Moving with Algebra® Curriculum Guide

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Math Teachers Press, Inc.
(800) 852-2435
What is Moving with Algebra?

Moving with Algebra is an algebra readiness program that provides underprepared middle- and high-school students with the skills they will need to succeed in a formal algebra class. The program focuses on content areas critical to success in algebra and is designed around three principal features:

▲ a standards-based assessment and learning system
▲ a conceptually based, hands-on instructional model
▲ exceptional instructional support

The program is divided into two parts—Part A and Part B—to provide flexibility in curriculum planning.

Part A
Moving with Algebra

✔ Unit 1 Number Sense—
  ◦ expanded notation, place value, and the concept of a number line
  ◦ properties of numbers

✔ Unit 2 Fractions—
  ◦ ordering natural numbers, integers, and rational numbers
  ◦ adding, subtracting, multiplying, and dividing integers and fractions
  ◦ estimating and problem solving with fractions

✔ Unit 3 Decimals and Percents—
  ◦ ratios and proportions
  ◦ ordering and relating fractions and decimals
  ◦ equivalent fractions, decimals, and percents
  ◦ estimating and problem solving with decimals and percents

Part B
Moving with Algebra

✔ Unit 4 Geometry and Measurement—
  ◦ naming and constructing points, lines, rays, angles, and common figures
  ◦ measuring angles and naming angles and triangles
  ◦ perimeter, circumference, area, and volume
  ◦ exponents, roots, and the Pythagorean theorem
  ◦ ratios and proportions of similar figures
  ◦ measurement and precision in customary and metric units

✔ Units 5 & 6 Algebra and Algebra Functions—
  ◦ understanding order of operations
  ◦ understanding the concept of equivalence in algebraic expressions
  ◦ using tables and graphs to describe functions
  ◦ linear equations and inequalities
  ◦ solving word problems using algebraic concepts
  ◦ graphing equations on a coordinate grid
  ◦ writing equations in slope-intercept form
Organization of Materials

Program Components

Moving with Algebra is available in class sets for 20 or 30 students. Student manipulatives and overhead manipulatives are sold separately.

Teacher Manual

Foreword

- Correlations to Objectives
- 90-lesson pacing plan for each Part

Lesson Plans Section

- Table of Contents
- Lightly scripted, manipulative-based lesson plans
- Instructions and answers for student book pages
- Follow-up activities: games, journal prompts, and suggested Skill Builders for reteaching

Assessment Section

- Student Progress Report
- Class Record Sheet
- Cumulative Pre- and Post-Tests for each Part (reproducible)
- Pre- and Post-Tests for each Unit (reproducible)
- Weekly Quizzes

Masters and Skill Builders Section (black-line reproducibles)

- Masters for lesson activities
- Skill Builders pages matched to standards for reteaching and extra practice
- Answer keys to Skill Builders pages
- Glossary

Student Activity Book

- 336 total student activity pages
- Blank Student Glossary
- 30 Weekly Quizzes (15 for Part A and 15 for Part B)
- Weekly Quiz Record Sheet results with Skill Builders recommended for reteaching

- Classroom manipulative kits and overhead manipulative kits—essential components of the curriculum. Sold separately.
The Problem with Algebra

Algebra is widely (and correctly) viewed as the gateway to desirable career opportunities, including careers in engineering, medicine, and the sciences. Unfortunately, mastering algebra presents a serious challenge for many students. In response to this challenge, curriculum developers have broadened exposure to algebraic reasoning in early grades and made formal algebra courses available to a broader population of students. These increased expectations have, in turn, highlighted the need to prepare a more diverse student population for the rigors of a formal course in algebra. The Moving with Algebra program has been designed to address this need.

While important gains have been made in math proficiency among middle-school students (as measured by NAEP testing in 2007), less than one-third of eighth graders tested Proficient or higher in the most recent NAEP assessment. As has been seen in past testing, lack of conceptual understanding and weak problem-solving skills account for much of the problem, especially within the lowest quartile of test takers.

**SAMPLE TEST QUESTION—NAEP 2007**

**Question:** The sum of three numbers is 173. If the smallest number is 23, could the largest number be 62? Explain your answer.

**Correct:** 42%

The arithmetic required to answer this question is not difficult but addressing the question correctly requires important problem-solving skills and a firm grasp of the concept of inequality. A student who cannot deal with a question like this is probably not ready for a formal course in algebra.
Moving with Algebra tackles the challenge of algebra readiness in three important ways: (1) by employing a standards-based assessment and learning system, (2) by using conceptually based instruction, and (3) by providing exceptional instructional support in all aspects of the program.


Conceptually based instruction guides teachers and students from hands-on activities to the abstract expression of concepts. See pages 7–8, 15.
Moving with Algebra Solution:
A Standards-Based Assessment and Learning System

All components of Moving with Algebra—Pre-Tests, lesson plans, weekly quizzes, skill-building practice sheets, and Post-Tests (with matching record sheets)—are explicitly correlated to math content standards and learning objectives. By linking teaching, testing, and reteaching to clearly stated objectives, Moving with Algebra keeps both teacher and student on task and simplifies the job of diagnosing, tracking, and reporting student progress.

Moving with Algebra Assessment and Learning System

The Linking Wheel above illustrates how Moving with Algebra connects learning objectives (and state content standards) to all aspects of the program. This integrated linkage ensures that students, teachers, parents, and administrators remain focused on shared goals and informed about student progress toward reaching them.

“All elements of the curriculum, instruction, materials, and assessment should be aligned to common learning goals.”

Moving with Algebra Solution: A Conceptually Based Instructional Model

Every *Moving with Algebra* lesson starts with a hands-on activity that provides a solid, concrete basis for understanding the math concept presented in the lesson. Students develop conceptual understanding and acquire math vocabulary and skills through these manipulative-based activities and problem-solving situations. *Moving with Algebra* students are guided from this hands-on exploration of concepts through the transitional stage where those concepts are represented in drawings and communicated both orally and in writing and, finally, to the presentation of those same concepts using the formal (abstract) symbols of algebra.

Since algebra is the language of generalization, showing students how to move from a hands-on problem to a more general (and abstract) statement is especially crucial. The ability to do so prepares the way for restating the problem in the formal language of algebra.

The *Moving with Algebra* instructional model enables all students to be successful, regardless of their academic background, English language proficiency, or special learning needs. The guided, hands-on manipulations, written journal entries, games, and teacher-led and student-generated discussions also address the persistent achievement gap by fully acknowledging multiple intelligences and learning styles. The range of learning activities included in the curriculum opens the door to learning for every student.

“We remember 10% of what we hear, 30% of what we see, and 90% of what we do.”

—Jean Piaget
Objective: To add positive and negative integers.

Materials: Black and white cubes (or positive and negative integer squares, Master 9), 2 clear jars, playing cards

Introductory Activities

Adding Positive Integers
Write on the board:
Sue earned $5 one day and $2 the next day. How much did she earn? Remind students to build the first number and addition of negative integers.

(5 black + 2 black = 7 black)

Write on the board: +5 +

Adding Negative Integers
Write on the board:
A football team lost 5 yards on the first play of the game. What was the total gain or loss? Have students use white cubes to show the value of a positive 1 and a negative 1?

There are three unmatched white cubes. Show the pairing of 5 white cubes with 5 black cubes, leaving 4 black cubes.

Write on the board:
5 + 4 = 9

Adding Positive and Negative Integers
Write on the board:
What is the value of a positive 1 and a negative 1?

The two numbers. One positive and one negative cubes are unmatched cubes. What cubes are unmatched cubes?

There are three unmatched white cubes.

Adding Positive and Negative Integers
Write the integers. Count to find the sum.

