

## Mayan Math

By Julie Kilcullen, 5<sup>th</sup> grade

**Objective:** Students will be able to compare the American Number System to that of the ancient Mayan Number System. Students will be able to identify the differences and similarities between the two systems.

### **TEKS: §111.17. Mathematics, Grade 5.**

(3) Throughout mathematics in Grades 3-5, students develop numerical fluency with conceptual understanding and computational accuracy. Students in Grades 3-5 use knowledge of the base-ten place value system to compose and decompose numbers in order to solve problems requiring precision, estimation, and reasonableness. By the end of Grade 5, students know basic addition, subtraction, multiplication, and division facts and are using them to work flexibly, efficiently, and accurately with numbers during addition, subtraction, multiplication, and division computation.

(4) Problem solving, language and communication, connections within and outside mathematics, and formal and informal reasoning underlie all content areas in mathematics. Throughout mathematics in Grades 3-5, students use these processes together with technology and other mathematical tools such as manipulative materials to develop conceptual understanding and solve meaningful problems as they do mathematics.

(b) Knowledge and skills.

(5.1) **Number, operation, and quantitative reasoning.** The student uses place value to represent whole numbers and decimals.

The student is expected to:

(A) use place value to read, write, compare, and order whole numbers through the 999,999,999,999; and

(B) use place value to read, write, compare, and order decimals through the thousandths place.

(5.3) **Number, operation, and quantitative reasoning.** The student adds, subtracts, multiplies, and divides to solve meaningful problems.

The student is expected to:

(A) use addition and subtraction to solve problems involving whole numbers and decimals;

**(5.5) Patterns, relationships, and algebraic thinking.** The student makes generalizations based on observed patterns and relationships.

The student is expected to:

(A) describe the relationship between sets of data in graphic organizers such as lists, tables, charts, and diagrams; and

**(5.6) Patterns, relationships, and algebraic thinking.** The student describes relationships mathematically.

The student is expected to select from and use diagrams and equations such as  $y = 5 + 3$  to represent meaningful problem situations.

**(5.14) Underlying processes and mathematical tools.** The student applies Grade 5 mathematics to solve problems connected to everyday experiences and activities in and outside of school.

The student is expected to:

(A) identify the mathematics in everyday situations;

(B) solve problems that incorporate understanding the problem, making a plan, carrying out the plan, and evaluating the solution for reasonableness;

(C) select or develop an appropriate problem-solving plan or strategy, including drawing a picture, looking for a pattern, systematic guessing and checking, acting it out, making a table, working a simpler problem, or working backwards to solve a problem; and

(D) use tools such as real objects, manipulatives, and technology to solve problems.

**(5.15) Underlying processes and mathematical tools.** The student communicates about Grade 5 mathematics using informal language.

The student is expected to:

(A) explain and record observations using objects, words, pictures, numbers, and technology; and

(B) relate informal language to mathematical language and symbols.

(5.16) **Underlying processes and mathematical tools.** The student uses logical reasoning.

The student is expected to:

- (A) make generalizations from patterns or sets of examples and nonexamples; and
- (B) justify why an answer is reasonable and explain the solution process.

**Focus:** The teacher will show the students a Power Point of the Ancient Mayan Ruins and lead a discussion on the culture of these people, as well as the role the Mayans played as mathematicians in the ancient world. The students will then engage in a brief question and answer session with their teacher.

**Instruction:** The teacher will model the Ancient Mayan language and number system on the board in the classroom. Students will practice writing each numeric symbol and saying the corresponding word in Mayan for that symbol. This will continue until all the students can write and speak the Mayan numbers from 0-20. The teacher will explain that the American Standard number system is a base 10 system and that the Ancient Mayan number system is a base 20 system. The students will then be introduced to Ancient Mayan manipulatives of sticks and stones. The students will practice doing computations with the manipulatives in small groups. The teacher will write various basic math problems on the board in the American Standard system and students will translate the problem into Ancient Mayan. (Be advised that the teacher may choose to spread this lesson out over several days to allow adequate practice and mastery.) The teacher will ask students to compare the differences and similarities between the two systems. The students will record their responses in their math journals. The students will continue to work in groups to attain mastery of the Mayan system. Each student will take turns modeling different problems for the members of their group.

**Assessment:** Once students have attained a basic understanding of the Ancient Mayan number system they will be asked to generate independently at least five computation or word problems using the system. The questions generated by the students will be used in a quiz at a later date.

**Enrichment Activity:** Students will be asked to develop their own number system in a number base of their choice. They must design the symbols, language and rules that govern their number system and then teach that system to their individual small groups.