

DREYFOUS

Thematic guide

Algebra II

DREYFOUS

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Course Description

The fundamental objective of EduSystem's Algebra II course is to develop a high level of mathematical skills in the student, and to create awareness about the importance of studying Algebra to address problems and situations that arise in everyday life. Through the content and the strategies that have been developed and techniques used, the student is given a deep understanding of the concepts, as well as the technical skills necessary for the study of later courses such as Pre-calculus, Calculus, and other applied mathematics. The multiple representation approach is used throughout the course to facilitate the visualization of concepts. The way topics and examples are presented and applications are used, as well as the way math skills are developed, allows the student to visualize, understand and value their usefulness in everyday life.

The course content is aligned with the *Estándares de contenido y expectativas de grado (Puerto Rico Core Standards)* del Departamento de Educación de Puerto Rico (2014) and the *Common Core State Standards* of the U.S. and emphasizes Algebra and Functions standards, integrating also the areas of Numbering and Operation, Geometry and Data Analysis, and Probability. The function standard is carefully worked out, and special attention is given to the graphical representation of linear, quadratic, polynomial, rational, exponential and logarithmic functions, as well as trigonometrics. The concepts of linear regression, probability, normal distribution (bell curve), imaginary number, complex number and their properties are also studied, as well as rational expressions and operations with radicals and complex numbers. Another topic covered is simplifying expressions with rational exponents. We work with trigonometric concepts such as right triangle, trigonometric ratios and equations, laws of sines and cosines, distance, scales and successions. Emphasis is also placed on mathematical problem-solving processes to promote the integration of subjects and encourage the communication and acquisition of concepts, and the effective mastery of standards.

The objectives designed for each lesson take into account the skills and concepts necessary for the student to make the connections between the different math standards established by the Puerto Rico Department of Education (PRDE) and the *Common Core State Standards*.

The teaching method focuses on conceptual understanding, the development of critical thinking skills, and the solution of mathematical problems as a means for the

integral formation of the student. The course focuses on the fundamental processes in the study of mathematics. These are:

1. Understanding problems as you develop your ability to solve them with confidence.
2. Reasoning in a concrete and semi-concrete way until reaching the quantitative abstraction.
3. Building and defending viable arguments, and also understanding and criticizing the arguments and reasoning of others.
4. Using mathematics to solve everyday problems.
5. Using the appropriate and necessary tools (including technology) to solve problems in different contexts.
6. Being precise in their own reasoning and in discussions with others.
7. Discerning and using patterns or structures.
8. Identifying and expressing regularity in repeated reasoning.

Students are also expected to communicate using the appropriate mathematical terminology, and to aptly incorporate technology into their learning process.

Course Structure

The Algebra II course consists of 17 units carefully divided into different lessons. The number of lessons per unit depends on the scope and depth with which the different topics are discussed and developed. Each lesson has an interactive presentation divided, in turn, into sections that present and explain the contents of the topic to be studied. Each presentation includes conceptual definitions, concrete examples, explanations, multiple representations, practice exercises, application of concepts and skills in everyday life.





In addition, the lessons include practice exercises, quizzes, assignments, self-assessment exercises and a descriptive log with detailed information for the teacher, as well as a variety of web links, among other resources. The activities are varied and flexible, with the purpose of satisfying the particular needs and interests of each student. The practice and self-assessment activities seek to make the student aware of their strengths and weaknesses in the mastery of the content, with the purpose of them gradually taking









control of their learning. The teacher, as an integral and essential part of the process, will have the responsibility of stimulating, orienting, guiding and periodically evaluating the learning achieved of each student.

The units are made up of the following parts:

Lessons

Each unit is made up of different lessons, divided into topics, macro concepts and skills. In turn, each lesson consists of five key elements: presentation or content of the course, documents in digital format (PDF), Internet links, self-assessment and Descriptive Log.

- **Lesson Content.** Each lesson content presented contains a detailed explanation of the concepts and skills of the lesson as established in the objectives. In addition, it consists of the following elements that systematically contribute to the development of the desired learning in the student:
 - **Examples.** In each section, when skills are developed, examples that explain step-by-step the solution to an exercise or problem are included, so that the student reviews the concepts and skills presented.

 - **Practice.** This includes a series of carefully selected exercises to expose the student to practice the skills and concepts discussed. Its purpose is to periodically compare the learning achieved by the student before continuing with other subjects and skills. It does not include procedures or explanations, it only includes the solution of the exercises.

 - **Solution.** It is used to hide the solution to an exercise or problem that the student should try to answer. Once you click on this icon, the solution or answer to the exercise will be displayed.

 - **Process.** It is a button behind that brings up the steps or the algorithm to follow when solving an exercise or problem.


- 
 ▪ **Demonstration / Steps.** It presents formal demonstrations of the derivation of important formulas or algorithms.
- 
 ▪ **Calculator.** It includes the explanation of the processes when using and handling the calculator to solve the section's exercises. It also connects the student to the virtual graphing calculator.
- 
 ▪ **Animation.** It gives access to explanations, procedures or graphics that visually show the concepts and skills discussed in the section. It ensures that the development and conceptual understanding of the student is looked after.
- 
 ▪ **Definition.** It includes formal mathematical definitions of concepts and processes mentioned or discussed.
- 
 ▪ **Biography.** Includes a short biography of the mathematician or scientist who is credited with developing the definition, formula, procedure, or demonstration used in the lesson.
- 
 ▪ **Note.** This icon points out common errors or reinforces details that should not be forgotten.
- 
 ▪ **Did you know...** This section presents an explanation or situation that connects aspects of everyday life with the mathematical skills and concepts discussed. In some cases, this section shows the link between the development of logical thinking in humans with certain mathematical skills and processes.
- 
 ▪ **Tabs.** They are located on the right side of the presentation, and can be maroon or blue. They unfold to the left, and include flow charts, biographies, notes, photos, explanations, suggestions, reminders, Did you know... or necessary background knowledge.

- **Incorrect.** Indicates when the student has selected an incorrect answer in the included practice exercises.



