

Balancing with Balloons: Solving Equations with Negatives

Description: Students use a Sketchpad pan balance model to solve a sequence of equations with positive numbers and variables, represented by weights, and negative numbers and variables, represented by balloons. As the problems increase in difficulty, students transfer the manipulation of the pan balance to solving equations independent of the balance.

Technology Strength: Positive numbers and variables are represented by weights; negative numbers and variables are represented by balloons. Both weights and balloons can be dragged to and from the pans of a balance, and balloons pull up on the pans as much as weights push down on them. The pan balance tilts when the weight on the two sides is unequal, reinforcing the idea of keeping an equation balanced by adding or removing the same values from both sides. The value of x can be reset. An example page presents a step-by-step animation, and a practice page provides an infinite number of randomly generated linear equations to solve.

Objectives: Learn how to solve linear equations with negative numbers and negative variables by balancing

Prerequisites: Experience with solving equations with positive numbers and variables; familiarity with operations on integers

Suggested Grade Level: 6 to 8

Sketchpad Level: Beginning

Suggested Duration: 45 minutes. The time can be extended for students to use the page "Practice."

Suggested Classroom Setting: Whole Class, Student Pairs. This activity, designed for use by student pairs, can be easily modified for whole-class use.

Preparation: Review the Activity Notes. Preview the student sketch. Work through the steps on the worksheet and make a copy of the worksheet for each student.

Materials: None

Student Worksheet(s): Balancing with Balloons

Student Sketch: Balancing with Balloons.gsp

Presentation Sketch: None

Vocabulary: Balance, equation, solution to equation, positive, negative

Sketchpad Version: GSP5

Using the Sketch:

The model displays a pan balance and a storage bin with weights that represent positive numbers and variables and balloons that represent negative numbers and variables. The teacher first introduces the idea of building an equation. Page “Balance” has a default value of $x = 4$, which can be represented visually by dragging weights from the storage bin and symbolically by using the **Text** tool. After adding a -1 -balloon to both sides, students see that a -1 -balloon and a 1 -weight add to zero. Removing them together keeps the balance level, as shown in the first illustration.

Students then work through a sequence of problems, such as the one shown in the second illustration, using the pan balance to solve each equation. Students add or remove the same number of identical weights or balloons on both sides, remove pairs that add to zero, and divide both sides into an equal number of groups, with the goal of achieving a balance with a single x isolated in one pan.

As students manipulate the model, they record the intermediate equations on their worksheet. The third illustration shows the page “Example,” which can be used to provide additional guidance either to the entire class or to individual pairs that need more support. In addition, page “Practice” provides randomly generated equations in symbolic form for students to solve using the the idea of balancing independent of the model.

Sketch Tips:

Sketch Tips show skills needed in this activity, and the step at which the skill is first used.

Sketch Tip	Tip Sheet or Tip Video
Step 1: Change to a different page using page tabs	Moving Between Pages
Step 2: Select, deselect, and drag objects with the Arrow tool	Using the Arrow Tool