Grades 9-12 Mathematics
Algebra Concepts

Numbers and Variables

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

2. Know that we must assume responsibility for the acts we perform (CCC 1781).

4. Sustain the Christian life through the practice of the gifts of the Holy Spirit (CCC 1831).

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

The Rights of Children

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

Summary

Focus on the transition from generalized arithmetic to algebraic concepts.Although many of the topics have been investigated informally at previous grade levels, the expectation at the secondary level is for the use of formal mathematical language and reasoning.

Unit Goals

1. a. Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
2. b. Understand meanings of operations and how they relate to one another.
3. c. Become proficient in computations and in making reasonable estimates.

Big Ideas

1. Properties and Operations of Real Numbers and Variables

Enduring Understandings

1. My knowledge of number systems helps me recognize and appreciate the inherent order and beauty of Gods creation.
2. Using numbers and variables to solve problems is satisfying, enjoyable, and confidence-building.
3. Knowing how to represent numbers with variables allows me to communicate effectively across disciplines and cultures.

Content

1. Define and use a number line andinterval notation
2. Differentiate betweentypes of numbers (rational, irrational, square roots, higher roots, etc.).
3. Simplify radical expressions.
4. Operate on radical expressions.
5. Simplyfy expressions usingorder of operations
6. Underestand properties of real numbers
7. Model and solve real-world situationsusing variables

Skills

1. Compare, order and determine equivalentforms of rational and irrational numbers. (9N2)
2. Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities. (9N3)
3. Simplify radicals involving products and quotients. (9N2, 9N3, 9N4)
4. Identify properties of real numbers (closure, identity, inverse, commutative, and associative) and whether they hold for a given set of operations. (9N1)
5. Demonstrate fluency in computations using real numbers. (9N4)
6. Estimate the solutions for problem situations involving square and cube roots. (9N5)
7. Connect physical, verbal, and symbolic representations of irrational numbers. (10N1)
8. Translate from a verbal expression to an algebraic expression. (9P3)
9. Simplify numerical and algebraic expressions.

Essential Questions

1. Why should I know how to use numbers and variables?
2. How does knowing how to write algebraic
3. expressions and equations enhance my ability to communicate?

Stage 2: Assessment Evidence

Diagnostic: Quiz

Diagnostic: Test

Pre-test to Determine Computational Ability

Formative: Observation

Drills to Practice Computational Skills

Formative: Homework

Checking daily homework.

Formative: Quiz

Quiz on basic computational skills.

Summative: Test

Written Test

Stage 3: Learning Plan

Learning Experiences

1. Students will complete a pre-test on computation without a calculator. Teacher will then plan remediation as needed.
2. Activities to enhance students' mental computations.
3. After proficiency without a calculator has been demonstrated, teacher should demonstrate how a calculator can be used for a variety of calculations with real numbers, discuss the difference between exact and rounded values, etc. An activity to practice these calculator skills would then determine who understands how to use the technology.
4. Daily homework should be demonstrated, explained, discussed daily with teacher informally checking student skills. Drills on operations with various types of numbers, combining like terms, etc. will also be useful to solidify student understanding.
5. Students willparticipate in an activity requiring them to order various types of numbers along a number line. This activity will test their ability to do mental math, to approximate values, and to compare values of numbers.
6. The final written test willprovide evidence of individual proficiency with these concepts.

Technology Integration

1. A scientific or graphing calculator will be used to do computations with real number

Resources

1. Order of Operations: http://amby.com/educate/ord-op/
2. Properties of Numbers: http://school.discoveryeducation.com/lessonplans/programs/DM\_computation/
3. Real Number Properties: http://www.regentsprep.org/Regents/Math/realnum/properties.htm
4. Verbal Expressions: http://www.redcomet.org/Preview/Ma15aRev.html
5. Simplifying Expressions: http://www.math.com/school/subject2/lessons/S2U2L5GL.html
6. Combine Like Terms: http://www.algebrahelp.com/lessons/simplifying/combiningliketerms/

Grades 9-12 Mathematics
Algebra Concepts

Solving Linear Equations and Inequalities

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

4. Sustain the Christian life through the practice of the gifts of the Holy Spirit (CCC 1831).

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

The Rights of Children

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

10. THE RIGHT TO GUIDANCE FROM THE CHURCH in their development as loving people.

Summary

Determinegraphical and algebraic solutions to linear equations and inequalities.

Unit Goals

1. Understand patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols.
2. Understand meanings of operations and how they relate to one another.

