

Station Activities

for Mathematics

Grade 8



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Introduction

Instruction

This book 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 five sets of activities for each of the four strands: Number and Operations; Geometry and Measurement; Algebra; and Data Analysis and Probability. You may use these activities in addition to the direct instruction lessons, or, especially if the pre-test or other formative assessment suggests it, instead of direct instruction in areas where 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.

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 below, 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.

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.

Materials List

Class Sets

- calculators
- rulers
- protractors
- scissors

Station Sets

- fraction circles
- algebra tiles and equation mats
- counters (50–100 chips, counters, beans, pennies)
- tiles (+/– 25 of each of several colors)
- integer chips
- rectangular prism
- regular shapes (triangle, square, pentagon, hexagon, heptagon, octagon, nonagon, decagon, dodecagon)
- variety of round objects
- string
- box/container 2 in. \times 4 in. \times 8 in.
- 64 1-inch cubes
- cylinder
- geoboards and rubber bands
- spinners
- Unifix or other connecting cubes
- colored cubes
- bags (fabric or opaque paper)

Ongoing Use

- index cards (need to be prepared according to specifications in teacher notes for many of the station activities)
- graph paper
- pencils
- highlighters of several colors
- pencils/markers of several colors
- pennies
- number cubes

Other

- bags of fun-size M&Ms®
- boxes of toothpicks

Overhead Manipulatives (optional)

- clock
- algebra tiles
- geometric shapes
- protractor
- tiles
- fraction circles
- spinners

Algebra

Set 3: Evaluating and Simplifying Expressions

Instruction

Goal: To provide opportunities for students to develop concepts and skills related to evaluating and simplifying expressions

NCTM Standards, Grades 6–8

Algebra

Represent and analyze mathematical situations and structures using algebraic symbols: use symbolic algebra to represent situations and to solve problems, especially those that involve linear relationships.

Student Activities Overview and Answer Key

Station 1

Students roll a number cube to get values for three variables. Then they work together to evaluate a set of expressions that contain these variables. Students are encouraged to make sure everyone agrees on each answer before writing it down, and they are also asked to reflect on the steps they used to evaluate the expressions.

Answers: Students will depend upon the numbers that are rolled.

Possible steps to each expression: replace each variable by its value. Then simplify the numerical expression using the order of operations and the rules of integer arithmetic.

Station 2

Students are given a set of cards with algebraic expressions written on them. Students work together to sort the cards into pairs so that the cards in each pair show equivalent expressions. Then they explain the strategies they used to solve the problem.

Answers: The cards should be paired as follows: $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$; $3x + 2x + 4y$ and $5x + 4y$.

Possible strategies: First simplify the expressions on the cards that have expressions that can be simplified. Then look for another card that contains the simplified expression or an expression that can be simplified to the same expression.

Algebra

Set 3: Evaluating and Simplifying Expressions

Instruction

Station 3

Students are given a set of cards with simple algebraic expressions on them. Students choose four cards at random and write the expressions in boxes provided on the activity sheet. In this way, students generate expressions that they will simplify by working together.

Answers: Answers will depend upon the cards that are chosen. Note that it is possible to generate expressions that cannot be simplified.

Station 4

Students work together to match a set of given expressions with a set of integer values of the variable. The goal is to pair expressions and values of the variable so that every expression has a value of 24 when evaluated for the value of the variable with which it is paired. All students should agree on the pairing of the cards before writing the answer.

Answers: The cards should be paired as follows: $3x + 2$ and $x = 20$, $4x^2$ and $x = -2$, $2x^2 + 6$ and $x = -2$, $6(5 - x)$ and $x = 1$, $30 - 3x$ and $x = 2$.

Possible strategies: Choose an expression and evaluate it for each possible value of the variable until the result is 24. Alternatively, choose an expression and decide which value of the variable makes it equal 24, then match it with this value.

