

Algebra I Station Activities

for Texas Essential Knowledge and Skills (TEKS)



The classroom teacher may reproduce materials in this book for classroom use only.
The reproduction of any part for an entire school or school system is strictly prohibited.
No part of this publication may be transmitted, stored, or recorded in any form
without written permission from the publisher.

1 2 3 4 5 6 7 8 9 10

ISBN 978-0-8251-6727-0

Copyright © 2011

J. Weston Walch, Publisher

Portland, ME 04103

www.walch.com

Printed in the United States of America

Table of Contents

<i>Introduction</i>	<i>v</i>
<i>Materials List</i>	<i>viii</i>
Number and Operations	1
Set 1: Operations with Numbers	1
Equations	9
Set 1: Solving Linear Equations	9
Set 2: Literal Equations	21
Set 3: Ratios and Proportions	32
Set 4: Graphing Linear Equations/Solving Using Graphs	45
Set 5: Relations Versus Functions/Domain and Range	63
Set 6: Real-World Situation Graphs	72
Set 7: Writing Linear Equations	86
Set 8: Line of Best Fit	94
Inequalities	104
Set 1: One-Variable Inequalities	104
Set 2: Absolute Value Equations	118
Set 3: Absolute Value Inequalities	131
Set 4: Two-Variable Inequalities	140
Systems	154
Set 1: Solving 2-by-2 Systems by Graphing	154
Set 2: Solving 2-by-2 Systems by Substitution	165
Set 3: Solving 2-by-2 Systems by Elimination	175
Set 4: Using Systems in Applications	186
Quadratic Equations and Functions	199
Set 1: Solving Quadratic Equations by Finding Square Roots	199
Set 2: Graphing Quadratic Equations	212
Set 3: Solving Quadratic Equations Using the Quadratic Formula	226
Set 4: Comparing Linear, Exponential, and Quadratic Models, and Absolute Value	240
Polynomials	256
Set 1: Operations with Polynomials	256
Set 2: Factoring Polynomials	270
Data Analysis	287
Set 1: Data Displays	287

Introduction

Algebra I Station Activities for Texas Essential Knowledge and Skills (TEKS) includes a collection of station-based activities to provide students with opportunities to practice and apply the mathematical skills and concepts they are learning. It contains several sets of activities for each of the seven topics: Number and Operations; Equations; Inequalities; Systems; Quadratic Equations and Functions; Polynomials; and Data Analysis. You may use these activities as a complement to your regular lessons or in place of your regular lessons, if formative assessment suggests students have the basic concepts but need practice. The debriefing discussions after each set of activities provide an important opportunity to help students reflect on their experiences and synthesize their thinking. It also provides an additional opportunity for ongoing, informal assessment to inform instructional planning.

Implementation Guide

The following guidelines will help you prepare for and use the activity sets in this book.

Setting Up the Stations

Each activity set consists of four or more stations. Set up each station at a desk, or at several desks pushed together, with enough chairs for a small group of students. Place a card with the number of the station on the desk. Each station should also contain the materials specified in the teacher's notes, and a stack of student activity sheets (one copy per student). Place the required materials (as listed) at each station.

When a group of students arrives at a station, each student should take one of the activity sheets to record the group's work. Although students should work together to develop one set of answers for the entire group, each student should record the answers on his or her own activity sheet. This helps keep students engaged in the activity and gives each student a record of the activity for future reference.

Forming Groups of Students

All activity sets consist of four stations. You might divide the class into four groups by having students count off from 1 to 4. If you have a large class and want to have students working in small groups, you might set up two identical sets of stations, labeled A and B. In this way, the class can be divided into eight groups, with each group of students rotating through the "A" stations or "B" stations.

Introduction

Assigning Roles to Students

Students often work most productively in groups when each student has an assigned role. You may want to assign roles to students when they are assigned to groups and change the roles occasionally. Some possible roles are as follows:

- Reader—reads the steps of the activity aloud
- Facilitator—makes sure that each student in the group has a chance to speak and pose questions; also makes sure that each student agrees on each answer before it is written down
- Materials Manager—handles the materials at the station and makes sure the materials are put back in place at the end of the activity
- Timekeeper—tracks the group’s progress to ensure that the activity is completed in the allotted time
- Spokesperson—speaks for the group during the debriefing session after the activities

Timing the Activities

The activities in this book are designed to take approximately 15 minutes per station. Therefore, you might plan on having groups change stations every 15 minutes, with a two-minute interval for moving from one station to the next. It is helpful to give students a “5-minute warning” before it is time to change stations.

