Eighth Grade Standards for Mathematics

Minimum Standards Set

In this document we have listed things students should be able to explain and tasks students should be able to perform. True mathematical literacy includes the capacity to perform simple computations in the mind, more complex computations with traditional algorithms, and computations with large numbers or complex arithmetic with a computing device and have sense of whether or not the result is correct. Students will be expected to give sound mathematics reasons for the decisions they make in computations and in problem solving. The goal is to have the students think above the knowledge and skill level and be able to do higher order or critical thinking. To accomplish this, we urge that teachers be trained in how to let students do critical thinking and not make the mistake of doing it for the students under the assumption that the students cannot do it.

**The instruction should require the student to know how to do these things:**

1. Use mathematics to solve “real life” problems.
2. Have a strategy to solve problems that requires the student to select data that is essential to solve the problem, have a plan of attack to find the solution to the problem, perform any necessary calculations or operations to find the solution, determine if the solution is reasonable and correct, and be requires the student to be able to justify the steps taken in the solution process.
3. Develop a way to use mathematics to express relationships by using such approaches as symbols, diagrams, graphs, mathematical language, manipulatives, technology, text, or real objects.
4. Use the skills learned in number three to justify and defend a solution to a problem.

**Numbers and Operations: The student is expected to—**

1. Represent and use real numbers in various forms including integers, common and decimal fractions, mixed numbers, ratios, percent, radicals, and scientific notation.
2. Perform calculations of addition, subtraction, multiplication, and division for any form of real numbers and use this ability to solve real world problems.
3. Know the properties of real numbers including the identities, the inverses, commutative and associative, and distributive properties and use these to simplify expressions and solve equations and inequalities.
4. Define and illustrate natural number exponents, the zero exponent and negative integer exponents and simplify expressions using the rules of exponents.
5. Give approximate values of irrational numbers including π and square roots and locate the approximations on a number line.
6. Simplify radical expressions.
7. Identify significant digits in a whole or decimal number.
8. Simplify complex fractions.

**Algebraic Expressions and Operations: The student will be able to—**

1. Translate words and phrases involving variable quantities into mathematical expressions.
2. Simplify algebraic expressions by combining like terms and applying properties of real numbers including the distributive property and operation rules for real numbers.
3. Apply addition, subtraction, multiplication, division to two or more algebraic expressions.
4. Use the laws of exponents to simplify algebraic expressions using exponents when applicable.
5. Show the result when negative exponents are applied to numeric or algebraic expressions.

**Equations and Inequalities: The Student will—**

1. Write equations or inequalities to represent word sentences or to represent problems in real world circumstances.
2. Use the properties of equality/ inequality to solve equations.
3. Solve multistep equations or inequalities.
4. Show solutions for special equations such as proportions or those using rates and percent.
5. Change the subject of a formula accomplishing a general solution for one of the variable in the formula.
6. Solve equations that have terms raised to the second power such as applications of the Pythagorean theorem and quadratic equations that can be solved by factoring.
7. Use substitution and elimination to find solutions to systems of linear equations including those represented circumstances in real world problems.

**Ratio and Proportion: The student is expected to—**

1. Define right triangle ratios and use them to solve problems.
2. Use rates of change to translate measurements from one unit to another.
3. Use ratio and proportions to demonstrate similarity in plane and solid figures and to solve problems involving similar figures.
4. Recognize that probability is a ratio and use such to make predictions on real world problems..
5. Learn the ratios in special right triangles and use them to solve for unknowns in real world problems.
6. Make predictions and determine solutions using experimental data or theoretical probability for simple and compound events.
7. Find the probabilities of a simple event and its complement, and experimental and theoretical probabilities related to simple and compound events using different methods.
8. Recognize that per cents are special ratios and use them to solve real world problems related to taxes, loans, part of whole, contents in a mixture and other circumstances

**Geometry: Student will be able to:**

1. Draw geometric solids and their nets.
2. Use formulas to find the perimeters and areas of composite plane figures as well as the surface area and volume of composite solid figures and solve problems involving formulas for the volume and surface area of prisms, pyramids, cylinders, cones and spheres.
3. Use scaling to change the size of a figure to a similar figure and determine the effect on the area or volume of the figure.
4. Identify the following circles: central angles, arcs, and sectors. The student will also determine the length of an arc and the area of a sector.
5. Recognize which transformation are isometries.
6. Determine the perimeter and area of composite plane figures composed of combinations of parallelograms, squares, parallelograms, trapezoids, triangles, semicircles, and quarter circles.
7. Use modeling and investigation to determine formulas for circumference and area of a circle and use the formulas for solving problems related to the circumference and area of a circle.

**Functions and graphing: The student will be able to:**

1. Graph linear equations by using slope and y-intercept.
2. Solve linear systems of equations and inequalities by graphing.
3. Show the effect of a transformation on a graph.
4. Graph linear functions, quadratic functions and exponential function that show exponential growth or decay.
5. Apply the vertical line test to any graph to determine if the graph is of a function or not.
6. Recognize that a sequence can be a linear function and write a either a linear function rule or a recursive rule for the sequence.

**Data Analysis: The student will be able to:**

1. Display data in various graphical forms to assist in the analysis of a set of data.
2. Compute the measures of central tendency to analyze data.