Big Ideas

1. Solve linear equations and inequalities
2. Graph linear equations and inequalities

Enduring Understandings

1. Mathematical thinking and problem solving will help me in the workplace and in everyday life.
2. The universal language of mathematics allows me to communicate effectively across disciplines and cultures.
3. Learning mathematics is satisfying, enjoyable, and confidence-building.

Content

1. Solve one-step and multi-step equations.
2. Solve equations with variables on both sides
3. Apply equations to real-world problem solving situations
4. Solve literal equations for a selected variable
5. Solve and graph inequalities
6. Solve and graph compound inequalities
7. Solve absolute value equations
8. Solve and graph absolute value inequalities

Skills

1. Write and use equivalent forms of equations and inequalities in problem situations. (9P6)
2. Compare, order and determine equivalent forms of rational and irrational numbers. (9N2)
3. Solve linear, absolute value, and literal equations and inequalities using properties of equality and properties of real numbers (9P6)
4. Represent solution sets using an algebraic equation or inequality and graph on a number line (9P3)
5. Use unions and intersections to determine solution sets of absolute value and compound inequalities.(9P6)

Essential Questions

1. How does knowing how to solve equations and inequalities help me to solve real-world problems?
2. How does using equations and inequalities allow me to succeed in other subjects?
3. Why is mathematics considered a universal language?

Stage 2: Assessment Evidence

Diagnostic: Test

A pretest on solving linear equations.

Formative: Homework

Demonstrate competence on daily homework.

Formative: Observation

Students will solve problems and share their solutions with the class.

Summative: Test

Written test.

Stage 3: Learning Plan

Learning Experiences

1. Demonstrate using a pan balance that equal amounts must be added, subtracted, multiplied, or divided to both sides of an equation.
2. Demonstrate the steps needed to solve multi-stepped equations using homework, group work, and boardwork.
3. Use worksheets that show the similarity in solving linear equations and literal equations.
4. Use number lines to discover the solution set for absolute value inequalities. Then, introduce the procedure to solve absolute value inequalities.
5. Use number lines in order to make the visual connection of the solution set of inequalities.

Technology Integration

1. Internet resources
2. Scientific and graphing calculator

Resources

1. solving equations and inequalities:http://library.thinkquest.org/20991/alg2/eq.html
2. Solving literal equations (practice):http://regentsprep.org/regents/math/formulas/litPrac.htm
3. solving absolute value inequalities (board game):http://www.quia.com/cb/25114.html

Grades 9-12 Mathematics
Algebra Concepts

Polynomials and Factoring

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

2. Know that we must assume responsibility for the acts we perform (CCC 1781).

4. Sustain the Christian life through the practice of the gifts of the Holy Spirit (CCC 1831).

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Call to Family, Community, and Participation

The Rights of Children

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

Summary

Students will develop skills relative to polynomials. These skills include: classification of polynomials, arithmetic operations (addition, subtraction, and multiplication) on polynomials, and factoring (including using a greatest common factor, factoring trinomials, factoring special cases, and factoring by grouping). Arithmetic operations on rational expressions should be studied in the Honors program.

Unit Goals

1. Understand patterns and relations; analyze mathematical situations and structures using algebraic symbols.

Big Ideas

1. Classifying of polynomials
2. Adding, subtracting, and multiplyingpolynomials
3. Factoring
4. Simplifying rational expressions and rational equations

Enduring Understandings

1. Factoring helps me recognize and appreciate the inherent order and beauty of Gods creation.
2. Factoring isuseful in helping me to solve real-world problems.

Content

1. Definepolynomial
2. Perform operationson polynomials
3. Factor polynomials
4. Perform operationswith rational expressions
5. Solve rational equations

Skills

1. Describe and compare characteristics offamilies of functions; e.g., general shape, number of roots, domain, and range. (9P5)
2. Solve quadratic equations with real roots by factoring, graphing, using the quadratic formula and with technology. (9P10)
3. Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs. (9P15)
4. Solve real-world problems that can be modeled using appropriate functions. (10P10)
5. Explain the effects of operations such as multiplication or division, and of computing powers and roots on the magnitude of quantities.(9N3)
6. Estimate the solutions for problem situations involving square roots.(9N5)
7. Demonstrate the relationship among zeros of a function, roots of equations, and solutions of equations graphically and in words. (9P4)
8. Factor using the following techniques: factor a monomial from a polynomial, factor binomials by difference of two squares, factor trinomials. (9P10)
9. Generalize patterns using functions or relationships and freely translate among tabular, graphical and symbolic representations. (9P2)
10. Add, subtract, multiply and divide monomials and polynomials (division of polynomials by monomials only). (9P11)
11. Simplify rational expressions by eliminating common factors and applying properties of integer exponents. (9P12) (Honors)