Materials List/Set Up

Station 1 number cube (numbers 1–6)

Station 2 set of 10 index cards with the following expressions written on them:
 $3p + 4n + 3p$, $n + 3p$, $4n + 3p - 2n$, $n + 6p + 3n$, $2n + 8p - 3n$, $2(3p - n)$, $2n + 3p$,
 $10p - 2n - 4p$, $8p + n - 5p$, $2p + 6p - n$

Station 3 set of 10 index cards with the following expressions written on them:
 $2x$, $4x$, $2x^2$, $3x^2$, $6x^2$, $3y$, $4y$, $2y^2$, $3y^2$, $8y^2$

Station 4 set of 5 index cards with the following expressions written on them:
 $2(x + 2)$, $6x^2$, $2x^2 + 6$, $6(5 - x)$, $30 - 3x$
set of 5 index cards with the following values of x written on them:
 $x = -3$, $x = -2$, $x = -1$, $x = 2$, $x = 10$

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 evaluate an expression for a given value of the variable or variables?
2. After you substitute the value of the variable or variables in the expression, how do you simplify the result?
3. How do you evaluate the expression $12n^2 + t$ for specific values of n and t ?
4. What steps do you use to simplify an algebraic expression?

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. Substitute the value of the variable for the variable in the expression and simplify.
2. Perform the operations, using the order of operations and the rules of integer arithmetic.
3. Substitute the values for n and t in the expression. Square the value of n by multiplying it by itself. Then multiply by 12 and add the value of t .
4. Look for like terms. Combine like terms by adding or subtracting coefficients.

Possible Misunderstandings/Mistakes

- Applying an incorrect operation (e.g., adding instead of multiplying when evaluating for a value of x)
- Incorrectly applying the order of operations when evaluating or simplifying an expression that involves more than one operation
- Incorrectly applying the Distributive Property (e.g., writing $3(x + 1) = 3x + 1$)

NAME: _____

Algebra

Set 3: Evaluating and Simplifying Expressions

Station 1

You will find a number cube at this station.

Roll the number cube three times. Write the numbers in the boxes below. This will give you values for the variables m , q , and s . (Note that the value of s is a negative number.)

$$m = \square \quad q = \square \quad s = -\square$$

Work with other students to use these values to evaluate each expression. When everyone agrees on an answer, write it on the line.

1. $4m + q$ _____

5. $3s^2$ _____

2. $3q + s$ _____

6. $s - m$ _____

3. $4qs$ _____

7. $\frac{60}{m} + q$ _____

4. $-2mq + 3$ _____

8. $5(q - m)$ _____

Explain the steps you used to evaluate the expressions.

NAME: _____

Algebra

Set 3: Evaluating and Simplifying Expressions

Station 2

You will find a set of ten cards at this station. The cards contain the following expressions.

$$3p + 4n + 3p$$

$$n + 3p$$

$$4n + 3p - 2n$$

$$n + 6p - 3n$$

$$2n + 8p - 3n$$

$$2(3p - n)$$

$$2n + 3p$$

$$10p - 2n - 4p$$

$$8p + n - 4p$$

$$2p + 6p - n$$

Work together to sort the cards into pairs. The cards in each pair should show equivalent expressions.

When everyone agrees on the answer, write the five pairs below.

Explain the strategies you used to solve this problem.

NAME: _____

Algebra

Set 3: Evaluating and Simplifying Expressions

Station 3

You will find a set of cards at this station. The cards should be spread out, face-down.

Choose four cards without looking. Write the expressions on the cards in the boxes below.

$$\square + \square + \square + \square$$

Work together to simplify the expression. When everyone agrees on the answer, write it below.

Simplified expression: _____

Put the cards back. Mix up the cards. Then repeat the above process four more times.

$$\square + \square + \square + \square$$

Simplified expression: _____

$$\square + \square + \square - \square$$

Simplified expression: _____

$$\square + \square - \square - \square$$

Simplified expression: _____

$$\square + \square - \square + \square$$

Simplified expression: _____

NAME: _____

Algebra

Set 3: Evaluating and Simplifying Expressions

Station 4

At this station, you will find five cards with the following expressions written on them:

$2(x + 2)$

$6x^2$

$2x^2 + 6$

$6(5 + x)$

$30 - 3x$

You will also find five cards with the following values of x written on them:

$x = -3$

$x = -2$

$x = -1$

$x = 2$

$x = 10$

Work together to match each expression with a value of x so that when you evaluate each expression, the result is 24.

Work together to check that each pair gives a value of 24.

When everyone agrees on the results, write the five pairs below.

Describe the strategies you used to solve this problem.
