DREYFOUS & ASSOCIATES

Course Description

Algebra D&A

Table of Contents

Course Description

The main objectives of the Algebra course are to help students develop high level mathematical skills and to create awareness about the importance of studying mathematics in order to respond to problems and situations that emerge in day to day life. Through the developed content and the strategies and techniques used we intend to bring about a deep understanding of the concepts, as well as the technical skills necessary for subsequent courses and their applications. The way the topics are introduced and presented, as well as the way the mathematical skills are developed through examples and applications, allow students to visualize, understand, and value their usefulness in daily life. The areas and topics discussed in the course include: introduction to geometry, basic elements of the algebraic language, the solution of equations and inequations, polynomials and their operations, factoring, relationships and functions, lineal and quadratic models, equation systems, rational expressions and equations, and rational and radical exponents.

The content takes into account the *Estándares de Contenido y Expectativas por Grado* (Content Standards and Grade-Level Expectations, Puerto Rico Core Standards) of the Department of Education of Puerto Rico (2014) and the United States *Common Core State Standards*. The outline of objectives per lesson takes into account all of the necessary skills and concepts for students to establish connections between the different standards (numbering and operations, algebra, functions, geometry, measurement, and data analysis), into which mathematics are currently categorized. The learning focus is based on conceptual understanding, skill development, and solving mathematical problems, along with the development of critical thinking as a medium for integral development in students.

The course deliberately includes content related to science, technology, and engineering, among other disciplines, with a dual purpose: to help the student see the direct application of what they learn, and visualize the importance of mathematics as a universal discipline that serves society and its institutions. On the other hand, the inclusion of real life problems and situations in each of the topics discussed is intended to awaken an interest toward the study of the discipline.

Course Structure

The Algebra course consists of thirteen units that are carefully subdivided into several lessons. The amount of lessons per unit depends on the reach and depth with which we discuss and develop different topics. Each unit begins with a series of essential questions to explore and expose students to the situations they will encounter throughout the lesson. They will also find a short video that concretely exposes them to the importance in everyday life of the topics to be discussed. Each lesson has an interactive presentation which is divided into sections in which we expose and explain the topic under study. In each presentation, there are definitions, concrete examples, explanations, simulations, representations using the AlgeBlocks© manipulatives, practice exercises and application of concepts and skills used in daily life.

On the other hand, lessons also include practice exercises, quizzes, extra practice laboratory, homework, self-evaluation and a descriptive log with detailed information for the teacher, as well as a variety of Internet links and other resources.

Some lessons include laboratories that present and reinforce algebraic and geometric concepts, through the use of manipulatives and technological tools like the graphing calculator and AlgeBlocks©. The activities are varied and flexible, with the purpose of satisfying the particular needs and interests of each student. The practice and self-evaluation activities aim to make students aware of their strengths and weaknesses in gaining command of the content, with the purpose of having the students gradually take control of their learning process. The teacher, as an essential part of the process, will have the responsibility of stimulating, counseling, guiding, and periodically evaluating the level of learning each student achieves.

The units are made up of the following parts:

Lessons

Each unit is made up of different lessons, divided by topics, macroconcepts, and skills. Simultaneously, each lesson is made up of five basic elements: presentation or lesson content, documents in digital format (PDF), Internet links, self-evaluation and descriptive log.

- **Descriptive Log.** It's a detailed plan of the lesson. It includes the specific objectives of the lesson, the content standards and grade-level expectations, the teaching strategies and resources, keywords, Internet links, and references. Only the teacher will have access to the descriptive log for each lesson.
- **Presentation (*Lesson Content*).** Each presentation contains a detailed explanation of the lesson's concepts and skills, as per the established objectives. Additionally, they are made up of the following elements that systematically contribute to the development of learning in students:
  - **Examples.** In each section, as skills are developed, we include examples that  explain, step by step, the solution of an exercise or problem, so that students can review concepts and skills.
  - **Practice.** It includes a series of exercises that have been carefully chosen to have  students practice the skills and concepts under discussion. Its purpose is to verify the level of learning students have reached before carrying on with other topics and skills. It does not include processes or explanations, only solutions.
  - **Solution.** It's used to keep the solution to an exercise or problem hidden while  students try to answer it. When you touch the button, the solution is displayed.
  - **Process.** It's a label under which the steps or algorithm for solving an exercise or  problem appear.

- **Proof.** A presentation of formal proofs showing the breakdown of important formulas or algorithms.

- **Calculator.** This includes an explanation of the processes in the use and management of a calculator in order to solve the exercises in a section. It also connects the students to a virtual graphing calculator.

- **Animation.** It provides access to explanations, processes, or graphics that visually demonstrate the concepts and skills discussed in the section. They allow us to tend to students' development and conceptual understanding.

- **Definition.** It includes formal definitions of mathematical concepts and processes that have been mentioned or discussed.

- **Biography.** It includes a short biography of the mathematician or scientist we credit for the development of a definition, formula, process, or demonstration used in the lesson.

- **Note.** Under this icon, we discuss common mistakes or reinforce details that must not be forgotten.

- **Did You Know…** It's a section that presents an explanation or situation that connects aspects of daily life with the skills and concepts discussed. In some cases, this section shows the link between the development of logical thought in human beings with certain skills and mathematical processes.

- **Tabs.** They are on the right side of the presentation and can be red or blue. They unfold toward the left and provide flow charts, biographies, notes, pictures, explanations, suggestions, reminders, "Did You Know...," or necessary previous knowledge.

- **Incorrect.** It indicates when the student has chosen an incorrect answer in the practice exercises. 
- **Correct.** It indicates that the correct answer has been chosen in an exercise or practice problem. 
- **Picture.** It connects to a particular explanation to a picture that is probably accessed via Internet. 
- **Video.** It helps you access a short video that links the mathematical concept to daily life. 
- **Internet.** It's a direct link to a page that is closely related to the topic. 

Each of the sections included in the presentation are linked to a particular icon that identifies it with its explanation. In the initial presentations of the course, we include an icon with a word that describes each section so that students can become familiar with what each of the icons represents. In subsequent presentations, it only includes the icon that provides access to the section. Pressing the icon will take the presentation to the section it represents.

- **PDF Documents.** These documents include a copy of the practice exercises in the lesson, an additional practice section, activities to work on with a calculator, or homework. These documents can be printed so that students can work on them with pencil. The homework documents are exercises and problems that students can work on at home and allow them, through practice, to refine their newly acquired skills and concepts. Homework is optional.
- **Internet Links.** These links are a direct connection to the internet and can be accessed from the presentation. They include extra explanations, examples, applications, or

demonstrations that allow students to conceptually develop the skills and topics discussed.

- **Self-Evaluation.** It consists of practice tests for students to answer so that they can monitor their own progress by taking formal evaluation tests on the unit offered by the teacher.