1. +2 = 3
2. +5 = 9
3. +3 = 3
4. +6 = 2
5. +5 = 10
6. +4 = 4
7. +9 = 13

Exceptional Instructional Support
continued through all phases of planning, teaching, and assessment. Pages 9–19 will guide you through our teacher-friendly curriculum. Start at Step 1 and continue through Step 7.

“I know how to teach algebra.
I just don’t know what to do when they don’t get it.”

—Math Teacher
LA Times, October 28, 2003
### Correlation to Objectives—Part A and Part B

Use this table to match standards to pages in Lesson Plans, Student Book, and Skill Builders.

<table>
<thead>
<tr>
<th>MA Objective</th>
<th>Description of Standard/Objective</th>
<th>Part A</th>
<th>Part B</th>
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</thead>
<tbody>
<tr>
<td>MA-1</td>
<td>Describe the relationship between the subsets of the real number system. Recognize and implement the properties of rational numbers (e.g., commutative, associative, distributive, identity). Solve problems using the order of operations.</td>
<td>10–15, 62, 80</td>
<td>9–12, 61</td>
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<tr>
<td>MA-2</td>
<td>Define and identify prime and composite numbers. Write the prime factorization of a number less than 100.</td>
<td>20–21</td>
<td>15–16</td>
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<tr>
<td>MA-3</td>
<td>Recognize place values and read, write, compare and order numbers up to 12 digits, including use of expanded notation. Round any number to any place.</td>
<td>2–9</td>
<td>1–8</td>
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<tr>
<td>MA-4</td>
<td>Explore the concept of exponents. Interpret positive whole number powers as repeated multiplication and negative whole number powers as repeated division or multiplication by the multiplicative inverse. Write numbers in scientific notation. Multiply and divide using exponents with a common base.</td>
<td>16–19, 22–23, 25</td>
<td>13–14, 17–18</td>
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<tr>
<td>MA-5</td>
<td>Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
<td>26–29</td>
<td>19–24</td>
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<tr>
<td>MA-6</td>
<td>Multiply and divide numbers up to 4 digits. Multiply by powers of 10 and multiples of 10. Relate division to multiplication.</td>
<td>35–40, 42–51</td>
<td>29–41</td>
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<tr>
<td>MA-7</td>
<td>Determine the average of a data set, and know and interpret appropriate measures of central tendency (mean, median and mode) and spread (range).</td>
<td>56–57</td>
<td>47–50</td>
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<tr>
<td>MA-8</td>
<td>Identify, compare and order integers, and locate integers on a number line. Know the meaning of the absolute value sign, and that an integer and its opposite have a sum of zero.</td>
<td>63–67</td>
<td>54–55, 139</td>
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<tr>
<td>MA-9</td>
<td>Add, subtract, multiply, and divide with the set of integers. Solve word problems involving integers.</td>
<td>68–78</td>
<td>56–60</td>
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</tbody>
</table>
Pre-Test Learning Objectives

Pre- and Post-Tests for Part A and Part B, as well as for each of the six units in the curriculum, identify learning needs and measure both student and class progress.

CUMULATIVE Pre- and Post-Tests covering the three Units of both Part A and Part B measure student growth over the entire program.

UNIT Pre- and Post-Tests provide data to differentiate instruction. Test questions are linked to learning objectives, so a teacher can precisely identify the objectives on which the student needs to focus.
Ways to Assess and Interpret

The **Class Record Sheet** is grouped by objective, so a teacher can identify class weaknesses for each learning objective/standard, and identify *individual* students who are at-risk. At a glance, teachers can also select students for differentiated instruction in small groups.

### Moving with Algebra Part A Class Record Sheet

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</table>

The **Class Record Sheet** allows the teacher to identify at-risk students, group students for differentiated instruction, and identify content objectives that need extra attention.
# Identify Student Needs

The **Student Progress Report** is designed to provide an Individualized Education Plan (IEP) for each student. It is also an excellent tool to communicate student strengths and weaknesses to parents and guardians.

## Program Overview

The **Student Progress Report** is matched to learning objectives/standards and can be used to evaluate individual needs and progress.

## Step 4: Identify Student Needs

The **Student Progress Report** can be sent home to keep parents informed about student progress.

## Moving with *Algebra*

### Student Progress Report, Part A

<table>
<thead>
<tr>
<th>Objective Number and Description</th>
<th>Pre</th>
<th>Total Number Correct (out of 60 items)</th>
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<tbody>
<tr>
<td>1. <strong>MA-2</strong></td>
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<td>25. <strong>MA-26</strong></td>
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<td>60. <strong>MA-61</strong></td>
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</tr>
</tbody>
</table>

### Step 4: Identify Student Needs

The **Student Progress Report** can be sent home to keep parents informed about student progress.

--

*The Student Progress Report* is designed to provide an Individualized Education Plan (IEP) for each student. It is also an excellent tool to communicate student strengths and weaknesses to parents and guardians.*
Instructional Support—Lesson Planning. The pacing calendar directs the instruction for each lesson and reduces planning and prep time. Teachers just turn to the Foreword of the Teacher Manual to find their lesson calendar. Each lesson may be taught in one or more hours, depending on the time available and the math abilities of the class.

### Moving with Algebra

#### Pacing Calendar for Part A: Lessons 1–30

<table>
<thead>
<tr>
<th>Lesson 1</th>
<th>Lesson 2</th>
<th>Lesson 3</th>
<th>Lesson 4</th>
<th>Lesson 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tests, Quizzes, and Reviews</td>
<td>Objectives: MA-3</td>
<td>Objectives: MA-3</td>
<td>Objectives: MA-3</td>
<td>Objectives: MA-3</td>
</tr>
<tr>
<td>Pre-Test on Part A (Units 1, 2, &amp; 3)</td>
<td>Pre-Test on Unit 1</td>
<td>Pre-Test on Unit 1</td>
<td>Quiz 1 (covers pp. 2–9)</td>
<td></td>
</tr>
<tr>
<td>(See p. 33 of Assessment Section)</td>
<td>See p. 33 of Assessment Section</td>
<td>See p. 65 of Assessment Section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Math Practice</td>
<td>Student Book pages: 2, 3</td>
<td>Student Book pages: 4, 5</td>
<td>Student Book pages: 6, 7</td>
<td>Student Book pages: 8, 9</td>
</tr>
<tr>
<td>Extra Practice</td>
<td>Skill Builders pages: 1, 2 (MA-3)</td>
<td>Skill Builders pages: 3, 4 (MA-3)</td>
<td>Skill Builders pages: 5, 6 (MA-3)</td>
<td>Skill Builders pages: 7, 8 (MA-3)</td>
</tr>
<tr>
<td>Games</td>
<td>Filler-Up, p. 5</td>
<td>Companion Game, p. 6</td>
<td>Greatest Number, p. 7</td>
<td>Rounding Relays, p. 9</td>
</tr>
<tr>
<td>Test Prep</td>
<td>Test Prep: Student Book p. 5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sum It Up!</td>
<td>Sum It Up! Student Book p. 2</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Unit 1

Weekly Quizzes are printed at the back of each Student Book (15 quizzes at the back of Part A and 15 quizzes at the back of Part B).}

Program Overview

Each lesson lists the objectives taught, the materials needed, and the lesson plan pages used.

Journal Prompts, Test Prep, and Sum It Ups! encourage students to demonstrate their knowledge in a variety of ways.

Games at the end of the lesson make learning more fun and help cement student understanding.
The **Lesson Plans** section of the Teacher Manual contains everything the teacher needs to do and say for each lesson, so teachers who need to strengthen their own math skills are provided with daily professional development.

1. **Before We Begin: Objective, Materials, Vocabulary**

Each lesson starts with a **learning objective** for the day, the **materials** required, and the math **vocabulary** word(s) introduced in the lesson.

2. **Introductory Activities: Hands-On Learning**

The Introductory Activities section allows students to discover the day’s learning objective using an active, hands-on approach. The teacher will find a **lightly scripted** description of what to do, what to say, what questions to ask, and what answers to look for (with statements to be made aloud printed in **bold type**).

