Name: ______________________________________ Date: ___________________

MODELING WITH INEQUALITIES
COMMON CORE ALGEBRA I

Just as we can solve many real-world problems involving linear equations, there are plenty of situations when an inequality is called for instead. In this lesson, we will practice setting up and solving inequalities based on real-world scenarios.

***Exercise* #1:** A school is taking a field trip with 195 students and 10 adults. Each bus can hold at most 40 students. We need to determine the smallest number of busses needed for the trip.

(a) Using a guess-and-check method, determine the minimum number of busses needed. Show evidence of your thinking.

(b) Let n be the number of busses taken on the trip. Write and solve an inequality that models this problem based on n.

It is important that you are able to deal with the phrases **at least** and **at most**. Let's try to do some translating.

***Exercise* #2:** Translate each of the following phrases into an inequality. Do not solve.

(a) When three times a number n is increased by 12, the result is at least 32.

(b) The sum of two consecutive even integers, n and $n + 2$, is at most 8.

***Exercise* #3:** Find all numbers for which five less than half the number is at least seven. Set up an inequality, carefully define expressions and solve the inequality.

***Exercise* #4:** Find all numbers such that twice the sum of the number and eight is at most four. Solve this problem by setting up and solving an inequality.

Let's try to model a real world scenario with an inequality.

***Exercise* #5:** A stadium is steadily filling up with people. It holds at most 2,500 people. Of the 2,500 seats, 350 are reserved for special guests. When the doors open, people fill the seats at a rate of 10 seats per minute.

(a) If *m* represents the number of minutes that have gone by, fill out the following chart for how many seats have either been taken or are reserved.

m (minutes)	Seats Filled	Seats Reserved	Total
1		350	
5		350	
50		350	
100		350	

(b) Write an **expression** that calculates the number of seats filled and reserved in terms of the minutes, *m*, that have passed.

(c) Write an inequality that shows times, in minutes, before the stadium is over-filled. Solve the inequality.

(d) At the rate that people are entering, will any more people be able to find a seat after 4 hours? Justify your yes/no answer.

(e) To cover the cost of the stadium, labor, and other overhead costs, stadium organizers must raise at least $39,000 from ticket sales. If they sell tickets at $25 each, will they have covered the cost if 1,250 tickets are sold?

(f) Let *n* represent the number of tickets sold. Write and solve an inequality that represents all values of *n* that guarantee the organizers will cover their ticket sales.

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MODELING WITH INEQUALITIES
COMMON CORE ALGEBRA I HOMEWORK

FLUENCY

1. Translate each of the following phrases into an inequality, then find the solution set by solving the inequality.

(a) When 4 times a number *n* is decreased by 3 it's at most 21.

(b) When 6 less than 3 times a number is increased by 2, it's at least 5 times the same number decreased by 8.

(c) Find all numbers such that a third of a number increased by half that number is at least 3 less than that same number.

(d) The sum of 2 consecutive integers is at most the difference between nine times the smaller and 5 times the larger.

(e) The sum of two consecutive even integers is at most seven more than half the sum of the next two consecutive even integers.

(f) A fish tank can hold at most 315 gallons of water. If a hose is filling the fish tank at a rate of 15 gallons every 10 minutes, how many *hours* can the hose be left on before the tank overflows?

APPLICATIONS

2. A 2.2 GB game is being downloaded onto your laptop. When you have downloaded half a gigabyte, you notice that your computer has been downloading at a rate of .01GB/min.

   (a) Write an inequality that represents at least how many minutes *m* it will take to download the whole game.

   (b) At this point you also realize your computer only has 2 hours of battery life left and you've forgotten your charger. Will there be enough time to download the entire game? Don't forget you've already downloaded some of it.

   (c) If, after turning off a few applications, the download speed increases to .015GB/min will you be able to download the entire game now?

REASONING

3. At an amusement park there's only enough room for 4500 people to be in it at any time. The manager has also worked out that there needs to be 2800 people in the park to make a profit after all the overhead costs and employee pay. If people are entering the park at a rate of 12 people a minute and there are 850 people in the park currently *between* how many minutes should the door stay open to let guests in?

   (a) Translate the scenario above into a compound inequality involving the number of minutes, *m*, that the door has been open. Take into account both the fact that there must be a minimum of 2800 people and a maximum of 4500 people.

   (b) Rewrite the inequality you found in part (a) using the AND connector and then solve the compound inequality.

   (c) Write the solution set as a single statement using interval notation.