Since the activity sets consist of four stations, the above timeframe means that it will take about an hour and 10 minutes for groups to work through all stations. If this is followed by a 20-minute class discussion as described on the next page, an entire activity set can be completed in about 90 minutes.

Guidelines for Students

Before starting the first activity set, you may want to review the following “ground rules” with students. You might also post the rules in the classroom.

- All students in a group should agree on each answer before it is written down. If there is a disagreement within the group, discuss it with one another.
- You can ask your teacher a question only if everyone in the group has the same question.
- If you finish early, work together to write problems of your own that are similar to the ones on the student activity sheet.
- Leave the station exactly as you found it. All materials should be in the same place and in the same condition as when you arrived.

Introduction

Debriefing the Activities

After each group has rotated through every station, bring students together for a brief class discussion. At this time you might have the groups' spokespersons pose any questions they had about the activities. Before responding, ask if students in other groups encountered the same difficulty or if they have a response to the question. The class discussion is also a good time to reinforce the essential ideas of the activities. The questions that are provided in the teacher's notes for each activity set can serve as a guide to initiating this type of discussion.

You may want to collect the student activity sheets before beginning the class discussion. However, it can be beneficial to collect the sheets afterward so that students can refer to them during the discussion. This also gives students a chance to revisit and refine their work based on the debriefing session.

Introduction

Materials List

Class Sets

- calculators
- rulers

Station Sets

- at least 40 red, 20 blue, 20 green, and 20 yellow algebra tiles
- measuring stick
- graphing calculators
- at least 24 green and 16 yellow marbles
- bag to hold marbles
- spaghetti noodles
- slips of paper with $<$, $>$, \leq , and \geq written on them
- deck of playing cards that contains only the numbers 2–10

Ongoing Use

- index cards (prepared according to specifications in teacher notes for many of the station activities)
- number cubes
- graph paper
- pencils

Number and Operations

Set 1: Operations with Numbers

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to operations with exponents, powers, scientific notation, expressions, equations, inequalities, and order of operations

Texas Essential Knowledge and Skills (TEKS)

4. Foundations for functions. The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. The student is expected to:
 - a. find specific function values, simplify polynomial expressions, transform and solve equations, and factor as necessary in problem situations.

Student Activities Overview and Answer Key

Station 1

Students are given a set of eight index cards that contain real number expressions written in exponential and expanded form. Students work together to match cards that show the expressions written in exponential and expanded form. When all the cards have been matched, students work together to simplify the expressions and determine the rules of exponents.

Answers

1. $5^2 \cdot 5$ and $5 \cdot 5 \cdot 5$; $\frac{4^2}{4^2}$ and $\frac{4 \cdot 4}{4 \cdot 4}$; $(2^3)^2$ and $2^3 \cdot 2^3$; $\frac{3^5}{3^2}$ and $\frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3}$

2. $5^2 \cdot 5 = 5 \cdot 5 \cdot 5 = 5^3$. When you multiply powers with the same base, you add the exponents. $\frac{4^2}{4^2} = \frac{4 \cdot 4}{4 \cdot 4} = 4^0 = 1$. Any number raised to the zero power is equal to 1.

$(2^3)^2 = 2^3 \cdot 2^3 = 2^6$. When you find the power of a power, you multiply the exponents.

$\frac{3^5}{3^2} = \frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3} = 3^3$. When you divide powers with the same base, you subtract the exponents.

Number and Operations

Set 1: Operations with Numbers

Instruction

Station 2

Students are given 12 index cards with real numbers in equivalent forms including integer exponents, radicals, percents, scientific notation, absolute value, rational numbers, and irrational numbers. Students work together to find groups of cards that represent equal numbers. Students write equality statements based on the groups of matching cards.

