

EDUCATIONAL GOAL: MATHEMATICAL REASONING

To develop mathematical reasoning and an ability to apply quantitative methods.

DEFINITION OF SKILL
1. Students will engage in substantial problem solving:
a. Use problem solving strategies that require persistence and are relevant to their needs and interests.
b. Organize information.
c. Build new mathematical knowledge through problem solving.
d. Gain the ability to recognize inappropriate assumptions and solutions.
e. Learn to use a combination of appropriate algebraic, graphical, and numerical methods to form conjectures about, and to solve, problems.
2. Students should be able to communicate and interpret their results:
a. Communicate mathematical ideas and procedures using appropriate mathematical vocabulary and notation.
b. Analyze and evaluate mathematical thinking.
c. Recognize and apply mathematics in contexts outside mathematics.
3. Students will learn mathematics through modeling real-world situations.
a. Use models to make predictions and informed decisions.
b. Use representations to model and interpret physical, social, and mathematical phenomena.
4. Students will expand their mathematical reasoning skills as they develop convincing mathematical arguments:
a. Apply inductive and deductive reasoning techniques to build convincing mathematical arguments.
b. Develop conjectures on the basis of past experiences and intuition and test these conjectures using logic and/or probabilistic and statistical reasoning.
c. Explore the meaning and role of mathematical concepts, support them graphically or numerically, and verify them algebraically or geometrically.
d. Judge the validity of mathematical arguments and draw appropriate conclusions.

5. Students will use appropriate technology to enhance their mathematical thinking and understanding, to solve mathematical problems, and to judge the reasonableness of the results:
a. Develop an ability to use technology to aid in the understanding of mathematical principles.
b. Use technology to aid in the solution of realistic applications.
c. Use technology to enhance the study of mathematics but technology should not become the main focus for understanding mathematics.
6. Students will perform arithmetic operations, as well as reason and draw conclusions from numerical information:
a. Develop number sense and an understanding of basic numerical operations.
b. Judge the reasonableness of numerical results.
c. Estimate reliability.
d. Understand the concepts of and solve problems involving proportions.
7. Students will use algebra and/or other symbolic representations to translate and solve problems:
a. Move beyond concrete numerical operations to use abstract concepts and symbols to solve problems.
b. Represent mathematical situations symbolically.
c. Use a combination of appropriate algebraic, graphical, and numerical methods to form conjectures about problems.
d. Obtain solutions to equations using graphical, numerical, and/or algebraic methods.
e. Explore and analyze patterns, relations, and other mathematical structures.
8. Students develop a spatial and measurement sense:
a. Visualize, compare, and transform objects.
b. Develop a spatial sense including the ability to draw one-, two-, and/or three-dimensional objects.
c. Specify location and describe spatial representations using coordinate geometry.

d. Apply transformations and use symmetry, congruence, and similarity.
e. Select and use appropriate measurement units, techniques, and tools.
9. Students will demonstrate understanding of the concept of function verbally, numerically, graphically, and/or symbolically.
a. Formulate and interpret functional relationships between two or more variables and/or between data sets.
b. Use functions to model real-world problems.
c. Make generalizations about families of elementary functions and their behavior.
d. Use technological tools to explore and represent fundamental concepts of functions.
10. Students will analyze data and use probability and statistical models to make inference about real- world situations.
a. Learn the basic concepts of counting and probability.
b. Understand the basic concepts of descriptive statistics and/or inferential statistics.
c. Gather, organize, display, and summarize numerical data.
d. Draw conclusion and/or make predictions from data.