

Mathematics
Precalculus: Academic
Unit 5: Systems

Essential Understandings	<ul style="list-style-type: none"> ▪ Mathematics can be used to model real-life situations. ▪ Systems of equations are used in business applications to determine profit, loss and break-even points. ▪ Systems of equations are used in the sciences to organize the many variables and then to solve a problem using those variables.
Essential Questions	<ul style="list-style-type: none"> ▪ What is a system of equations? ▪ Why use a system of equations? ▪ How can a system of equations be solved? ▪ What is a feasible region? ▪ What is a matrix? ▪ What is a determinant? ▪ What is linear programming? ▪ What is a 3-d grid?
Essential Knowledge	<ul style="list-style-type: none"> ▪ Most word problems can be solved using two or more variables. ▪ Word problems can be solved using various systems of equations. ▪ The feasible region of a system is where the problem's solution lies. ▪ 2-dimensional problem-solving techniques can be applied to 3-dimensional problems.
Vocabulary	<ul style="list-style-type: none"> ▪ <u>Terms:</u> <ul style="list-style-type: none"> ○ system of equations, solving a system of equations by the substitution method, the elimination method, the graphing method or the matrix method, break-even point, consistent system, ordered triple, square system, three-dimensional grid, optimization, linear programming, optimization equation, feasible solution
Essential Skills	<ul style="list-style-type: none"> ▪ Write an appropriate system of equations based on the situation. ▪ Solve a system using the best method. ▪ Apply proper techniques to interpret solution.
Related Maine Learning Results	<p><u>Mathematics</u> A. Number Real Number A1.Students will know how to represent and use real numbers.</p> <ol style="list-style-type: none"> a. Use the concept of nth root. b. Estimate the value(s) of roots and use technology to approximate them. c. Compute using laws of exponents. d. Multiply and divide numbers expressed in scientific notation. e. Understand that some quadratic equations do not have real solutions and that there exist other number systems to allow for solutions to these equations.

Mathematics
Precalculus: Academic
Unit 5: Systems

**Related
Maine Learning
Results**

D. Algebra

Symbols and Expressions

D1.Students understand and use polynomials and expressions with rational exponents.

- a. Simplify expressions including those with rational numbers.
- b. Add, subtract, and multiply polynomials.
- c. Factor the common term out of polynomial expressions.
- d. Divide polynomials by $(ax+b)$.

Equations and Inequalities

D2.Students solve families of equations and inequalities.

- a. Solve systems of linear equations and inequalities in two unknowns and interpret their graphs.
- b. Solve quadratic equations graphically, by factoring in cases where factoring is efficient, and by applying the quadratic formula.
- c. Solve simple rational equations.
- d. Solve absolute value equations and inequalities and interpret the results.
- e. Apply the understanding that the solution(s) to equations of the form $f(x) = g(x)$ are x -value(s) of the point(s) of intersection of the graphs of $f(x)$ and $g(x)$ and common outputs in table of values.
- f. Explain why the coordinates of the point of intersection of the lines represented by a system of equations is its solution and apply this understanding to solving problems.

D3.Students understand and apply ideas of logarithms.

- a. Use and interpret logarithmic scales.
- b. Solve equations in the form of $x + b^y$ using the equivalent form $y = \log_b x$.

Functions and Relations

D4.Students understand and interpret the characteristics of functions using graphs, tables, and algebraic techniques.

- a. Recognize the graphs and sketch graphs of the basic functions.
- b. Apply functions from these families to problem situations.
- c. Use concepts such as domain, range, zeros, intercepts, and maximum and minimum values.
- d. Use the concepts of average rate of change (table of values) and increasing and decreasing over intervals, and use these characteristics to compare functions.

Mathematics
Precalculus: Academic
Unit 5: Systems

Related Maine Learning Results	<p>D5.Students express relationships recursively and use iterative methods to solve problems.</p> <ol style="list-style-type: none"> a. Express the $(n+1)$st term in terms of the nth term and describe relationships in terms of starting point and rule followed to transform one terms to the next. b. Use technology to perform repeated calculations to develop solutions to real life problems involving linear, exponential, and other patterns of change.
Sample Lessons And Activities	<ul style="list-style-type: none"> ▪ Optimize the profit for a business using the business's profit, revenue and cost constraints to write and solve a system of equations. ▪ Using the inventory and the related costs from a sporting goods store, set up and solve a matrix.
Sample Classroom Assessment Methods	<ul style="list-style-type: none"> ▪ Homework ▪ Quizzes ▪ Chapter test
Sample Resources	<ul style="list-style-type: none"> ▪ <u>Publications:</u> <ul style="list-style-type: none"> ○ <u>Precalculus with Limits – A Graphing Approach</u> ▪ <u>Other Resources:</u> <ul style="list-style-type: none"> ○ Graphing calculator ○ A+ learning system for remediation