Grade 9 Mathematics
First Year High School Math

Numbers and Variables

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

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 calculatorwill be used to do computations with real numbers.
2. Smartboard
3. Excel spreadsheets

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/

Grade 9 Mathematics
First Year High School Math

Solving Linear Equations and Inequalities

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

Solidarity

The Rights of Children

1. THE RIGHT TO A CATHOLIC COMMUNITY that witnesses to Christ and the Gospel by protecting them from child abuse, including sexual abuse and neglect.

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.

9. THE RIGHT TO MAKE RESPONSIBLE DECISIONS founded on religious conviction.

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.

Formative: Technology Project

Student will take a formula, such as P = 2l + 2w, and rearrange it to isolate one of the other variables. Then, he or she will enter the rearranged formula into an excel spreadsheet and will also enter the needed data in the various columns of the spreadsheet in order for the program to calcualte the value of the isolated variable. Enough data should be entered so as to calculate approximately 20 different values for the isolated variable.

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. Smartboard
2. Internet resources
3. 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

Grade 9 Mathematics
First Year High School Math

Linear Functions

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Solidarity

Care for God's Creation

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 calculators
2. Geometer's Sketchpad

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/

Grade 9 Mathematics
First Year High School Math

Systems of Linear Equations and Inequalities

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Solidarity

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. SmartBoard
2. TI SmartView Calculator
3. Graphing calculators
4. Geometer's Sketchpad

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>)

Grade 9 Mathematics
First Year High School Math

Polynomials and Factoring

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

Solidarity

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>

Grade 9 Mathematics
First Year High School Math

Quadratic Functions and Equations

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

Solidarity

Summary

Introduce students toquadratic functions and the quadratic formula. By analyzingquadratic functions, students will be able to predict characteristics oftheir graphs. Using the quadratic formula, factoring and graphing, students will determine the zeros of a function.

Unit Goals

1. The student will demonstrate an ability to solve, analyze, and interpretquadratic functions and their graphs.

Big Ideas

1. Quadratic Formula
2. Quadratic Functions
3. Quadratic Equations

Enduring Understandings

1. Solving quadratic equations gives me self-confidence.
2. Understanding the relationship among the zeros of a function, roots of equations, and solutions of equations help me to recognize and appreciate the inherent order and beauty of God's creation.
3. Math gives me the power to make informed everyday decisions in order to live more effectively in the world.

Content

1. Relate the zeros, roots, and solutions of a quadratic function
2. Grapha quadratic function
3. Factor quadratic equations
4. Use the quadratic formula
5. Discover the meaning of the discriminant

Skills

1. Demonstrate the relationshipbetween zeros of a function, roots of equations, and solutions of equations (9P4)
2. Describe and compare characteristics of the quadratic function; e.g. general shape, number of roots, domain, and range (9P5)
3. Solve quadratic equations with real roots by factoring , graphing, using the quadratic formula with technology (9P10)
4. Describe how a change in the value of a constant in a linear or quadratic equation affects the related graphs (9P15)
5. Solve real-world problems that can be modeled using quadratic functions (10P10)
6. Determine the number of solutions of a quadratic using the discriminant (9P10)

Essential Questions

1. Why is it important to know more than one method of solving a quadratic equation?
2. What is the relationship among zeros of a function, roots of equations, and solutions of equations?
3. In what real-life problems is it appropriate to use a quadratic function?

Stage 2: Assessment Evidence

Diagnostic: Written Assessment

Pretest over factoring and radicals.

Formative: Homework

Students will share homework solutions with class.

Summative: Test

Written assessment.

Stage 3: Learning Plan

Learning Experiences

1. Students will complete a pretest on factoring and radicals.
2. Apply quadratic functions and theirzeros to real-world problem situations.
3. Daily homework involving the graphinig method, factoring method, and quadratic formula should be completed and discussed in groups and as a class.
4. Inquiryactivity in which students explore how changing a, b and c affects the graph of a quadratic function.
5. A final written test will provide evidence of individual proficiency with these concepts.

Technology Integration

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

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. Glencoe Publishing Company [www.glencoe.com](http://www.glencoe.com/)

Grade 9 Mathematics
First Year High School Math

Exponents and Exponential functions

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

Solidarity

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. Smartboard
2. 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/)

Grade 9 Mathematics
First Year High School Math

Data Analysis

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Solidarity

Summary

Collecting, representing and analyzing data in a variety of ways.

Unit Goals

1. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
2. Select and use appropriate statistical methods to analyze data.
3. Develop and evaluate inferences and predictions that are based on data.

Big Ideas

1. Collection and analysis of data

Enduring Understandings

1. Data analysis gives me the power to make informed everyday decisions in order to live more effectively in the world.
2. Understanding and using data analysis will give me opportunities to make the world a better place.
3. Learning data analysis is satisfying, enjoyable, and confidence-building.

Content

1. Understand mean, median and mode
2. Compute mean, median, maximum, minimum, and quartiles.
3. Create box and whisker plots, scatterplots, and line of best fit.
4. Understand correlation and causation

