

# SPECTRUM<sup>®</sup>

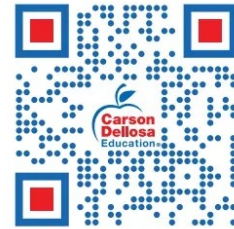
## MATH

### Grade 6

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- Point the camera at the QR code
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Spectrum®

An imprint of Carson Dellosa Education

PO Box 35665

Greensboro, NC 27425 USA

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ISBN 978-1-4838-7232-2

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# Spectrum Introduction

For more than 20 years, Spectrum® workbooks have been the solution for helping students meet and exceed learning goals. Each title in the Spectrum workbook series offers grade-appropriate instruction and reinforcement in an effective sequence for learning success.

Spectrum partners with you in supporting your student's educational journey every step of the way! This book will help them navigate Grade 6 math and will give you the support you need to make sure your student learns everything they need to know. Inside you will find:

# Chapter Introductions

These introductions provide useful information about the chapter. They may include:

### Helpful Definitions

These terms either appear in the chapter or are important for the skills being taught.

### Skills Checklist

This checklist helps ensure your student is practicing grade-level skills.

**Chapter 5: Expressions and Equations**

**Helpful Definitions**

**exponent:** a number that represents repeated multiplication of the number by itself

**base:** the number that is multiplied

$2^3 = 2 \times 2 \times 2 = 8$   
2 to the 3rd power

**expression:** a combination of numbers, variables, and of at least one operation

**equation:** a number sentence that contains an equal sign

**terms:** a number, variable, product, or quotient in an algebraic expression

**variable:** a symbol, usually a letter of the alphabet, that stands for an unknown number or quantity

**coefficient:** a number that multiplies a variable

**constant:** a term that contains only a number

**order of operations:** the rule that tells the sequence of operations that should be followed in a multi-step problem (the acronym PEMDAS can be used to help remember the order)

|             |           |                    |                 |   |   |
|-------------|-----------|--------------------|-----------------|---|---|
| P           | E         | M                  | D               | A | S |
| 1           | 2         | 3                  | 4               |   |   |
| Parentheses | Exponents | Multiply or Divide | Add or Subtract |   |   |

**( )**  **$a^2$**   **$\times$**   **$\div$**   **$+$**   **$-$**

**inequality:** a number sentence that contains a greater than (>), less than (<), greater than or equal to ( $\geq$ ), or less than or equal to ( $\leq$ ) sign

**dependent variable:** the value that is affected by the other values in a problem

**independent variable:** the value that affects the outcome of the dependent variable

**Skills Checklist**

- Identify the opposite of a number
- Write a power as the product of factors; use exponents to rewrite expressions showing repeated multiplication
- Evaluate expressions using exponents
- Identify the parts of an expression or equation
- Write a mathematical phrase as an expression or equation, and vice versa
- Evaluate expressions when given a value for the variable(s)
- Simplify values and combine like terms to identify and create equivalent expressions
- Solve one-step equations with addition and subtraction or multiplication and division
- Solve one-step inequalities with addition and subtraction
- Represent the possible values for the variable of an inequality on a number line
- Determine if an equation or inequality is true when given a value for the variable
- Write the related equation for a word problem and solve
- Identify the dependent and independent variables in a problem
- Use a table to solve a problem with two variables

**Tools and Tips**

Variables can be strange and intimidating when most students have only worked with numbers in math so far. It can help students to change the language and help them better understand what a variable represents before trying to solve a problem. For example, regarding the problem  $2x + 8 = 12$ , minus what equals 8? can help students see that they are trying to find an unknown number, and that they do know how to find the answer.

Also, using simple tools like a number line with addition and subtraction problems, or bar models with multiplication and division can help students visualize a tricky problem. For more information on bar modeling, refer back to page 19.

## Lessons

Name \_\_\_\_\_

**Lesson 1.1 Number Properties**



There are certain rules or properties of math that are always true. The commutative properties of addition and multiplication state that the order in which numbers are added or multiplied does not change the result.

$$a + b = b + a \quad \text{and} \quad a \times b = b \times a$$
$$7 + 3 = 10 \quad \text{and} \quad 3 + 7 = 10$$

These pages begin with a definition, step-by-step instructions where needed, and examples, followed by independent practice.

## Enrichment

If you were at the store purchasing items for a party with 85 guests where you planned to give each guest 7 tickets, how many tickets will you need? Explain how the distributive property can help you find the total number of tickets you need without using a calculator.

These problems appear throughout the book. They allow your student to dig deeper and apply the skill they learned in a different way than it is practiced on the page. The two types of problems will ask your student to think critically  and explain reasoning .

