Section 1.7 Guided Notebook

Section 1.7 Linear Inequalities

- ☐ Work through Section 1.7 TTK #1
- ☐ Work through Section 1.7 TTK #2
- ☐ Work through Objective 1
- ☐ Work through Objective 2
- ☐ Work through Objective 3
- ☐ Work through Objective 4

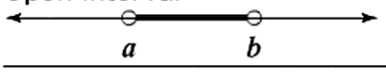
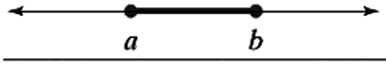
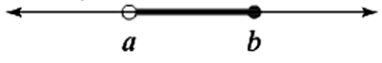
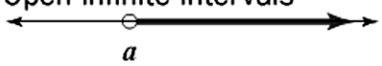
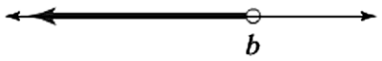
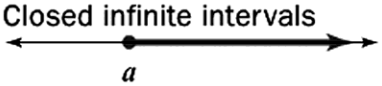
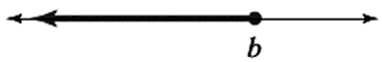
Section 1.7 Linear Inequalities in One Variable

1.7 Things To Know

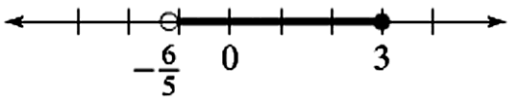
1. Describing Intervals of Real Numbers (Section R.1)

You must get familiar with **Interval Notation, Set Builder Notation, and Using a Number Line** to describe solutions. Click on Section R.1 to see the following summary table which describes 5 different types of intervals.

Table 1

Type of Interval and Graph	Interval Notation	Set-Builder Notation
Open interval 	(a, b)	$\{x \mid a < x < b\}$
Closed interval 	$[a, b]$	$\{x \mid a \leq x \leq b\}$
Half-open intervals  	$(a, b]$ $[a, b)$	$\{x \mid a < x \leq b\}$ $\{x \mid a \leq x < b\}$
Open infinite intervals  	(a, ∞) $(-\infty, b)$	$\{x \mid x > a\}$ $\{x \mid x < b\}$
Closed infinite intervals  	$[a, \infty)$ $(-\infty, b]$	$\{x \mid x \geq a\}$ $\{x \mid x \leq b\}$

Try Section R.1 Example 2: Given the set sketched on the number line, a) identify the type of interval, b) write the set using set-builder notation, and c) write the set using interval notation.



Try Section R.1 Example 3 and work through the video:

a) Write the set $\left[-\frac{1}{3}, \infty\right)$ in set-builder notation and graph the set on a number line.

b) Write the set $\left\{x \middle| -\frac{7}{2} < x \leq \pi\right\}$ in interval notation and graph the set on a number line.

1.7 Things To Know

2. Determining the Intersection and Union of Sets and Intervals (Section R.1)
Watch the video to see how to find the intersection and union of intervals. Take notes on the following two examples that appear in this video:

Example a) Find the intersection: $[0,\infty)\cap(-\infty,5]$

Example b) Find the intersection: $\left((-\infty,-2)\cup(-2,\infty)\right)\cap[-4,\infty)$

Read through the Introduction to Section 1.7 and answer the questions below:

Consider the inequality $2x - 3 \leq 5$. Explain why the numbers $-1, \frac{7}{2}$ and 4 are all solutions to this inequality.

There are acutely infinitely many solutions to the inequality y$2x - 3 \leq 5$. List three different ways that are typically used to describe the solution to an inequality.

1.

2.

3.

Section 1.7 Objective 1 Solving Linear Inequalities

What is the definition of a **linear inequality in one variable**?

Be sure that you are familiar with the properties of linear inequalities that are discussed in the following table.

