

Greater than or equal to ($\geq$) and every inequality symbol: the chart, how to type each, and what the words mean

The symbols

Symbol	Name	Means	Example	Unicode	HTML	LaTeX
>	greater than	the left side is bigger	$7 > 3$	U+003E	>	>
<	less than	the left side is smaller	$3 < 7$	U+003C	<	<
$\geq$	greater than or equal to	bigger or the same	$x \geq 5$ (5 counts)	U+2265	≥	\geq
$\leq$	less than or equal to	smaller or the same	$x \leq 5$ (5 counts)	U+2264	≤	\leq
$\neq$	not equal to	the two sides differ	$4 \neq 5$	U+2260	≠	\neq
$\approx$	approximately equal to	close, rounded	$\pi \approx 3.14$	U+2248	≈	\approx
>> <<	much greater / much less than (written as a double sign)	far bigger / far smaller	a million >> 10	U+226B / U+226A	≫ ≪	\gg \ll

How to type each one

Where	$\geq$	$\leq$	$\neq$	$\approx$
Windows (hold Alt, type on the number pad)	Alt+242	Alt+243	Alt+8800	Alt+247
Mac	Option + . (full stop)	Option + , (comma)	Option + =	Option + X
Microsoft Word (type the code, then Alt+X)	2265 Alt+X	2264 Alt+X	2260 Alt+X	2248 Alt+X
Google Docs: Insert > Special characters, search	greater than or equal	less than or equal	not equal	almost equal
iPhone and Android: hold the key on the symbols keyboard	hold >	hold <	hold =	hold =
Excel, Sheets, Python, Java, C, JavaScript (two characters)	>=	<=	<> (Excel, Sheets), != (code)	not used

The words that mean each symbol

The words	Symbol	Example
at least, a minimum of, no less than, ... or more, ... or older	$\geq$	"at least 13": age ≥ 13 (13 counts)
at most, a maximum of, no more than, not over, up to, ... or less	$\leq$	"no more than 20 kg": mass ≤ 20
more than, greater than, over, above, exceeds, older than	>	"over 18 only": age > 18 (18 is not over 18)
less than, fewer than, under, below, younger than	<	"under 12s go free": age < 12
between a and b inclusive	$a \leq x \leq b$	"between 50 and 60 marks": $50 \leq m \leq 60$

Which way: the wide open end faces the bigger number and the point faces the smaller one (the crocodile opens its mouth towards the bigger meal): $9 > 4$ and $4 < 9$. The line under $\geq$ or $\leq$ adds "or equal to".

Reading an inequality on a number line, the rules for solving one, and practice

On a number line

- [] Draw a circle at the boundary number: FILLED for $\geq$ or $\leq$ (the number is included), EMPTY for $>$ or $<$ (it is not)
- [] Shade or arrow towards the solutions: right for "greater", left for "less"
- [] $x \geq 5$: filled circle at 5, arrow right. $x < 5$: empty circle at 5, arrow left. $-2 < x \leq 3$: empty at -2, filled at 3, shade between
- [] Interval notation: $[5, \infty)$, $(-\infty, 5)$, $(-2, 3]$; a square bracket includes the end, a round one excludes it

Solving: the rules

Do this to both sides	The sign	Example
add or subtract the same number	stays	$x + 3 \geq 10 \rightarrow x \geq 7$
multiply or divide by a POSITIVE number	stays	$3x < 12 \rightarrow x < 4$
multiply or divide by a NEGATIVE number	FLIPS	$-2x > 6 \rightarrow x < -3$ (check $x = -4$: $8 > 6$, true)
swap the two sides	flips	$5 > x \rightarrow x < 5$

Worked: $5 - 3x < 20$. Subtract 5: $-3x < 15$. Divide by -3 and flip: $x > -5$. Integers satisfying $-2 < x \leq 3$: -1, 0, 1, 2, 3 (five; -2 is excluded by the empty circle).

Practice (write the inequality 1-4, true or false 5-8, solve 9-12)

- [] 1. A film is for people aged 15 or over.
- [] 2. The lift holds at most 8 people.
- [] 3. A number is more than 20 and less than 30.
- [] 4. The temperature stayed under 0°C .
- [] 5. $0.5 \geq 1/2$
- [] 6. $-3 > -2$
- [] 7. $7 \leq 7$
- [] 8. $2/3 < 0.6$
- [] 9. $x - 4 > 1$
- [] 10. $2x + 1 \leq 9$
- [] 11. $-x \geq 3$
- [] 12. $10 - 2x < 4$

Answers

- 1) age ≥ 15 2) people ≤ 8 3) $20 < n < 30$ 4) $T < 0$ 5) true (equal is allowed) 6) false 7) true 8) false ($2/3 = 0.667$) 9) $x > 5$ 10) $x \leq 4$ 11) $x \leq -3$ (flipped) 12) $-2x < -6$, so $x > 3$ (flipped)

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