

Leap Frog Lesson

Standards:

A-CED 1 Create Equations and inequalities in one variable and use them to solve problems. *Include equations arising from linear and quadratic functions, and single rational and exponential functions.*

A-REI 1 Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A-REI 3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A-REI 4 Solve quadratic equations in one variable.

- a. Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.
- b. Solve quadratic equations by inspection (e.g., for $x^2 = 49$), taking square roots, completing the square, the quadratic formula, and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b .

Materials: Leap Frog Mat, Counters (two different colors), Pencil, Paper, Graph Paper

Procedures:

Part I

After reading Two of Everything, students are familiar with the magic pot and the Haktaks. Review with students the pattern from the story. (everything that goes into the pot doubles)

Introduce the game of Leap Frog (the Haktaks' favorite game).

Go over the rules of Leap Frog with students and have them work in pairs to solve the puzzle. Stop students if they are having difficulties and remind them of the strategies, discussed in class, for solving problems. Lead students to discover that solving a simpler problem may be able to help them solve this larger problem.

Allow students to solve the problem. When students begin to discover their solutions, have them write in their notebooks or journals what they did to solve the problem and any patterns they noticed as they were solving the problem. Have students use words from word wall or word bank in their writing.

Discuss results, having students read from journals.

Part II

Remind students of the Leap Frog game played a day earlier. Ask them to reflect on what they learned from the experience by looking at the writing in their journals.

Share. Tell student that they are going to play the game again – with a partner. First they will play the game with one pair of frogs (as they may have done yesterday). However, this time they need to keep track of the number of jumps and slides for each game they play. After playing the game with one pair of frogs, students will play with two pairs, then three pairs and finally four pairs of frogs. Students will record their results as data in a T-table as shown below:

Pairs of Frogs	Slides	Jumps	Total # of Moves
1			
2			
3			
4			

Part III

Ask students to see if they can find how many total moves there would be for 5 pairs of frogs? 10 pairs? 20 pairs? Have students write in journals how they know what they know (explain). Again, have students use words from word walls or word banks in journal entries. Have students share with one another to refine ideas, then come together as a class to discuss.

Lead students to look for patterns in the extended T-table they made.

Follow up with a discussion of all patterns. Ask students to find how many moves for each 5 pairs of frogs.

Finally, give the following to students to solve:

The Haktaks love leapfrog so much, they have asked several friends to join them in a game. It took the Haktaks and their friends 80 moves to complete the leapfrog puzzle. How many people were involved in the game? Show your mathematical thinking using models and algebraic thinking.