- **Correct.** Indicates the correct selection to the answer of an exercise or practice problem.



- **Photo or image.** It connects a particular explanation with a photo or image that is likely to access the Internet.



- **Video.** It accesses a short video that links mathematical content to everyday life.



- **Internet.** It is a direct link to a site or Internet portal closely related to the topic.



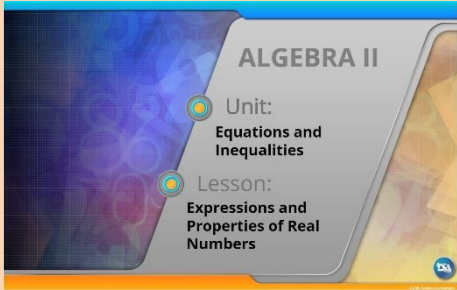
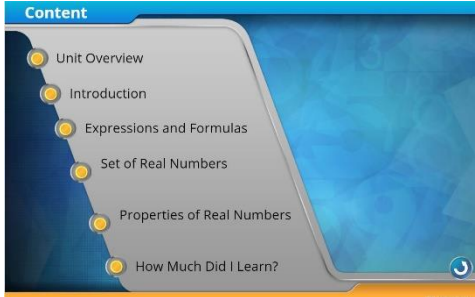
Each of the sections included in the presentation is connected to a particular icon that identifies it, as shown in the explanation provided. In the initial presentations of the course the icon with the word that describes the section is included, this way the student will become familiar with what each of the icons represents. In subsequent presentations only the icon that accesses the section is included. In subsequent presentations only the icon that accesses to the section is included.

- **PDF documents.** These documents include a copy of practice exercises from the lesson, an additional practice section, activities that require the use of a calculator, or assignments. These documents can be printed out for the student to work on in pencil and on paper. Assignments are exercises and problems that the student works on at home, and that allow him/her, through practice, to strengthen the skills and concepts learned. Assignments are optional.
- **Internet Links.** These links are a direct connection to the Internet, and can be accessed directly from the presentation. They include additional explanations,

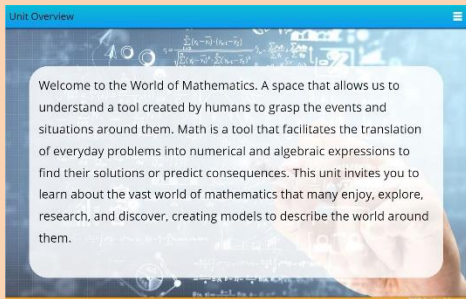
examples, applications or demonstrations that allow students' conceptual development in the skills and topics discussed.

- **Self-assessment.** It consists of practice tests that the student answers to monitor their own learning before taking the formal unit evaluation tests offered by the teacher.
- **Descriptive Log.** This is the detailed lesson plan. This includes specific lesson objectives, standards and expectations, teaching strategies and resources, concepts, Internet links and references, among others. The only person with access to the descriptive logs will be the teacher.

Course Structure: Curricular Components

<i>Lesson content</i>	
<p>Title Page</p> 	<p>This is the presentation letter of the course and the lesson. Identifies the course, unit, and lesson. Contiens:</p> <ul style="list-style-type: none">○ Course title○ Title of the unit and lesson○ Image○ Credits
<p>Directory</p> 	<p>Presents the sections and the topics of the lesson. Each button has a link to the section it presents.</p>

Unit Introduction



Welcome to the World of Mathematics. A space that allows us to understand a tool created by humans to grasp the events and situations around them. Math is a tool that facilitates the translation of everyday problems into numerical and algebraic expressions to find their solutions or predict consequences. This unit invites you to learn about the vast world of mathematics that many enjoy, explore, research, and discover, creating models to describe the world around them.

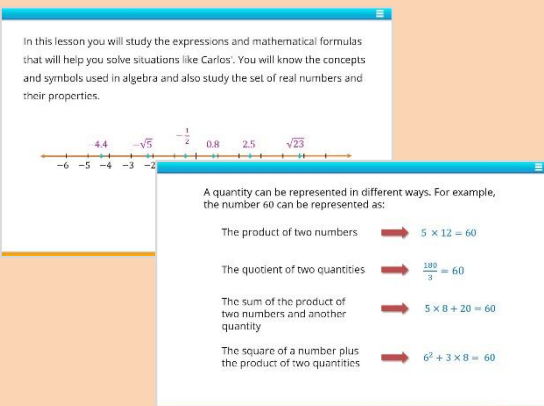
This is a section that is only present in the first lesson of each unit.



Have you ever used public transport or a taxi? Did you know that many means of transportation charge a fixed fee at the beginning of the trip, and add cost for each kilometer traveled from the starting point to the final destination.

This section is found in all lessons.

Topics (content)



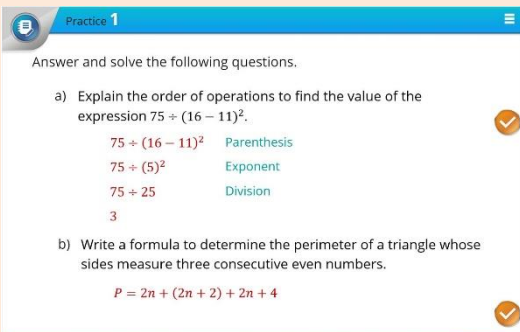
In this lesson you will study the expressions and mathematical formulas that will help you solve situations like Carlos'. You will know the concepts and symbols used in algebra and also study the set of real numbers and their properties.

A quantity can be represented in different ways. For example, the number 60 can be represented as:

- The product of two numbers $\rightarrow 5 \times 12 = 60$
- The quotient of two quantities $\rightarrow \frac{180}{3} = 60$
- The sum of the product of two numbers and another quantity $\rightarrow 5 \times 8 + 20 = 60$
- The square of a number plus the product of two quantities $\rightarrow 6^2 + 3 \times 8 = 60$

Content development using definitions, explanations, examples, and demonstrations.

How Much Did I Learn?



Answer and solve the following questions.

a) Explain the order of operations to find the value of the expression $75 \div (16 - 11)^2$.

