Chapter 9 Linear Inequalities

Section 9.1 Representing Inequalities

Term: An inequality is a mathematical statement comparing expressions that may not be equal.

Symbols:

$<$ = less than	$\leq$ = less than or equal to
$>$ = greater than	$\geq$ = greater than or equal to
$\neq$ = not equal to	

Common ways to express:

1) verbally or word sentence
2) graphically (diagram or number line)
3) algebraically (with math symbols)

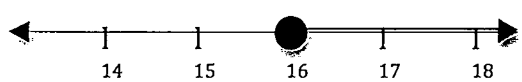
Boundary Point: separates the values that are less than from the values greater than a specified point. It may or may not be a possible value in the solution.

a) an open circle shows that the boundary point is not included in the solution.
b) a closed circle shows that the boundary point is included in the solution.

Eg #1: Illustrate in 3 ways the following: "In Alberta schools, a student must go to school until they are at least 16."

#1) Verbal/Word Sentence: Student must be 16 or older

#2) Graph (number line):



#3) Algebraically: $x \geq 16$

An inequality can be combined; it has 2 limits, an upper and a lower limit.

Eg: the age of Jr. High students average from 12 to 16. You can use two inequalities, or a combined one.

$x \geq 12$ and $x \leq 16$

or to combine:

lower limit + upper limit

~~$12 \leq x \geq 16$~~ (Fix)

$12 \leq x \leq 16$

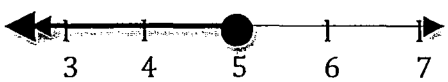
Section 9.2 Solve Single-Step Inequalities

A solution of an inequality is a value, or set of values, that makes an inequality true. Inequalities are solved using algebra, much like equations with one important exception.

Eg #1

$\frac{3x}{3} \le \frac{15}{3}$

$x \le 5$



Eg #2

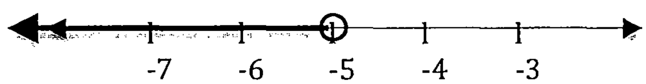
$\frac{15}{-3} < \frac{-3x}{-3}$

$-5 < x$

$x < -5$

note that x is now written on the left side

when you mult/divide by a negative number you must switch the inequality sign Rewrite with the x on the left **



Verify (like a check): Try -6 in this case

x = -6 is part of the solution set of (x ≤ 5), proving our solution is correct.

$15 < -3x$

15<-3(-6) ~~15 < 3(-6)~~

15< + 18 ~~15 < 18~~ **true, we have the correct solution.

(Don't change the sign during a verify, even though you may have mult/divided by a negative.)

Eg #3

Jaxon buys baseball cards for $5.95. He has decided to spend a most, $39.00. How many cards can he buy and not overspend?

$\frac{5.95x}{5.95} \le \frac{39}{5.95}$

$x \le 6.5$

∴ He can buy at most, 6 baseball cards.

Section 9.3 Solve Multiple Step Inequalities

Solve and graph:

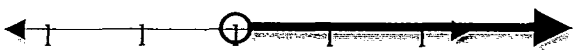
$\frac{x}{4} + 3 > 8$

$\quad -3 \quad -3$

$\frac{x}{4} > 5^{\times 4}$

$\times 4$

$x > 20$



$-3x - 10 \leq 5x + 38$

$+3x \qquad +3x$

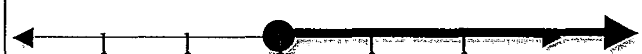
$-10 \leq 8x + 38$

$-38 \qquad -38$

$\frac{-48}{8} \leq \frac{8x}{8}$

$-6 \leq x$ **rewrite with the

$x \geq -6$ x on the left**



Eg: You have two jobs you can take. Store A pays $55/day plus 3% of your sales. Store B pays $40/day plus 5% of your sales. What would your sales need to be to make more at Store B?

Let x represent commission

Store B > Store A

$40 + .05x > 55 + .03x$

$-.03x \qquad -.03x$

$40 + .02x > 55$

$-40 \qquad -40$

$\frac{.02x}{.02} > \frac{15}{.02}$

$x > 750$

$\therefore$ He would need to sell more than $750 to make more at Store B.