Essential Questions

1. Why do I need to factor a polynomial?
2. To what extent will being able to perform arithmetic operations on rational expressions help me?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-test of Numerical Factors (GCF, LCM, etc.), Numerical Terminology, Basic Exponent Properties

Formative: Homework

Individual Student Demonstrations

Formative: Lab Assignment

Creating Polynomials

Formative: Performance

Team Factoring

Formative: Observation

Practice Drill on Operations with Polynomials and Rational Expressions (Honors)

Summative: Test

Written Test

Stage 3: Learning Plan

Learning Experiences

1. Engage in an activity which will determine if students recognize like terms.
2. Apretest will determine previous skillsinvolving factors and exponents.
3. Homework demonstrations throughout the unit will require students to verbally explain written work and will promote a dialogue about the techniques of factoring and simplifying rational expressions .
4. Engage in an activity where students create polynomials. This will reinforce the recognition and classification of polynomials. It will also give students an idea of the variety and usefulness of these expressions.
5. A factoring competition promotes peer teaching and learning and provides satisfaction and self-confidence for the participants.
6. A written test will provide evidence of individual proficiency.

Technology Integration

1. Students can use a calculator to determine factors
2. Manipulatives can also be used to model factoring.

Resources

1. Tutorial on factoring: <http://www.wtamu.edu/academic/anns/mps/math/mathlab/col_algebra/col_alg_tut7_factor.htm>
2. Factoring: <http://www.algebralab.org/lessons/lesson.aspx?file=Algebra_factoring.xml>

Grades 9-12 Mathematics
Algebra Concepts

Linear Functions

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

2. Know that we must assume responsibility for the acts we perform (CCC 1781).

4. Sustain the Christian life through the practice of the gifts of the Holy Spirit (CCC 1831).

6. Seek the common good together (CCC 1905).

7. Assume personal responsibility (CCC 1914).

14. Demonstrate appropriate care of social communication and technology (CCC 2496).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Call to Family, Community, and Participation

Solidarity

The Rights of Children

2. THE RIGHT TO A SAFE ENVIRONMENT that promotes care, protection, and security.

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

Summary

Formalize the study of linear functions and their graphs. Students will determine and connect the graphical and algebraic solutionsof linear equations and inequalities.

Unit Goals

1. Understand patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols.
2. Use mathematical models to represent real-world situations.
3. Develop and evaluate inferences and predictions that are based on data.

Big Ideas

1. Connections between linear equations/inequalities and their graphs.

Enduring Understandings

1. Math gives me the power to make informed everyday decisions in order to live more effectively in the world.
2. Slopeplays a role in the recreational and aesthetic aspects of my life.
3. Mathematics helps me recognize and appreciate the inherent order of God's creation.
4. The universal language of mathematics allows me to communicate effectively across other subjects.

Content

1. Compute slope
2. Recognize different forms of equationsof lines, including slope-intercept, point-slope, and standard form
3. Graph a linear function
4. Write a linear function given information about the function
5. Recognize special lines including parallel, perpendicular, horizontal, and vertical
6. Connect the algebraic solutions of linear functions and inequalities to their graphical representations
7. Use linear models to make predictions

Skills

1. Compute slope given two points on a line. (9P3, 9P5)
2. Write an equation for a line using point-slope form, graph a line using slope-intecept form, and represent a line with its standard form. (9P2, 9P5, 9P6, 9P8)
3. Identify slope and y-intercept and use these to find two points to graph the line. (9P5, 9P6, 10P10)
4. Use slope and y-intercept or two points to write an equation for a line. (9P2, 9P5, 9P6, 9P8)
5. Identify slopes, relationships, and graphs of parallel, perpendicular, horizontal and vertical lines. (9P6, 9P15)
6. Determine if the line in a linear inequality is part of the solution set. (9P3)
7. Identify the shaded region as a solution set, and provide multiple solutions to the inequality. (9P3)
8. Create a regression model.(9D2)
9. Define function with ordered pairs in which each domain element is assigned exactly one range element (9P1)
10. Model and solve problems involving direct and inverse variation using proportional reasoning. (9P13)
11. Describe the relationship between slope and the graph of a direct variation and an inverse variation. (9P14)

Essential Questions

1. Why do we graph lines?
2. How does rate of change relate to the graph of a line?
3. How can a linear function or inequality be used to represent a real-life situation?
4. To what extent does the relationship between two quantities help me to predict the future?
5. How do linear functions help me in other subjects?

