Lesson 7: Literal Equations, Inequalities, and Absolute Value

In this lesson, we first look at literal equations, which are equations that have more than one variable. Many of the formulas we use in everyday life are literal equations.

We then look at algebraic inequalities, how they are written, how to solve them and how to represent the solution set graphically and using interval notation.

Finally, we look at algebraic expressions, equations, and inequalities that involve absolute value.

Mini-Lesson

Section 7.1: Literal Equations

Section 7.2: Linear Inequalities

Section 7.3: Solving Linear Inequalities

Section 7.4: Solving Inequalities – Applications

Section 7.5: Compound Inequalities

Section 7.6: Absolute Value

Lesson 7 Checklist

Component	Required? Y or N	Comments	Due	Score
Mini-Lesson				
Online Homework				
Online Quiz				
Online Test				
Practice Problems				
Lesson Assessment				

Name: _____ Date: _____

Mini-Lesson 7

Section 7.1: Literal Equations

LITERAL EQUATIONS

What are literal equations? _____

What does it mean to "solve" a literal equation? _____

Example 1: Solve for b in each of the following equations.

$2b = 8$ $\qquad$ $ab = c$

$5 + b = 9$ $\qquad$ $a + b = c$

$2b + 1 = 13$ $\qquad$ $ab + c = d$

SOLVING LITERAL EQUATIONS

Example 2: Solve the following equation for c: $4abc = 32$

Example 3: Solve the following equation for B: $A = B + C + D$

Example 4: Solve the following equation for x: $y = mx + b$

Example 5: Solve the following equation for y: $3x + 4y = 20$

Example 6: Solve the following equation for y: $x - y = 5$

Example 7: Solve the following equation for C: $F = \frac{9}{5}C + 32$

You Try

1. Solve the following equation for y: $3xyz = 9$

2. Solve the following equation for y: $5x - y = 2$

Section 7.2: Inequalities

DEFINITION: An algebraic inequality is a mathematical sentence connecting an expression to a value, variable, or another expression with an inequality sign.

Symbol	In words	Examples
$<$		
$\leq$		
$>$		
$\geq$		
$\neq$		

Verify that a given value is a solution to the inequality.

DEFINITION: A solution to an inequality is a value that makes the inequality true.

Example 1: Determine whether the number 4 is a solution to the following inequalities.

$x > 1$ $x < 1$ $x \leq 9$ $x > 4$ $x \geq 4$

THE SOLUTION SET OF A LINEAR INEQUALITY

Inequality	Graph	Interval Notation
$x > 2$	$-\infty$ ∞	
$x \geq 2$	$-\infty$ ∞	
$x < 2$	$-\infty$ ∞	
$x \leq 2$	$-\infty$ ∞	

Translate a statement into an inequality.

Example 2: Write an inequality to represent the following situation. Clearly indicate what the variable represents.

a. In order to go on the ride, a child must be more than 48 inches tall.

b. Jordan can spend at most $10 on lunch.

You Try

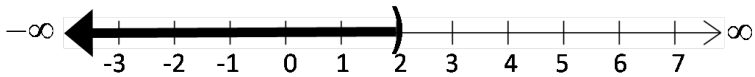
3. Which of the following values are in the solution set for $n < 5$?

$n = -3$ $n = 0$ $n = 4.99$ $n = 5$ $n = 12$

4. Translate the statement into an inequality.

Children age 2 and under are free at Disneyland.

5. Complete the table below:

Inequality	Graph	Interval Notation
$x \geq -3$		
		$(-\infty, 11]$
		

Section 7.3: Solving Linear Inequalities

STEPS FOR SOLVING A LINEAR INEQUALITY

1. Simplify each side of the inequality. Remove parenthesis if necessary. Collect like terms.
2. Add or subtract terms on each side of the inequality so that all terms containing the variable are on one side and all constant terms are on the other side.
3. Simplify each side of the inequality by combining like terms.
4. Multiply or divide on both sides to isolate the variable. CAUTION*!!! If you multiply or divide both sides of an inequality by a* ***negative number****, you have to reverse the inequality sign.*
5. Check by substituting the solution (*endpoint and a value from the solution set*) into the original inequality.

Solve the inequality, check your answer, and graph the solution on a number line.

Example 1: Solve the inequality, check your answer, and graph the solution on a number line.

$3x > x + 6$

Graph:

$-\infty \longleftrightarrow \infty$

Interval Notation: _____

Example 2: Solve the inequality and graph the solution on a number line.

