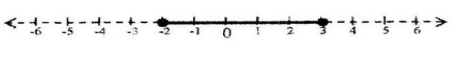
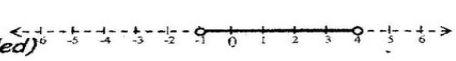
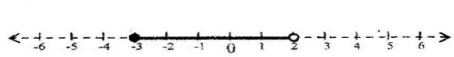
name _____

Intervals, Inequalities, and notation .doc 3/29/2002

Using Inequalities to show Intervals

One important use of inequalities in math is to describe intervals. An interval can be all the numbers between two numbers (a bounded interval), or it can be all the numbers greater than some minimum or all the numbers less than some maximum (unbounded intervals). Intervals can also be shown using brackets and parentheses. The endpoints of an interval are important. Sometimes they are included in the interval, and sometimes not. Look at these examples:

Bounded intervals

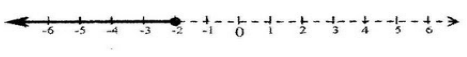
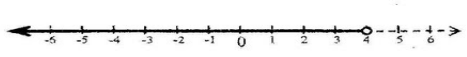
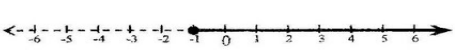
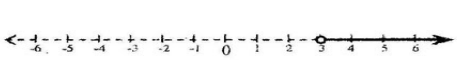
		Inequality notation	Bracket notation
closed (endpoints included)		$-2 \leq X \leq 3$	$[-2, 3]$
open (endpoints not included)		$-1 < X < 4$	$(-1, 4)$
half-open (one of each)		$-3 \leq X < 2$	$[-3, 2)$

Even though it's quicker to write Intervals with brackets or parentheses, it's not done as often -partly because an open interval can be confused with a coordinate point. You need to be able to use both! -besides, inequality notation is way more sophisticated.

The first example can also be written "$3 \geq X \geq -2$", but we don't usually do it that way, since it's more conventional to read from left to right (least to greatest).

Be careful to keep the inequalities in the same direction. Things like "$-3 \geq X \leq 2$" or "$2 \leq X \geq 5$" aren't very useful.

Unbounded intervals

		Inequality notation	Bracket notation
closed		$X \leq -2$	$(-\infty, -2]$
open		$X < 4$	$(-\infty, 4)$
closed		$X \geq -1$	$[-1, \infty)$
open		$X > 3$	$(3, \infty)$

Lots of details here. Notice that the symbol for infinity never appears with inequality notation. If you say "X is greater than 3", it already means that X could be anything from 3 towards infinity. Likewise "X is less or equal to -2" means X could be anything from negative infinity up to -2.

It's important to remember that infinity is not a number- you can never capture it, so never use a square bracket next to the infinity symbol.

All these unbounded intervals are written with inequalities that begin with X. This is just the convention. ($X > 3$ could also be written as $3 < X$ although we don't usually do it that way)

By the way, $X > 0$ is a quick way of writing _____

and $X < 0$ is a quick way of writing _____