# 2022-2023 James E Davis Trimester 1 Algebra 1 Class Notes

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## Inequalities

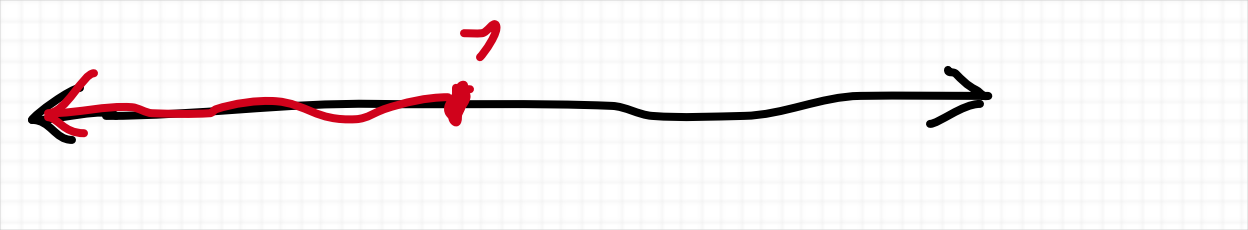
**Inequality Signs:**

- $<$ less than
- $>$ greater than
- $\leq$ less than or equal to
- $\geq$ greater than or equal to

We call $<$ , $>$ strict inequalites because the numbers that we're comparing are not included

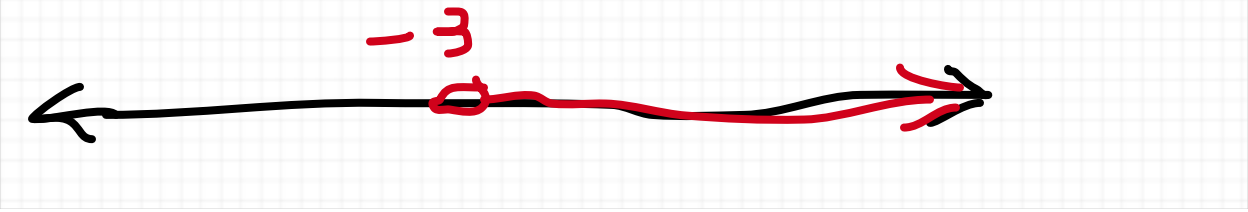
**Example 1.**

$x \leq 7$




**Example 2.**

$x > -3$



**Example 3.**

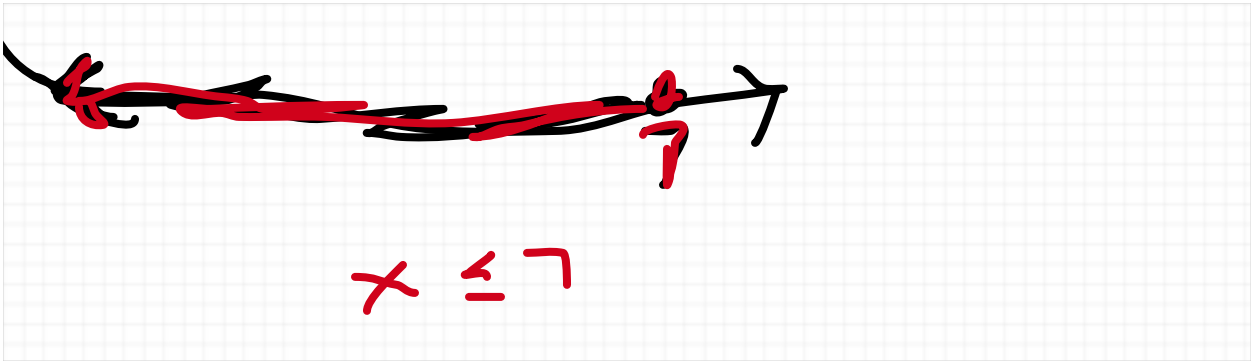
$x \geq 2$

**Example 4.**

$x < -4$

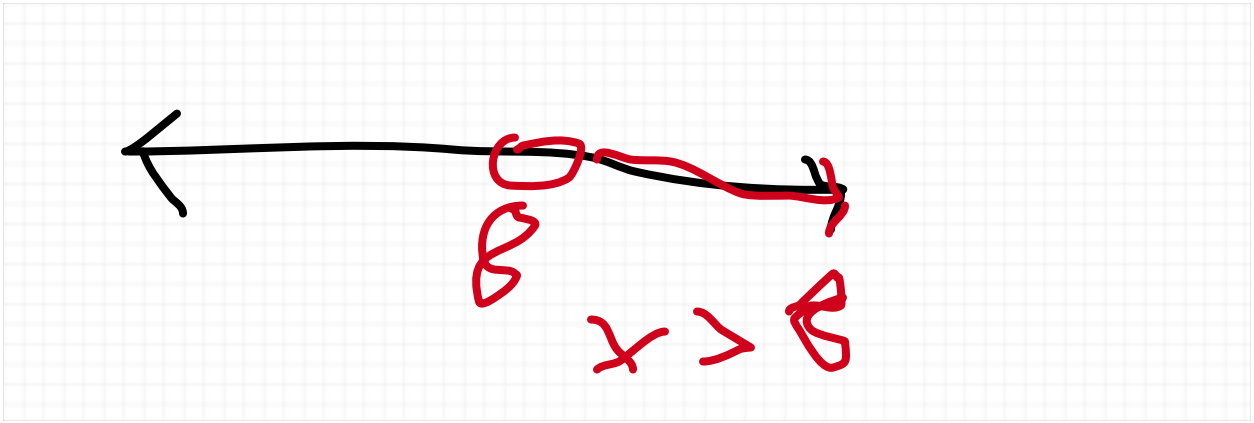
For some problems, you may have to start at the picture and say what the inequality is.