Answers

- $\sqrt{7} = 7^{\frac{1}{2}}$; $\frac{32}{4} = 2^3 = \sqrt{64}$; $|-5| = \sqrt{25} = 5^1$; $1.44 \times 10^2 = 12^2$; $80\% = \frac{4}{5}$
- Answers will vary. Possible answers: $\sqrt{7} = 7^{\frac{1}{2}} = \frac{\sqrt{7}}{1}$; $\frac{32}{4} = 2^3 = \sqrt{64} = 8$;
 $|-5| = \sqrt{25} = 5^1 = \frac{35}{7}$; $1.44 \times 10^2 = 12^2 = |144|$; $80\% = \frac{4}{5} = 0.80$

Station 3

Students will be given the acronym PEMDAS to help them remember the order of operations. They will use the order of operations: parentheses, exponents, multiplication and division, addition and subtraction to simplify expressions.

Answers

- $10 \cdot 3 = 30$, multiplication; $2 + 30 = 32$, addition; 32
- $|-10| = 10$, absolute value; $14 \cdot 2 = 28$, multiplication; $10 - 28 = -18$, subtraction; -18
- $(30 - 10) = 20$, parentheses; $20 \div 5 = 4$, division; 4
- $(10 \cdot 2) = 20$, parentheses; $5^2 = 25$, exponents; $3 + 25 = 28$, addition; $28 - 20 = 8$, subtraction; 8

Station 4

Students will be given 12 index cards with expressions and integer values on them. Students will work together to simplify six expressions using the appropriate variable. Then students work together to find how changing the integer value of the variables to a negative number affects their answer.

Number and Operations

Set 1: Operations with Numbers

Instruction

Answers

1. $2x + 10 = 16$; $\frac{3}{4}y = 6$; $b^2 + 10 = 35$; $\frac{(z-3)^2}{5} = \frac{49}{5}$; $\frac{7t^3}{2t^4} = \frac{7}{4}$; $5d^2 + 2d - 1 = 23$

2. $2x + 10 = 4$; $\frac{3}{4}y = -6$; $b^2 + 10 = 35$; $\frac{(z-3)^2}{5} = \frac{169}{5}$; $\frac{7t^3}{2t^4} = \frac{-7}{4}$; $5d^2 + 2d - 1 = 15$

3. $b^2 + 10 = 35$ has the same answer when $b = 5$ and $b = -5$ because when you square both positive and negative numbers, the answer is positive.

Materials List/Setup

Station 1 calculators; eight index cards with the following real number expressions in exponential and expanded form written on them:

$$5^2 \cdot 5, \frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3}, \frac{4^2}{4^2}, (2^3)^2, \frac{3^5}{3^2}, 5 \cdot 5 \cdot 5, 2^3 \cdot 2^3, \frac{4 \cdot 4}{4 \cdot 4}$$

Station 2 calculators; 12 index cards with the following numbers written on them:

$$\frac{32}{4}, |-5|, 1.44 \times 10^2, 2^3, \sqrt{25}, \sqrt{7}, 12^2, \frac{4}{5}, \sqrt{64}, 80\%, 5^1, 7^{\frac{1}{2}}$$

Station 3 calculators

Station 4 calculators; 12 index cards with following expressions and integer values of variables written on them:

$$2x + 10, \frac{3}{4}y, b^2 + 10, \frac{(z-3)^2}{5}, \frac{7t^3}{2t^4}, 5d^2 + 2d - 1, z = 10, b = 5,$$

$$x = 3, t = 2, y = 8, d = 2$$

Number and Operations

Set 1: Operations with Numbers

Instruction

Discussion Guide

To support students in reflecting on the activities and to gather formative information about student learning, use the following prompts to facilitate a class discussion to “debrief” the station activities.

Prompts/Questions

1. What are the rules of exponents for multiplication, division, powers, and a variable raised to the zero power?
2. What are different representations of writing the same number?
3. What is the order of operations? When using the order of operations, do you work from right to left or left to right?
4. What do you do when substituting a variable into an expression?
5. Why is following the order of operations important?

Think, Pair, Share

Have students jot down their own responses to questions, then discuss with a partner (who was not in their station group), and then discuss as a whole class.

Suggested Appropriate Responses

1. When you multiply powers with the same base, you add the exponents. When you divide powers with the same base, you subtract the exponents. When you find the power of a power, you multiply the exponents. Any number raised to the zero power is equal to 1.
2. exponents, square roots, scientific notation, fractions, and decimals
3. Parentheses, Exponents, Multiplication and Division, Addition and Subtraction; work from left to right.
4. Substitute the value of the variable into the expression and simplify by using the order of operations.
5. The order of operations is a standard used in algebra. Without this standard, an expression or equation could be solved differently, which would result in different answers.