Properties of Inequalities

Let a, b, and c be real numbers:

	Property	In Words	Example
1	If $a < b$, then $a + c < b + c$	The same number may be added to both sides of an inequality.	$-3 < 7$ $-3 + 4 < 7 + 4$ $1 < 11$
2	If $a < b$, then $a - c < b - c$	The same number may be subtracted from both sides of an inequality.	$9 \geq 2$ $9 - 6 \geq 2 - 6$ $3 \geq -4$
3	For $c > 0$, if $a < b$, then $ac < bc$	Multiplying both sides of an inequality by a *positive* number *does not* switch *the direction* of the inequality.	$3 > 2$ $(3)(5) > (2)(5)$ $15 > 10$
4	For $c < 0$, if $a < b$, then $ac > bc$	Multiplying both sides of an inequality by a *negative* number switches *the direction* of the inequality.	$3 > 2$ $(3)(-5) < (2)(-5)$ $-15 < -10$
5	For $c > 0$, if $a < b$, then $\frac{a}{c} < \frac{b}{c}$	Dividing both sides of an inequality by a *positive* number *does not* switch *the direction* of the inequality.	$6 > 4$ $\frac{6}{2} > \frac{4}{2}$ $3 > 2$
6	For $c < 0$, if $a < b$, then $\frac{a}{c} > \frac{b}{c}$	Dividing both sides of an inequality by a *negative* number switches *the direction* of the inequality.	$6 > 4$ $\frac{6}{-2} < \frac{4}{-2}$ $-3 < -2$

When do you switch the direction of the inequality symbol when solving a linear inequality?

Watch the **animation** seen on page 1.7-7 to see why it is important to be very careful when working with inequalities. Take your animation notes here.

Work through Example 1 and take notes here. Watch the video to check your solution.

Solve the inequality $2-5(x-2)<4(3-2x)+7$. Express your answer in set-builder notation.

Work through Example 2 and take notes here. Watch the video to check your solution.

Solve the inequality $-9x-3\geq 7-4x$. Graph the solution set on a number line, and express the answer in interval notation.

Work through Example 3 and take notes here. Watch the interactive video to check your solutions.

Solve the linear inequalities.

a. $\frac{1-4w}{5}-\frac{w}{2}\leq -5$

b. $3.7y-6>6.1+3.45y$

Section 1.7 Objective 2 Solving Three-Part Inequalities in One Variable

Work through Example 4 taking notes here. Watch the video to check your solution.

Solve the inequality $-2 \le \frac{2-4x}{3} < 5$. Graph the solution set on a number line, and write the solution in set-builder notation.

Section 1.7 Objective 3 Solving Compound Inequalities in One Variable

Fill in the blanks:

A **compound inequality** consists of two inequalities that are joined together using the words _____ or _____ .

A number is a solution to a compound inequality involving the word "and" if that number is a solution to _____ inequalities.

A number is a solution to a compound inequality involving the word "or" if that number is a solution to _____ inequality.

Write down the **Guidelines for Solving Compound Linear Inequalities.**

Step 1.

Step 2.

Step 3.

Work through Example 5 and take notes here. Watch the video to check your solution.

Solve $2x-7<-1$ *and* $3x+5\geq 3$. Write the solution in interval notation.

Work through Example 6 and take notes here. Watch the video to check your solution.

Solve $1-3x \geq 7$ *or* $3x+4>7$. Write the solution in interval notation.

Work through Example 7 and take notes here. Watch the video to check your solution.

Solve $3x-1<-7$ *and* $4x+1>9$.

Section 1.7 Objective 4 Solving Linear Inequality Word Problems

Write down the 7-step **Strategy for Solving Application Problems Involving Linear Inequalities**

Step 1.

Step 2.

Step 3.

Step 4.

Step 5.

Step 6.

Step 7.

Work through Example 8 and take notes here:

Suppose you rented a forklift to move a pallet with 70-lb blocks stacked on it. The forklift can carry a maximum of 2,535 lbs. If the pallet weighs 50 lbs. by itself with no blocks, how many blocks can be stacked on a pallet and lifted by the forklift?

Work through Example 9 and take notes here. Watch through the video to check your solution.

The perimeter of a rectangular fence is to be at least 80 feet and no more than 140 feet. If the width of the fence is 12 feet, what is the range of values for the length of the fence?

Work through Example 10 and take notes here. Watch through the video to check your solution.

Suppose that a wireless phone company offers a monthly plan for a smartphone that includes 4 GB of data for $110. Each additional GB of data (or fraction thereof) costs $15. If Antoine subscribes to this plan, how many GB of data can he use each month while keeping his total monthly cost to no more than $180 (before taxes)?

Work through Example 11 and take notes here. Watch through the video to check your solution.

An online retailer sells plush toys. She purchases the toys at the wholesale price of $2.75 each and sells them online for $7.75. If her fixed costs are $900, how many plush toys must she sell in order to make a profit? Solve the inequality $R > C$ with R as her revenue and C as her cost.