3. **About This Page: Student Practice**

The About This Page section links the hands-on activity to the pictures and practice on pages in the Student Book. Each Lesson Plan page number matches the corresponding page number in the Student Activity Book.

4. **Follow-Up Activities: Closing the Lesson**

The Follow-Up Activities section provides additional instructional support in the form of games, problem-solving activities, and suggested reinforcement Masters for remedial practice (found in the **Skill Builders** section of the Teacher Manual).

5. **Games:** As students discover the winning strategy for each game, they go through steps similar to those used in problem solving.

6. **Reinforcement Masters:** Many Lesson Plan pages list a **Skill Builders** page to support the lesson and provide differentiated instruction. These pages may be used as homework or as additional in-class practice when needed.

---

**Structured Lesson Plans**

**Lesson Plan Page**

- **Objective:** To subtract integers by adding the opposite.
- **Materials:** Black and white cubes (or positive and negative integer squares).
- **Vocabulary:** Sum, minuend, subtrahend, difference.
- **Procedure:**
  1. **Step 5b:**
     - **Adding Opposites:** A Shortcut for Subtraction
     - Write the opposite of each number.
     - Rewrite each subtraction problem as an addition of opposites. Solve.
     - **Table:**
       - Original Number
       - No. being subtracted
       - Difference
       - ____________________________________________

- **About This Page:**
  - Student Practice
  - Follow-Up Activities

---

**Step-by-Step Activities**

- **Dice Game:**
  - **Sums and Differences:**
    - Use two colors of 6-sided dice. The score for each throw is the algebraic sum of numbers that land face up.
    - Materials:
      - Two colors of 6-sided dice (two colors)
      - Black and white cubes (or positive and negative integer squares).
      - Objective:
        - To subtract integers by adding the opposite.
  - **Practice:**
    - Record the difference of each problem.
    - **Table:**
      - Original Number
      - No. being subtracted
      - Difference
      - ____________________________________________

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Step 5c

Objectives: To describe the set of integers by a rule, roster, and graph.

Materials: Black and white interlocking cubes or Black and White Squares (Master 9), Number Line (Master 9)

Vocabulary: integers, opposite numbers

Introductory Activities

Models of Integers

Integers on a Number Line and Roster

Display a set of ten black or red squares so that all students may see them. Write number 18 on the board. What number is shown? (18) What temperature is associated with positive 107? (107 degrees above zero) Arrange the cubes or squares in a straight line and expand the number line to include the negative part of a thermometer or the negative part of 107. You will need a tape to tape the ends of the cube strips of number lines.

Rotate the number line for horizontal position with the positive numbers going to the right and the negative numbers going to the left.

We can rotate the vertical number line. Which direction shows the positive numbers? (right) Which direction shows the negative numbers? (left)

Navigating the Stages of Learning. Each lesson starts with a concrete, hands-on activity to introduce the mathematical concept and then guides students as they progress to increasingly abstract statements of the concept. Activities in the Student Book help students move from the hands-on understanding of the concept to more abstract language and written expressions.
Step 5d

Varied Assessment Opportunities

Following the Lesson Plan, students complete practice exercises on the accompanying page of their Student Activity Book. These pages give procedural practice, along with problem-solving and other developmental exercises. Student Activity Book pages provide varied opportunities for assessment to demonstrate their understanding of math concepts, as explained in the examples below.

Sum It Up!
This icon indicates an occasion for students to summarize their knowledge and presents an assessment opportunity for the teacher. Teachers lead discussions to develop student understanding of central ideas. Sum It Up! questions may also be used as talking points, so students can hear the views of others and clarify their own thinking.

How are arithmetic patterns and geometric patterns alike? How are they different?

Test Prep
These questions give students practice answering questions in standardized test format. Teachers may discuss test-taking strategies such as eliminating obviously incorrect answers and checking back for reasonableness.

Which sentence is not true?

| A | \(-2 - \(-7\) = -9 | B | \(-2 - 6 = -8) | C | \(7 - 4 = 3) | D | \(4 - \(-3) = 7) |

Journal Prompts
Journal Prompts ask students to demonstrate their math understanding using words, pictures, diagrams, and graphs.

Joyce bought a pair of jeans for $28.00 and 3 blouses for $12.95 each. How much did she spend? Draw a picture. Write a number sentence to solve the problem. Explain how you know where to write the numbers in the picture.
Periodic Assessments with Reteaching

Step 6a

Weekly Quizzes Assess Progress and Direct Reteaching Needs.

Quick, 10-question quizzes provide continuous assessments on all objectives covered in the Lesson Plans. The Weekly Quiz Record Sheet printed on the back inside cover of the student book allows students and teachers to track individual progress. The Record Sheet links missed test questions to Skill Builder reteaching pages and provides teachers with guidance for individualized instruction.

Name: ____________________
Date: ________________

1. 346 × 25

2. Find the missing factor. ________

3. 20 doughnuts are to be packed in 4 boxes. Which number sentence could you use to find the number of doughnuts in each box?
   - A 20 ÷ 4
   - B 20 – 4
   - C 20 × 4
   - D 20 ÷ 4

4. 4378

5. The club wants to buy a number of sweatshirts that cost $6 each. How many sweatshirts can they buy for $30?

6. A basket of 96 apples was shared equally by 4 classrooms. How many apples did each classroom get?

Moving with Algebra Part A

Weekly Quiz Record Sheet

Name ____________________

Quiz 1   Quiz 2   Quiz 3   Quiz 4   Quiz 5

Quiz 6   Quiz 7   Quiz 8   Quiz 9   Quiz 10

Quiz 11   Quiz 12   Quiz 13   Quiz 14   Quiz 15

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Reproducible Blackline Masters Reinforce Important Skills and Reteach Essential Concepts. *Skill Builders* make reteaching easy. Every learning objective is covered by at least one *Skill Builder*. The top of each page explains the learning objective using pictorial representations that review the activities from the Lesson Plan. Students then apply that understanding when completing the accompanying practice problems.

**Adding Integers**

Use black cubes to represent positive integers and white cubes to represent negative integers. These patterns will help you add integers.

<table>
<thead>
<tr>
<th>A number and its opposite has a sum of zero.</th>
<th>The sum of two positive integers is positive.</th>
<th>The sum of two negative integers is negative.</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1 + (-1) = 0$</td>
<td>$2 + (1) = 3$</td>
<td>$2 + (-3) = 5$</td>
</tr>
</tbody>
</table>

- The sum of a positive integer and a negative integer will be positive or negative.
- Match pairs of black and white cubes to get sums of zero.

**Write the integers. Count to find the sum.**

1. [Diagram]

2. [Diagram]

3. [Diagram]

4. [Diagram]

5. Complete the addition table for the integers from $-5$ to $5$.

<table>
<thead>
<tr>
<th>$+5$</th>
<th>$6$</th>
<th>$7$</th>
<th>$8$</th>
<th>$9$</th>
<th>$10$</th>
</tr>
</thead>
<tbody>
<tr>
<td>$5$</td>
<td>$4$</td>
<td>$3$</td>
<td>$2$</td>
<td>$1$</td>
<td>$0$</td>
</tr>
</tbody>
</table>

6. The sum of a positive integer and a negative integer will be positive if ____________

7. The sum of a positive integer and a negative integer will be negative if ____________

8. The sum of a positive integer and a negative integer will be zero if ____________

*Skill Builder* MA-9

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A Post-Test is administered at the end of each Unit and also at the conclusion of both Part A and Part B.

