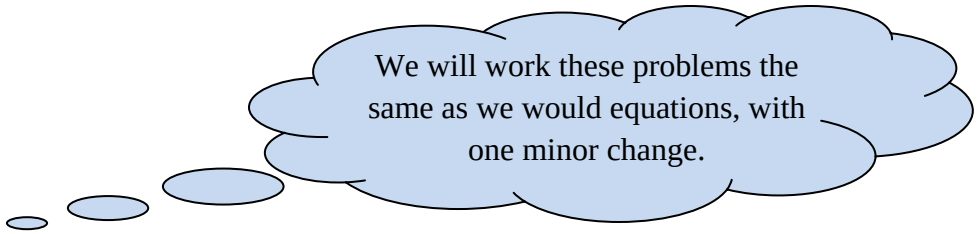
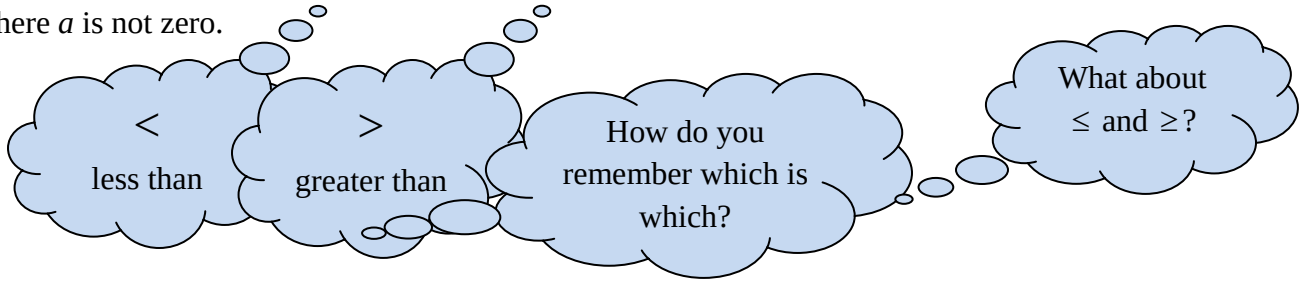
Elementary algebra
Class notes
Solving Linear Inequalities (section 2.8)



Recall Linear Equation: an equation that could be written in the form $ax + b = c$ where a is not zero.

We now have **Linear Inequality:** an inequality that could be written in the form $ax + b < c$ where a is not zero.



We will solve them similarly with one exception. Do you know what the exception is? We will investigate this by experimenting with the true inequality 4 < 10. Perform each operation below to see if the inequality is still true. The first is started for you.

4 < 10	4 < 10	4 < 10	4 < 10	4 < 10
Divide by -2	Multiply by 2	Add 5	Subtract 7	Multiply by -1
↓	↓	↓	↓	↓
$\frac{4}{-2} \stackrel{?}{<} \frac{10}{-2}$				

So which operations made the inequalities untrue? What do we need to do to correct for this?

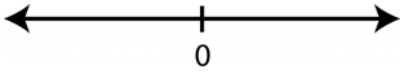
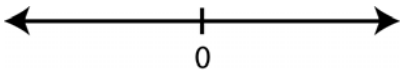
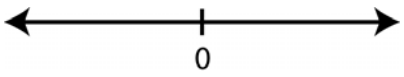
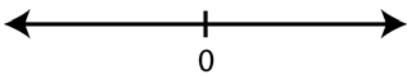
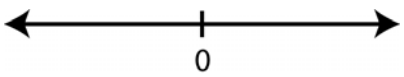
expl 1: Solve. Graph the solution set and write it in interval notation.

$2x < -6$

Do you have to switch the sign?

Check your answer by plugging a number less than -3 into the original inequality? Does it make it true? Now plug in a value greater than -3; is the inequality true?

Let's talk about how we might represent a set of numbers like those less than -3. Graphing on the real number graph can help visualize the set.

Inequality Notation	**What it means**	**Graph on Number Line**	**Interval Notation**
$4 < x < 10$	the numbers in between 4 and 10, including neither		
$-3 \leq x < 5$	the numbers in between -3 and 5, including -3 but not 5		
$x > 5$	the numbers greater than 5		
$x < -3$	the numbers less than -3		
$x \leq 10$	the numbers less than or equal to 10		

Think about the endpoints of each set.