$75 \div (16 - 11)^2$ Parenthesis
 $75 \div (5)^2$ Exponent
 $75 \div 25$ Division
3

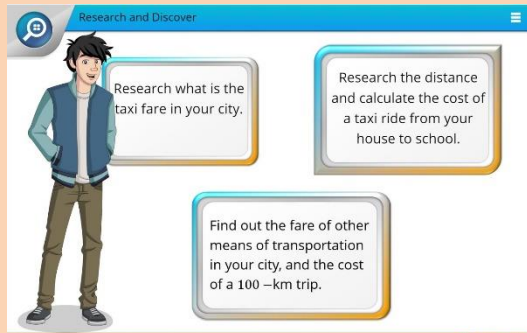
b) Write a formula to determine the perimeter of a triangle whose sides measure three consecutive even numbers.

$P = 2n + (2n + 2) + 2n + 4$



Short and objective exercises aimed at evaluating and applying knowledge, located at the end of the topics. It contains the answers.

Special Sections



Research and Discover

Research what is the taxi fare in your city.

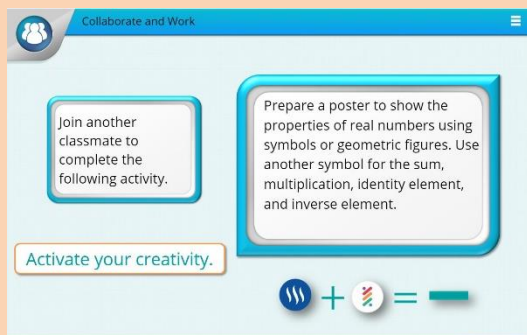
Research the distance and calculate the cost of a taxi ride from your house to school.

Find out the fare of other means of transportation in your city, and the cost of a 100 -km trip.



Create and Build

Create a collage with photos or magazine prints that represent each set of real numbers. Show the number it represents and to what subset of the real numbers it belongs.



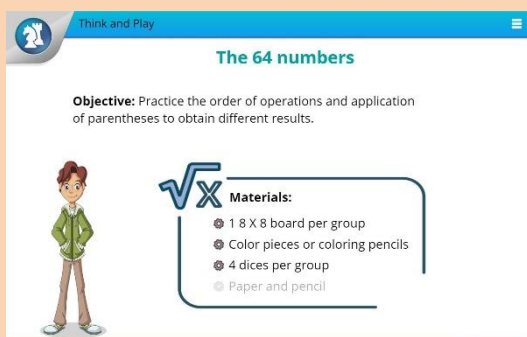
Collaborate and Work

Join another classmate to complete the following activity.

Prepare a poster to show the properties of real numbers using symbols or geometric figures. Use another symbol for the sum, multiplication, identity element, and inverse element.

Activate your creativity.

$\text{W} + \text{V} = \text{—}$



Think and Play

The 64 numbers

Objective: Practice the order of operations and application of parentheses to obtain different results.

Materials:

- 1 8 X 8 board per group
- Color pieces or coloring pencils
- 4 dices per group
- Paper and pencil

They broaden students' learning experiences. One or more may appear in the lesson. They will be included when relevant. These sections are:



Research and Discover: Research of additional topics or integrating other subjects.



Create and Build: Applying what has been learned and creating projects

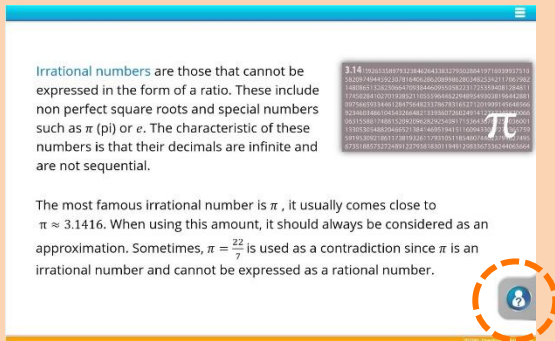


Collaborate and Work: An opportunity for collaborative or cooperative work with the goal of exchanging knowledge.

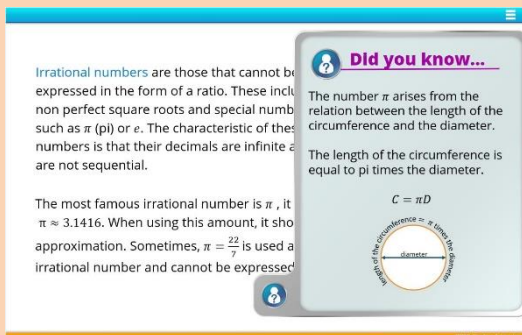


Think and Play: Integration of a more engaging strategy for developing concepts and skills.

The Tab












By clicking the gray tab at the top or bottom right of some of the *Lesson Content* slides, the student will be able to see some important notes to reinforce or clarify the content, such as formulas or prior definitions.



Button Directory

Navigation

	Close		Credits
	Answer		Return
General			
	Animation		Practice
	Link		Reason

	Definition		Review
	Biography		Steps
	Connect what you have learned		Graph
	Image		Calculator
	Note		Example
	Diagram		Self-assessment
	Question		Procedure
	Video		Zoom
	Did You Know		Text
	Challenge Your Mind		
Special Sections			
	Research and Discover		Create and Build
	Collaborate and Work		Think and Play

Work Documents

Objective Exercises

The image shows two overlapping worksheets. The top worksheet is titled "Practice 1" and the bottom one is "Practice 2". Both worksheets have a header with a logo and the title. Below the header, there are fields for "Name" and "Date", and a "Group" field with "Course Algebra 2" written next to it. The main content of both worksheets consists of two sections: "I. Solve the following exercises carrying out the indicated operations." and "II. Solve each of the following exercises substituting for the value of the indicated variables." The exercises involve basic algebraic operations like addition, subtraction, and multiplication of integers and simple expressions.