Possible Misunderstandings/Mistakes

- When dividing exponential expressions, incorrectly subtracting the exponent in the numerator from the exponent in the denominator
- Incorrectly working from right to left when using the order of operations
- Neglecting the sign of the variable and the rules of multiplying and dividing positive and negative numbers

NAME: _____

Number and Operations

Set 1: Operations with Numbers

Station 1

You will be given eight index cards with the following real number expressions in exponential and expanded form written on them:

$$\begin{array}{cccc} 5^2 \cdot 5 & \frac{3 \cdot 3 \cdot 3 \cdot 3 \cdot 3}{3 \cdot 3} & \frac{4^2}{4^2} & (2^3)^2 \\ \frac{3^5}{3^2} & 5 \cdot 5 \cdot 5 & 2^3 \cdot 2^3 & \frac{4 \cdot 4}{4 \cdot 4} \end{array}$$

Work with other students to match the real number expressions with the same expression written in expanded form. After you have matched the cards into pairs, work together to simplify the expression and figure out the rules of exponents for each expression.

1. Write the four pairs below and simplify each expression.

2. What rule for exponents can you determine for each pair?

NAME: _____

Number and Operations

Set 1: Operations with Numbers

Station 2

You will be given 12 index cards with the following numbers written on them:

$\frac{32}{4}$	$ -5 $	1.44×10^2	2^3	$\sqrt{25}$	$\sqrt{7}$
12^2	$\frac{4}{5}$	$\sqrt{64}$	80%	5^1	$7^{\frac{1}{2}}$

Work with other students to group the cards that show equivalent numbers. After you have grouped the cards, work together to check that the numbers in each group are equal.

1. Write five statements that use the equals sign(s) (=) to list the groups of equal numbers.

2. For each group of numbers, write a new number that is equivalent to the group of numbers.

Number and Operations**Set 1: Operations with Numbers****Station 3**

Below is an acronym to help you remember the order of operations for real numbers.

PEMDAS

Parentheses, Exponents, Multiplication and Division, Addition and Subtraction

You will be given an index card that has “PEMDAS” written on it to help you remember the order of operations. Work as a group to use the order of operations in order to simplify the following real number expressions. Write each operation step by step and give the operation used. The first step of problem 1 is done for you. *Hint:* Absolute value calculations are performed at the same time as parentheses.

1. $2 + 10 \cdot 3$

Step 1: $10 \cdot 3 = 30$ Operation: multiplication

Step 2: _____ Operation: _____

Final answer: _____

2. $|-10| - 14 \cdot 2$

Step 1: _____ Operation: _____

Step 2: _____ Operation: _____

Step 3: _____ Operation: _____

Final answer: _____

3. $30 - 10 \div 5$

Step 1: _____ Operation: _____

Step 2: _____ Operation: _____

Final answer: _____

4. $3 + 5^2 - (10 \cdot 2)$

Step 1: _____ Operation: _____

Step 2: _____ Operation: _____

Step 3: _____ Operation: _____

Step 4: _____ Operation: _____

Final answer: _____

NAME: _____

Number and Operations

Set 1: Operations with Numbers

Station 4

You will be given 12 index cards with the following expressions and integer values of variables written on them:

$$\begin{array}{cccccc} 2x + 10 & \frac{3}{4}y & b^2 + 10 & 5d^2 + 2d - 1 & \frac{(z - 3)^2}{5} & \frac{7t^3}{2t^4} \\ z = 10 & b = 5 & x = 3 & t = 2 & y = 8 & d = 2 \end{array}$$

Work as a group to simplify each expression using the appropriate variable.

1. Simplify each expression using the given value of the variable. Write your answers below.

2. What happens to each expression if you change each variable to its opposite?

$$(z = -10, b = -5, x = -3, t = -2, y = -8, d = -2)$$

3. Do any of the new simplified expressions have the same value as in problem 2? Why or why not?

Equations

Set 1: Solving Linear Equations

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to simplifying algebraic expressions, solving linear equations in one variable, and solving multi-step linear equations and inequalities. Students will also identify and apply properties of real numbers and equality.