## Pretests

Name \_\_\_\_\_

**Pretest Chapter 1**

Rewrite each expression using the distributive property.

These quick skill assessments serve as a starting point for the chapter. They will include the skills covered in the chapter and allow your student to gauge what they already know and what they need extra practice with.

## Posttests

Name \_\_\_\_\_

**Posttest Chapter 1**

Rewrite each expression using the distributive property.

These end-of-chapter assessments test to see if your student gained the skills they needed from the chapter they just completed. You can compare these tests to the pretests and measure your student's growth.

## Learning Checkpoints

Name \_\_\_\_\_

**Learning Checkpoint Chapters 1-4**

Multiply or divide. Write fractions in simplest form.

These reviews break up the book into halfway points to prepare your student for the final test.

## Final Test

Compare the integers using  $<$ ,  $>$ , or  $=$ .

23.  $0$    $-1$    24.  $-44$    $-41$    25.  $-4$    $8$    26.  $-15$    $-17$

Solve each ratio.

This test covers the skills learned in the book. Use this comprehensive test to assess what your student has learned and to identify what they still need to work on.

## Answer Key

The answers to the lessons, reviews, and tests are provided in an answer key.

## Chapter 1: Understanding the Number System and Operations

### Helpful Definitions

**distributive property of multiplication:** a property that states when a number is multiplied by the sum or difference of two numbers in parentheses, the answer is equal to the answer you would get by distributing the number inside the parentheses, multiplying the number by each number separately, then solving the addition or subtraction problem

$$a \times (b + c) = (a \times b) + (a \times c) \quad \text{and} \quad a \times (b - c) = (a \times b) - (a \times c)$$

**reciprocal operations:** addition and subtraction, and multiplication and division are inverse, or opposite, operations; they can be used to reverse an operation, like when checking an answer

**prime factorization:** a way of expressing a number as a product of its prime factors, like 2, 3, and 5

**greatest common factor:** the largest common factor, or divisor, shared by two or more numbers

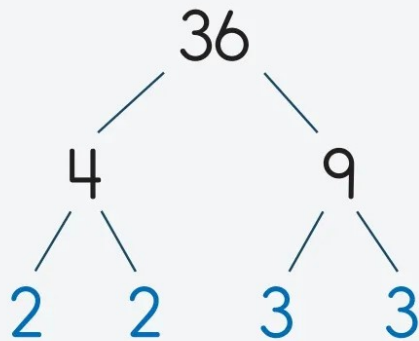
**least common multiple:** the smallest multiple two or more numbers have in common

### Skills Checklist

- Understand and apply the distributive property to create equivalent expressions
- Multiply and divide fluently with multi-digit numbers
- Find the greatest common factor for a set of numbers
- Find the least common multiple for a set of numbers
- Add, subtract, multiply, and divide decimals fluently

## Tools and Tips

**factor tree:** a visual way to break a composite number into its factors, and those into their factors until you are left with only prime factors



$$36 = 2 \times 2 \times 3 \times 3$$

$$36 = 2^2 \times 3^2$$

Factor trees are only one way to find the factors and prime factors of a number. Students may also use tables or lists. Encourage your student to use exponent notation when writing the prime factorization. This will help them to become comfortable with the notation and what it means before computing with it in expressions later.

This book presents multiplication and division using the standard algorithm. However, there are many other ways to solve multi-digit multiplication and division problems. While the ultimate goal is for students to be fluent with the algorithm, allow your student to use any method that they are comfortable with. Other methods you may expect to see include area models and the partial products or partial quotients methods.

Name \_\_\_\_\_

## Pretest Chapter 1

Rewrite each expression using the distributive property.

1.  $(6 \times 4) + (6 \times 2)$  \_\_\_\_\_

2.  $5 \times (5 + 7)$  \_\_\_\_\_

3.  $(2 \times 2) + (2 \times 8)$  \_\_\_\_\_

4.  $20 + 4$  \_\_\_\_\_

Write the missing number.

5.  $3 \times (2 + 8) = (3 \times 2) + (3 \times n)$   $n =$  \_\_\_\_\_

6.  $2 \times (n + 5) = 12 + 10$   $n =$  \_\_\_\_\_

Find the greatest common factor of each set of numbers.

7. 4 and 6 \_\_\_\_\_

8. 24 and 15 \_\_\_\_\_

9. 27 and 18 \_\_\_\_\_

10. 14 and 42 \_\_\_\_\_

Find the least common multiple of each set of numbers.