Unit Documents

- **Lesson 0.** It's not a lesson that provides content, but rather a file with elements inside the Unit: PDF documents, unit evaluations, and introductory video.
    - **PDF Documents.** Documents with laboratory activities for application and conceptual development, laboratory activities for the development of skills, activities using a calculator, extra exercises, and assessment activities.
    - **Evaluations.** This includes the evaluations to be used in the unit: the unit pretest and post-test. Lesson 00 of Unit I includes a diagnostic test for the entire course.
    - **Real Zone.** It consists of a short video that presents situations or elements in our immediate environment, in which we concretely visualize the use and application of concepts and skills to be studied in the Unit. In this video, we can introduce the topic to be studied, presenting the usefulness in daily life of what the student will learn.

Unit Breakdown

Below, we present a breakdown of the content of the course with its units, lessons, and general objectives per unit, unit topic or title for each lesson, as well as the specific objectives and concepts per lesson.

Unit 1. Elements of Arithmetic, Geometry, Measurement, and Statistics

In this introductory unit, we review, generally but comprehensively, all of the basic skills from previous courses which are necessary to properly enter the study of the Algebra course. These skills include: the problem solving process, the real number set, operations using whole numbers, operations with rational numbers, ratios or proportions, perimeter and area, volume and surface area of figures, and basic principles of probability and statistics.

General Objectives

- Define and classify numbers in different sets: natural, cardinal, whole, and rational.
- Solve addition, subtraction, multiplication, and division exercises with whole and rational numbers.
- Solve exercises by applying the problem solving process.
- Solve problems that relate proportions.
- Find the perimeter and area of basic figures such as rectangles, triangles, and circles.
- Find the probability of a simple event.
- Describe a data set and interpret the graph that represents it.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Problem Solving

Code: C323G0SU01L01

Objectives

- Define and distinguish a mathematical exercise from a problem.
- Define problem solving as a form of logical reasoning and number the steps involved in problem solving in daily life.
- Relate the different problem solving strategies: *trial and error, making a list, finding a pattern, making a table, making a drawing, using a formula, using a model,* among others.
- Develop a mathematical thought process with a structure of logical reasoning for problem solving or for situations in the world around us.
- Solve problems applying the steps Pólya suggested, in a systematic and structured way: *understanding and organizing the information, making a plan, executing the plan, and revising and checking*.

Keywords

- logical reasoning

- mathematical exercise
- problem
- problem solving
- trial and error

Lesson 2. The Real Number Set

Code: C323G0SU01L02

Objectives

- Define, name, and identify numeric sets: *natural, cardinal, whole, rational, irrational, and real.*
- Classify whole numbers within different numeric sets.
- Establish the subset relationship between certain defined numeric subsets.
- Become familiar with symbols and nomenclature for set notation.
- Define and identify a finite decimal, an infinite periodic decimal, and an infinite non-periodic decimals.
- Establish the relationship of order of real numbers and finds them on the number line.
- Expresses infinite periodic decimals as fractions, using an algebraic algorithm.

Keywords

- cardinal
- infinite non-periodic decimal
- irrational
- natural
- periodic decimal
- rational
- sets
- subsets
- whole

Lesson 3. Operations Using Whole Numbers

Code: C323G0SU01L03

Objectives

- Find whole numbers on the number line.
- Establish a comparative relationship between numbers.
- Define the addition and subtraction operations for whole numbers, establishing their rules.
- Use the number line and the Algeblocks™ manipulatives to carry out addition and subtraction using whole numbers.
- Define the multiplication and division operations using whole numbers, establishing their rules.
- Carry out multiplication and division operations of whole numbers with and without the use of manipulatives.

Keywords

- manipulatives
- rules for whole numbers
- whole numbers

Lesson 4. Adding and Subtracting Rational Numbers

Code: C323G0SU01L04

Objectives

- Define and identify rational numbers.
- Describe sets of whole numbers, cardinal numbers, and natural numbers as subsets of rational numbers.
- Define decimal numbers and distinguish the whole from the fraction with their place values.
- Distinguish infinite periodic decimals and non-periodic or irrational decimals.
- Express infinite periodic decimal numbers and non-periodic or irrational numbers.
- Solve addition and subtraction of homogenous fractions.
- Convert heterogeneous fractions into homogenous fractions and carries out addition and subtraction and operations with heterogeneous fractions.
- Define and establish equivalences between mixed numerals and improper fractions.
- Convert from mixed numeral to improper fraction and vice versa.
- Carry out addition and subtraction operations with mixed numerals that contain homogeneous fractions.
- Carry out addition and subtraction operations with mixed numerals that contain heterogeneous fractions.
- Carry out addition and subtraction operations of decimals.

Keywords

- improper fraction
- mixed numeral
- periodic decimal
- proper fraction
- rational number decimal

Lesson 5. Multiplying and Dividing Rational Numbers

Code: C323G0SU01L05

Objectives

- Conceptualize the multiplication of fractions concretely.
- Solve multiplication with fractions, simplifying before or after the process.
- Conceptualize the division of fractions concretely.
- Define the division of fractions as a multiplication of the remainder of the second fraction.
- Solve division of fraction exercises.
- Apply the algorithm for the multiplication of decimals to problem solving.

- Apply the algorithm for the division of decimals in solving division of decimals exercises.

Keywords

- dividing decimals
- dividing fractions
- multiplying decimals
- multiplying fractions

Lesson 6. Ratios, Proportions, and Percentages

Code: C323G0SU01L06

Objectives

- Define ratio and relates the ways of expressing ratios.
- Express ratios for different situations.
- Become familiar with the properties of ratios.
- Define proportions and relate the different ways of expressing ratios.
- Relate proportions with equivalent fractions and apply the same properties of equivalent fractions.
- Define, identify, and use the terms “fourth proportional to three given quantities”, “third proportional to two given quantities”, and “mean proportional to two given quantities”.
- Solve proportion problems.
- Define percent as a fraction and establish its equivalence with ratios.
- Convert fractions to percentages by applying the algorithm.
- Become familiar with the triangle diagram in order to visualize percentages as proportions and solve different percentage situations.
- Solve all three types of percentage problems: What is the something percent of a number? What number is the something percent of another? What percentage is one number of another?

Keywords

- fourth proportional
- mean proportional
- percent
- percentage
- proportion
- ratio
- third proportional crossed

Lesson 7. Perimeter

Code: C323G0SU01L07

Objectives

- Define perimeter conceptually and concretely.
- Establish formulas to determine the perimeters of rectangular figures, square figures, and triangle figures.
- Find the perimeter of different figures.
- Define circumference conceptually and concretely.
- Become familiar with the concepts related to the circle like: circumference, radius, and diameter.
- Establish circumference formulas and find the circumference of different circles.

Keywords

- circumference
- diameter
- perimeter
- circle
- radius

Lesson 8. Area

Code: C323G0SU01L08

Objectives

- Define area both conceptually and concretely, applying it to daily life.
- Establish the formulas to determine the area of different parallelograms.
- Determine the area of different parallelograms.
- Find the area of different triangles and how to establish the formula to determine the area of either.
- Determine the area of different triangles.
- Visualize the area of a circle both conceptually and concretely.
- Establish the formula to determine the area of a circle.
- Determine the area of circles.

