Lesson 12: Properties of Inequalities

Classwork

Example 1

Preserves the inequality symbol:

Reverses the inequality symbol:

Station 1

Die 1	Inequality	Die 2	Operation	New Inequality	Inequality Symbol Preserved or Reversed?
-3	$<$	5	Add 2	$-3+2<5+2$ $-1<7$	Preserved
			Add -3		
			Subtract 2		
			Subtract -1		
			Add 1		

Examine the results. Make a statement about what you notice, and justify it with evidence.

Station 2

Die 1	Inequality	Die 2	Operation	New Inequality	Inequality Symbol Preserved or Reversed?
-3	$<$	4	Multiply by -1	$(-1)(-3) < (-1)(4)$ $3 > -4$	Reversed
			Multiply by -1		
			Multiply by -1		
			Multiply by -1		
			Multiply by -1		

Examine the results. Make a statement about what you notice and justify it with evidence.

Station 3

Die 1	Inequality	Die 2	Operation	New Inequality	Inequality Symbol Preserved or Reversed?
-2	$>$	-4	Multiply by $\frac{1}{2}$	$(-2)\left(\frac{1}{2}\right) > (-4)\left(\frac{1}{2}\right)$ $-1 > -2$	Preserved
			Multiply by 2		
			Divide by 2		
			Divide by $\frac{1}{2}$		
			Multiply by 3		

Examine the results. Make a statement about what you notice, and justify it with evidence.

Station 4

Die 1	Inequality	Die 2	Operation	New Inequality	Inequality Symbol Preserved or Reversed?
3	$>$	-2	Multiply by -2	$3(-2) > (-2)(-2)$ $-6 < 4$	Reversed
			Multiply by -3		
			Divide by -2		
			Divide by $-\frac{1}{2}$		
			Multiply by $-\frac{1}{2}$		

Examine the results. Make a statement about what you notice and justify it with evidence.

Exercise

Complete the following chart using the given inequality, and determine an operation in which the inequality symbol is preserved and an operation in which the inequality symbol is reversed. Explain why this occurs.

Inequality	Operation and New Inequality Which Preserves the Inequality Symbol	Operation and New Inequality Which Reverses the Inequality Symbol	Explanation
$2 < 5$			
$-4 > -6$			
$-1 \leq 2$			
$-2 + (-3) < -3 - 1$			

Lesson Summary

When both sides of an inequality are added or subtracted by a number, the inequality symbol stays the same, and the inequality symbol is said to be _____.

When both sides of an inequality are multiplied or divided by a positive number, the inequality symbol stays the same, and the inequality symbol is said to be _____.

When both sides of an inequality are multiplied or divided by a negative number, the inequality symbol switches from $<$ to $>$ or from $>$ to $<$. The inequality symbol is _____.

Problem Set

1. For each problem, use the properties of inequalities to write a true inequality statement.
   The two integers are -2 and -5.
   a. Write a true inequality statement.
   b. Subtract -2 from each side of the inequality. Write a true inequality statement.
   c. Multiply each number by -3. Write a true inequality statement.

2. On a recent vacation to the Caribbean, Kay and Tony wanted to explore the ocean elements. One day they went in a submarine 150 feet below sea level. The second day they went scuba diving 75 feet below sea level.
   a. Write an inequality comparing the submarine's elevation and the scuba diving elevation.
   b. If they only were able to go one-fifth of the capable elevations, write a new inequality to show the elevations they actually achieved.
   c. Was the inequality symbol preserved or reversed? Explain.

3. If a is a negative integer, then which of the number sentences below is true? If the number sentence is not true, give a reason.
   a. $5 + a < 5$
   b. $5 + a > 5$
   c. $5 - a > 5$
   d. $5 - a < 5$
   e. $5a < 5$
   f. $5a > 5$
   g. $5 + a > a$
   h. $5 + a < a$
   i. $5 - a > a$
   j. $5 - a < a$
   k. $5a > a$
   l. $5a < a$