

Lesson 12: Properties of Inequalities

Fill in the Inequality Symbols:

Less than:

Greater than:

Less than or equal to:

Greater than or equal to:

Fill in the following definitions:

Preserves the inequality symbol:

Reverses the inequality symbol:

Directions: Roll each die, record the numbers in the first and third columns. Write an inequality symbol that makes the statement true. Perform the operation that is stated in the fourth column, and write a new inequality statement. Determine if the inequality symbol is preserved or reversed when the operation is performed. Repeat this process four times at each station.

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		

Fill in the blanks on the statement below using your results.

When a number is added or subtracted to both sides of the inequality, the symbol _____,

and the inequality symbol is _____.

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		

Fill in the blanks on the statement below using your results.

When both numbers are multiplied by -1, the symbol _____, and the inequality symbol is _____.

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		

Fill in the blanks on the statement below using your results.

When both numbers on either side of the inequality symbol are multiplied or divided by a positive number, the symbol

_____ , and the inequality symbol is _____.

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 $-\frac{1}{2}$		

Fill in the blanks on the statement below using your results.

When both numbers on either side of the inequality symbol are multiplied or divided by a negative number, the symbol

_____ and the inequality symbol is _____.

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 _____.

Ch.6 Lesson 8 ~ HOT Problems

Name _____

Date _____

Write and solve an inequality for each statement:

- 1) Three times a number increased by four is less than -62.

Inequality: _____ Solution: _____

- 2) The quotient of a number and -5 increased by one is at most 7.

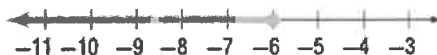
Inequality: _____ Solution: _____

- 3) Tyler needs at least \$205 for a new video game system. He has already saved \$30. He earns \$7 an hour at his job. Write and solve an inequality to find how many hours he will need to work to buy the system. Interpret the solution.

Inequality: _____ Solution: _____

Interpretation: _____

- 4) Which of the following inequalities has the solution set shown below?



Ⓕ $-2x - 5 < 7$

Ⓖ $-2x - 5 > 7$

Ⓗ $-2x - 5 \leq 7$

Ⓘ $-2x - 5 \geq 7$

- 5) In five games, you score 16, 12, 15, 13, and 17 points. How many points must you score in the sixth game to have an average of at least 15 points?

- 6) Compare the solutions to $2x + 8 > 18$ and $2x + 8 \leq 18$.

- 7) Catie is starting a babysitting business. She spent \$26 to make signs to advertise. She charges an initial fee of \$5 and then \$3 for each hour of service. Write and solve an inequality to find the numbers of hours she will have to babysit to make a profit. Interpret the solution.

Inequality: _____ **Solution:** _____

Interpretation: _____

Lesson 13: Inequalities

Opening Exercise: Writing Inequality Statements

Tarik is trying to save \$265.49 to buy a new tablet. Right now, he has \$40 and can save \$38 a week from his allowance.

Write and evaluate an expression to represent the amount of money saved after ...

2 weeks

3 weeks

4 weeks

5 weeks

6 weeks

7 weeks

8 weeks

When will Tarik have enough money to buy the tablet?

Write an inequality that will generalize the problem.

Example 1: Evaluating Inequalities—Finding a Solution

The sum of two consecutive odd integers is more than -12 . Write several true numerical inequality expressions.

The sum of two consecutive odd integers is more than -12 . What is the smallest value that will make this true?

- a. Use the following information to write an inequality that can be used to find the smallest value that will make the statement true.

$x = \text{Integer}$

$2x + 1 = \text{Odd integer}$

$2x + 3 = \text{Next consecutive odd integer}$

- b. Solve the inequality written in part (a).
- c. What is the smallest value that will make this true?

Exercises

1. Connor went to the county fair with \$22.50 in his pocket. He bought a hot dog and drink for \$3.75 and then wanted to spend the rest of his money on ride tickets, which cost \$1.25 each.
- a. Write an inequality to represent the total spent where r is the number of tickets purchased.

b. Connor wants to use this inequality to determine whether he can purchase 10 tickets. Use substitution to show whether he will have enough money.

c. What is the total maximum number of tickets he can buy based upon the given information?