Keywords

- area
- base
- circle
- height
- length
- parallelograms
- polygons

Lesson 9. Volume

Code: C323G0SU01L09

Objectives

- Define volume concretely.
- Relate rectangular figures with figures that occupy a certain volume by their width, length, and height.
- Define volume as an area projected into a third dimension such as height or depth.
- Establish the formula for the volume of rectangular prisms, and determine the volume of different rectangular prisms.
- Define the volume of a cylinder as the area of a circle projected on a given length (height).
- Establish the formula for the area of cylinder and determine the area of different cylinders.
- Define the volume of a sphere, establishing its relationship with the volume of the cylinder that contains it.
- Establish the area for the volume of a sphere and determine the volume of different spheres.

Keywords

- cube
- cylinder
- rectangular prism
- sphere
- volume

Lesson 10. Surface Area

Code: C323G0SU01L10

Objectives

- Describe and define what the surface area is for different figures.
- Distinguish faces, bases, and curved three-dimensional figures.
- Break down geometric figures into plane areas that make up their exterior surface.
- Visualize different three-dimensional figures in drawing, as well as the parts that make them up even when they are not visible in a drawing.
- Establish formulas to determine the surface area of different three-dimensional figures like rectangular prisms (cube), cylinder, and sphere.
- Determine the surface area of prisms, cylinder, and spheres.

Keywords

- cube
- cylinder
- prism
- rectangular
- sphere and surface area

Lesson 11. The Principles of Probability

Code: C323G0SU01L11

Objectives

- Define terms related to probability such as event, total number of events, and sample space.
- Define probability and establish the probability that an event will occur, expressing said probability as a fraction.
- Describe the numeric expression for a probability as a value between 0 and 1.
- Establish the sample space for a given situation or probability.
- Establish the probability that an event will occur in its three expressions: as a fraction, decimal, and percentage.
- Determine the probability that different events, establishing the sample space.
- Define geometric probability in terms of lengths and areas.
- Establish the geometric probability that an event, either from a given length or in a particular area.

Keywords

- event
- geometric probability
- probability
- sample space

Lesson 12. Data Representation

Code: C323G0SU01L12

Objectives

- Define concepts related to statistics, such as data, frequency, and class.
- Recognize data and organize it into tables.
- Distinguish between data tables grouped by frequency or class.
- Interpret the data presented in different tables.
- Present and interpret data in the form of a stem and leaf graph.
- Use graphs to present data.
- Define, use, and interpret data in bar graphs, line graphs, and pie charts.

Keywords

- class
- data
- frequency
- graphs
- line graph
- pie chart
- stem and leaf graph
- tables

Lesson 13. Principles of Statistics

Code: C323G0SU01L13

Objectives

- Define statistics as a discipline that helps society as well as to collect and interpret social or scientific data.
- Point out and define the two branches of statistics (descriptive and inferential).
- Define and determine the measures of central tendency (mean, median, and mode).
- Solve problems where it is necessary to determine the measures of central tendency.

Keywords

- descriptive statistics
- inferential statistics
- mean (arithmetic mean)
- measures of central tendency
- median
- mode

Unit 2. Elements of Algebra

This unit intends to provide a general view of some of the elements or questions we must form when beginning the study of algebra. It also intends to explore, investigate, and analyze the reasoning skills or patterns we must use throughout the course.

General Objectives

- Promote and create awareness about the importance of algebra in our daily lives.
- Simplify expressions using the mathematical order of operations.
- Translate verbal expressions into algebraic expressions and vice versa.
- Establish mathematical statements from a real life situation.
- Recognize and classify numbers in the real number set.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Introduction to Algebra

Code: C323G0SU02L01

Objectives

- Generally know the story of Algebra as a field of study.
- Visualize algebra as a way of thinking and reasoning, useful to other branches of mathematics, science, and daily life.
- Think about the usefulness of learning algebra for academic success and in daily life.

Keywords

- algebra
- algebraic expression
- arithmetic
- pattern
- rules
- terms

Lesson 2. Order of Operations

Code: C323G0SU02L02

Objectives

- Establish the order in which operations are carried out within a numerical expression.
- Simplify numerical expressions that contain several operations, including grouping symbols.
- Evaluate algebraic expressions.
- Use vocabulary and algebraic symbols correctly when working numerical and algebraic expressions.

- Apply the evaluation of expressions in different problems or situations presented.

Keywords

- algebraic expression
- arithmetic operations
- braces
- brackets
- evaluate exressions
- grouping symbols
- numerical expression
- parenthesis
- simplify expressions

Lesson 3. Introduction to Mathematical Translation

Code: C323G0SU02L03

Objectives

- Translate from the common language (verbal expressions) into the mathematical language (using of symbols).
- Translate from algebraic expressions into verbal expressions.
- Determine when an algebraic expression is correct.
- Select the vocabulary and mathematical symbolism relating to a translation.
- Translate word problems into mathematical expressions.

Keywords

- algebraic expression
- algebraic phrase
- symbols
- translation
- unknown
- variable
- verbal phrase

Lesson 4. Mathematical Statements

Code: C323G0SU02L04

Objectives

- Establish the importance of statements in mathematics.
- Form different kinds of mathematical statements.
- Determine whether a statement is true or false.
- Identify and use different symbols to represent mathematical relationships.
- Define and use logical connectives when reading, interpreting, and constructing compound statements.
- Distinguish between singular connectives and binary connectives.

- Define and distinguish the equations and inequations of a group of algebraic expressions.
- Find the solution set for an equation or inequation.
- Represent and interpret the solution set of an equation or inequation in a graph.
- Represent and interpret graphs of compound statements made up of inequalities.

Keywords

- algebraic expressions
- binary connectives
- compound statements
- equality an inequality symbols
- equations
- equations
- graph of solution set
- inequation
- logical connectives
- simple statements
- singular connective
- solution set

Lesson 5. Properties of Real Numbers

Code: C323G0SU02L05

Objectives

- Define and distinguish between an axiom, a theorem, and a property.
- Define and identify the real number set.
- Establish the one to one correspondence between the real number set and points on a number line.
- Define the properties of real numbers: Closure, Commutative, Associative, Distributive, Identity Element, and Inverse Element.
- Identify the properties of real numbers in a statement.
- Appropriately use the properties of real numbers to solve arithmetic or algebraic problems.
- Explain the procedures carried out when they solve problems using the properties of real numbers.

Keywords

- associative property
- axiom
- closure
- commutative property
- counterexample
- identity
- inverse
- one to one correspondence
- postulate
- property
- similar terms
- theorem

Lección 6. Set Theory

Código: C316G0SU02L06

Objetivos

- Write sets in descriptive or list form.
- Identify finite and infinite sets.
- Determine if an element belongs or does not belong to a set.
- Define the null or empty set.
- Determine the union and intersection of sets.
- Determine the subsets of a set.

