointing triangle
<code>\therefore</code>	$\therefore$	therefore
<code>\because</code>	$\because$	because

## AMS binary symbols negated

<code>\ne</code>	$\neq$	not equal
<code>\notin</code>	$\notin$	not an element of
<code>\nless</code>	$\nless$	not less
<code>\ngtr</code>	$\ngtr$	not greater
<code>\nleq</code>	$\nleq$	neither less or equal
<code>\ngeq</code>	$\ngeq$	neither greater or equal
<code>\lneq</code>		less than and single line not equal to
<code>\gneq</code>		greater than and single line not equal to
<code>\lneqq</code>	$\lneqq$	Less than but not equal to
<code>\gneqq</code>	$\gneqq$	greater but not equal
<code>\lnsim</code>	$\lnsim$	less but not equivalent
<code>\gnsim</code>	$\gnsim$	greater but not equivalent to
<code>\lnapprox</code>		less and not approximately equal
<code>\gnapprox</code>		greater and not approximately equal to
<code>\nprec</code>	$\nprec$	does not precede
<code>\nsucc</code>	$\nsucc$	does not succeeds

<code>\npreceq</code>	$\nprec$ does not precede or equal
<code>\nsucceq</code>	$\nsucc$ does not succeed or equal
<code>\precneqq</code>	Precedes above not equal
<code>\succneqq</code>	succeeds above not equal to
<code>\precnsim</code>	$\nsim$ precedes but not equivalent to
<code>\succnsim</code>	$\nsucc$ succeeds but not equivalent
<code>\precnapprox</code>	precedes above not almost equal to
<code>\succnapprox</code>	succeeds above not approximately equal to
<code>\nsim</code>	$\sim$ not similar
<code>\ncong</code>	$\ncong$ not congruent
<code>\nmid</code>	$\nmid$ not divide
<code>\nparallel</code>	$\nparallel$ not parallel
<code>\nvdash</code>	$\nvdash$ does not prove
<code>\nvDash</code>	$\nvDash$ not true
<code>\nVdash</code>	$\nVdash$ not force
<code>\nVDash</code>	$\nVDash$ negated double vertical bar double right turnstile
<code>\ntriangleleft</code>	$\ntriangleleft$ not normal subgroup of
<code>\ntriangleright</code>	$\ntriangleright$ does not contain as normal subgroup
<code>\ntrianglelefteq</code>	$\ntrianglelefteq$ not normal subgroup of or equal
<code>\ntrianglerighteq</code>	$\ntrianglerighteq$ does not contain as normal subgroup or equal
<code>\nsubseteq</code>	$\nsubseteq$ neither subset of nor equal
<code>\nsupseteq</code>	$\nsupseteq$ neither superset of nor equal
<code>\subsetneq</code>	$\subsetneq$ subset of with not equal
<code>\supsetneq</code>	$\supsetneq$ superset with not equal
<code>\subsetneqq</code>	subset of above not equal to
<code>\supsetneqq</code>	superset of above not equal to

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