



# Multiplying Inequalities by Negative Numbers

## Student Activity

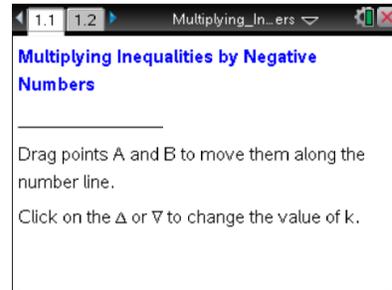
Name \_\_\_\_\_

Class \_\_\_\_\_

Open the TI-Nspire document

*Multiplying\_Inequalities\_by\_Negative\_Numbers.tns.*

Note that  $1 < 5$ , but  $-1 > -5$ . This activity lets you explore how pairs of numbers are ordered on a number line. You will also learn about the resulting effects of multiplying both numbers by positive or negative numbers.



Move to page 1.2.

Press **ctrl** and **ctrl** to navigate through the lesson.

- How is the inequality between  $A$  and  $B$  related to the inequality between  $A'$  and  $B'$ ?
  - How is  $A'$  related to  $A$  on the number lines?
- By clicking on the up or down symbol on the screen ( $\Delta$  or  $\nabla$ ), change the multiplier  $k$  to 3.
  - What is the relationship between  $A$  and  $B$  related to the inequality between  $A'$  and  $B'$ ?
  - How is  $A$  related to  $A'$  and  $B$  to  $B'$ ?
- Move point  $A$  from  $-5$  to  $5$ , and describe the changes that occur
  - Move point  $B$  to  $5$ , and describe the changes that occur
- Vary the value of the multiplier  $k$  between  $-4$  and  $4$ . Identify all values for  $k$  in the following.
  - $A' = B'$
  - $A' = A, B' = B$
  - $A'$  and  $B'$  are in the same order as  $A$  and  $B$
  - $A'$  and  $B'$  are in a different order than  $A$  and  $B$
- Sara multiplied both sides of the inequality  $1 < 5$  by  $-1$ . Her answer was  $-1 < -5$ . Is she correct? Explain.



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6. Complete the table below. For each description, state the inequality in column 2. Then describe how each value of  $k$  affects the relation on the right. The first row is partly done for you.

Description	Inequality	$k = 3$	$k = 0$	$k = 2$	$k = -4$
Point $A$ is left of point $B$	$1 < 5$	$3 < 15$			
Point $A$ is right of point $B$ and point $B$ is less than 0					
Point $A$ is negative and point $B$ is positive					
Both points $A$ and $B$ are negative					

7. In general, what value(s) of  $k$  will result in:
- The relationship in both inequalities being the same?
  - The inequality symbol on the left becoming an equals sign on the right?
  - The relationship in the inequalities being reversed?
8. Write an inequality comparing the two given numbers. Then complete the table using what you have learned about working with inequalities.

Numbers	Inequality	Multiply both sides by $-3$	Multiply both sides by $4$	Add 2 to both sides	Subtract 3 from both sides	Divide both sides by $-1$
$-1, -10$	$-10 < -1$					
$2, -10$						
$-4, -8$						

9. Tell whether the statement is always true, sometimes true, or never true. Give a reason for your thinking. (It might help to choose values for  $a$ ,  $b$ , and  $c$  and test them with or without the .tns file.)
- If  $a < b$ , then  $ac > bc$ .
  - If  $a \geq b$ , then  $b \leq a$ .