Conceptos

- complement
- infinite set
- finite set
- null set
- empty set
- element of a set
- intersection of sets
- subset
- set theory
- set union

Unit 3. Solving First Degree Equations and Inequalities

This unit intends to develop elementary skills and concepts necessary for solving 1st degree equations and inequalities that include an absolute value. Additionally, we introduce the solution of linear inequalities and equations that contain an absolute value. This unit essential for students because it encourages a command of skills that will be used in all of the mathematics courses they will take in the future.

General Objectives

- Solve 1st degree equations and inequalities using the inverse additive.
- Solve 1st degree equations and inequalities using the inverse multiplicative.
- Solve equations with several operations.
- Solve 1st degree equations and inequalities that include absolute value expressions.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Solving Equations with Addition and Subtraction

Code: C323G0SU03L01

Objectives

- Define the equality sign as a symbol that expresses equal value on both of its sides.
- Define equation and illustrate equations of a different kind.
- Identify linear equations, or first degree equations, and establish their general equation
  $ax + b = c$.
- Use Algeblocks to solve linear equations.
- Signal the importance of following steps to solve equations.
- Establish that solving an equation is finding the set of all of the values in a domain of a variable that make a statement true.
- Identify and use the properties studied to solve equations with addition and subtraction.
- Justify the steps to follow in order to solve an equation.
- Identify life situations for which it is necessary to write equations.
- Solve life problems by stating and solving an equations.

Keywords

- Algeblocks
- domain
- equation
- inequality
- linear equation
- solution

- solution set
- solving

Lesson 2. Solving Equations with Multiplication and Division

Code: C323G0SU03L02

Objectives

- Define the property of the inverse multiplicative or reciprocal.
- Establish that a division by zero $\left(\frac{x}{0}\right)$, is not defined and division by zero $\left(\frac{0}{0}\right)$, is undetermined.
- Solve linear equations in one variable that contain division and multiplication using the property of the inverse multiplicative.
- Solve equations using the Algeblocks™ manipulatives and divide with them by separating the pieces into equal pieces.
- Solve linear equations in one variable with and without the use of a manipulative.
- Apply and justify the steps needed to solve linear equations in one variable with multiplication and division.
- Use appropriate mathematical vocabulary and symbolism to solve linear equations of multiplication and division.

Keywords

- inverse multiplicative
- inverse operations
- multiplication identity
- reciprocal
- similar terms

Lesson 3. Solving Equations with Several Operations

Code: C323G0SU03L03

Objectives

- Solve equations that contain more than one operation at a time.
- Solve equations that contain a variable on both sides of the equality by applying the properties of equality and the association of similar terms.
- Write the solution of the equation as its solution sets, using corresponding symbols.
- Solve equations that contain more than one operation and parenthesis where the distributive property is applied.
- Identify and describe situations in which are solved using linear equations in one variable.
- Verify whether the solution of an equation is indeed its solution set.
- Use mathematical vocabulary and symbolism to solve equations.
- Identify a null or empty set as a solution.
- Apply the solution of linear equation in a single variable to solve everyday problems.

Keywords

- contradiction
- false numerical statement
- true numerical statement
- verification

Lesson 4. Solving Equations with an Absolute Value

Code: C323G0SU03L04

Objectives

- Define, both verbally and algebraically, what absolute value means.
- Distinguish between the expression “subtract a number” and “the opposite of a number”.
- Identify and describe everyday situations where the concept of absolute value can be applied.
- Use the symbols and vocabulary associated with absolute value appropriately.
- Solve linear equations that contain an absolute value geometrically and algebraically.

Keywords

- absolute value
- common language
- direction
- distance
- geometric representation
- number line

Lesson 5. Solving Inequalities with One Variable

Code: C323G0SU03L05

Objectives

- Solve linear inequalities in one variable.
- Identify and use the properties of inequalities.
- Apply inequations in solving different situations.
- Establish differences between the processes of solving equations and solving inequalities.
- Identify situations in which inequalities are used.
- Use mathematical vocabulary and symbolism related to inequalities.

Keywords

- inequalities
- solution set

Lesson 6. Solving Inequalities with an Absolute Value

Code: C323G0SU03L06

Objectives

- Solve inequalities that contain an absolute value such as $|ax + b| < c$ and $|ax + b| > c$, for $c > 0$.
- Solve inequalities with the conjunction *or* and the conjunction *and*.
- Write the solution set of inequalities with absolute value using interval notation.
- Draw the graph of inequalities with an absolute value.
- Use mathematical vocabulary and symbolism related to inequalities with absolute value.

Keywords

- absolute value
- graph of solution set
- inequalities
- solution set

Unit 4. Polynomials

In this unit, we will work with algebraic expressions known as polynomials. We will develop operations of addition, subtraction, multiplication, and division. We will review the laws of exponents which are essential for operations with polynomials.

General Objectives

- Define and classify polynomials by degree.
- Identify similar terms in a polynomial.
- Carry out addition and subtraction of polynomials.
- Use the laws of exponents to carry out multiplication and division operations.
- Simplify expressions by applying the laws of exponents.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Introduction to Addition and Subtraction of Polynomials

Code: C323G0SU04L01

Objectives

- Define and distinguish polynomials in other algebraic expressions.
- Rewrite polynomials in ascending or descending order.
- Classify and name polynomials by degree and number of terms.
- Apply polynomials to represent everyday situations.
- Use polynomials to solve situations.
- Appropriately use vocabulary and symbolism related to polynomials.
- Add and subtract polynomials.

Keywords

- binomial
- coefficient
- degree of the polynomial
- monomial
- numerical coefficient
- polynomial
- similar terms
- sum of the opposite
- terms
- trinomial

Lesson 2. Multiplying Monomials

Code: C323G0SU04L02

Objectives

- Identify monomial expressions.
- Multiply polynomials by applying the laws of exponents.
- Apply the simplification of monomials in different situations.
- Use appropriate mathematical vocabulary and symbolism related to the multiplication of monomials.

Keywords

- base
- even power
- exponent
- factor
- monomial
- negative base
- power
- product of powers
- uneven power

Lesson 3. Multiplying Polynomials

Code: C323G0SU04L03

Objectives

- Carry out the multiplication of two binomials, of a binomial by a trinomial, and of a trinomial by a trinomial.
- Apply the multiplication of polynomials to the solution of situations in day to day life.
- Identify mistakes in multiplying polynomials.
- Identify the null or empty set as a solution to equations.
- Use vocabulary and mathematical symbols appropriately when related to the multiplication of polynomials.

Keywords

- area, binomial
- difference of squares
- distributive property
- factor
- manipulative
- notable
- products
- perfect square trinomial
- product
- rectangle
- similar terms
- special products

- square of a difference
- square of a sum
- trinomial

Lesson 4. Laws of Dividing Exponents

Code: C323G0SU04L04

Objectives

- Recognize the cases in which the division of polynomials is not possible, it also recognizes the relation between the division of exponential forms and the remainder of a number, and when the division of powers produces an exponent of 0.
- Divide exponential powers with the same base.
- Simplify situations of the division of powers when zero appears as an exponent.
- Simplify situations of the division of powers when they appear with negative exponents.
- Identify the laws of exponents related with the division of powers.
- Identify common mistakes when dividing powers.
- Use appropriate mathematical symbolism and vocabulary related to the division of powers.