Texas Essential Knowledge and Skills (TEKS)

1. Foundations for functions. The student understands that a function represents a dependence of one quantity on another and can be described in a variety of ways. The student is expected to:
 - d. represent relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities.
3. Foundations for functions. The student understands how algebra can be used to express generalizations and recognizes and uses the power of symbols to represent situations. The student is expected to:
 - a. use symbols to represent unknowns and variables.
4. Foundations for functions. The student understands the importance of the skills required to manipulate symbols in order to solve problems and uses the necessary algebraic skills required to simplify algebraic expressions and solve equations and inequalities in problem situations. The student is expected to:
 - a. find specific function values, simplify polynomial expressions, transform and solve equations, and factor as necessary in problem situations; and
 - b. use the commutative, associative, and distributive properties to simplify algebraic expressions.

Equations

Set 1: Solving Linear Equations

Instruction

Student Activities Overview and Answer Key

Station 1

Students will be given four index cards that contain equations and fifteen index cards that contain the “steps” required to solve the equations. Students work as a group to place “step” cards sequentially with the appropriate equation, ending in the solution.

Answers

Order of equation cards will vary. Check to ensure steps are grouped in the following order with their respective equations:

Equation card: $3x + 2 - x = -\frac{2}{3}x + 26$

Step cards:

$$2x + 2 = -\frac{2}{3}x + 26$$

$$\frac{8}{3}x + 2 = 26$$

$$\frac{8}{3}x = 24$$

$$x = 9$$

Equation: $\frac{x}{2} = \frac{x}{4} + 12$

Step cards:

$$\frac{x}{2} - \frac{x}{4} = 12$$

$$\frac{2x}{4} - \frac{x}{4} = 12$$

$$\frac{x}{4} = 12$$

$$x = 48$$

Equation: $10x - 5 = 5x + 20$

Step cards:

$$5x - 5 = 20$$

$$5x = 25$$

$$x = 5$$

Equation: $2(x + 4) = \frac{2}{3}(x - 24)$

Step cards:

$$2x + 8 = \frac{2}{3}x - 16$$

$$\frac{4}{3}x + 8 = -16$$

$$\frac{4}{3}x = -24$$

$$x = -18$$

Equations

Set 1: Solving Linear Equations

Instruction

Station 2

Students will be given eight index cards with the following final simplified algebraic expressions written on them: $4x + 2$, $3b - 10$, $\frac{5}{8}y - 12$, $\frac{-3}{7}c + \frac{4}{9}$, $-x$, $6xy^3$, $\frac{2x}{3z^2}$, a^3b^2 . Students shuffle and place the index cards in a pile. One student draws a card and they work as a group to create an algebraic expression that precedes this simplified expression. Then they simplify given algebraic expressions.

Answers

- Answers will vary. Possible answers include:

$$2x + 2x + 2; 10b - 7b - 5 - 5; \frac{3}{8}y + \frac{1}{4}y - 12; \frac{-3}{7}c + \frac{2}{9} + \frac{2}{9}; 5x - 6x; 2xy \cdot 3y^2;$$

$$\frac{x}{3z} \cdot \frac{2}{z}; a^2b \cdot ab$$

2a. $-4x + 15$

2b. $8x^2y + 72y - 3$

2c. $14x^3 + 3xy^2 + 12x^2 - 21x$

2d. $-\frac{1}{4}x + 4$

Station 3

Students will be given a number cube. They roll the number cube to populate boxes that will represent the commutative and associative properties. They will derive the commutative and associative properties based on their observations. Students will realize that these properties only work for addition and multiplication. They will derive the distributive property based on an example.

Answers

- Answers will vary; yes; commutative property is when you change the order of the numbers without changing the result; just addition and multiplication. Subtraction and division won't give you the same answer.
- Answers will vary; no, because they are addition and multiplication; associative property is when you change the grouping of the numbers without changing the result; just addition and multiplication. Subtraction and division won't give you the same answer.
- Distributive property is when a number is multiplied by the sum of two other numbers; the first number can be distributed to both of those two numbers and multiplied by each of them separately.
- a. $10x + 2y$; distributive; b. commutative; c. no, because it is subtraction; d. associative; e. no, because it is division.