Moving with Algebra Part A Post-Test

1. There are 1356 students in Hudson Middle School. Which digit is in the hundreds place?
   
   A 1  
   B 3  
   C 5  
   D 6

2. Which choice shows the number 3148 in expanded notation?
   
   A $3 + 1 + 4 + 8$  
   B $3000 + 148$  
   C $3000 + 100 + 48$  
   D $3000 + 100 + 40 + 8$

3. Blue Lake measures 42,810 feet wide. What is this number rounded to the nearest thousand?
   
   A 42,000  
   B 43,000  
   C 44,000

4. What number do you multiply 635 by to get an answer of 635?________
   
   A $\frac{1}{635}$  
   B $\frac{1}{1}$  
   C 1

5. Define and identify prime and composite numbers. Write the prime factorization of a number less than 100.

6. Add and subtract mixed numbers with like and unlike denominators. Find a fractional discount. Write the reciprocal of a fraction.

The Student Progress Report compares Pre- and Post-Test results and shows the student's progress vis-a-vis each learning objective and math content standard.
### Moving with Algebra Number Sense

**Unit 1 Student Progress Report**

Record results from the Pre- and Post-Test here to see strengths and weaknesses on test questions aligned to the objectives for this level.

<table>
<thead>
<tr>
<th>Total Number Correct (out of 40 items)</th>
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</thead>
<tbody>
<tr>
<td>24. MA-6 Multiply and divide numbers up to 4 digits. Multiply by powers of ten and multiples of 10. Relate division to multiplication.</td>
</tr>
<tr>
<td>25. MA-3 Solve 1- and 2-step word problems. Employ a problem-solving model that incorporates understanding the problem, making a plan, choosing a strategy, and evaluating the solution for reasonableness. Select the correct operation, number sentence and necessary information to solve a problem, and justify those selections. Know when and how to break a problem into simpler parts.</td>
</tr>
<tr>
<td>26. MA-5 Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
</tr>
<tr>
<td>27. MA-2 Define and identify prime and composite numbers. Write the prime factorization of a number less than 100.</td>
</tr>
<tr>
<td>28. MA-1 Describe the relationship between the subsets of the real number system. Recognize and implement the properties of rational numbers (e.g., commutative, associative, distributive, identity). Solve problems using the order of operations.</td>
</tr>
<tr>
<td>29. MA-3 Recognize place values, and read, write, compare and order numbers up to 12 digits, including use of expanded notation. Round any number to any place.</td>
</tr>
<tr>
<td>30. MA-4 Explore the concept of exponents. Interpret positive whole number powers as repeated multiplication and negative whole number powers as repeated division or multiplication by the multiplicative inverse. Write numbers in scientific notation. Multiply and divide using exponents with a common base.</td>
</tr>
<tr>
<td>31. MA-7 Determine the average of a data set, and know and interpret appropriate measures of central tendency (mean, median and mode) and spread (range).</td>
</tr>
<tr>
<td>32. MA-5 Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
</tr>
<tr>
<td>33. MA-5 Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
</tr>
<tr>
<td>34. MA-5 Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
</tr>
<tr>
<td>35. MA-33 Estimate using various techniques, including estimating solutions to application problems, with whole numbers, fractions, decimals, and percents. Judge the reasonableness of results, and determine when an estimate rather than an exact answer is appropriate.</td>
</tr>
<tr>
<td>36. MA-32 Solve 1- and 2-step word problems. Employ a problem-solving model that incorporates understanding the problem, making a plan, choosing a strategy, and evaluating the solution for reasonableness. Select the correct operation, number sentence and necessary information to solve a problem, and justify those selections. Know when and how to break a problem into simpler parts.</td>
</tr>
<tr>
<td>37. MA-32 Solve 1- and 2-step word problems. Employ a problem-solving model that incorporates understanding the problem, making a plan, choosing a strategy, and evaluating the solution for reasonableness. Select the correct operation, number sentence and necessary information to solve a problem, and justify those selections. Know when and how to break a problem into simpler parts.</td>
</tr>
<tr>
<td>38. MA-7 Determine the average of a data set, and know and interpret appropriate measures of central tendency (mean, median and mode) and spread (range).</td>
</tr>
<tr>
<td>39. MA-5 Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
</tr>
<tr>
<td>40. MA-5 Add and subtract numbers up to 6 digits, in vertical and horizontal formats. Check subtraction by addition.</td>
</tr>
</tbody>
</table>
Prime and Composite Numbers

Finding a pattern for prime and composite numbers

Objective: To find a pattern for prime and composite numbers.

Materials: Cubes or squares cut from Inch Graph Paper (Master 5), index cards, playing cards

Vocabulary: array, prime number, composite number, factor

Introductory Activities

Prime Numbers

Each group will need cubes or square tiles cut from Inch Graph Paper (Master 5). Count out 8 tiles and arrange them to show how they might be packed into rectangular shaped boxes with only one layer. Draw a picture of the different ways you could arrange the 8 tiles. Display or draw a sketch of the two possible rectangles: a $1 \times 8$ and a $2 \times 4$. Rotate each rectangle to several positions to establish that the shape of the rectangle is the same, regardless of the position.

These rectangles are also called arrays. The numbers on the side of each box are related to the multiplication facts equal to 8. What are the two multiplication facts shown? (1 $\times 8 = 8$ and $2 \times 4 = 8$) The numbers on each side are the factors of 8.

Write on the board:

The factors of 8 are: 1, 8, 2, and 4.

Numbers that have more than one array are called composite numbers.

Now select 11 cubes. Find all the different arrays that can be made using exactly 11 cubes. (There will be only one array, a $1 \times 11$.) Write on the board:

The factors of 11 are: 1 and 11.

Numbers that have only one array also have only two different or unique factors.

We call these numbers prime numbers. Direct attention to the factors for 8 and 11 on the board. Is 8 prime or composite? (composite) Is 11 prime or composite? (prime)

Distribute a set of index cards numbered from 1 to 20 to each small group. Each student selects an index card and builds all the different arrays that can be found for the number shown on the card. Students write the number of arrays and the sides (or factors) of each array on the back of each card. Continue until all the cards have been selected.

Ask each small group to select the cards with numbers having only one array. List these numbers on the board: 1, 2, 3, 5, 7, 11, 13, 17, 19. Which

Sample Scripting (Bold Type)

These rectangles are also called arrays. The numbers on the side of each box are related to the multiplication facts equal to 8. What are the two multiplication facts shown? (1 $\times 8 = 8$ and $2 \times 4 = 8$) The numbers on each side are the factors of 8.

Prime Card

Have the class separate into groups of 3 with a deck of 52 playing cards (jacks and face cards included). Deal 5 cards to each player and turn the remaining cards face down in a pile.

Players take turns discarding one card with a prime number on it or drawing cards from the deck until it is impossible to discard a prime card. The person with the fewest cards at the end of the round wins. The winner receives 1 point for each card in the opponents' hands after subtracting the points in her hand. Play several rounds as time permits. Aces = 1, jacks = 11, queens = 12, kings = 13. Prime numbers: 2, 3, 5, 7, 11 (jacks) and 13 (kings).