Keywords

- negative exponents
- power of zero
- quotient
- reciprocal

Lesson 5. Dividing Polynomials

Code: C323G0SU04L05

Objectives

- Divide a polynomial by a monomial.
- Carry out long division between polynomials.
- Verify the division of polynomials.
- Explain the process that we follow when dividing any two polynomials.
- Use appropriate mathematical vocabulary and symbolism related to the division of polynomials.

Keywords

- dividend
- divisor
- long division
- partial quotient
- remainder
- theorem of the remainder

Unit 5. Factoring

In this unit we will develop the concepts and skills related to the factoring process from students' previous knowledge about factors of numbers. We apply the factoring process for polynomials that have a common factor, differences of squares, quadratic trinomials that contain whole factors and for the difference and sum of cubes. We show the graphic demonstration of the factoring process.

General Objectives

- Break down a number or an expression as the product of factors.
- Factor polynomials using the distributive property.
- Factorize polynomials by difference of squares.
- Factorize quadratic trinomials that contain whole factors.
- Factorize polynomials made up of the sum or difference of cubes.
- Use the associative and distributive properties to factor polynomials for grouping.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Introduction to Factoring

Code: C323G0SU05L01

Objectives

- Define and illustrate the idea of factor.
- Define and distinguish the multiples of a number.
- Define and enumerate prime numbers.
- Explain how we can determine whether a number is prime or not.
- Use the sieve of Eratosthenes to find prime numbers.
- Recognize what the fundamental theorem of arithmetic consists of.
- Express a number as a product of prime numbers.
- Use the rules of divisibility to make prime factorization easier.
- Determine when an algebraic expression has been factored.
- Identify situations in which factorization has been used.
- Use the mathematical symbolism and vocabulary related to factorization.

Keywords

- breakdown
- compound number
- divisibility
- divisor
- exponent
- factor
- factorization
- power
- prime number

Lesson 2. Factoring Through the Distributive Property

Code: C323G0SU05L02

Objectives

- Identify the numerical and algebraic factors of a polynomial.
- Define and determine the greatest common factor in a polynomial.
- Define the distributive property as an equality between the product of factors (in which at least one of them is a sum or difference) and the development of that product.
- Recognize that the factorization of a polynomial is to express the sum (or difference) as a product of factors.
- Identify situations in which we can use the distributive property.
- Factor polynomials using the distributive property.
- Verify that a factorization is complete and correct.
- Use mathematical vocabulary and symbolism related to factorization of polynomials through the distributive property.

Keywords

- common factor
- distributive property
- factor
- factorization
- greatest common factor (GCF)
- greatest common divisor (GCD)
- polynomial
- product

Lesson 3. Factoring the Difference of Two Squares

Code: C323G0SU05L03

Objectives

- Identify and describe perfect squares.
- Identify binomials that are the difference of two square.
- Identify the difference of squares as one of the special products of algebra.
- Establish that the difference of two squares is factored as the product of the sum and difference of square roots (product of conjugates).
- Factor polynomials that are the difference of squares.
- Verify the factorization of polynomials that are the difference of squares.
- Use mathematical symbolism and vocabulary related to the factorization of the difference of two squares.
-

Keywords

- difference of squares
- factorization
- perfect squares

Lesson 4. Factoring Quadratic Trinomials

Code: C323G0SU05L04

Objectives

- Identify and distinguish perfect square trinomials.
- Factor perfect square trinomials.
- Factor trinomials in the form $x^2 + bx + c$.
- Factor trinomials in the form $ax^2 + bx + c$.
- Factor polynomials using several combined methods.
- Use mathematical vocabulary and symbolism related to the factorization of trinomials.

Keywords

- inside terms
- outside terms
- special products
- trinomial

Lesson 5. Factoring by Grouping

Code: C323G0SU05L05

Objectives

- Identify polynomials that are convenient to group in order to factor.
- Factor polynomials using grouping.
- Find the cases in which there is one more than one possibility for grouping.
- Determine when factorization is complete.
- Use vocabulary and mathematical symbols related to factoring by grouping.

Keywords

- binomials
- grouping
- inverse additives

Lesson 6. Factoring the Sum or Difference of Two Cubes

Code: C323G0SU05L06

Objectives

- Identify polynomials that are perfect cubes because they recognize and distinguish their particular characteristics.
- Distinguish polynomials that are the sum or difference of two cubes.
- Factor the sum or difference of two cubes.
- Use mathematical vocabulary and symbolism related to the sum or difference of cubes.

Keywords

- perfect cubes
- trinomials

Unit 6. Relations and Functions

The concept of functions is one of the most important notions in mathematics. In this unit, we will present and discuss the types of relations between variables and which of them meet the criteria to be considered functions. Additionally, in this unit we will study function notation, graphs of functions, and their transformations (linear, quadratic), characteristics of functions (increasing, decreasing, domain, field of values), and graphs.

General Objectives

- Define the different types of relations between sets and identify examples of them in the real world.
- Establish which of the relations between sets are functions.
- Evaluate functions.
- Trace the graphs of functions.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Rectangular Coordinate System

Code: C323G0SU06L01

Objectives

- Identify the axis of the Cartesian plane.
- Identify points on the Cartesian plane given coordinates.
- Establish coordinates of points graphed on the Cartesian plane.
- Use mathematical vocabulary and symbolism related to the rectangular coordinate system.

Keywords

- abscissa
- Cartesian plane
- coordinate
- ordered pair
- ordinate
- origin
- point
- quadrant

Lesson 2. Introduction to Functions

Code: C323G0SU06L02

Objectives

- Define what a relation between sets is.
- Establish the different types of representations of relations.
- Identify the domain and field of values (run) of a function.
- Define and illustrate relations and functions.
- State whether a relation is a function.

- Represent functions using verbal description, diagrams, tables, ordered pairs, and graphs.
- Evaluate a function for a given value.
- Identify real life situations where the use of functions is useful.
- Use mathematical vocabulary and symbolism related to functions.

Keywords

- domain
- field of values (run)
- relation

Lesson 3. Graphing Functions

Code: C323G0SU06L03

Objectives

- Define function.
- Classify a relation as a function given different representations.
- Establish function notation f(x).
- Evaluate functions for specific values.
- Determine whether a graph on a Cartesian plane belongs to a function.
- Identify increasing, decreasing, and constant intervals in a function.
- Identify the coordinates in the graph of a function.

Keywords

- constant
- coordinate
- decreasing
- evaluation
- function
- function notation
- graph
- increasing
- vertical line test

Unit 7. The Linear Model

This unit develops the linear model as the function of a ratio of constant change. The student will have the opportunity to model real life events that can be represented using a straight line. We will analyze the concept of slope as related to the graph of a straight line. Determine and interpret critical points such as intercept on the abscissa and ordinate. The linear model will provide students with the opportunity to represent events around them in such a way that they can solve problems and reach conclusions that allow them to make assertive decisions.