$3 - 5a \leq 2(a + 5)$

Graph:

$-\infty \longleftrightarrow \infty$

Interval Notation: _____

Example 3: Solve the inequality and graph the solution on a number line.

$-5(x+2) \geq -3(x+4)$

Graph:

$-\infty \longleftrightarrow \infty$

Interval Notation: _____

You Try

Solve the inequality, check your answer, and graph the solution on a number line.

6. $7 - 4x \geq -5$

Graph:

$-\infty \longleftrightarrow \infty$

Interval Notation: _____

7. $6x + 13 < 5(2x - 3)$

Graph:

$-\infty \longleftrightarrow \infty$

Interval Notation: _____

Section 7.4: Solving Inequalities – Applications

For each problem, underline the Givens and circle the Goal. Form a Strategy, Solve, and Check. Write your answer in a complete sentence.

Example 1: The cost of tuition is $76 per credit hour. Write an *inequality* that can be used to determine the number of credit hours a student can take for under $1000. Solve the inequality, and write your answer in a complete sentence.

Example 2: Sean owns a business that builds computers. The fixed operating costs for his business are $2,700 per week. In addition to fixed operating costs, each computer costs $600 to produce. Each computer sells for $1,500. Write an *inequality* that can be used to determine the number of computers Sean needs to sell in order make a profit each week. Solve the inequality, and write your answer in a complete sentence.

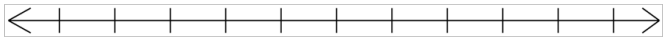
You Try

To solve this problem, first underline the Givens and circle the Goal. Form a strategy, solve, check, and write your answer in a complete sentence.

8. Gasoline costs $3.79 per gallon. Write an *inequality* that can be used to determine how many gallons of fuel can be purchased for under $20. Solve the inequality, and write your answer in a complete sentence.

Section 7.5: Compound Inequalities

THE SOLUTION SET OF A COMPOUND INEQUALITY

Inequality	Graph	Interval Notation
$-1 < x < 2$	$-\infty$ ∞	
$-1 \le x \le 2$	$-\infty$ ∞	
$-1 \le x < 2$	$-\infty$  ∞	

Verify that a given value is a solution to the inequality.

Example 1: Which of the following values are in the solution set for $-3 \le n < 5$?

$n = -5$ $n = -3$ $n = 0$ $n = 4.99$ $n = 5$ $n = 12$

$-\infty$ ∞

Translate a statement into an inequality.

Example 2: Write a compound inequality to represent the following situation. Clearly indicate what the variable represents.

a. A number is greater than or equal to 5 but less than 8.

b. My car's tank can hold a maximum of 20 gallons of gas.

You Try

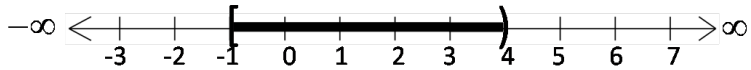
9. Which of the following values are in the solution set for $-8 < w < 2$?

$w = -11$ $w = -8$ $w = -5$ $w = 0$ $w = 2$ $w = 2.1$

10. Translate the statement into a compound inequality.

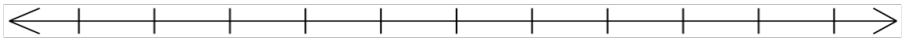
A number is greater than 0, and less than or equal to 8.

11. Complete the table below:

Inequality	Graph	Interval Notation
$5 < x < 11$		
		(–3, 1]
		

Section 7.6: Absolute Value

Absolute Value

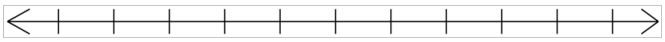
$-\infty$  ∞

Example 1: Evaluate the following: $|2| =$ $|-2| =$

Absolute Value Equations

Determine the solution to each of the following equations.

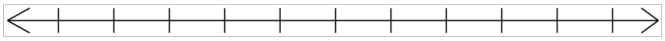
Example 2: $|x| = 2$ $|x| = 3$ $|x| = -4$

Absolute Value Inequalities	
$\lvert x\rvert < 2$	List some values in the solution set: _____ $-\infty$ ∞
$\lvert x\rvert \le 2$	List some values in the solution set: _____ $-\infty$ ∞
$\lvert x\rvert > 2$	List some values in the solution set: _____ $-\infty$  ∞

You Try

12. Determine the solution to the equation $|x| = 8$.

13. Absolute Value Inequalities:

$\lvert x\rvert < 3$	List some values in the solution set: _____ $-\infty$  ∞
$\lvert x\rvert \geq 3$	List some values in the solution set: _____ $-\infty$ ∞