Skill Builders pp. 15–16
### Objective Number and Description

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Objective Number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ☐ ☐</td>
<td>MA-1</td>
<td>Describe the relationship between the subsets of the real number system. Recognize and implement the properties of rational numbers (e.g., commutative, associative, distributive, identity). Solve problems using the order of operations.</td>
</tr>
<tr>
<td>2. ☐ ☐</td>
<td>MA-8</td>
<td>Identify, compare and order integers and locate integers on a number line. Know the meaning of the absolute value sign, and that an integer and its opposite have a sum of zero.</td>
</tr>
<tr>
<td>3. ☐ ☐</td>
<td>MA-9</td>
<td>Add, subtract, multiply, and divide with the set of integers. Solve word problems involving integers.</td>
</tr>
<tr>
<td>4. ☐ ☐</td>
<td>MA-10</td>
<td>Recognize common representations of fractions, including fractions as parts of a whole and parts of a set, compare and order fractions, and locate fractions on a number line. Understand equivalence and interchange mixed numbers and improper fractions.</td>
</tr>
<tr>
<td>5. ☐ ☐</td>
<td>MA-11</td>
<td>Add and subtract like and unlike rational numbers, including simplifying and/or regrouping, identify common denominators, least common multiples, and greatest common factors.</td>
</tr>
<tr>
<td>6. ☐ ☐</td>
<td>MA-12</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping.</td>
</tr>
<tr>
<td>7. ☐ ☐</td>
<td>MA-13</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping. Write the reciprocal of a fraction.</td>
</tr>
<tr>
<td>8. ☐ ☐</td>
<td>MA-14</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping. Write the reciprocal of a mixed number.</td>
</tr>
<tr>
<td>9. ☐ ☐</td>
<td>MA-15</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping. Write the reciprocal of a mixed number.</td>
</tr>
<tr>
<td>10. ☐ ☐</td>
<td>MA-16</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping. Write the reciprocal of a fraction.</td>
</tr>
<tr>
<td>11. ☐ ☐</td>
<td>MA-17</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping, identify common denominators, least common multiples, and greatest common factors.</td>
</tr>
<tr>
<td>12. ☐ ☐</td>
<td>MA-18</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping, identify common denominators, least common multiples, and greatest common factors.</td>
</tr>
<tr>
<td>13. ☐ ☐</td>
<td>MA-19</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping, identify common denominators, least common multiples, and greatest common factors.</td>
</tr>
<tr>
<td>14. ☐ ☐</td>
<td>MA-20</td>
<td>Add and subtract mixed numbers with like and unlike denominators, with simplifying and/or regrouping, identify common denominators, least common multiples, and greatest common factors.</td>
</tr>
</tbody>
</table>

**Total Number Correct (out of 40 items):**

Pre: ☐  Post: ☐
Finding the pattern for multiplying fractions

**Objective:** To subtract fractions with unlike denominators.

**Materials:** Fraction Bars®, multiple strips (made from the Multiplication Table (Master 6)), 10-sided dice

**Introductory Activities**

**Subtraction with Fraction Bars**

Write on the board:
- You buy \( \frac{3}{4} \) yard of fabric. You use \( \frac{1}{2} \) yard to make a pillow. How much do you have left?
- You live \( \frac{3}{5} \) kilometer from school. You walk \( \frac{1}{2} \) kilometer. How far are you from school?

Demonstrate the solution to each problem with Fraction Bars® and multiple strips. Each small group will need a set of fraction bars and a Multiplication Table (Master 6) cut into multiple strips.

Remember the Golden Rule of fractions. You cannot add or subtract fractions unless they are the same color. Find \( \frac{3}{4} \) and \( \frac{1}{2} \). Are they the same color? (No) What color can they be changed to? (orange)

For problem 1 change the blue \( \frac{3}{4} \) bar into orange \( \frac{9}{12} \) and the yellow \( \frac{1}{2} \) bar to orange \( \frac{6}{12} \).

To show the same problem with multiple strips, place the 3 multiple strip over the 4 strip and the 1 strip over the 3 strip.

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>8</td>
<td>12</td>
<td>16</td>
<td>20</td>
<td>24</td>
<td>28</td>
<td>32</td>
<td>36</td>
<td>40</td>
<td>44</td>
<td>48</td>
</tr>
</tbody>
</table>

Write on the board:
- \( \frac{2}{3} \) – \( \frac{1}{4} \) = \( \frac{5}{12} \)

For problem 2, change \( \frac{1}{2} \) green to \( \frac{3}{6} \) white and then subtract: \( \frac{5}{6} – \frac{1}{2} = \frac{3}{6} \). The fraction \( \frac{3}{6} \) may be simplified to \( \frac{1}{2} \).

**About This Page**

Direct attention to the top of the page. Demonstrate the solution with multiple strips. Students may use fraction bars or multiple strips to complete the rest of the page.

**Follow-Up Activities**

**Dicey Differences**

Game for 2 players. Players take turns throwing two 10-sided dice twice and forming a fraction each time using the smaller number for the numerator and the larger number for the denominator. The player with the greater difference between his or her fractions earns one point. For example, a player throwing a 1 and a 6 on the first throw and a 2 and a 3 on the second throw would subtract: \( \frac{5}{6} – \frac{1}{2} \) for a difference of \( \frac{1}{2} \).

**Authoring Word Problems**

Continue developing a class file of word problems by having students author at least one addition problem and one subtraction problem that might be solved by a computation problem from pages 98–100. Suggest common settings for the problems, e.g., cooking, map directions, capacity. Encourage students to write problems about their real world.

**Skill Builders pp. 80, 81**
Recognize common representations of fractions, including fractions as parts of a whole and parts of a set. Compare and order fractions, and locate fractions on a number line. Understand equivalency and interchange mixed numbers and improper fractions.

Add and subtract like and unlike rational numbers, including simplifying and/or regrouping. Identify common denominators, least common multiples, and greatest common factors.

Examine decimal place values, and place a decimal on a number line. Read, write, compare and order decimals up to the ten-thousandths place. Round a decimal or money amount to the nearest indicated place value.

Interpret percent as parts per 100. Understand the relationships among fractions, terminating decimals, and percents, including interchanging representations. Know common equivalencies (e.g. 1/2, 0.5, 50%).

Find a percent of a number and what percent one number is of another. Solve problems involving discounts, net price, sales tax, interest, and circle graphs with percents.

Estimate using various techniques, including estimating solutions to application problems. With usable numbers, fractions, decimals, and percents. Judge the reasonableness of results, and determine when an estimate rather than an exact answer is appropriate.

Multiply and divide decimals and money amounts in vertical and horizontal format.
Objective: To change fractions to decimals when the denominator is a factor of 10 or 100.

Materials: Interlocking cubes

Introductory Activities

Factors of 10 and 100 from Arrays

Each small group will need at least 10 interlocking cubes and the class will need at least 100 interlocking cubes.

Use 10 cubes to build all the different rectangles you can. How many different rectangles can you build? [2]

Ask a volunteer to draw a picture of the two different rectangles on the board:

The sides of the rectangles are the factors of 10. What are the factors of 10? [2, 5, 1, 10]

Repeat the activity with the whole class, this time using 100 cubes. The rectangles that can be built are 2 x 50, 4 x 25, 5 x 20, 10 x 10, and 100 x 1. What are the factors of 100? [1, 2, 5, 10, 20, 25, 50, and 100]

Changing Fractions to Decimals: Denominator is a Factor of 10 or 100

Can we change 3/4 to an equivalent fraction with a denominator of 10? [No] Can we change 3/4 to an equivalent fraction with a denominator of 100 ... is 4 a factor of 100? [Yes]

Write on the board:

\[
\frac{3}{4} = \frac{25}{100}
\]

\[
\frac{75}{100} = 0.75
\]

Write on the board:

Change each fraction to an equivalent fraction with a denominator of 10 or 100. Then change each fraction to a decimal in tenths or hundredths.

\[
\frac{3}{5} = \frac{11}{25} = \frac{21}{50}
\]

How can we change 7/20 to an equivalent fraction with a denominator of 10 or 100? [Multiply both terms by 2 to change the fraction to tenths.]
## Geometry & Measurement Unit 4 Student Progress Report

**Record results from the Pre- and Post-Test here to see strengths and weaknesses on test questions aligned to the objectives for this level.**