General Objectives

- Trace the graph of a linear equation that has two variables.
- Identify and calculate the slope of a line on the Cartesian plane.
- Interpret the slope of a line.
- Determine the linear model of an event with a constant change ratio.
- Find the equation of a line with information provided.
- Determine the relation between parallel and perpendicular lines.
- Find an equation parallel and perpendicular to another.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Graph of a Linear Equation

Code: C323G0SU07L01

Objectives

- Determine whether a function is linear given the different representations.
- Trace the graph of a function or linear model.
- Identify ratios of constant change.
- Translate from the common language (linguistic expressions) to the mathematical language (using symbols).
- Solve an equation with two variables for one of the variables.
- Identify situations that can be translated into linear equations with two variables.

Keywords

- linear function
- linear model
- ratio of change

Lesson 2. Slope of a Line

Code: C323G0SU07L02

Objectives

- Find the slope of a line.
- Identify the intercepts on the coordinate axes of a line.
- Define and calculate vertical and horizontal change or shift.
- Explain the concept of ratio or change.
- Explain the significance of magnitude and direction of the slope of the line.
- Explain why the slope of a line is constant.
- Identify situations of everyday life where we can apply the concept of slope.
- Use mathematical vocabulary and symbolism related to the slope of a line.

Keywords

- intercepts
- line
- shift
- slope
- ratio of change

Lesson 3. Equation of a Line

Code: C323G0SU07L03

Objectives

- State the slope-intercept form $y = mx + b$ of a line in a Cartesian plane, given the slope and intercept of the ordinate (y) axis.
- State the slope-intercept form $y = mx + b$ of a line, given the slope and any which point on the line.
- State the slope-intercept form of $y = mx + b$ of a line, given any which two points of a line.
- Transform an equation from slope-intercept form $y = mx + b$ form to the standard form $Ax + By = C$ and viceversa.
- Translate real world situations to linear equations with two variables.
- Use mathematical vocabulary and symbolism related to the equation of a line.

Keywords

- standard equation $Ax + By = C$
- slope-intercept form $y = mx + b$

Lesson 4. Parallel and Perpendicular Line

Code: C323G0SU07L04

Objectives

- Establish the relation between slopes of parallel and perpendicular lines.
- Determine whether two lines are parallel, perpendicular, or oblique.
- Determine the equation for a line that is parallel or perpendicular to another line.
- Identify figures or situation where we use parallel and perpendicular lines.
- Use mathematical language and symbolism related to parallel or perpendicular lines.

Keywords

- oblique
- parallel
- perpendicular

Unit 8. System of Equations and Inequalities

In previous units, we analyzed linear equations individually. In this unit, we analyze the relationship between two lines that can be parallel, perpendicular, or oblique. If they are not parallel, they will have a point of intersection. In this unit, we present different methods to determine the point of intersection of two non-parallel lines and for this, we establish a system of equations. In this unit, the solution of a system of equations will be done through a graphic method, substitution method, or method of elimination. The skills that the student can develop in this unit will allow them to apply them in advanced courses such as Precalculus and Geometry, among others.

General Objectives

- Define what a system of linear equations is and their solutions as the values of the variables that simultaneously satisfy each of the equations of a system of equations.
- Define a system of consistent linear equations as that which has one solution and whose graphics (lines) intersect at a point.
- Define a system of inconsistent equations as that which has no solution in which the lines are parallel.
- Define a consistent and dependent system as that which has infinite solutions in which the lines coincide in all of their points, since the equation in the system are equivalent.
- Solve linear equation systems using the different methods of substitution or elimination.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Solving Systems of Linear Equations Using the Graphical Method

Code: C323G0SU08L01

Objectives

- Define systems of linear equations and their solution as values variables can assume that satisfy each of the equations in the system.
- Define systems of linear equations that have a solution and whose lines intersect that has one solution and whose lines intersect in one point as consistent.
- Define systems of linear equation that do not have a solution where the lines are parallel as inconsistent.
- Define systems of linear equations with infinite solutions where the lines coincide in all of their points, as consistent and dependent.
- Write systems of two linear equations that have a single solution.
- Algebraically verify the solution of a system of equations.
- Establish the solution of a system of equations using the graphical method.

- Use the mathematical symbolism and vocabulary related to systems of equations.

Keywords

- consistent
- consistent and dependent
- graphical method
- inconsistent
- system of linear
- equations

Lesson 2. Solving Systems of Linear Equations Using the Substitution Method

Code: C323G0SU08L02

Objectives

- Solve systems of two equations in two variables using the substitution method.
- Identify systems where the use of the substitution is best to solve them.
- Translate situations or problems into systems of linear equations.
- Determine whether the system of linear equations is consistent, inconsistent, and dependent.
- Use mathematical vocabulary and symbolism related to the substitution method.
- Algebraically verify the solution of a system of equations.
- Write systems of two linear equations that have a single solution.

Keywords

- sets
- consistent
- dependent
- inconsistent
- substitution method

Lesson 3. Solving Systems of Linear Equations Using the Elimination Method

Code: C323G0SU08L03

Objectives

- Solve systems of two equations with two variables using the elimination method.
- State whether the system of equations is consistent, inconsistent, or dependent.
- State when the method of elimination is easier for solving a system of linear equations.
- Solve problems or situations using systems of equations and the elimination method.

Keywords

- consistent

- dependent
- elimination method
- inconsistent
- sets

Lesson 4. Solving Systems of Linear Equations in Three Variables (3X3)

Code: C323G0SU08L04

Objectives

- Define a linear equation in three variables.
- Explain what a triple ordinate is.
- Verify the solution of a 3×3 system.
- Solve systems of three equations with three variables using the substitution method.
- Solve systems of three equations with three variables using the elimination method.
- Use mathematical vocabulary and symbolism related to the solution of a system of three linear equations in three variables.

Keywords

- elimination method
- substitution method
- system of three equations

Lesson 5. Determinants and Systems of Linear Equations

Code: C323G0SU08L05

Objectives

- Define determinant.
- Solve a system of linear equations in two variables through order 2 determinants.
- Solve a system of linear equations in three variables through order 3 determinants.

Keywords

- Cramer's rule
- determinant
- order
- Sarrus' rule

Lesson 6. Solving Systems of Linear Inequalities

Code: C323G0SU08L06

Objectives

- Trace graphs of systems of inequalities on a single plane and distinguish the areas of each inequality.
- Identify the area of intersection between both graphs of inequalities that represent the solution of the system.
- Solve the system of inequalities to determine the points that limit the solution area of a system of inequalities.
- Determine the values that limit the area comprised in a system of inequalities.

