Solving Multiplication and Division Equations

PART 1 *(14 MIN)*

Before the Intro animation

- What is the goal when solving equations?

After the Intro animation

- Why is the first step to arrange the tiles into 3 equal groups?
- What operation was used to solve $3x = 15$? Explain why.

Before solving the problem

- Into how many equal groups should you arrange the 8 tiles? Explain.

After solving the problem

- Explain how to check that $x = 4$ is the solution to the equation. Does it check?

PART 2 *(13 MIN)*

After the Intro animation

- Compare the process for solving an equation in which a number is being multiplied by the variable to the process for solving an equation involving addition or subtraction.
- What operation is used in the undo step of an equation in which a number is multiplied by the variable? Explain.

Before solving the problem

- Why is the equation $7w = 98$ used to find the number of weeks in 98 days?
- Explain how to get the variable by itself on one side of the equation.

After solving the problem

- What does the solution represent?

PART 3 *(13 MIN)*

After the Intro animation

- How does the undo step change for an equation in which the variable is divided by a number? Explain.

Before solving the problem

- What does the variable, m, represent?
- Explain why the solution to $m \div 60 = 14$ gives the number of minutes in 14 hours.

LESSON CHECK *(5 MIN)*

Key Concept

- Why do you use division to solve a one-step equation in which the variable is multiplied by a number?

LESSON GOAL

Solve one-step equations using multiplication and division of whole numbers.

Author Intent

Students begin by using algebra tiles to solve an equation of the form $px = q$. Students then solve one-step equations by multiplying or dividing each side of the equation by the same number. This lesson prepares students for solving equations with rational numbers.

PART 1 *(14 MIN)*

Objective: Solve one-step equations in the form $px = q$ using algebra tiles.

Questions for Understanding

Before the Intro animation

- What is the goal when solving equations? [The goal is to get the variable alone on one side of the equation.]

After the Intro animation

- Why is the first step to arrange the tiles into 3 equal groups? [The equation $3x = 15$ means that 3 equals groups of some size x equals 15 ones, so you divide the tiles into 3 equal groups to find out how many ones are in each group.]
- What operation was used to solve $3x = 15$? Explain why. [Division was used; each side was divided by 3 because $3x$ means 3 times x, so to get the variable alone on one side of the equation you divide each side by 3 to undo multiplying by 3.]

Before solving the problem

- Into how many equal groups should you arrange the 8 tiles? Explain. [There are two x tiles on the left side of the equation, so divide the 8 ones tiles on the right side into 2 equal groups.]

After solving the problem

- Explain how to check that $x = 4$ is the solution to the equation. Does it check? [Substitute 4 for x and check that a true equation results. $x = 4$ checks as the solution to the equation.]

Solution Notes

You can also use the partition feature of the Algebra Tiles tool to separate the groups on each side of the equation so that each equal group is in its own partition.

Got It Notes

Encourage students to check their solution as well.

PART 2 *(13 MIN)*

Objective: Solve one-step equations in the form $px = q$ by dividing each side of the equation by the same number.

Questions for Understanding

After the Intro animation

- Compare the process for solving an equation in which a number is being multiplied by the variable to the process for solving an equation involving addition or subtraction. [The process is the same: analyze, undo, simplify.]

- What operation is used in the undo step of an equation in which a number is multiplied by the variable? Explain. [Division is used in the undo step because it undoes multiplication.]

Before solving the problem

- Why is the equation $7w = 98$ used to find the number of weeks in 98 days? [There are 7 days in one week, so $7w$ represents the number of days in w weeks.]
- Explain how to get the variable by itself on one side of the equation. [Since the variable is being multiplied by 7, divide each side of the equation by 7 to get the variable by itself and maintain equality.]

After solving the problem

- What does the solution represent? [It represents the number of weeks in 98 days.]

Solution Notes

Point out to students that they should substitute their solution into the original equation when checking their answer.

Got It Notes

If students answer 112 for Exercise 1, remind them that a number written directly next to a variable means multiplication is being performed; they should divide each side by 8 to undo multiplying by 8.

PART 3 *(13 MIN)*

Objective: Solve one-step equations in the form $x \div p = q$ by multiplying each side of the equation by the same number.

Questions for Understanding

After the Intro animation

- How does the undo step change for an equation in which the variable is divided by a number? Explain. [Each side is multiplied by the number because multiplication undoes division.]

Before solving the problem

- What does the variable, m, represent? [It represents the number of minutes in 14 hours.]
- Explain why the solution to $m \div 60 = 14$ gives the number of minutes in 14 hours. [There are 60 minutes in one hour, so dividing the number of minutes in 14 hours by 60 equals 14.]

Got It Notes

Emphasize that students should begin by analyzing the equation to determine what operation is used on the side of the equation with the variable and what the inverse of that operation is.

LESSON CHECK *(5 MIN)*

Questions for Understanding

- Why do you use division to solve a one-step equation in which the variable is multiplied by a number? [Multiplication and division are inverse operations so dividing each side of an equation in which the variable is being multiplied by a number gets the variable alone on one side of the equation.]