Practice 1

Name: _____ Date: _____
Group: _____ Course Algebra 2

Unit 1. Equations and Inequalities
Lesson 1. Expressions and Properties of Real Numbers

I. Solve the following exercises carrying out the indicated operations.

1) $8 - 4^2$

2) $5 + (3 + 2) + 4$

3) $2 + 9 - 2 + 1$

4) $-4 + 2 \times 3(-5 - 1)$

5) $(5 - 3)(-3 + 4) \times 2$

II. Solve each of the following exercises substituting for the value of the indicated variables.

1) $2x + 3z - 2y = 2$

2) $3xy - 3 - 4z = -5, y = -3$

Practice 2

Name: _____ Date: _____
Group: _____ Course Algebra 2

Unit 1. Equations and Inequalities
Lesson 1. Expressions and Properties of Real Numbers

I. Solve the following exercises carrying out the indicated operations.

1) $(3x + 5) + (2x - 2y^2) + 5$

2) $(x^2 + 3x - 4 - 2y^2) - 4^2$

3) $(-5) - (-8) + 6$; 4) $(4 - 2y^2) - 7y$

5) $3(-5 - 4)^2 - 3(8 \times 9) - (-8)$

6) $3(-8) + (3 + (-7))(x + 2) - (-7)$

II. Solve each of the following exercises substituting for the value of the indicated variables.

1) $4x - 3z$ if $x = -4, z = 10$

2) $-3a^2 + (x + 2z)a - 2, a = -4$

They are found in all lessons and provide the key for the teacher.

- Practice 1 and 2
- Activity

Unit Breakdown

The titles of each unit will be detailed below, and the content of the units will be broken down into lessons with their titles, codes, objectives, topics, concepts and vocabulary.

Unit 1. Equations and Inequalities

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Expressions and Properties

Code: C340G0SU01L01

Objectives

At the end of the lesson the student will:

- use the order of operations to evaluate expressions.
- distinguish between natural, cardinal, integer, rational, irrational and real numbers.
- use the properties of real numbers to simplify expressions.

Essential Questions

- Why is the correct use of the properties of real numbers important in mathematical operations?
- How is mathematics incorporated into our everyday experiences?
- How can we apply it correctly to solve these problems?

Topics

- Expressions and formulas
- Set of real numbers
- Properties of real numbers

Concepts/Vocabulary

- area
- base
- centigrade
- quotient
- constant
- brackets
- cost
- dividend
- divisor
- equation
- exponent
- algebraic expression

- numerical expression
- factor
- Fahrenheit
- financing
- formula
- degrees Celsius
- degrees Fahrenheit
- interest
- additive inverse
- multiplicative inverse
- minuend
- order of operations
- parenthesis
- perimeter
- percent
- reciprocal
- subtrahend
- term
- variable

Lesson 2. Linear Equations and Problem Solving

Code: C340G0SU01L02

Objectives

At the end of the lesson the student will:

- solve equations using the properties of equality.
- use the equations to solve practice problems.
- solve equations containing absolute value.
- use the properties of inequalities to solve inequalities.

Essential Questions

- How do linear equations help us model real-life problems?
- How do we apply the concept of absolute value in the real-life situations we model through linear equations?
- How important is an appropriate mathematical translation of a verbal expression to ensure the correct solution of a problem?

Topics

- Solving linear equations
- Algebraic translation and problem solving
- Solving equations with an absolute value

Concepts/Vocabulary

- argument

- coefficient
- null or void set
- solution set
- linear equation
- additive inverse
- multiplicative inverse
- solving equations
- solution
- term
- value
- variable

Lesson 3. Linear Inequalities and Problem Solving

Code: C340G0SU01L03

Objectives

At the end of the lesson the student will:

- use the inequities to solve practice problems.
- solve compound iniquities.
- solve inequalities that contain absolute values.

Essential Questions

- How do linear inequalities help us solve everyday problems?
- How are the inequalities that contain absolute value applied in situations of our daily lives?

Topics

- Solving inequalities
- Algebraic translation and the application of inequalities
- Solving equations with an absolute value

Concepts/Vocabulary

- | | |
|-----------------------------|--------------------------|
| ○ null or void set | ○ additive inverse |
| ○ solution set | ○ multiplicative inverse |
| ○ continuous | ○ greater than |
| ○ discrete | ○ less than |
| ○ graph of the solution set | ○ pair |
| ○ odd | ○ solving inequalities |
| ○ inequality | ○ semi-closed |
| ○ linear inequality | ○ solution |
| ○ interval | ○ trichotomy |

Unit 2. Relationships, Functions and the Straight Line

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Relationships and Functions

Code: C340G0SU02L01

Objectives

At the end of the lesson the student will:

- graph the ordered pairs on the Cartesian plane.
- determine the domain and range of a relation.
- evaluate a function given the whole domain.
- determine whether a relation is a function.

Essential Questions

- What types of relations can be modeled with graphics?
- Why do we use variables?
- What is the difference between a function and a relationship?
- What role do functions play in explaining everyday phenomena?

Topics

- The Cartesian (or coordinate) plane
- Relationships and Functions

Concepts/Vocabulary

- range
- range
- codomain
- coordinate
- quadrant
- domain
- **determining
- function
- inverse function
- intercept
- function operations
- origin
- root
- range
- relation

Lesson 2. Linear equations, Slope and Intercepts

Code: C340G0SU02L02

Objectives

At the end of the lesson the student will:

- recognize whether an equation is linear and whether it is written in its standard form.
- draw the graphs of a linear equation.
- determine the slopes and the intercept in the ordinate of a straight line.
- plot a straight line given the slope and intercepts, and find other points on the line.
- determine the standard equation of a straight line using the slope and one or two given points.

Essential Questions

- How can relations and functions be represented?
- How can linear models be used to represent various real-life situations?
- In what ways can you visualize the reason for change in a linear model?
- What are the different representations of the straight line that we can use when representing linear models?

Topics

- Linear function
- Slopes and intercepts
- Straight line equation

Concepts/Vocabulary

- abscissa
- constant
- increasing
- decreasing
- horizontal
- indefinite
- intercept
- Linear model
- ordinate
- parallel
- slope
- perpendicular
- Cartesian plane
- Rate of change
- line
- vertical

Lesson 3. Special Functions and Inequalities

Code: C340G0SU02L03

Objectives

At the end of the lesson the student will:

- identify and graph the constant functions, the identity of the direct variation, the absolute value and the integer.
- use the linear function to solve practice problems.
- draw the graph of linear inequalities.