Keywords

- frontier
- graph or area
- greater
- inequality
- lesser
- region
- semi-plane
- systems of inequalities

Unit 9. Rational Expressions and Equations

In this unit, we will present algebraic expressions that are not considered polynomials. One of these expressions is known as rational expressions. This unit will allow us to reinforce the division of polynomials previously discussed. We will also apply what we learned about the solution of proportions in order to solve rational equations.

General Objectives

- Define rational algebraic expressions.
- Establish for which value or values a rational expression is undefined.
- Carry out operations with rational algebraic expressions.
- Simplify rational expressions with terms made up of factors.
- Simplify rational expressions with terms made up of complex fractions.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Introduction to Rational Expressions

Code: C323G0SU09L01

Objectives

- Identify rational algebraic expressions.
- Classify rational and non-rational expressions.
- Determine the domain of the variables in a rational expression.
- Explain how rational expressions are constructed.
- Translate situations into rational expressions.
- Use mathematical vocabulary and symbolism related to rational expressions.
- Evaluate rational algebraic expressions.

Keywords

- evaluating expressions
- rational expressions

Lesson 2. Simplifying Rational Expressions

Code: C323G0SU09L02

Objectives

- Simplify rational algebraic expressions by factoring.
- Identify the values for which a rational expression is not defined.
- Determine the greatest common factor (GCF) of two or more expressions.
- Identify mistakes when simplifying rational expressions.
- Determine when a rational expression is in its simplest form.
- Use mathematical vocabulary and symbolism related to simplifying rational expressions.

Keywords

- rational expressions
- undefined expression

Lesson 3. Multiplying and Dividing Rational Expressions

Code: C323G0SU09L03

Objectives

- Find the product and quotient of two rational expressions.
- Use factorization to simplify the product or quotient of rational expressions.
- Explain the processes for multiplying and dividing rational expressions.
- Write the multiplication or division of the two rational expressions with a known result.
- Use mathematical vocabulary and symbolism related to the multiplication and division of rational expressions.

Keywords

- factorization
- product
- quotient
- simplify

Lesson 4. Adding and Subtracting Rational Expressions

Code: C323G0SU09L04

Objectives

- Find the common denominator of rational expressions.
- Explain and describe the process of adding or subtracting rational expressions.
- Add and subtract rational algebraic expressions.
- Find the least common denominator (LCD) of two or more polynomials.
- Simplify rational expressions.
- Use mathematical vocabulary and symbolism related to the addition and subtraction of rational expressions.

Keywords

- common denominator
- least common denominator

Lesson 5. Mixed Expressions and Complex Fractions

Code: C323G0SU09L05

Objectives

- Define and illustrate mixed rational expressions.
- Define and illustrate complex fractions.
- Use mathematical vocabulary and symbolism related to mixed expressions and complex fractions.
- Simplify rational complex expressions using addition, subtraction and division.

Keywords

- complex fraction
- simplify complex fractions

Lesson 6. Equations with Rational Expressions

Code: C323G0SU09L06

Objectives

- Identify equations that contain rational expressions.
- Determine the values excluded from the domain of the variable of an equation that contains rational expressions.
- Solve rational algebraic equations using proportions.
- Use the equations that contain rational expressions to represent different situations.
- Identify extraneous roots when they happen in solving equations that contain rational expressions.
- Apply the solution of equations with rational expressions.
- Use mathematical vocabulary and symbolism related to equations that contain rational expressions.

Keywords

- equation
- factorization
- proportions
- rational expression
- simplify expressions

Unit 10. Quadratic Equations

In previous units we worked on degree 2 polynomials known as quadratic expressions. In this unit, we will work on solving quadratic equations and the different ways of solving them, among them factorization, completing a quadratic binomial, and the quadratic formula. This unit will provide the necessary skills and concepts for students to be successful in advanced courses such as Algebra II and Precalculus.

General Objectives

- Factor different types of trinomials.
- Solve quadratic equations by factoring.
- Solve quadratic expressions concretely, using manipulatives (algebraic tiles). Solve simple quadratic equations using the square root.
- Apply the rules of notable products to develop the method of completing the square.
- Solve quadratic equations through the method of completing the square.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Introduction to Solving Quadratic Equations

Code: C323G0SU10L01

Objectives

- Define the general representation of a quadratic expression.
- Identify the terms in a quadratic equation.
- Evaluate a quadratic expression.

Keywords

- coefficient
- constant
- quadratic equation
- variable

Lesson 2. Solving Quadratic Equations by Factoring

Code: C323G0SU10L02

Objectives

- Factor different types of trinomials.
- Solve quadratic equations by factoring them.
- Solve quadratic equations concretely, using manipulatives (algebraic tiles).

Keywords

- factorization
- null product
- quadratic equations
- quadratic trinomials

Lesson 3. Solving Quadratic Equations by Completing the Square

Code: C323G0SU10L03

Objectives

- Solve simple quadratic equations through the application of a square root.
- Apply the rules of notable products to develop the method to complete the square.
- Solve quadratic equations through the method of completing the square.

Keywords

- complete the square
- manipulatives
- quadratic binomial
- root
- trinomials

Lesson 4. Solving Quadratic Equations Using the Quadratic Formula

Code: C323G0SU10L04

Objectives

- Transform quadratic equations to their general form: $ax^2 + bx + c = 0$.
- Use the quadratic formula $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$, in order to find solutions to quadratic equations.
- Apply the discriminant in order to determine the number and type of solutions in a quadratic equation.

Keywords

- coefficient
- complete the square
- discriminant
- quadratic formula

Unit 11. The Quadratic Model

In previous units we worked with functions classified as polynomials from a monomial and binomial point of view. In this unit, we will work on polynomial functions with two or more terms in proper, different than those which have been previously discussed. Here, we will begin investigating graphs of quadratic functions and we intend that students will be able to draw the graph of a quadratic model that includes all of the elements such as intercepts in the axes and vertex. This unit will develop the necessary skills and concepts for students to construct an event with characteristics similar to quadratic behavior.

General Objectives

- Identify real events that can be represented through a quadratic model.
- Trace the graph of a quadratic model.
- Identify the intercepts on the axes.
- Find the vertex of a graph of a quadratic model.
- Find the concavity of the graph of a quadratic model.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Introduction to the Quadratic Model

Code: C323G0SU11L01

Objectives

- Define quadratic model.
- Identify real events that can be represented with a quadratic model.
- Identify quadratic relationships from a data series.
- Use the method of consecutive differences to find a quadratic relationship.
- Write a quadratic equation or function that models or represents a situation.
- Use mathematical vocabulary and symbolism corresponding to the quadratic model or quadratic function.

Keywords

- quadratic model
- quadratic order

Lesson 2. Graph of a Quadratic Model

Code: C323G0SU11L02

Objectives

- Make a table of values to draw the graph of a quadratic function.
- Identify the vertex of the graph of a quadratic function.
- Determine whether a graph has a maximum point or minimum point.
- Find the intercepts of the graph.
- Identify the graph of a quadratic model.
- Find the quadratic model of a real event.
- Trace the graph of a real model.

- Use mathematical vocabulary and symbolism related to the graphs of quadratic functions.