Equations

Set 1: Solving Linear Equations

Instruction

5. Answers will vary. Possible answers include: Figuring out the cost of a movie based on the number of people in two families that are going to the movie. $C(F_1 + F_2)$, for which C = cost of movie, F_1 = number of people in family 1, and F_2 = number of people in family 2.

Station 4

Students will work together to write and solve linear equations based on real-world examples. They will provide the equation and the solution.

Answers

- $45 + 0.25x = 145$; $x = 400$ minutes
- $125 + 4x = 157$; $x = \$8$ per can
- $20 + 10x \leq 100$; $x \leq 8$; no more than 8 yoga classes per month
- $x(16 - 2) \geq 210$; $x \geq 15$; no fewer than 15 DVDs per month

Materials List/Setup

Station 1 four index cards with the following equations written on them:

$$3x + 2 - x = -\frac{2}{3}x + 26, 10x - 5 = 5x + 20, \frac{x}{2} = \frac{x}{4} + 12, 2(x + 4) = \frac{2}{3}(x - 24)$$

fifteen index cards with the following “steps” written on them:

$2x + 2 = -\frac{2}{3}x + 26$	$5x - 5 = 20$	$\frac{x}{2} - \frac{x}{4} = 12$	$2x + 8 = \frac{2}{3}x - 16$
$\frac{8}{3}x + 2 = 26$	$5x = 25$	$\frac{2x}{4} - \frac{x}{4} = 12$	$\frac{4}{3}x + 8 = -16$
$\frac{8}{3}x = 24$	$x = 5$	$\frac{x}{4} = 12$	$\frac{4}{3}x = -24$
$x = 9$		$x = 48$	$x = -18$

Station 2 eight index cards with the following final simplified algebraic expressions written on them:

$$4x + 2, 3b - 10, \frac{5}{8}y - 12, \frac{-3}{7}c + \frac{4}{9}, -x, 6xy^3, \frac{2x}{3z^2}, a^3b^2$$

Station 3 number cube

Station 4 none

Equations

Set 1: Solving Linear Equations

Instruction

Discussion Guide

To support students in reflecting on the activities and to gather some formative information about student learning, use the following prompts to facilitate a class discussion to “debrief” the station activities.

Prompts/Questions

1. How do you solve linear equations?
2. How do you simplify algebraic expressions?
3. What is the commutative property?
4. What is the associative property?
5. What is the distributive property?
6. What are examples of real-world applications of linear equations?

Think, Pair, Share

Have students jot down their own responses to questions, then discuss with a partner (who was not in their station group), and then discuss as a whole class.

Suggested Appropriate Responses

1. Combine like terms if necessary. Use the properties of equality to get the variable by itself on one side of the equation. Solve for the variable by making its coefficient equal to 1.
2. Combine like terms and use the order of operations.
3. The commutative property is when you change the order of the numbers without changing the result.
4. The associative property is when you change the grouping of the numbers without changing the result.
5. The distributive property is when a number is multiplied by the sum of two other numbers; the first number can be distributed to both of those two numbers and multiplied by each of them separately.
6. Answers will vary. Possible answers include: the cost of services (including water, telephone, and electricity) based on a flat rate plus a usage fee

Equations

Set 1: Solving Linear Equations

Instruction

Possible Misunderstandings/Mistakes

- Incorrectly identifying subtraction and division problems as depicting commutative or associative properties
- Incorrectly identifying the constant versus the coefficient of the variable when writing and solving linear equations and inequalities
- Using the wrong sign (i.e., $<$ instead of $>$) when writing and solving inequalities
- Simplifying algebraic expressions by combining unlike terms

NAME: _____

Equations

Set 1: Solving Linear Equations

Station 1

You will be given four index cards with equations written on them. You will also be given fifteen index cards with steps for solving the equations written on them. Place the “equation” cards in one pile and lay out the “step” cards on your table or desk. Draw a card from the equation deck. Find all the step cards that show the steps for solving that equation. Place them in order underneath the equation, ending with the solution as the last step. Repeat the process for each equation card.

On the lines below, write the equation, the steps to solve it in order, and the corresponding last step (the solution).