11. 42 and 63 \_\_\_\_\_

12. 3 and 8 \_\_\_\_\_

13. 12 and 16 \_\_\_\_\_

14. 9, 10, and 45 \_\_\_\_\_

Name \_\_\_\_\_

## Pretest Chapter 1

Multiply or divide.

15. 
$$\begin{array}{r} 314 \\ \times 623 \\ \hline \end{array}$$

16. 
$$\begin{array}{r} 4,152 \\ \times 351 \\ \hline \end{array}$$

17. 
$$\begin{array}{r} 0.83 \\ \times 0.165 \\ \hline \end{array}$$

18. 
$$\begin{array}{r} 0.61 \\ \times 0.7 \\ \hline \end{array}$$


19.  $86 \overline{)6,278}$

20.  $27 \overline{)53,570}$

21.  $0.04 \overline{)64}$

22.  $3.8 \overline{)17.48}$

Solve each problem.

Show your work. 

23. One container of fish food costs \$2.23. How many containers can you buy with \$31.22?

You can buy \_\_\_\_\_ containers.

24. Yazmin has 36 tomato plants, 72 bean plants, and 45 squash plants. She wants to put the same number of plants in each row, and she doesn't want to mix plants on a row. What is the greatest number of plants she can put in a row?

She can put \_\_\_\_\_ plants in a row.

Name \_\_\_\_\_

## Lesson 1.1 Number Properties

There are certain rules or properties of math that are always true.

The **commutative properties** of addition and multiplication state that the order in which numbers are added or multiplied does not change the result.

$$a + b = b + a \quad \text{and} \quad a \times b = b \times a$$

$$2 + 3 = 5 \quad 5 \times 2 = 10$$

$$3 + 2 = 5 \quad 2 \times 5 = 10$$

The **associative properties** of addition and multiplication state that the way in which addends or factors are grouped does not change the result.

$$(a + b) + c = a + (b + c) \quad \text{and} \quad (a \times b) \times c = a \times (b \times c)$$

$$(2 + 3) + 4 = 2 + (3 + 4) \quad (2 \times 4) \times 5 = 2 \times (4 \times 5)$$

$$5 + 4 = 2 + 7 \quad 8 \times 5 = 2 \times 20$$

$$9 = 9 \quad 40 = 40$$

The **identity property of addition** states that the sum of an addend and 0 is the addend.

$$\text{For example, } 5 + 0 = 5$$

The **identity property of multiplication** states that the product of a factor and 1 is that factor.

$$\text{For example, } 4 \times 1 = 4$$

The **properties of zero** state that the product of a factor and 0 is 0 and that the quotient of zero and any non-zero divisor is 0.

$$\text{For example, } 5 \times 0 = 0, 0 \div 5 = 0$$

Name the property shown by each statement.

1.  $(3 \times 2) \times 6 = 3 \times (2 \times 6)$  \_\_\_\_\_

2.  $0 \div 12 = 0$  \_\_\_\_\_

3.  $7 + 2 + 12 = 2 + 12 + 7$  \_\_\_\_\_

Rewrite each expression using the property indicated.

4. Identity;  $24 \times 1$  \_\_\_\_\_

5. Associative;  $(9 + 3) + 5$  \_\_\_\_\_

6. Commutative;  $4 \times 12$  \_\_\_\_\_

Name \_\_\_\_\_



## Lesson 1.2 The Distributive Property

The **distributive property** combines the operations of addition and multiplication. When an expression is multiplied by a number, each number inside the expression is multiplied by that factor. Then, their products can be added together.

$$a \times (b + c) = (a \times b) + (a \times c)$$

$$3 \times (2 + 5) = (3 \times 2) + (3 \times 5)$$

$$3 \times 7 = 6 + 15$$

21                      21      Solved either way, the answer is the same.

Indicate which operation should be done first.

1.  $(3 \times 4) + (3 \times 6)$  \_\_\_\_\_      2.  $8 \times (5 + 2)$  \_\_\_\_\_

Rewrite each expression using the distributive property.

3.  $5 \times (3 + 5)$  \_\_\_\_\_

4.  $(3 \times 4) + (3 \times 3)$  \_\_\_\_\_

Write each missing number.

5.  $2 \times (6 + 5) = (2 \times 6) + (2 \times n)$   $n =$  \_\_\_\_\_

6.  $(8 \times 2) + (n \times 3) = 8 \times (2 + 3)$   $n =$  \_\_\_\_\_

Replace  $a$  with 3,  $b$  with 4, and  $c$  with 6. Then, find the value of each expression.

7.  $a \times (b + c) =$  \_\_\_\_\_

8.  $(b \times a) + (b \times c) =$  \_\_\_\_\_