Topics

- Special functions
- Troubleshooting and the linear function
- Graphing linear inequalities in two variables

Concepts/Vocabulary

- increasing
- decreasing
- boundary
- entire function
- piecewise
- inequality
- intercept
- interval
- origin

Unit 3. System of Equations and Inequalities

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. System of Linear Equations

Code: C340G0SU03L01

Objectives

At the end of the lesson the student will:

- determine the equation of the parallel line or perpendicularity of the equation of the other line.
- solve systems of linear equations by the graphical method, and determine whether they are consistent and independent, consistent and dependent or inconsistent systems.
- solve the system of equations by the substitution and elimination method.
- will find the value of the second and third order determinants.
- solve systems of linear equations using Cramer's rule.

Topics

- Parallel and perpendicular lines
- Solving systems of equations using the graphical method
- Solving systems of equations by the algebraic method
- Cramer's rule

Concepts/Vocabulary

- solution set
- consistent
- dependent
- determinant
- inconsistent
- independent
- intersection
- Cramer's rule
- elimination method
- Gaussian elimination
- substitution method
- parallel
- perpendicular
- System of equations

Lesson 2. System of Inequalities and Linear Programming

Code: C340G0SU03L02

Objectives

At the end of the lesson the student will:

- solve the systems of linear inequalities using the graphical method.
- solve practice problems related to maximizing or minimizing using linear programming.

Topics

- Graph of a system of inequalities
- Linear programming
- Solving problems using linear programming

Concepts/Vocabulary

- solution set
- determinant
- boundary
- inequality
- intersection
- Cramer's rule
- elimination method
- Gaussian elimination
- substitution method
- Polygon
- linear programming
- region
- system constraints
- System of equations
- maximum value
- minimum value
- critical value
- vertices

Unit 4. Systems of Equations and Matrices

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. System of Equations with Three Variables

Code: C340G0SU04L01

Objectives

At the end of the lesson the student will:

- solve systems of equations with three variables.
- determine the octant where a point in space is located.
- graph the linear equations of three variables in space, and determine the intercepts.
- find the value of the third-order determinant.
- use Cramer's rule to solve systems of three equations with three variables.

Topics

- Solving systems of equations with three variables
- Equation of planes
- Determinants and Cramer's rule

Concepts/Vocabulary

- solution set
- determinant
- intersection
- Cramer's rule
- elimination method
- Gaussian elimination
- substitution method
- parallel
- plane
- System of equations

Lesson 2. Matrices and Operations

Code: C340G0SU04L02

Objectives

At the end of the lesson the student will:

- solve the systems of equations using the matrix reduction method and the argument.
- perform the operations of addition and multiplication of matrices.
- will find the inverse matrix of a matrix 2×2 .
- determine the transposition of a matrix.
- perform the reduction of a matrix 3×3 , and find its inverse.
- solve practice problem using the system of three equations with three variables.

Topics

- The argument and solutions
- Operations with matrices
- Identity and Inverse Matrix

Concepts/Vocabulary

- argument
- determinant
- diagonal
- scale
- matrices
- Augmented matrix
- Square matrix
- Identity matrix
- Inverse matrix
- Transpose of a matrix
- multiple

Lesson 3. Solving Problems Using Matrices

Code: C340G0SU04L03

Objectives

At the end of the lesson the student will:

- use the inverse matrix to solve the systems of equations represented in a matrix.
- solve practice problem using systems of 3 equations with three variables.

Topics

- Solving systems of equations using matrices
- Solving systems of equations with three variables using matrices

Concepts/Vocabulary

- argument
- solution set
- determinant
- homothetic
- matrices
- Identity matrix
- Inverse matrix
- Transpose of a matrix
- reflection
- rotation
- transformations
- orbit
- vector

Unit 5. Polynomials

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Monomials and Polynomials

Code: C340G0SU05L01

Objectives

At the end of the lesson the student will:

- raise a monomial to a power.
- multiply monomials, and raise powers.
- divide monomials, and simplify expressions containing negative exponents and zero.
- simplify the powers of monomial quotients.
- change one decimal place in scientific notation
- determine the sum, difference and product of the polynomials.

Topics

- Simplifying monomials
- Dividing monomials
- Integer exponent
- Polynomials

Concepts/Vocabulary

- quadratic binomial
- quotient
- coefficient
- exponent
- monomial
- polynomial operations
- polynomial
- **special products
- distributive property
- similar terms
- variable

Lesson 2. Factorization

Code: C340G0SU05L02

Objectives

At the end of the lesson the student will:

- factor in polynomials by using the distributive property.
- factor in the difference of two squares.

- factor the sum and difference of two cubes.
- factor in quadratic trinomials.
- apply the factorization techniques in clustering factorizations.

Topics

- Common factor
- Difference of squares
- Factorization of trinomials
- Factorization of the difference of cubes
- Factorization by grouping

Concepts/Vocabulary

- | | |
|-----------------------------|---------------------------|
| ○ group | ○ greatest common divisor |
| ○ difference | ○ polynomial |
| ○ difference of squares | ○ prime |
| ○ difference of cubes | ○ product |
| ○ exponent | ○ distributive property |
| ○ common factor | ○ sum of cubes |
| ○ factorization | ○ trinomial |
| ○ factorization by grouping | |

Lesson 3. Polynomial and Synthetic Division

Code: C340G0SU05L03

Objectives

At the end of the lesson the student will:

- divide polynomials using the algorithm.
- ***divide divisors in the form of polynomials $x - c$ using synthetic division

Topics

- Polynomial Division
- Synthetic Division

Concepts/Vocabulary

- | | |
|----------------------|----------------------------------|
| ○ zero of a function | ○ remainder |
| ○ quotient | ○ factor theorem |
| ○ dividend | ○ residue theorem |
| ○ division | ○ fundamental theorem of algebra |
| ○ synthetic division | |
| ○ divisor | |
| ○ factor | |

Unit 6. Roots and Rational Exponents

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Involving Radicals

Code: C340G0SU06L01

Objectives

At the end of the lesson the student will:

- find the n th root of a number and an expression.
- multiply and simplify the radicals.
- add, subtract and multiply the expressions containing radicals
- simplify the radicals by including the rationalization of the denominators.