**Example 5.**




The drawing above is $x \leq 7$.

**Example 6.**




The drawing above is $x > 8$.

## Preview for Tomorrow

We're going to solve inequalities!

Let's say that we have $5x - 7 > 53$. Can we from this information figure out the number line that fits the inequality. Using techniques similar to algebra, the answer is yes we can. And next class, we'll figure that out.

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## Previously...

We talked about the language of inequalities, i.e., the symbols

$<$ less than
$>$ greater than
$\leq$ less than or equal to
$\geq$ greater than equal to

and phrases like $x > 8$

Then we showed how to represent in a number line that inequality

## Solving Inequalities

For this topic, we're going to learn how to solve for inequalities. So sometimes you're given inequalities as so

$$13 - 2x \geq 22 \quad \iff \quad 13 - 2x = 22$$

So to solve for the inequality, we think about the properties we learned in algebra, and make adjustments to get the solution, which is in the form of

$a \geq x$

for some real number $a$.

$$
\begin{array}{lll}
13-2x \geq 22 & \Longleftrightarrow & 13-2x=22 \\
-13 \quad -13 & & -13 \quad -13 \\
-2x \geq 9 & & -2x=9 \\
\div -2 \quad \div -2 & & \div -2 \quad \div -2 \\
x \leq 4.5 & & x=4.5\ (9/2)
\end{array}
$$

**Addition/Subtraction property of order**

If $a < b$ (resp. $a \leq b$), then $a + c < b + c$ (resp. $a + c \leq b + c$)

$$
\begin{array}{l}
13-2x \geq 22 \\
-13 \quad -13 \\
-2x \geq 9
\end{array}
$$

**Multiplication/division property of order**

If $a < b$ (resp. $a \leq b$), then either

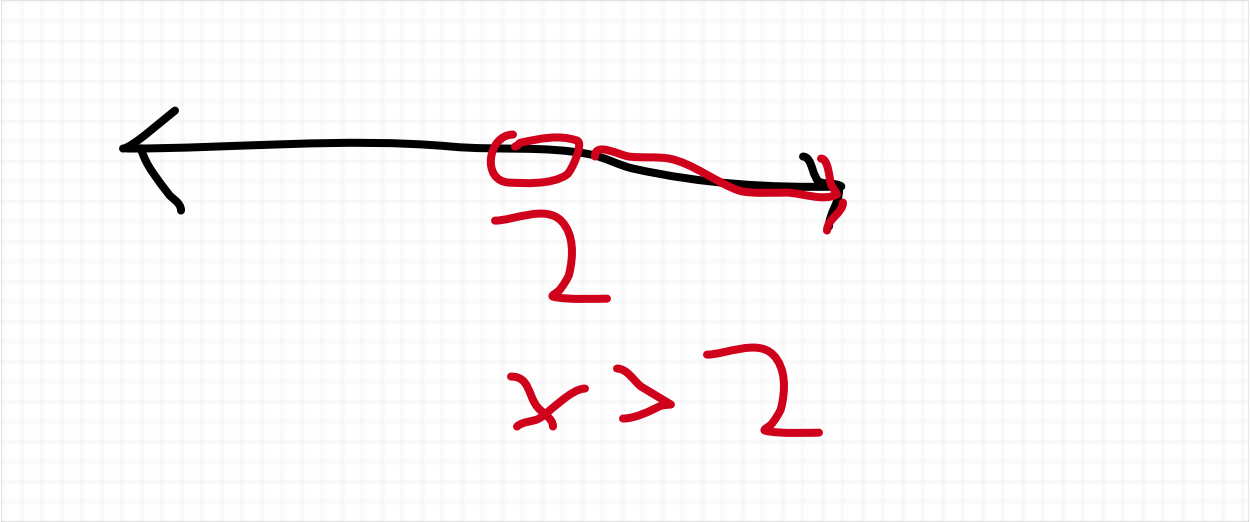
$ac < bc$ (resp. $ac \leq bc$) if $c$ is positive
$ac > bc$ (resp. $ac \geq bc$) if $c$ is negative

$$
\begin{array}{l}
-2x \geq 9 \\
\div 2 \quad \div 2 \\
-x \quad \geq 4.5
\end{array}
$$