<table>
<thead>
<tr>
<th>Objective Number and Description</th>
<th>Pre-T Test</th>
<th>Post-Test</th>
<th>Total Number Correct (out of 40 items)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. MA-21 Recognize geometric symbols and/or the properties of the following: point, line, ray, angle, parallel, perpendicular, intersecting, radius, diameter, circumference, and chord.</td>
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</tr>
<tr>
<td>2. MA-22 Identify angles as acute, right, obtuse, and straight. Measure and estimate angles. Find the measure of a missing angle for complementary, supplementary, vertical and adjacent angles. Recognize the relationships of angles when parallel lines are cut by a transversal.</td>
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</tr>
<tr>
<td>3. MA-23 Classify triangles and quadrilaterals by the relationships of their sides and angles. Name polygons with up to 10 sides. Know and apply the Pythagorean theorem to find missing sides of right triangles.</td>
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</tr>
<tr>
<td>4. MA-24 Recognize properties of common 3-dimensional solids (pyramid, cone, cylinder, and sphere), including faces, edges and vertices. Create 2-dimensional nets for 3-dimensional figures. Find the volume of a rectangular solid and other prisms with and without formulas.</td>
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<tr>
<td>5. MA-25 Measure to the nearest 1/8 inch and millimeter. Convert measurements within the customary and metric measurement systems. Solve word problems involving measurements.</td>
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</tr>
<tr>
<td>6. MA-26 Measure to the nearest 1/8 inch and millimeter. Convert measurements within the customary and metric measurement systems. Solve word problems involving measurements.</td>
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<tr>
<td>7. MA-27 Determine the perimeter of a square, rectangle, or any polygon, with and without a formula. Calculate the circumference of a circle.</td>
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<tr>
<td>8. MA-28 Determine the area of a square, rectangle, and triangle, with and without a formula.</td>
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<tr>
<td>9. MA-29 Determine the area of a square, rectangle, and triangle, with and without a formula.</td>
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</tr>
<tr>
<td>10. MA-30 Understand ratio and proportion. Find a missing number in a proportion, and use proportions to solve word problems involving geometric figures, scale drawings and rates.</td>
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<tr>
<td>11. MA-31 Understand ratio and proportion. Find a missing number in a proportion, and use proportions to solve word problems involving geometric figures, scale drawings and rates.</td>
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</tr>
<tr>
<td>12. MA-32 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
<td></td>
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<tr>
<td>13. MA-33 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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<tr>
<td>14. MA-34 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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</tr>
<tr>
<td>15. MA-35 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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</tr>
<tr>
<td>16. MA-36 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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</tr>
<tr>
<td>17. MA-37 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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<tr>
<td>18. MA-38 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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<tr>
<td>19. MA-39 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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<tr>
<td>20. MA-40 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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</tbody>
</table>
Objective: To find the Pythagorean relationship in right triangles.

Materials: Centimeter Graph Paper (Master 4), scissors, glue

Vocabulary: square of a number, exponent, factor, Pythagorean theorem, legs, hypotenuse

Introductory Activities

Discover the Right Triangle Pattern

In this activity, students find the squares of numbers from 1 to 10. Each student or small group will need a sheet of centimeter graph paper and scissors. Have students outline and cut out 10 squares having sides of 1, 2, 3, ..., 10 cm.

Display a 1-centimeter square and describe the number of units on each side. This is the smallest square shape we can make with these squares. Each side of the square has a unit of 1. How many units on the horizontal side? (1) on the vertical side? (1) How many small squares in the whole figure? (1)

Write on the board:
The square of 1 or 1 squared or 1² means 1 × 1 = 1

Have students complete the following table:

<table>
<thead>
<tr>
<th>Units</th>
<th>Vertical x</th>
<th>Squares</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1 × 1</td>
<td>1</td>
<td>1² = 1 × 1 = 1</td>
</tr>
<tr>
<td>2</td>
<td>2 × 2</td>
<td>4</td>
<td>2² = 2 × 2 = 4</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>10 × 10</td>
<td>100</td>
<td>10² = 10 × 10 = 100</td>
</tr>
</tbody>
</table>

Try forming a right triangle by connecting the sides of any 3 of your squares. How many different right triangles can you make? (2)

Ask students to describe each right triangle they find. (Students will find the 3-4-5 right triangle and the 6-8-10.)

About This Page

Read the top of the page with the class.

Ask students to circle the side that would be the hypotenuse (the longest side) in each of the problems 1 to 6. Ask volunteers to use the words "if" and "then" to describe how they will know if the sides form a right triangle. (In problem 1, if the sum of the squares of 5 and 12 equals the square of 13, then the triangle is a right triangle.)

Follow-Up Activities

Skill Builders p. 186
## Moving with Algebra Algebra and Functions

### Unit 5 Student Progress Report

Record results from the Pre- and Post-Test here to see strengths and weaknesses on test questions aligned to the objectives for this level.

<table>
<thead>
<tr>
<th>Test Item</th>
<th>Objective Number and Description</th>
<th>Pre Test</th>
<th>Post Test</th>
<th>Pre-Post</th>
<th>Total Correct (out of 40 items)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ☐ MA-9</td>
<td>Identify, compare and order integers, and locate integers on a number line. Know the meaning of the absolute value sign, and that an integer and its opposite have a sum of zero.</td>
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<td>☐ ☐</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
</tr>
<tr>
<td>2. ☐ MA-9</td>
<td>Add, subtract, multiply, and divide with the set of integers. Solve word problems involving integers.</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
</tr>
<tr>
<td>3. ☐ MA-9</td>
<td>Translate models, pictures and words into an algebraic expression.</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
</tr>
<tr>
<td>4. ☐ MA-9</td>
<td>Simplify algebraic expressions before solving equations by combining like terms and removing parentheses, including expressions that involve exponents.</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
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</tr>
<tr>
<td>5. ☐ MA-9</td>
<td>Solve 1-step and multi-step algebraic equations involving addition, subtraction, multiplication and division, providing justification for each step. Understand the properties of equality, equals added to equals are equal and equals multiplied by equals are equal. Multiply and divide monomials, and find square roots.</td>
<td>☐ ☐</td>
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<tr>
<td>6. ☐ MA-9</td>
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<tr>
<td>7. ☐ MA-9</td>
<td>15. ☐ 20. ☐ 25. ☐</td>
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<tr>
<td>8. ☐ MA-9</td>
<td>Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship $d = rt$.</td>
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<td>10. ☐ MA-9</td>
<td>17. ☐ 22. ☐ 27. ☐</td>
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<td>11. ☐ MA-9</td>
<td>18. ☐ 23. ☐ 28. ☐</td>
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<td>18. ☐ MA-9</td>
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<td>19. ☐ MA-9</td>
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<td>☐ ☐</td>
</tr>
<tr>
<td>23. ☐ MA-9</td>
<td>30. ☐ 35. ☐ 40. ☐</td>
<td>☐ ☐</td>
<td>☐ ☐</td>
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<td>☐ ☐</td>
</tr>
</tbody>
</table>
Positive and Negative Integers

Objective: To add positive and negative integers.

Materials: Black and white cubes (or positive and negative integer squares, Master 19), Algebra Tiles

Introductory Activities

Adding Positive and Negative Integers

In this lesson, students begin operations with integers. Positive and negative integers may be modeled using black and white cubes, black and white squares (Master 19), or Algebra Tiles. If using Algebra Tiles, distribute a small set to each group. Let the students explore and discover the tiles’ similarities and differences. (The important similarity is that all tiles have one side that is red.) Explain that the red side of each tile represents the negative value. We will use the smallest squares to represent integers.

Write on the board:

Stephen owed his father $6. He earned $8 mowing the lawn. After paying his father back, how much money did Stephen have?

Have students use black and white cubes, or integer squares or tiles, to model the problem and find the solution. Match pairs of red and yellow tiles, making 6 zero pairs and leaving 2 yellow tiles, or $2.

Write on the board:

1. $6 + 8 = 2

Write on the board:

Kelly owes her father $8. She earns $6 weeding. What is Kelly’s current money situation?

Have students use black and white cubes, or integer squares or tiles to model the problem and solve.

Write on the board:

2. $8 + 6 = 2

Does Kelly owe her father $2 or is the $2 hers? (Kelly still owes her father $2.) Put together 8 white cubes and 6 black cubes. Make all the pairs of zero, and two white cubes will be left.