Topics

- Roots
- Multiplying radicals
- Simplifying radicals
- Division of Radicals and Rationalization

Concepts/Vocabulary

- conjugate
- square number
- denominator
- n th
- exponents
- factors
- Index notation
- rationalize
- radical
- radicand
- simplify

Lesson 2. Rational Exponents and Solving Equations

Code: C340G0SU06L02

Objectives

At the end of the lesson the student will:

- write expressions with rational exponents in the form of a radical and vice versa.
- evaluate expressions containing radicals or rational exponents.
- simplify expressions containing rational exponents.
- solve equations containing rational or radical exponents.

Topics

- Rational exponents
- Simplifying expressions with rational exponents
- Equations with Radicals

Concepts/Vocabulary

- radical equation
- exponents
- Index notation
- rational numbers
- radical
- radicand
- extraneous solution

Lesson 3. Complex Numbers

Code: C340G0SU06L03

Objectives

At the end of the lesson the student will:

- simplify powers and products of imaginary numbers.
- add, subtract and multiply complex numbers.
- simplify rational expressions containing complex numbers in the denominator.

Topics

- Pure imaginary number
- Complex Numbers

Concepts/Vocabulary

- complex
- conjugates
- radical equation
- imaginary
- complex plane
- imaginary unit
- absolute value

Unit 7. Quadratic Equations

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Solving Quadratic Equations

Code: C340G0SU07L01

Objectives

At the end of the lesson the student will:

- solve quadratic equations by the factorization method.
- solve quadratic equations using the method of completing the quadratic binomial.
- solve quadratic equations using the quadratic formula.
- evaluate the discriminant to determine the number and type of roots in a quadratic equation.

Topics

- Solving quadratic equations by factorization
- Completing the square
- Quadratic Formula
- The discriminant

Concepts/Vocabulary

- zeros
- complete the square
- coordinate
- discriminant
- quadratic equation
- factorization
- quadratic formula
- intercept
- property of zero
- root
- solution

Lesson 2. Solving Problems with Radicals and Quadratic Equations

Code: C340G0SU07L02

Objectives

At the end of the lesson the student will:

- find the sum and product of the roots of a quadratic equation.
- determine the quadratic equation given their roots.
- solve practice problems using quadratic equations.
- solve second degree equations that are expressed as a quadratic equation.

Topics

- Addition and subtraction of roots
- Solving problems with quadratic equations
- Quadratic form

Concepts/Vocabulary

- zeros
- quadratic equations
- rational exponents
- intercept
- substitution method
- radical
- root

Unit 8. Quadratic Relationship and Functions

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Parabolas

Code: C340G0SU08L01

Objectives

At the end of the lesson the student will:

- write the equations in quadratic form, and identify the term quadratic, linear and constant.
- plot the graph of the equation of the form ax^2 , and identify the vertex, the axis of symmetry and the direction of opening.
- plot the graph of the equation of the form $a(x - h)^2$, and identify the vertex, the axis of symmetry and the direction of opening.
- plot the graph of the equation of the form $a(x - h)^2 + k$, and identify the vertex, the axis of symmetry and the direction of opening.

Topics

- Quadratic function
- Parabolas
- Vertex and the increasing and decreasing intervals
- Graph of the quadratic function of the vertex form

Concepts/Vocabulary

- quadratic equation
- concave
- conical
- directrix
- axis of symmetry
- focuses
- vertex form
- intercepts
- increasing interval
- decreasing interval
- maximum
- minimum
- root
- solution
- vertex

Lesson 2. Quadratic Inequalities and Problem Solving

Code: C340G0SU08L02

Objectives

At the end of the lesson the student will:

- solve practice problems using the quadratic equation.
- graph quadratic inequalities.
- solve single-variable quadratic inequalities.

Topics

- Solving problems using the parabola
- Graph of quadratic inequalities
- Resolution of quadratic inequalities

Concepts/Vocabulary

- area under the curve
- area over the curve
- boundary curve
- quadratic inequalities
- maximize
- minimize
- region
- solution
- shadow
- critical value

Unit 9. Conic Sections

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Distance Formula, Parabolas and Circles

Code: C340G0SU09L01

Objectives

At the end of the lesson the student will:

- will find the distance between two points on the Cartesian plane.
- find the midpoint of a segment in the Cartesian plane.
- write the parabola equation, and draw the graph.
- write the equation of a circle, and draw the graph.

Topics

- Distance formula
- Parabolas
- Circles

Concepts/Vocabulary

- center
- circle
- circumference
- concavity
- coordinate
- directrix
- distance
- axis of symmetry
- focuses
- radius
- orbit
- vertex

Lesson 2. Ellipses and Hyperbolas

Code: C340G0SU09L02

Objectives

At the end of the lesson the student will:

- write the equations of the ellipses using data such as center, vertex, focuses and axes.
- graph the ellipses.
- write the hyperbolic equations using data such as center, vertex, and asymptotes.
- graph the hyperbolas.

Topics

- Ellipses
- Hyperbolas
- Conic sections

Concepts/Vocabulary

- asymptotes
- center
- co-vertices
- axis of symmetry
- major axis
- minor axis
- focuses
- vertices

Lesson 3. System of non-linear equations

Code: C340G0SU09L03

Objectives

At the end of the lesson the student will:

- graph systems of non-linear equations by the graphical method.
- graph systems of non-linear equations by the algebraic method.
- solve the systems of quadratic inequalities, and draw the graph.