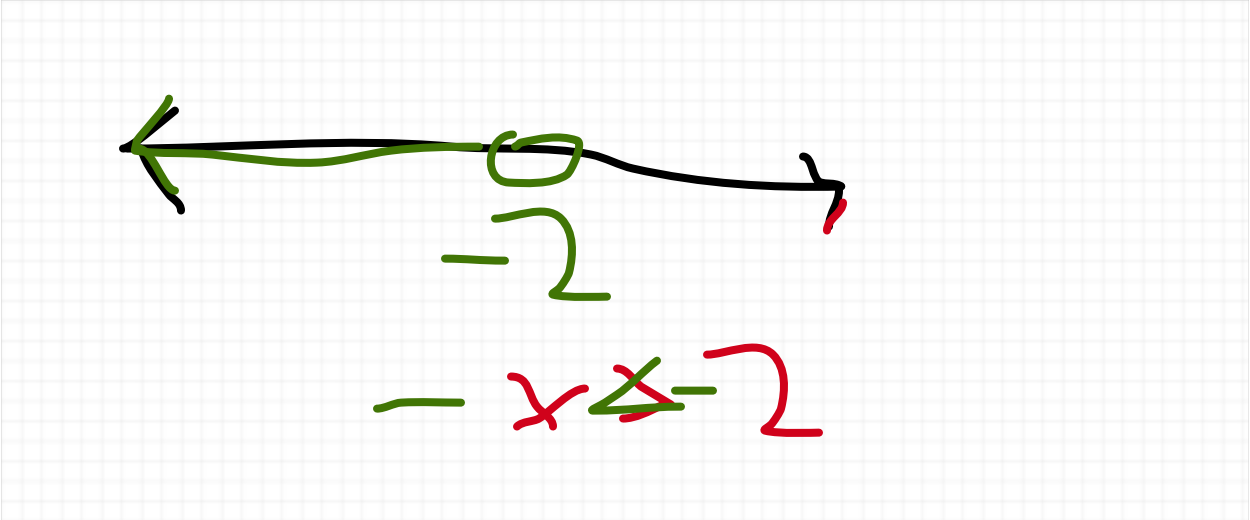
$$
\begin{array}{l}
-2x \geq 9 \\
\div -2 \quad \div -2 \\
x \leq 4.5
\end{array}
$$

So let's understand the intuition of why it is that we switch signs when multiplying a negative

Let's say we have $x > 2$

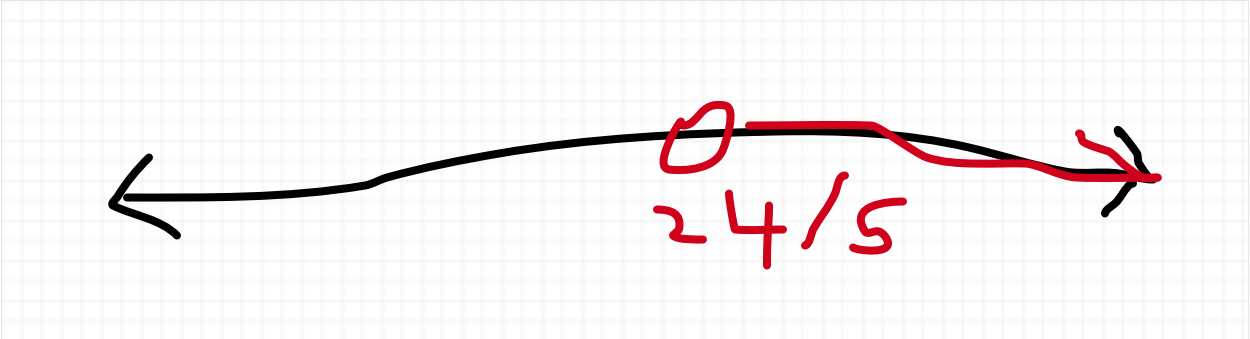



We want to look at the number line for $y = -x$, everything that is greater as a positive number is less as a negative number (think about absolute value).




**Example 1.** Solve and graph

$$
\begin{aligned}
12 - 4(x-5) &< 8 + x \\
12 - 4x + 20 &< 8 + x \\
32 - 4x &< 8 + x \\
+4x & \quad +4x \\
32 &< 8 + 5x \\
-8 & \quad -8 \\
24 &< 5x \\
\div 5 & \quad \div 5 \\
24/5 &< x
\end{aligned}
$$




**Example 2.**

$3x + 11 \leq 3(x + 7)$

The solution is actually all real numbers, since we do the algebra and get

$0 \leq 10$

which is true for any real number $x$.

$x =$ all real numbers $\mathbb{R} \quad (-\infty, +\infty)$

## Exit Ticket

3 questions

Solve for all of the following

1. $5x + 4 < 39$

2. $71 > 4 - x$

3. $5(x + 3) - 2x \geq -21$

## Preview for Monday

We will talk about unions and intersections of sets (in a venn diagram)

To demonstrate unions and intersections, we'll do the Lebron James and Michael Jordan conversation in a Venn Diagram to visualize intersections and unions.