Solving Inequalities by Balancing

Just as you solve equations by keeping the two sides of the equation balanced, you can solve inequalities by keeping the two sides of the inequality unbalanced.

EXPLORE IMBALANCE

1. Open **Inequalities by Balancing.gsp.**

On page 1 the pans are balanced. Use this page to review the rules for what you can do without affecting the balance.

Q1 Drag a 1 from the storage area to each pan. Then drag a $-x$ to each pan. Do these steps disturb the balance of the pans? This is Rule 1. Write it down.

Q2 Drag an x and a -1 to each pan. Remove the x and $-x$ from the left pan. Remove the 1 and -1 from the right pan. When you remove two opposite objects from a pan, does it disturb the balance? This is Rule 2. Write it down.

Q3 On page 2 the pans are not balanced. Write down the inequality the pans represent.

As long as you follow the rules, you will not disturb the state of the pans.

Q4 Move objects on and off the pans (always following the two rules) until you get a single x all by itself on one pan and only numbers on the other pan. Write down this inequality.

Q5 Page 3 has a different arrangement, but the pans are still unbalanced. Use the two rules again to solve this inequality. Write down the original inequality, the steps you use, and the final inequality (when a single x is left on a pan by itself).

Rule 3 for inequalities is more limited than it is for equations. Be sure to use it to multiply or divide only by numbers that you know are positive.

Q6 On page 4 the pans are balanced again. This time the objects are arranged in two identical stacks on each pan. What happens if you remove one complete stack from each pan? What arithmetic operation does this correspond to? This is Rule 3. Write it down.

Q7 Page 5 has unbalanced pans. Write down the inequality. Use the rules to get a single x on one pan and only numbers on the other. Write down the solution.

EXPLORE MORE

You can adjust the value of x if you want. Press the *Show x* button and then move the slider.

Q8 Page 6 has empty pans. Create your own problem by dragging objects onto the pans. Make sure this is a problem that can be solved without fractions. Save your problem, and ask a classmate to try it.