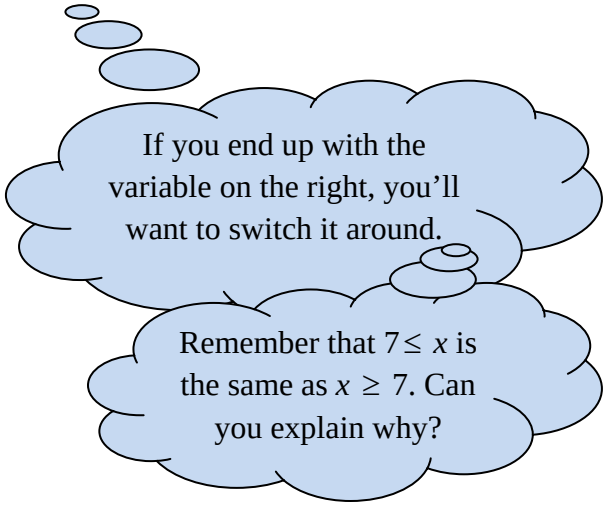
Interval notation:

smallest number in set , largest number in set

bracket: includes endpoint
parenthesis: does not include endpoint

expl 2: Solve. Graph the solution set and write it in interval notation.

$3x + 9 \leq 5(x - 1)$



expl 3: Solve. Graph the solution set and write it in interval notation.

$6(2 - x) \geq 12$

Take the time to check your answer by putting a few values (some in your solution set and some not) into the inequality.

Double or Compound Inequalities:

expl 4: Solve. Graph the solution set and write it in interval notation.

$1 < 4 + 2x \leq 7$

What operations would you do to solve $4 + 2x = 7$? Do the same here but to all three parts of the inequality.

If you prefer, you can solve $1 < 4 + 2x$ and $4 + 2x \leq 7$ separately, and then combine the solutions.

Applications:

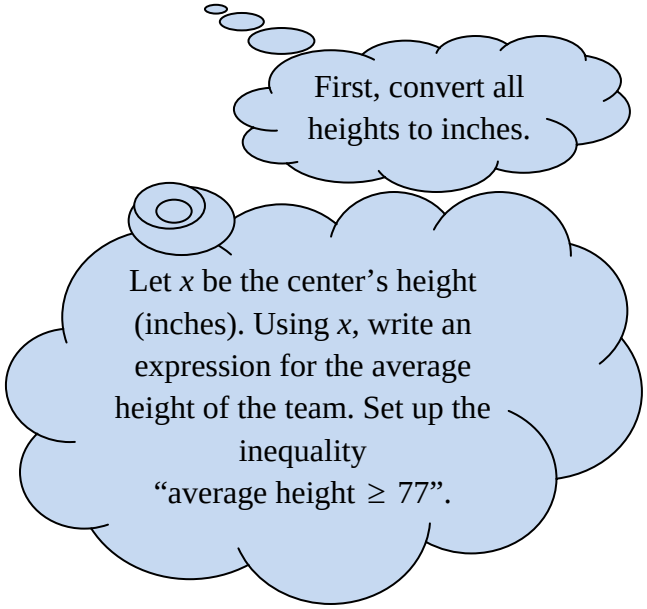
expl 5: Bob and JoAnn have $2500 to spend on their wedding reception. If the banquet hall charges a flat cleanup fee of $75 plus $35 per guest, what is the maximum number of people they can invite?

Let x represent the number of guests. Find the cost for x guests. Set up the inequality "cost $\leq$ 2500".

Make sure your answer makes sense in context.

What will their total bill be?

expl 6: A certain WNBA team has two forwards measuring 6’8” and 6’6” and two guards measuring 6’0” and 5’9”. How tall a center should they hire if they wish to have a starting team average height of at least 6’5”?



Now check your answer by finding the average height of the team using the center’s minimum possible height.

Worksheet: Inequalities and you 1:
This worksheet investigates the phenomenon of switching the sign when we divide or multiply by a negative. It also provides practice solving inequalities including double inequalities.