TIMSS

NAEP

Standard Indicator
8.3.1

What's Your Solution?

Purpose

Students will write and solve linear equations and inequalities in one variable, interpret the solution or solutions in their context, and verify the reasonableness of the results.

Materials

For the teacher: algebra tiles, chalkboard, chalk, tape
For each group of students: copy of Black Line Master (BLM) *Solving the Unknown,* pencils

Activity

A. Class Activity

1. Review with the class the difference between *linear equations* and *inequalities*.
2. Show students how to set up and solve the linear equation $4 + 5x = 24$ using algebra tiles.
3. Draw a balance on the chalkboard and have students tape four unit tiles and five rectangle tiles on the left side of the balance and 24 unit tiles on the right side of the balance.
4. Ask students to remove four units from each side, leaving five rectangle tiles on the left side of the balance and 20 unit tiles on the right side of the balance.
5. Have students arrange the 20 unit tiles into five groups of four. Tell students to remove one rectangle tile from the left side of the balance and one unit group from the right side of the balance. Ask students to continue removing an equal number of rectangle tiles from the left side and unit groups from the right side until only one rectangle remains.
6. Explain to students that the single rectangle represents the unknown value x and that since the left side of the balance equals the right side of the balance, x is equal to 4.
7. Show and explain to students how to solve the equation on paper.
8. Ask for a student volunteer to check the solution by substituting 4 for x in the original equation.
9. Write the inequality $2x + 5 \leq 13$ on the chalkboard and read the mathematical sentence aloud to the class.
10. Explain to students that an inequality is a mathematical sentence that describes the relationship between two quantities that are not equal.
11. Show students how to solve the inequality by writing each step on the chalkboard.

(continued)

EXTENDING THE ACTIVITY

Have groups of students create word problems and exchange them with other groups. Ask students to solve the problems and return them to their authors. Have groups share their problems and solutions with the entire class.

MEETING INDIVIDUAL NEEDS

Work with students who have difficulty understanding the difference between linear equations and inequalities; go through examples and underline the important words that determine the type of problem. Help them visualize solutions to inequalities by graphing them on a number line.

Standards Link
8.3.2

Activity (continued)

12. Explain that the value of the unknown, x, can be any real number less than or equal to 4.
13. Ask for a student volunteer to choose a few values for x to test the solution and remind students that multiplying or dividing by a negative value changes the direction of the inequality sign.
14. Read the following word problem to the class:
"A pine tree grows about three inches every day that it rains and around two inches every day that it does not. If the forecast is for sunshine over the next seven days, how many days of rain will be needed for the pine tree to grow approximately 41 inches?"
15. Ask for a student volunteer to come to the chalkboard to set up an equation or inequality for the problem. Allow the student to use algebra tiles or the "paper and pencil" method.
16. Review the equation and solution with the class. [$2 \times 7 + 3x = 41$, $x = 9$, 9 days of rain are needed] Have students check the answer and verify the answer makes sense in the context of the question.
17. Ask the student to explain how his/her answer would change if we needed to know how much rain would be required for the tree to grow at least 41 inches. [The equation would change to an inequality.]

B. Partner Activity

1. Divide students into groups of two and ask students to solve the problems on the BLM *Solving the Unknown* together. Remind students to check their solutions by substituting them back into the original problems.
2. After students finish the BLM, review the answers and offer individual help as needed.

Classroom Assessment

Basic Concepts and Processes

During the partner activity, discuss the following questions with students to gauge their understanding of the Standard Indicator:

- What is the difference between a *linear equation* and a *linear inequality*?
- How do you know when to write a linear inequality as opposed to a linear equation?
- What sign would you use in a linear inequality that uses the words *at least*?
- What sign would you use in a linear inequality that uses the words *no more than*?

Names: _____

Solving the Unknown

Write an equation or inequality for each problem below.
Solve each equation or inequality and check your answer.

1. You have been saving quarters, dimes, and nickels in your coin jar. You know that you have 35 dimes and 50 nickels. If you want to have at least $10 in your coin jar, how many quarters do you need?

2. It takes Jane 24 minutes to walk to school and back. It takes her 8 minutes to walk to the bank and back. Each week Jane spends 152 minutes on trips to school and the bank. If Jane makes 5 trips to school per week, how many trips does she make to the bank?

3. Jack works at a grocery store making $5 per hour. He also earns $16 a week mowing lawns. Jack is planning to work the next 3 weeks mowing and working at the grocery store. How many hours must he work in order to make a total of $248 to buy new tires for his car?

4. Mickey goes to the store for his mother to buy a gallon of milk. She gives him $3.50 and tells him he can spend whatever is left over on candy. Mickey wants to buy as many 5-cent pieces of candy as possible. The gallon of milk costs $2.99. How many 5-cent candy pieces can Mickey buy? How much money will Mickey have left?