Topics

- Graph of the system of non-linear equations and inequalities.
- Solving systems of non-linear equations and inequalities

Concepts/Vocabulary

- area between curves
- solution set
- intercepts
- regions
- System of equations

Unit 10. Polynomial Function

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Functions and Factors

Code: C340G0SU10L01

Objectives

At the end of the lesson the student will:

- evaluate the polynomial functions.
- divide a polynomial by a binomial of the form $x - c$ using synthetic division, and establish the quotient and remainder.
- find the factors of a polynomial using synthetic division and factor theorem.

Topics

- Polynomial Function
- Graph the polynomial function
- Residue theorem
- Factor theorem

Concepts/Vocabulary

- factors
- polynomial function
- function
- factor theorem
- residue theorem

Lesson 2. Graph the polynomial function

Code: C340G0SU10L02

Objectives

At the end of the lesson the student will:

- identify all possible rational zeros of a polynomial function using the rational zeroes theorem.
- find the possible positive, negative and imaginary zeros of a polynomial function using Descartes' rule of signs.
- will approximate the irrational zeros of a polynomial function.

Topics

- Zeros
- Rational zeros
- Descartes' rule of signs
- Approaching irrational zeros

Concepts/Vocabulary

- multiple zero
- zero of a function
- irrational zeros
- rational zeros
- synthetic division
- relative maximum
- linear approximation method
- bisection methods
- relative minimum
- factor theorem
- residue theorem

Lesson 3. Composition and Inverse Function

Code: C340G0SU10L03

Objectives

At the end of the lesson the student will:

- graph a polynomial function using the calculator and synthetic division to identify the critical points.
- find the composition of the functions.
- determine the inverse function.
- draw the graph of a function and its inverse simultaneously.

Topics

- Composition of functions
- Inverse function

Concepts/Vocabulary

- range
- composition of functions
- domain
- function composition
- identity function

Unit 11. Rational Expressions and Functions

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Simplifying Rational Expressions

Code: C340G0SU11L01

Objectives

At the end of the lesson the student will:

- multiply and simplify rational expressions.
- divide and simplify rational expressions.
- simplify complex rational expressions.

Topics

- Multiplication of rational expressions
- Division of rational expressions

Concepts/Vocabulary

- rational expressions
- factorization
- simpler form
- restrictions
- simplify rational expressions

Lesson 2. Solving Problems with Rational Expressions

Code: C340G0SU11L02

Objectives

At the end of the lesson the student will:

- add and subtract rational expressions using common denominators.
- solve the rational equations by multiplying by the least common multiple of the denominator in both parts of the equation.
- solve practice problems using rational expressions.

Topics

- Addition and subtraction of rational expressions
- Solving rational equations
- Problem solving using rational expressions

Concepts/Vocabulary

- factor
- complex fraction
- least common multiple
- age problems
- solution problems

- speed problems
- extraneous solution
- inverse variation

Lesson 3. Graph of the Rational Function and Variations

Code: C340G0SU11L03

Objectives

At the end of the lesson the student will:

- determine the domain of a rational function.
- graph the rational functions including the vertical and horizontal asymptotes.
- solve problems involving direct and inverse variation.

Topics

- Graph of the rational function
- Direct and indirect variations

Concepts/Vocabulary

- diagonal asymptote
- horizontal asymptote
- vertical asymptote
- range
- discontinuity
- domain
- rational function
- intercept in the abscissa
- intercept in the ordinate

Unit 12. Exponential and Logarithmic Functions

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Exponents, Logarithms and their Properties

Code: C340G0SU12L01

Objectives

At the end of the lesson the student will:

- simplify the expressions, and solve the equations with real exponents.
- write the exponential equations in logarithmic form and vice versa.
- evaluate the logarithmic expressions, and solve the logarithmic equations.
- solve equations containing logarithmic expressions.
- solve the logarithmic equations, or simplify and evaluate the expressions using the product properties, quotient and power of logarithms.

Topics

- Real exponents
- Inverse ratio and log notation
- Exponential function
- Logarithmic function
- Properties of logarithms

Concepts/Vocabulary

- asymptote
- common base
- range
- domain
- exponential equation
- growth factor
- decay factor
- exponential function
- exponential function
- law of exponents
- logarithms

Lesson 2. Common and Natural Logarithms

Code: C340G0SU12L02

Objectives

At the end of the lesson the student will:

- find the logarithms and identify the characteristics.
- find the antilogarithm of an expression.

Topics

- Common logarithms
- Natural logarithms and the number e

Concepts/Vocabulary

- base
- range
- domain
- exponential equation
- logarithmic equations
- logarithmic function
- common logarithm
- natural logarithm
- logarithms

Lesson 3. Exponential equation

Code: C340G0SU12L03

Objectives

At the end of the lesson the student will:

- will solve equations with variables in the exponent using logarithms.
- will use logarithms to solve practice problems, such as compound, continuous and half-life interest.

Topics

- Exponential equation
- Solving Problems Using Logarithms

Concepts/Vocabulary

- base change
- exponential equation
- logarithmic equations
- laws of logarithms
- logarithms

Unit 13. Sequences and Series

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Arithmetic Sequences and Series

Code: C340G0SU13L01

Objectives

At the end of the lesson the student will:

- find the n th term of an arithmetic succession.
- find the position of a term in an arithmetical sequence.
- find the sum of an arithmetic series and the unknown terms.
- find the average of an arithmetic succession.

Topics

- Arithmetic sequences
- Arithmetic series

Concepts/Vocabulary

- difference
- common difference
- Explicit formula
- recursive formula
- arithmetic series
- series
- sequences
- term n

Lesson 2. Geometric Sequences and Series

Code: C340G0SU13L02

Objectives

At the end of the lesson the student will:

- find the n th term of a geometric succession.
- find the position of a term in a geometric sequence.
- find the sum of a geometric series and the unknown terms.
- find the sum of an infinite geometric series.

Topics

- Geometric sequences
- Geometric series

Concepts/Vocabulary

- converges
- diverges

- Explicit formula
- recursive formula
- geometric mean
- reason
- common ratio
- geometric series
- series
- sequences
- term n

Lesson 3. Summation Notation and Numerical Series

Code: C340G0SU13L03

Objectives

At the end of the lesson the student will:

- convert a series into summation notation (sigma), and find the sum.
- use the recursive formula to find the terms of a geometric or arithmetic sequence.
- find the pattern of a sequence or series that is neither arithmetic nor geometric, and its terms are unknown.
- expand a power n binomial using the pascal triangle and the binomial theorem.
- find the specific terms of a developed binomial.