2. Write and solve an inequality statement to represent the following problem:

On a particular airline, checked bags can weigh no more than 50 pounds. Sally packed 32 pounds of clothes and five identical gifts in a suitcase that weighs 8 pounds. Write an inequality to represent this situation. Solve the inequality and write what it means.

Lesson 14: Solving Inequalities

Opening Exercise

The annual County Carnival is being held this summer and will last $5\frac{1}{2}$ days. Use this information and the other given information to answer each problem.

You are the owner of the biggest and newest roller coaster called the Gentle Giant. The roller coaster costs \$6 to ride. The operator of the ride must pay \$200 per day for the ride rental and \$65 per day for a safety inspection. If you want to make a profit of at least \$1,000 each day, what is the minimum number of people that must ride the roller coaster?

Write an inequality that can be used to find the minimum number of people, p , which must ride the roller coaster each day to make the daily profit.

Solve the inequality and interpret the solution

Example 1

A youth summer camp has budgeted \$2,000 for the campers to attend the carnival. The cost for each camper is \$17.95, which includes general admission to the carnival and two meals. The youth summer camp must also pay \$250 for the chaperones to attend the carnival and \$350 for transportation to and from the carnival. What is the greatest number of campers who can attend the carnival if the camp must stay within its budgeted amount? Write, solve and interpret the solution.

Example 2

The carnival owner pays the owner of an exotic animal exhibit \$650 for the entire time the exhibit is displayed. The owner of the exhibit has no other expenses except for a daily insurance cost. If the owner of the animal exhibit wants to make more than \$500 in profits for the $5\frac{1}{2}$ days, what is the greatest daily insurance rate he can afford to pay? Write, solve and interpret the solution.

Example 3

Several vendors at the carnival sell products and advertise their businesses. Shane works for a recreational company that sells ATVs, dirt bikes, snowmobiles, and motorcycles. His boss paid him \$500 for working all of the days at the carnival plus 5% commission on all of the sales made at the carnival. What was the minimum amount of sales Shane needed to make if he earned more than \$1,500?

Lesson 15: Graphing Solutions to Inequalities

Exercise 1

- Two identical cars need to fit into a small garage. The opening is 23 feet 6 inches wide, and there must be at least 3 feet 6 inches of clearance between the cars and between the edges of the garage. How wide can the cars be? Draw a picture to help. Graph the answer on a number line.

Example

A local car dealership is trying to sell all of the cars that are on the lot. Currently, there are 525 cars on the lot, and the general manager estimates that they will consistently sell 50 cars per week. Estimate how many weeks it will take for the number of cars on the lot to be less than 75.

Write an inequality that can be used to find the number of full weeks, w , it will take for the number of cars to be less than 75. Since w is the number of full or complete weeks, $w = 1$ means at the end of week 1.

Solve and graph the inequality.

Interpret the solution in the context of the problem.

Verify the solution.

Exercise 2

2. The cost of renting a car is \$25 per day plus a one-time fee of \$75.50 for insurance. How many days can the car be rented if the total cost is to be no more than \$525?
- Write an inequality to model the situation.
 - Solve and graph the inequality.
 - Interpret the solution in the context of the problem.

Additional Exercises

For each problem, write, solve, and graph the inequality, and interpret the solution within the context of the problem.

3. Mrs. Smith decides to buy three sweaters and a pair of jeans. She has \$120 in her wallet. If the price of the jeans is \$35, what is the highest possible price of a sweater, if each sweater is the same price?

4. The members of the Select Chorus agree to buy at least 250 tickets for an outside concert. They buy 20 fewer lawn tickets than balcony tickets. What is the least number of balcony tickets bought?
5. Samuel needs \$29 to download some songs and movies on his MP3 player. His mother agrees to pay him \$6 an hour for raking leaves in addition to his \$5 weekly allowance. What is the minimum number of hours Samuel must work in one week to have enough money to purchase the songs and movies?