**MCC. 3.OA.9 (Operations of Algebraic Thinking)**

Identify arithmetic patterns (including patterns in the addition table or multiplication table), and explain them using properties of operations. *For example, observe that 4 times a number is always even, and explain why 4 times a number can be decomposed into two equal addends.*

**ENDURING UNDERSTANDINGS**

● Each dimension can be considered repeated addition.

● Multiplication is repeated addition.

● Multiplication can be used to find the area of rectangles with whole numbers.

● A product can have more than two factors.

● Some word problems may require two or more operations to find the solution.

**ESSENTIAL QUESTIONS**

● How are patterns related to multiplication?

● How can an addition table help you explain the Commutative Property of Multiplication?

● How can base-ten blocks help us understand how to multiply a two-digit number?

● How can multiple math operations be used to solve real world problems?

● How can multiplication products be displayed on a 1-100 chart?

● How can multiplication used when reading a pictograph?

● How can the knowledge of area be used to solve real world problems?

● How can we use patterns to solve problems?

● How can you describe various patterns, (i.e. with words, as a visual pattern on a 1-100 chart, or using mathematical notations)?

● How do estimation, multiplication, and division help us solve problems in everyday life?

● How do two-step word problems differ from one-step word problems?

● How does understanding the distributive property help us multiply large numbers?

● How is the commutative property of multiplication evident in an area model?

● How is the decomposition of a factor in an equation related to the distributive property of multiplication?

● What does it mean to decompose a number?

● What is a pattern?

● What strategies can be used to solve word problems?

● What symbols can be used to represent an unknown amount?

● Why is it important to understand that more than one math operation may be needed to solve a problem?

**CONCEPTS/SKILLS TO MAINTAIN**

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

● Addition, Subtraction, Multiplication, Division

● Skip counting

● Relationship between addition and multiplication

● Two-dimensional plane figures

● Understanding of arrays

● Solving one-step word problems

● Factors of products

● Commutative Property of Multiplication

● Distributive Property of Multiplication

**STRATEGIES FOR TEACHING AND LEARNING**

**Solve problems involving the four operations, and identify and explain patterns in arithmetic.**

Students gain a full understanding of which operation to use in any given situation through contextual problems. Number skills and concepts are developed as students solve problems. Problems should be presented on a regular basis as students work with numbers and computations.

Researchers and mathematics educators advise against providing “key words” for students to look for in problem situations because they can be misleading. Students should use various strategies to solve problems. Students should analyze the structure of the problem to make sense of it. They should think through the problem and the meaning of the answer before attempting to solve it.

Encourage students to represent the problem situation in a drawing or using manipulatives such as counters, tiles, and blocks. Students should determine the reasonableness of the solution to all problems using mental computations and estimation strategies.

Students are to identify arithmetic patterns and explain these patterns using properties of operations. They can explore patterns by determining likenesses, differences and changes. Use patterns in addition and multiplication tables.

**EVIDENCE OF LEARNING**

By the conclusion of this unit, students should be able to demonstrate the following competencies:

● When problem solving, find the missing dimensions or factors.

**LEARNZILLION:**

<https://learnzillion.com/lessonsets/258-identify-and-explain-arithmetic-patterns-using-properties-of-operations>