Factors and Multiples
Topic 1 Overview

How are the key concepts of *Factors and Multiples* developed?

In this topic, students extend their knowledge of area and number to compose and decompose areas that represent numeric expressions. Students decompose numbers into factors to apply the Distributive Property to compute products efficiently. They use the Distributive Property to express sums of two numbers as a product of two factors. They use the Commutative Property to express equivalent expressions. Students use factor trees to determine all of the prime factors for a given number, and they use tables to organize prime factors for two or more numbers. Students then use their knowledge of factors to determine the greatest common factors and least common multiples. Students use whole number exponents and prime factorization to generate equivalent numerical expressions.

What is the entry point for students?

Students enter grade 6 with experiences using area models, both tiling areas with unit squares and representing multiplication. This topic draws on these experiences to formalize the Distributive Property and to decompose numeric expressions. Students' prior work with factor pairs supports their new learning about least common multiples and greatest common factors.

How does a student demonstrate understanding?

Students will demonstrate an understanding of the standards in this topic when they can:
- Apply properties of operations to compose and decompose numbers and shapes to understand the relationship between factors and multiples.
- Create equivalent expressions using the Commutative and Distributive Properties.
- Identify the factors of two whole numbers and determine the greatest common factor.
- Identify the multiples of two whole numbers and determine the least common multiple.
- Generate equivalent numerical expressions using whole number exponents and prime factorization.

Why is *Factors and Multiples* important?

This topic focuses on composing and decomposing numbers and expressions. Students will apply the same properties and terminology to algebraic expressions in a later module, where they will use the properties of operations to write equivalent algebraic expressions.

Students will continue to apply this knowledge throughout middle and high school as they generate equivalent algebraic expressions and solve multi-step equations and inequalities.

How do the activities in *Factors and Multiples* promote student expertise in the mathematical process standards?

All Carnegie Learning topics are written with the goal of creating mathematical thinkers who are active participants in class discourse, so the mathematical process standards should be evident in all lessons. Students are expected to make sense of problems and work towards solutions, reason using concrete and abstract ideas, and communicate their thinking while providing a critical ear to the thinking of others.

This topic highlights the need for precision and for seeing patterns and structure in mathematics. This topic provides students with formal language for previously learned concepts; this shared language will allow them to communicate more effectively. Throughout this topic and module, students are encouraged to look for structure and common structures in numbers and shapes.

Students should use mathematical reasoning to consider if expressions are equivalent and to determine whether their answers make sense. It is important to develop students' disposition early in the course, encouraging them to self-ask, "How is this similar to another concept?" and "Does my answer make sense based on the information given?". Throughout the topic, students should be looking for patterns to discern their own shortcuts before being provided with a standard algorithm.
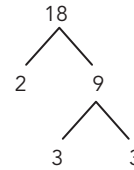
Materials Needed

- Scissors

Concrete and Visual Representations Used

Area Model to Illustrate the Distributive Property
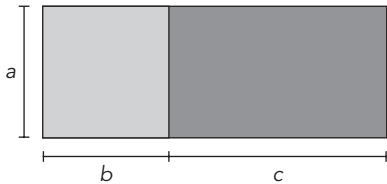
Factor Tree

$$a(b + c) = ab + ac$$

$$18 = 2 \cdot 3 \cdot 3$$

Prime Factor Table to Determine LCM and GCF

$24 = 2 \cdot 2 \cdot 2 \cdot 3$
$40 = 2 \cdot 2 \cdot 2 \cdot 5$
$72 = 2 \cdot 2 \cdot 2 \cdot 3 \cdot 3$

Number	Prime Factors					
24	2	2	2	3		
40	2	2	2		5	
72	2	2	2	3		3

Learning Together

ELPS: 1.A, 1.C, 1.E, 1.F, 1.G, 2.C, 2.E, 2.I, 3.D, 3.E, 4.B, 4.C, 5.B, 5.F, 5.G

Lesson	Lesson Name	TEKS	Days	Highlights
1	Taking Apart Numbers and Shapes: Writing Equivalent Expressions Using the Distributive Property	6.7D	1	Students divide area models in different ways to see that the sum of the areas of the smaller regions equals the area of the whole model. They then rewrite the product of two factors as a factor times the sum of two or more terms, leading to the formalization of the Distributive Property.
2	Searching for Common Ground: Identifying Common Factors and Common Multiples	6.7A	2	Students construct rectangles with given areas and relate their dimensions to factors and common factors. They create prime factorizations to determine the greatest common factor (GCF) and least common multiple (LCM) of two numbers. Students examine the rows and columns of an area model to identify multiples and the LCM. They describe the relationship between the product, GCF, and LCM.
3	Composing and Decomposing Numbers: Least Common Multiple and Greatest Common Factor	6.7A 6.7D	1	Students continue to expand their understanding of factors, multiples, common factors, and common multiples as introduced in previous lessons. They use greatest common factor (GCF) and least common multipe (LCM) to solve problems.

Suggested Topic Plan

*1 Day Pacing = 45 min. Session

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: 6.7D	TEKS: 6.7A	**LESSON 2** continued	TEKS: 6.7A, 6.7D	**END OF TOPIC ASSESSMENT**
LESSON 1 **Taking Apart Numbers and Shapes** GETTING STARTED	**LESSON 2** **Searching for Common Ground** GETTING STARTED	ACTIVITY 3 ACTIVITY 4 TALK THE TALK	**LESSON 3** **Composing and Decomposing Numbers** GETTING STARTED	
ACTIVITY 1	ACTIVITY 1		ACTIVITY 1	
TALK THE TALK	ACTIVITY 2		TALK THE TALK	

Assessments

There is one assessment aligned to this topic: End of Topic Assessment.