Topics

- Summation notation
- The term n of a sequence
- Succession and special series
- Binomial theorem

Concepts/Vocabulary

- Index notation
- summation rules
- limit
- arithmetic series
- series
- sigma
- summation

Unit 14. Probability

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Permutations and Combinations

Code: C340G0SU14L01

Objectives

At the end of the lesson the student will:

- solve problems using the counting principle.
- solve problems related to linear permutation.
- solve problems related to circular permutation.
- solve problems related to combinations.

Topics

- Counting
- Linear permutations
- Cyclic permutation
- Combinations

Concepts/Vocabulary

- combinations
- factorial
- permutations

Lesson 2. Binomial Probability and Development

Code: C340G0SU14L02

Objectives

At the end of the lesson the student will:

- find the probability of success or failure of an event.
- find the probabilities related to independent or dependent events.
- find the odds related to mutually exclusive or inclusive events.
- use binomial trials to find probabilities.

Topics

- Probability
- Multiplication of probabilities
- Sum of probabilities
- Development of the binomial and probabilities

Concepts/Vocabulary

- binomial
- dependent event
- independent event
- probability

Unit 15. Statistics

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Data Collection, Organization and Analysis

Code: C340G0SU15L01

Objectives

At the end of the lesson the student will:

- organize the data in a table.
- read and interpret the data from the tables.
- present the data using bar or column graphs, line graphs, and pie graphs.
- find the median, the arithmetic mean (average) and the mode of a data set.

Topics

- Data organization
- Data Representation and Graphing
- Measures of central tendency

Concepts/Vocabulary

- box whisker
- data
- standard deviation
- probability distribution
- descriptive statistics
- pie chart
- bar graph
- line graph
- graphs
- histogram
- list
- mean (average)
- median
- mode
- ogive
- cumulative probability
- conditional probability
- average
- frequency table
- tabulation
- stem and leaf
- variance

Lesson 2. Normal Data Dispersion and Distribution

Code: C340G0SU15L02

Objectives

At the end of the lesson the student will:

- find the range, variance and standard deviation of a data set.
- solve problems involving normal data distribution.
- draw point diagrams, and make predictions.
- solve problems using the prediction equations.

Topics

- Data scatter
- Normal distribution
- Predictions

Concepts/Vocabulary

- bimodal
- quartile
- scatter
- normal distribution
- measures of variations
- percentile
- projections
- range
- bias
- central tendency
- variance

Unit 16. Trigonometric Functions and Identities

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Trigonometric Functions and Their Graphs

Code: C340G0SU16L01

Objectives

At the end of the lesson the student will:

- change the measurements of the angles of the sexagesimal system to radians and vice versa.
- find the acute angle (reference) and the terminal side for any given angle.
- evaluate the expressions involving the sine and cosine of an angle.
- find the amplitude and period for the sine and cosine trigonometric functions and plot the graph.
- find the values of a trigonometric function, and plot the graph.

Topics

- Angles and the unit circle
- Sine and cosine functions
- Graph of the sine and cosine function
- Other trigonometric functions

Concepts/Vocabulary

- amplitude
- central angle
- reference angle
- coterminal angles
- range
- cycle
- unit circle
- cosecant
- cosine
- cotangent
- crest
- quadrants
- domain
- phase
- frequency
- periodic function
- trigonometric functions
- degrees
- trigonometric function graph
- initial side
- terminal side
- period
- standard position
- radian
- radians
- secant
- sine
- tangent
- orbit
- trough
- trigonometric values

Lesson 2. Trigonometric identities

Code: C340G0SU16L02

Objectives

At the end of the lesson the student will:

- use trigonometric identities to evaluate or simplify trigonometric expressions.
- verify and demonstrate trigonometric identities.
- evaluate the expressions, and verify the trigonometric identities involving the addition and subtraction of angles.
- find the sine and cosine values, and verify the trigonometric identities using the formulas of double and half of either.

Topics

- Trigonometric identities
- Verify trigonometric identities
- Formulas for the addition and subtraction of angles
- Double and half angle formulas

Concepts/Vocabulary

- equivalencies
- trigonometric identities
- Pythagorean theorem

Lesson 3. Inverse Function and Solving Trigonometric Equations

Code: C340G0SU16L03

Objectives

At the end of the lesson the student will:

- solve the trigonometric equations.
- find the values of the expressions using the inverse trigonometric function.

Topics

- Solve trigonometric equations
- Inverse function

Concepts/Vocabulary

- range
- domain
- trigonometric equations
- inverse function
- graph of the inverse function

Unit 17. Triangles and Trigonometry

At the end of this unit the student will have completed the objectives found in the following lessons.

Lesson 1. Right Triangles and Problem Solving

Code: C340G0SU17L01

Objectives

At the end of the lesson the student will:

- find the values of the trigonometric ratios of the acute angles of a right triangle as a decimal or fraction.
- use the calculator to find the trigonometric values.
- solve problems involving the solution of right triangles.
- solve practice problems involving the resolution of right triangles.

Topics

- Right triangles
- Trigonometric values
- Solving Right Triangles
- Problem solving using right triangles

Concepts/Vocabulary

- adjacent cathetus
- opposite cathetus
- hypotenuse
- trigonometric ratio
- right triangle

Lesson 2. Law of Sine and Cosine

Code: C340G0SU17L02

Objectives

At the end of the lesson the student will:

- solve oblique triangles by applying the law of sine.
- solve oblique triangles by applying the law of cosine.
- solve practice problems using the laws of sine and cosine.
- determine the number of possible solutions or if there is no solution for oblique triangles given the partial information on them.

Topics

- Law of sine
- Law of cosine
- Ambiguous cases

Concepts/Vocabulary

- ambiguity
- law of cosine
- law of sine
- oblique triangles