How do you know? (The money you owe someone is represented by negative numbers.)

Mia owes her father $5. She borrows another $9 to go out to lunch with friends. How much money does Mia owe her father?

Have students use black and white cubes, or integer squares or tiles, to model the problem and find the solution.

Write on the board:

3. $5 + (−9) = −4

How do you know? (The money you owe someone is represented by negative numbers.)

Show the students how to work the same problem using 8 red tiles and 6 yellow tiles. Match pairs of red and yellow tiles, making 6 zero pairs and leaving 2 red tiles, or $2. Also show how to write using positive and negative signs.

Sample Scripting (Bold Type)

Write on the board:

$8 + 6 = −2

Does Kelly owe her father $2 or is the $2 hers? (Kelly still owes her father $2.) Put together 8 white cubes and 6 black cubes. Make all the pairs of zero, and two white cubes will be left.

How do you know? (The money you owe someone is represented by negative numbers.)

Mia owes her father $5. She borrows another $9 to go out to lunch with friends. How much money does Mia owe her father?

Have students use black and white cubes, or integer squares or tiles, to model the problem and find the solution.

Write on the board:

$5 + (−9) = −4

How do you know? (The money you owe someone is represented by negative numbers.)

Show the students how to work the same problem using 8 red tiles and 6 yellow tiles. Match pairs of red and yellow tiles, making 6 zero pairs and leaving 2 red tiles, or $2. Also show how to write using positive and negative signs.

Follow Up Activities

Skill Builders p. 202
Objective: To solve addition or subtraction equations with models.

Materials: Rectangular rods or lunch bags (or positive rectangular rods, Master 19, or Algebra Tiles), black and white cubes (or positive and negative integer squares, Master 19), index card with equal sign (or Master 19)

Introductory Activities

Equations with Addition or Subtraction

Model the equation \( x + 3 = 8 \) with rods or lunch bags and cubes as shown. The activity may also be modeled on the overhead using black and white squares and rectangular rods from a transparency of Master 19.

Ask a student to translate the equation shown into words. (x plus three is equal to eight, or some number plus three is equal to eight.) What must be done to an equation to keep it balanced? (Whatever operation is done on one side of the equal sign must be repeated on the other side of the equal sign.)

To solve an equation, get the variable by itself on one side of the equal sign. What is on the same side as the variable \( x \)? (3) How can we get rid of the 3? (add -3) If we add -3 to the left side, what must be done on the right side of the equal sign? (add +3) Model this by placing 4 white cubes on each side. How does the equation read? (x + 3 - 3 = 8 - 3) If we put together the like terms on both sides, what do we get? (x = 5)

Let us check our answer. If we put 5 in for \( x \), is the equation true? (yes) Why? (because 5 + 3 = 8)

Model the equation \( x - 3 = -5 \) with rods and cubes as shown below.

Ask a student to translate the equation shown into words. (x minus three equals negative five, or a number minus three equals negative five) What must we get rid of to get \( x \) by itself on one side of the equal sign? (3) How can we do this? (add +3) If we add +3 to the left side, what must be done on the right side of the equal sign? (add +3) Model this by placing 3 black cubes on each side. Now how does the equation read? (x - 3 + 3 = -5 + 3) Simplify the equation by putting together the like terms on both sides of the equal sign. What are we left with? (x = 2) If we put 2 in for \( x \), is the equation true?

To check, we substitute 2 for \( x \). Show the check on the board: (2) - 3 = 5

Sample Scripting (Bold Type)

Ask a student to translate the equation shown into words. (x minus three equals negative five, or a number minus three equals negative five) What must we get rid of to get \( x \) by itself on one side of the equal sign? (3) How can we do this? (add +3) If we add +3 to the left side, what must be done on the right side of the equal sign? (add +3)

Skill Builders p. 212
Objective: To solve two-step equations using inverse operations.

Materials: Black and white cubes (or positive and negative integer squares, Master 19, or Algebra Tiles), brown paper bags (or envelopes), small paper plates

Introductory Activities

Two-Step Equations

Write on the board or overhead:
(Student’s name) thought of a number. He divided it by 2 and subtracted 5 from the quotient. The result was 1. What was the number?

Ask a student to suggest the related number sentence.

\[ \frac{n}{2} - 5 = 1 \]

Model the solution with rods, cubes (or squares) and bags (or envelopes). You will need 2 paper plates for the second step when 12 black cubes are shared or divided on 2 paper plates. Ask students to draw a picture of the solution and solve the problem with pencil.

Drawing:

\[ \frac{2}{2} \]

\[ \frac{2}{2} = \]

\[ 2 \cdot \frac{2}{2} = \]

\[ \frac{n}{2} - 5 = 1 \]

Solution with paper and pencil:

\[ \frac{n}{2} - 5 = 1 \quad \text{Add 5 to both sides.} \]

\[ \frac{n}{2} - 5 + 5 = 1 + 5 \]

\[ \frac{n}{2} = 6 \quad \text{Multiply both sides by 2.} \]

\[ 2 \cdot \frac{n}{2} = 6 \cdot 2 \]

\[ n = 12 \]

About This Page

Read the explanation together. Relate the pattern of undoing to using the inverse operation. In the first step, 5 was subtracted from the variable, so we add 5 to both sides of the equation to undo the operation. In the second step, the variable is multiplied by 2, so we divide both sides by 2.

The odd-numbered problems may be worked with a partner. Have students complete the even-numbered problems independently.

Follow-Up Activities

Checking by Substitution

Have students check their answers using substitution.

Creating Puzzles

Have students make up their own two-step number puzzles. Collect the problems and redistribute copies to other class members.

Example: If I multiply my age by 2 and subtract 6, the answer is 20. How old am I?

Skill Builders pp. 217, 218, 245
### Moving with Algebra Algebra and Functions

#### Unit 6 Student Progress Report

**Name**

Record results from the Pre- and Post-Test here to see strengths and weaknesses on test questions aligned to the objectives for this level.

<table>
<thead>
<tr>
<th>Pre-Test</th>
<th>Post-Test</th>
<th>Objective Number and Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-1 Describe the relationship between the subsets of the real number system. Recognize and implement the properties of rational numbers (e.g., commutative, associative, distributive, identity). Solve problems using the order of operations.</td>
</tr>
<tr>
<td>2. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-4 Explore the concept of exponents. Interpret positive whole number powers as repeated multiplication and negative whole number powers as repeated division or multiplication by the multiplicative inverse. Write numbers in scientific notation. Multiply and divide using exponents with a common base.</td>
</tr>
<tr>
<td>3. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-38 Solve one-step and multi-step algebraic equations involving addition, subtraction, multiplication and division, providing justification for each step. Understand the properties of equality, equations added to equals are equal and equals multiplied by equals are equal. Multiply and divide monomials and find square roots.</td>
</tr>
<tr>
<td>4. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-29 Understand and use coordinate graphs to place a point, name its coordinates, and draw and identify geometric figures.</td>
</tr>
<tr>
<td>5. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-39 Explore linear functions and related equations. Understand that a function represents a dependence of one quantity on another and can be described in a variety of ways. Write and graph functions with up to two variables. Solve word problems using the distance relationship ( d = rt ).</td>
</tr>
<tr>
<td>6. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-29 Understand and use coordinate graphs to place a point, name its coordinates, and draw and identify geometric figures.</td>
</tr>
<tr>
<td>7. ☐ ☐</td>
<td>☐ ☐</td>
<td>MA-40 Determine the slope of a line, and verify that a point lies on a line. Know and apply the relationship between slopes of parallel and perpendicular lines. Recognize lines with zero and undefined slopes, and identify lengths of horizontal and vertical line segments. Understand the slope-intercept form, and calculate ( x ) and ( y ) intercepts. Given ordered pairs for two points on a line, write and graph the equation for the line.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Pre-Post</th>
<th>Total Number Correct (out of 40 items)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ ☐</td>
<td>☐ ☐</td>
</tr>
</tbody>
</table>

**Total Number Correct** (out of 40 items)

Pre: ☐, Post: ☐
Lesson Plans

Objective: To find square roots of monomials.