Stage 2: Assessment Evidence

Diagnostic: Teacher Observation

Class discussion about the impact of adding a second variable to an equation (going from an equation to a function).

Formative: Homework

Demonstrate competence on daily homework.

Formative: Teacher Observation

Group work

Formative: Quiz

Demonstrating competence in graphing linear functions.

Summative: Test

Demonstrate competence in solving, graphing, and applying linear functions.

Stage 3: Learning Plan

Learning Experiences

1. The homework problems should provide students the opportunity to communicate mathematically while practicingthe content.
2. Use linear funtions to model real-world problem situations.
3. Have the students work in groupsto answer the following questions: How can you describe these lines? Why are slope and y-intercept useful? In what forms can these linear relationships be written? How can you write the relationship if you are given information about it?
4. Organize students into groups to answer the following questions. Are there any special types of lines? Are there any special relationships between parallel lines? How can we apply our knowledge to solve inequalities?How can we apply our knowledge to real-world problem situations?

Technology Integration

1. Scientific or graphing calculator

Resources

Websitesthat may be usefulin developing lesson plans:

1. Ohio Department of Education www.ode.state.oh.us
2. NCTM www.nctm.org
3. NCISLA www.wcer.wise,edu/ncisla/publications
4. Education World www.education-world.com
5. Glencoe Publishing Company www.glencoe.com
6. A place to start with links to other math sites => www.npac.syr.edu/textbook/kidsweb/math.htmlProvides
7. links to math resources => www.tc.cornell.edu/Edu/MathSciGatewayStudents
8. ask Dr. Math their own questions => www.forum.swarthmore.edu/dr.math/

Grades 9-12 Mathematics
Algebra Concepts

Systems of Linear Equations and Inequalities

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

2. Know that we must assume responsibility for the acts we perform (CCC 1781).

4. Sustain the Christian life through the practice of the gifts of the Holy Spirit (CCC 1831).

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Rights and Responsibilities

The Rights of Children

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

Summary

Focus on the use of a system of linear equations to solve real-life problems. Emphasis will be placed on using the appropriate method and interpreting the solution of a system.

Unit Goals

1. Understand patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols.
2. Use mathematical models to represent and understand quantitative relationships; analyze change in various contexts.
3. Specify locations and describe spatial relationships using coordinate geometry and other representational systems.

Big Ideas

1. Systems of Linear Equations
2. Systems of Linear Inequalities

Enduring Understandings

1. Solving systems requires mathematical thinking which will be usefulin the workplace and in everyday life.
2. Systems help me recognize and appreciate the inherent order and beauty of Gods creation.

Content

1. Write linear systems
2. Use graphing method for solving systems
3. Use substitution method for solving systems
4. Use elimination method for solving systems
5. Interpretsolutions of the system
6. Use methods for solving systems of linear inequalities

Skills

1. Solve and interpret the meaning of 2 by 2 systems of linear equations graphically, by substitution, and by elimination, with and without technology (9P9)
2. Solve systems of linear inequalities (10P7)
3. Solve real-world problems that can be modeled, using systems of linear equations and inequalities (10P11)

Essential Questions

1. To what extent can linear systems be used to solve problems?
2. Why is it important to know more than one way to solve a problem?

Stage 2: Assessment Evidence

Diagnostic: Quiz

pre test on graphing linear equations and inequalities

Formative: Teacher Observation

Students work problems at the board.

Formative: Homework

Demonstrate competence on daily homework.

Formative: Quiz

Solve systems using a variety of methods.

Summative: Test

Chapter test on solving and applying systems of linear equations using a variety of methods.

Stage 3: Learning Plan

Learning Experiences

1. Demonstrate methods of elimination, substitution and graphing.
2. Solve a system of equations algebraically and graphically and realize that the solution does not depend upon the method used.
3. Solve systems in groups with the goal of determining which method best solves the system.
4. Connect the use of systems to real-world problem solving situations with two unknowns.