Keywords

- graph
- parabola
- quadratic model

Lesson 3. Graphing the Quadratic Model in the form $f(x) = a(x-h)^2 + k$

Code: C323G0SU11L03

Objectives

- Find the vertex, intercept, concavity, and zeros in a quadratic function given its standard equation.
- Find the equation of the axis of symmetry.
- Apply the method for transforming a quadratic equation into standard form.
- Use mathematical vocabulary and symbolism related to the standard form of a quadratic equation ($f(x) = a(x-h)^2 + k$.

Keywords

- concavity
- intercept
- standard form of the quadratic equation
- zeroes

Lesson 4. Graph of the Quadratic Model in the Form $f(x) = ax^2 + bx + c$

Code: C323G0SU11L04

Objectives

- Find the y-intercept, the zeros in the function, the vertex, and the concavity in quadratic functions.
- Find the x intercepts in the graph of a function.
- Find the nature of zeroes in a quadratic function using the discriminant.
- Find a quadratic equation if you know its roots.
- Trace the graph of a quadratic function using the intercepts on the axis and vertex.
- Use mathematical vocabulary and symbolism related to the graph of $f(x) = ax^2 + bx + c$.

Keywords

- concavity
- discriminant
- intercepts
- vertex
- zeroes in the function

Unit 12. Rational and Radical Exponents

Radical expressions are those which contain a radical like the square root. There are many forms of radical expressions that can be very simple or complex depending on the index and radicand. In any case, we can use the laws of exponents and factorization to simplify and carry out operations.

General Objectives

- Apply the properties and laws of exponents with whole exponents to factionary exponents.
- Define a radical as an exponential expression with a factionary element and translate it from radical form to its exponential form and vice versa.
- Simplify radical expressions.
- Rationalize fractions whose terms are expressions with radicals, using the conjugate of the denominator.
- Define imaginary numbers as pair roots for negative numbers in which $i = \sqrt{-1}$, and complex numbers as numerals with one real part and one imaginary part.
- Carry out operations with real numbers.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Whole Exponents

Code: C323G0SU12L01

Objectives

- Identify the principal properties of whole exponents.
- Write a number using scientific notation.
- Apply the properties and laws of whole exponents.
- Simplify algebraic expressions with whole exponents.
- Use mathematical vocabulary and symbols related with the use of exponents.

Keywords

- simplify expressions
- whole exponents

Lesson 2. Fractional Exponents

Code: C323G0SU12L02

Objectives

- Apply the properties and laws of exponents studied with factional exponents.
- Define a radical as an exponential expression with a factional exponent, and translate it from a radical form to an exponential form and vice-versa.

Keywords

- fractional exponents
- index
- radical
- radicand

Lesson 3. Radicals

Code: C323G0SU12L03

Objectives

- Simplify expressions with square and cubic roots.
- Rationalize the denominator of a radical.
- Use factorial breakdown to simplify expressions with radicals.
- Use mathematical vocabulary and symbolism related to the simplification of radicals.

Keywords

- cubic roots
- factorial breakdown
- radical
- square root

Lesson 4. Operations with Radicals

Code: C323G0SU12L04

Objectives

- Determine when two or more radicals are similar.
- Establish similarities between operations with radicals and operations with polynomials.
- Add and subtract radicals with the same index.
- Multiply and divide expressions with radicals.
- Rationalize fractions with terms that are expressions with radicals, using the conjugate of the denominator.

Keywords

- complex numbers
- conjugate
- radicals

Unit 13. Algebra and Geometry

The intention of this unit is to introduce basic algebra students to essential geometrical concepts such as operations with segments and angles, similar shapes, and proportionality, perimeter, area and volume, and a basic notion of trigonometry and solving triangles. The objective of this unit is to prepare students for the high school Geometry course. This unit is meant to develop the necessary skills and concepts to face the most relevant geometry theorems.

General Objectives

- Use the equation solving concepts to solve problems involving operations with segments and angles.
- Identify like figures and solve problems by applying proportions
- Apply the solution of quadratic equations and the Pythagorean Theorem in order to solve problems related to right triangles.
- Find the area of plane shapes.
- Find the volume of basic three dimensional figures.
- Find the trigonometric ratios of the sine, cosine, and tangent of an angle in a right triangle.
- Solve a triangle by applying the learned skills and concepts.

At the end of this unit, the student will have completed the following objectives as developed in the different lessons.

Lesson 1. Algebra, Segments, and Angles

Code: C323G0SU13L01

Objectives

- Use concepts from algebra to solve statements related to operations with segments.
- Solve geometry problems involving algebraic expressions.
- Use mathematical vocabulary and symbolism related to the integration of algebra and geometry.
- Use algebraic manipulations to solve problems related to the use of segments, midpoints, and complimentary and supplementary problems.

Keywords

- angles
- segments

Lesson 2. Ratios, Proportions, and Similar Figures

Code: C323G0SU13L02

Objectives

- Define and illustrate what *ratio* is.
- Define *proportion* and its parts.
- Define and illustrate similarity between figures.
- Use the solution of proportions to solve problems with similar figures with algebraic expressions.
- Use mathematical vocabulary and symbolism related to ratios, proportions, and similar figures.

Keywords

- proportions
- ratios
- similarities

Lesson 3. Pythagorean Theorem and the Formula for Distance

Code: C323G0SU13L03

Objectives

- Explain the Pythagorean theorem symbolically and in words.
- Identify situations where the Pythagorean theorem can be used.
- Use the solution of quadratic equations to solve problems that relate to the Pythagorean theorem.
- Find the distance between two points on the Cartesian plane.
- Use mathematical vocabulary and symbolism related to the use and application of the Pythagorean theorem.

Keywords

- Cartesian plane
- distance
- Pythagorean Theorem

Lesson 4. Area and Quadratic Expressions

Code: C323G0SU13L04

Objectives

- Find the area of plane figures with dimensions that are algebraic expressions.
- Solve situations or problems related to the concept of area.
- Apply algebraic techniques to work on situations related to area.
- Use mathematical vocabulary and symbolism related to area and its applications.

Keywords

- area

Lesson 5. Volume and Algebraic Expressions

Code: C323G0SU13L05

Objectives

- Define and explain what *volume* is.
- Explain and wrote the formulas for volume for certain solid figures.
- Determine the volume of three-dimensional figures with dimensions that are algebraic expressions.
- Solve problems and situations where we use the concept of volume.
- Use mathematical vocabulary and symbolism related to the use of *volume.*

Keywords

- volume

Lesson 6. Trigonometric Ratios

Code: C323G0SU13L06

Objectives

- Solve similar triangles using the properties of proportions.
- Define the trigonometric functions of the sine, cosine, and tangent of an angle.
- Solve triangles using trigonometric ratios.
- Use mathematical vocabulary and symbolism related to the use of trigonometric ratios.

Keywords

- cosine of an angle
- proportions
- similarity
- sine of an angle
- tangent of an angle
- trigonometric ratios