Materials: Black and white cubes (or positive and negative integer squares, Master 19)

Vocabulary: squaring a number, square root, radical sign

Introductory Activities

Squares and Square Roots

Ask students to name everyday activities that are inverses, such as zipping and unzipping a jacket, tying and untying shoes. Then have them list mathematical operations and their inverses. (addition and subtraction; multiplication and division)

Squaring a number is like knowing the length of the sides of a rug and finding its area.

Example: A rug with 4 feet on each side has 4 squared or 16 square feet.

Finding the square root is the opposite of finding the area. The square root means to find the length of the sides of the square.

If you have 25 square inches and want to arrange them as a large square, how many inches on each side? Use 25 cubes, tiles or squares. Rearrange them as a square to find the number of units on each side.

Draw on the board:

\[ \sqrt{25} = 5 \]

The square root of 25 is 5.

This special symbol that means to find the square root is called a radical sign.

To find the square root of a monomial with a variable, break apart the numbers and letters. Then find the square root of each part.

Write on the board:

\[ \sqrt{16x^2} = \sqrt{16} \sqrt{x^2} = 4x \]

About This Page

Read the explanations at the top of the page together. Use cubes or squares on an overhead to demonstrate the examples related to the dog's pen and carpet. Emphasize that monomials with variables must be broken into separate parts.

Work problems with the class.

Sample Scripting (Bold Type)

Finding the square root is the opposite of finding the area. The square root means to find the length of the sides of the square.

If you have 25 square inches and want to arrange them as a large square, how many inches on each side? Use 25 cubes, tiles or squares. Rearrange them as a square to find the number of units on each side.
Objective: To write equations, tables and graphs for sets of ordered pairs.

Materials: Measuring cup, empty pint and quart containers, water or rice

Vocabulary: direct variation, constant of variation, independent variable, dependent variable

Introductory Activities

Converting Measurements
Display a measuring cup, an empty 1-pint carton and a 1-quart carton that might be found at a deli counter. Write “1 cup,” “1 pint” and “1 quart” on the correct containers.

How many cups are in 1 pint? Fill the measuring cup with water or rice and pour the cup into the pint container to show that 2 cups equal 1 pint.

How many cups in 1 quart? Fill a cup with rice or water and pour into the 1-quart container. Continue this activity to show that 4 cups equal 1 quart.

Write on the board:
Make a table to show the relationship between the number of cups in from 1 to 5 quarts.

Write an equation and make a graph of the information.

equation: \( c = 4q \)

<table>
<thead>
<tr>
<th>q</th>
<th>c</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>3</td>
<td>12</td>
</tr>
<tr>
<td>4</td>
<td>16</td>
</tr>
<tr>
<td>5</td>
<td>20</td>
</tr>
</tbody>
</table>

Which are the independent and dependent variables? (quarts and cups, respectively)

Graph:

About This Page
Read the explanation at the top of the page.

What is the equation showing the relationship between the total cost of the books, the cost per book and the number of books? \( t = 2b \)

Have students graph the 4 points from the table.

Read problem 1 together. What is the equation? \( y = 3x \)
If \( x \) is 1, what is \( y \)? \( 3 \)
If \( x \) is 2, what is \( y \)? \( 6 \)
If \( x \) is 3, what is \( y \)? \( 9 \)

Have students graph the 3 points and describe the graph. (a straight line) Have students complete the page on their own.

Follow-Up Activities

Skill Builders p. 237

Representation Rummy,
Skill Builders pp. 238–239
**Objective:** To define and explore the slope of a line.

**Materials:** Geoboards, overhead geoboard, Coordinate Grids (Master 30), transparency of Overhead Coordinate Grid (made from Master 39)

**Vocabulary:** slope, rise, run

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**Introducing Slope**

In this activity, a bicycle ride is used to introduce slope. The picture of the ride is drawn on the board or on a transparency.

*Suppose you are going on a bicycle ride. Your trip goes up and down several hills. As you look at the first hill you say to yourself, “This is a steep hill, I had better change the gears on my bike.”*

You start at point A and bike uphill to point B.

Draw a picture of the hill on the board or on a transparency of Master 39.

When you get to point B, you have gone 3 units in a horizontal direction at the same time you have gone 3 units in a vertical direction. The slope of this line is the ratio between the vertical change (rise) to the horizontal change (run).

Write on the board:

**slope of AB** = \( \frac{\text{rise}}{\text{run}} = \frac{3}{3} = 1 \)

Now you bike on a flat road from point B to point C. What is the slope? \( \text{rise} = 0/3, \text{or} 0 \)

You begin to go downhill from point C to point D.

Continue to draw on the board:

When you bike from point C to point D, you have gone 4 units in a horizontal direction at the same time you have gone down 3 units vertically or we could say rising 3 in the negative direction. What is the slope of CD?

**What is the slope of BC?**

\( \text{slope} = \frac{\text{rise}}{\text{run}} = \frac{3-3}{6-3} = \frac{0}{3} = 0 \)

**What kind of line is a line with a slope of 0?** (a horizontal line parallel to the x-axis)

**Slope on a Geoboard**

Each small group will need a geoboard labeled with the points A–Y. Use a geoboard to show line segment FC. Find the slope of FC.

\( \text{slope of FC} = \frac{\text{rise}}{\text{run}} = \frac{3+3}{2} = \frac{6}{2} = 3 \)

**Show line segment GX.** Find the slope of GX.

\( \text{slope of GX} = \frac{\text{rise}}{\text{run}} = \frac{3}{2} \)

**About This Page**

Read the explanation together. Demonstrate the slope on an overhead geoboard. Have students show each problem on a geoboard or compute slopes from the drawings.
**Moving with Algebra® RTI Component Checklist**

*Moving with Algebra®* is RTI Ready™ and integrates all eight of the RTI Best Practices recommended by What Works Clearinghouse.

1. **Predictive Screening:**
   - Pre-Tests, Post-Tests, Daily Reviews, and weekly Check Points
   - Identify at-risk students and monitor progress

2. **In-Depth Instruction:**
   - Focus on whole numbers in grades 1 through 4
   - Focus on rational numbers in grades 4 through 8 (decimals and fractions)

3. **Systematic and Explicit Instruction:**
   - Lightly-scripted lesson plans guide instruction
   - Classroom activities use explicit models and strategies
   - Students given opportunities to verbalize, write, discuss, and practice skills learned

4. **Solving Word Problems:**
   - Explicit steps and strategies for solving word problems
   - Practice solving word problems using alternative strategies
   - Use of word frames (underlying structures) in solving word problems

5. **Visual Representations of Math Concepts:**
   - Manipulative-based activities introduce each math concept
   - Pictorial representations on every student page

6. **Fluency-Building Activities:**
   - Skill Builder worksheets include flash cards, timed exercises, speed games
   - Include research-based strategies such as fact families

7. **Monitoring:**
   - Pre-Tests, Post-Tests, Daily Reviews, weekly Check Points, and embedded assessments monitor the progress of at-risk students

8. **Motivation:**
   - Activity-based instruction offers rich opportunities for student success and natural occasions for praise and encouragement

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“RTI intentionally cuts across the borders of special education and general education and involves school-wide collaboration.”

Assisting Students Struggling with Mathematics: Response to Intervention (RTI) for Elementary and Middle Schools, National Center for Education Evaluation and Regional Assistance, 2009

*Moving with Math® Foundations* and *Math by Topic (IM/MH)* are also RTI Ready™. Visit our website to learn more.

www.movingwithmath.com