Technology Integration

1. Graphing calculators

Resources

Websitesthat may be usefulin developing lesson plans:

1. Ohio Department of Education [www.ode.state.oh.us](http://www.ode.state.oh.us/)
2. NCTM [www.nctm.org](http://www.nctm.org/)
3. NCISLA www.wcer.wise,edu/ncisla/publications
4. Education World [www.education-world.com](http://www.education-world.com/)
5. Systems of Linear Equations: <http://www.purplemath.com/modules/systlin1.htm>
6. Glencoe Publishing Company [www.glencoe.com](http://www.glencoe.com/)

Resources

* Systems of Linear Inequalities (<http://www.purplemath.com/modules/syslneq.htm>)

Grades 9-12 Mathematics
Algebra Concepts

Exponents and Exponential functions

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

2. Know that we must assume responsibility for the acts we perform (CCC 1781).

4. Sustain the Christian life through the practice of the gifts of the Holy Spirit (CCC 1831).

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

The Rights of Children

3. THE RIGHT TO BE RESPECTED AS INDIVIDUALS with human dignity.

4. THE RIGHT TO WORK ACTIVELY TOWARD THEIR OWN EMPOWERMENT through the development of their gifts and talents.

5. THE RIGHT TO A LEARNING ENVIRONMENT THAT VALUES COOPERATION and challenges its members to critical and reflective thinking in their search for truth.

6. THE RIGHT TO DEVELOP POSITIVE, RESPONSIBLE AND CARING ATTITUDES AND BEHAVIORS TOWARD OTHERS and to recognize the rights of others to be safe and free from harassment and abuse.

7. THE RIGHT TO LEARN THE SKILL OF SELF PROTECTION by identifying safe and unsafe situations.

8. THE RIGHT TO LEARN RESPONSIBILITY for themselves and their actions.

Summary

Focus on simplifying expressions with zero and negative exponents, evaluating exponential expressions, applying properties of exponents, evaluating and graphing exponential functions, and modeling exponential growth and decay.

Unit Goals

1. Understand patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols.
2. Use mathematical models to represent and formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
3. Understand measurable attributes of objects and the units,systems, and processes of measurement.
4. Understand numbers, ways of representing numbers, relationships among numbers, and number systems.
5. Understand meanings of operations and how they relate to one another.
6. Compute fluently and make reasonable estimates.

Big Ideas

1. Exponents and Exponential Functions

Enduring Understandings

1. The ability to understand and use mathematics will give me opportunities to make the world a better place.
2. Mathematics helps me recognize and appreciate the inherent order and beauty of God's creation.
3. Learning mathematics is satisfying, enjoyable, and give me self-confidence.

Content

1. Use properties of exponents
2. Graph exponential functions
3. Apply exponential functions to growth and decaysituations

Skills

1. Demonstrate fluency in computations using real numbers (9N4)
2. Simplify monomial rational expressions and applying properties of integer exponents (9P12)
3. Use unit analysis to check computations involving measurement (9M2)
4. Solve problems involving unit conversion for situations involving distances, areas, volumes and rates within the same measurement system (9M5)
5. Apply the properties of exponents (9N3)
6. Generalize patterns using functions or relationships and freely translate among tabular, graphical, and symbolic representations (9P2)
7. Solve real-world problems that can be modeled using exponential functions (10P10)
8. Use formulas to solve problems involving exponential growth and decay (9P7)

Essential Questions

1. To what extent do exponential functions relate to real-world problems?
2. To what extent are exponential functions the fuel for technology, progress, invention, discovery, and creativity.
3. To what extent can learning about exponential functions be satisfying, enjoyable, and confidence-building?

Stage 2: Assessment Evidence

Diagnostic: Test

Pretest on graphing ordered pairs and raising real numbers to a power.

Formative: Teacher Observation

Board work, classwork, group work, and homework.

Summative: Test

Written test on unit.

Stage 3: Learning Plan

Learning Experiences

1. Students will complete a pretest on graphing ordered pairs and raising real numbers to a power.
2. Exponential functions will be applied to real-world problem situations such as growth and decay.
3. Daily homework involving properties of exponents and exponential functions should be completed and discussed in groups and as a class.
4. A final written test will provide evidence of individual proficiency with these concepts.

Technology Integration

1. A graphing or scientific calculator will be used to facilitate computations.

Resources

Websites that may be useful in developing lesson plans:

1. Ohio Department of Education [www.ode.state.oh.us](http://www.ode.state.oh.us/)
2. NCTM [www.nctm.org](http://www.nctm.org/)
3. NCISLA www.wcer.wise,edu/ncisla/publications
4. Education World [www.education-world.com](http://www.education-world.com/)
5. Glencoe Publishing Company [www.glencoe.com](http://www.glencoe.com/)