Equation 1: _____

Equation 3: _____

Equation 2: _____

Equation 4: _____

NAME: _____

Equations

Set 1: Solving Linear Equations

Station 2

You will be given eight index cards with the following final simplified algebraic expressions written on them:

$$4x + 2, 3b - 10, \frac{5}{8}y - 12, \frac{-3}{7}c + \frac{4}{9}, -x, 6xy^3, \frac{2x}{3z^2}, a^3b^2$$

Shuffle and place the index cards in a pile. Have one student draw a card. As a group, create an algebraic expression that precedes this simplified expression. For example, if you had drawn a card that read $3x - 15$, then your answer could be $7x - 4x - 15$ or $8x - 10 - 5x - 5$, etc.

1. As a group, come to an agreement on your answers. Write the final algebraic expression and your answers on the lines below.

2. As a group, simplify the following algebraic expressions:

a. $-x + 14 - 3x + 1 =$ _____

b. $8y(x^2 + 9) - 3 =$ _____

c. $12x^2 - 19x + 4xy^2 + 14x^3 - 2x - xy^2 =$ _____

d. $\frac{1}{2}x + 4 - \frac{3}{4}x =$ _____

Equations**Set 1: Solving Linear Equations****Station 3**

Use the number cube provided to complete and solve the problems below.

1. As a group, roll the number cube and write the result in the first box. Roll again, then write the second number in the second box for each problem. Then find the sum and product.

$$\square s + \square s =$$

$$\square a \times \square a =$$

If you add or multiply the terms in reverse order, do you get the same answers? _____

This problem represents the commutative property. Write a definition of the commutative property based on your observations.

Does the commutative property hold for addition, subtraction, multiplication, and division? Why or why not?

2. As a group, roll the number cube and write the result in the first box. Repeat this process to write a number in the second and third boxes for each problem. Then write the same three numbers in the same order in the last three boxes for each problem.

$$\square z + (\square z + \square z) = (\square z + \square z) + \square z =$$

$$\square a \times (\square b \times \square b) = (\square a \times \square b) \times \square b =$$

continued

Equations**Set 1: Solving Linear Equations**

Does the grouping of the terms, as shown by the parentheses, change the answer on each side of the equation? Why or why not?

This problem represents the associative property. Write a definition of the associative property based on your observations.

Does the associative property hold for addition, subtraction, multiplication, and division? Why or why not?

3. The following problem depicts the distributive property:

$$4x(7 + 9) = 4x(7) + 4x(9) = 28x + 36x = 64x$$

Based on this problem, write a definition for the distributive property in the lines below.

4. For each problem below, identify the property used as commutative, associative, or distributive. Simplify the problem if necessary. If the problem doesn't represent one of these properties, explain why.

a. $2(5x + y) =$

b. $34 + 12x + 10 = 10 + 34 + 12x$

continued

NAME: _____

Equations

Set 1: Solving Linear Equations

c. $12x^2 - 5x^2 = 5x^2 - 12x^2$

d. $(1a + 16a) + 29a = 1a + (16a + 29a)$

e. $24x^2 \div 3y = 3y \div 24x^2$

5. What is one real-world example of when you would use the distributive property?

Equations**Set 1: Solving Linear Equations****Station 4**

Write equations for real-world situations and then solve the equations. Work with your group to write and solve the equations. When everyone agrees on the correct equation and solution, write them in the space provided.

1. Janice needs to figure out her cell phone bill. She is charged a monthly flat fee of \$45. She is also charged \$0.25 per minute. How many minutes did she use if her cell phone bill was \$145?

Equation: _____ Solution: _____

2. Manny spent \$157 at a sporting goods store. He bought a warm-up suit for \$125 and spent the rest of the money on cans of tennis balls. If each can of tennis balls costs \$4, how many cans did he buy?

Equation: _____ Solution: _____

Now you will write inequalities for real-world situations and then solve the inequalities. Work with your group to write and solve the inequalities.

3. Megan joined a gym for a monthly fee of \$20. She has a budget of no more than \$100 per month. She wants to take yoga classes that cost \$10. How many yoga classes can she take each month and stay within her budget?

Inequality: _____ Solution: _____

4. John sells DVDs on the Internet. He wants to make no less than \$210 per month. He sells the DVDs for \$16, and it costs him \$2 to ship each DVD. How many DVDs must he sell to make no less than \$210 per month?

Inequality: _____ Solution: _____