Skills

1. Create a scatterplot for a set of bivariate data, sketch the line of best fit, and interpret the slope of the line of best fit (9D2)
2. Describe and compare various types of studies (survey, observation, experiment), and identify possible misuses of statistical data (9D4)
3. Make inferences about relationships in bivariant data, and recognize the difference between evidence of relationship (correlation) and causation (9D6)
4. Analyze and interpret frequency distributions based on spread, symmetry, skewness, clusters and outliers. (9D3)
5. Describe measures of center and the range verbally, graphically, and algebraically. (10D1)
6. Display bivariant data where at least one variable is categorical. (10D3)
7. Identify outliers on a data display; e.g., use interquartile range to identify outliers on a box and whisker plot. (10D4)
8. Provide examples and explain how a statistic may or may not be an attribute of the entire population; e.g., intentional or unintentional bias may be present. (10D5)
9. Interpret the relationship between two variables using multiple graphical displays and statistical measures; e.g., scatter plots, parallel box and whisker plots, and measures of center and spread. (10D6)
10. Describe characteristics and limitations of sampling methods, and analyze the effects of random versus biased sampling; e.g., determine and justify whether the sample is likely to be representative of the population. (9D5)
11. Classify data as univariate (single variable) or bivariate (two variables) and as quantitative (measurement) or qualitative (categorical) data (9D1)
12. Represent and analyze bvariate data using appropriate graphical displays (scatterplots, parallel box-and-whisker plots, histograms, etc.) with and without technology (10D2)

Essential Questions

1. How can collecting, analyzing, and representing data lead to decision making?
2. How can my learning to collect and analyze data help me understand my world?

Stage 2: Assessment Evidence

Diagnostic: Oral Assessment

Class Discussion, examining data from a real-world situation that is deliberately biased and manipulated to create the desired, but not true, results.

Formative: Homework

Homework from textbook

Summative: Project

Individual Project based on a list of Hypothesis that the students choose from; to affirm or disapprove.

Summative: Test

Written Test

Stage 3: Learning Plan

Learning Experiences

1. The students will be given data from some form of media, (newspaper, magazine, etc.), that is biased and/or has been manipulated as a means to discuss the importance and the impact data analysis has on peoples daily lives.
2. The homework will be on learning the different techniques for collecting, analyzing, and representing data.
3. The group work will be on choosing and applying the most appropriate techniques for collecting, analyzing, and representing data.
4. The written test will assess measures of center and spread, scatterplots with line of best fit, valid and invalid data.
5. The individual project will assess the students understanding and ability to validly analyze data.

Technology Integration

1. Graphing Calculator
2. Data Softwaresuch as Excel and/or Minitab

Resources

1. Radio
2. Television
3. Newspaper
4. Magazines
5. Internet
6. Business research documents
7. Math textbook

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. Glencoe Publishing Company [www.glencoe.com](http://www.glencoe.com/)

Grade 9 Mathematics
First Year High School Math

Probability

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Solidarity

Summary

Experimenting with certain events and predicting what the probable result of said event may be.

Unit Goals

1. Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them.
2. Understand and apply basic concepts of probability.

Big Ideas

1. Compute the probable result of an event.

Enduring Understandings

1. Knowing the probability of an event gives me the power to make informed everyday decisions in order to live more effectively in the world.
2. Understanding and applying concepts of probability will give me opportunities to make the world a better place.

Content

1. Understand the Fundamental Counting Principle
2. Differentiate betwee independent and dependent events
3. Contrast experimental and theoretical probability
4. Explore the uses of probabilityin making decisionsin daily life.

Skills

1. Determine the total number of possible outcomes for mathematical situations using counting techniques and the Fundamental Counting Principle (9D7)
2. Identify situations involving independent and dependent events, and explain differences between, and common misconceptions about, probabilities associated with those events (9D9)
3. Estimate probabilities and solve problems dealing with uncertainty using theoretical and experimental probability (9D10)
4. Describe, create and analyze a sample space and use it to calculate probability.(9D8)
5. Differentiate and explain the relationship between the probability of an event and the odds of an event, and compute one given the other. (10D8)
6. Use factorial notation and computations to represent and solve problemsituations involving arrangements.(10N3)

Essential Questions

1. How can understanding concepts of probability lead to better decision making?
2. How can applying concepts of probability help me understand my world?

Stage 2: Assessment Evidence

Diagnostic: Oral Assessment

Class Discussion, simulating trials of events from a real-world situation and/or playing games of chance to determine the probable result and discuss common misconceptions associated with these events or games of chance.

Formative: Homework

Homework from textbook

Summative: Test

Written Test

Summative: Project

Individual Experiment using simulations to describe, create, and analyze a sample space to calculate the probability of the event.

Formative: Project

Group work with presentations

Stage 3: Learning Plan

Learning Experiences

1. The students will be given an event such as Monty Halls three door problem to open discussion on the probable outcome and the common misconceptions associated with such events.
2. Students will work in groups to apply the most appropriate techniques to describe, create and analyze a sample space and use it to calculate probability.
3. The written test will assess the understanding of the basic concepts of probability.
4. The individual experiment will assess the students ability to use the concepts of probability in business decisions and/or daily life.

Technology Integration

1. Graphing Calculator
2. Probability Softwaresuch as Fathom or as found on the internet.

Resources

1. Radio
2. Television
3. Newspaper
4. Magazines
5. Internet
6. Math textbook

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. Glencoe Publishing Company [www.glencoe.com](http://www.glencoe.com/)

Grade 9 Mathematics
First Year High School Math

Measurement

Stage 1: Desired Results

Catholic Standards

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

Solidarity

Summary

Students will use rates, ratios, unit conversions, and measurements to represent and solve real life problems.

Unit Goals

1. Understand measurable attributes of objects and the units, systems, and processes of measurement.
2. Apply appropriate techniques, tools, and formulas to determine measurements.

Big Ideas

1. Measurement
2. Right Triangle Trigonometry

Enduring Understandings

1. The ability to use measurement helps me to recognize and appreciate the inherent order and beauty of God's creation.
2. Using the measurable relationships in triangles will help me to solve problems in the workplace and in everyday life.
3. An understanding of how to measure our world can lead to discovery, invention, and improved technology.

Content

1. Conduct measurement conversions
2. Establish and compute rates and ratios
3. Calculate ratios of areas and volumes of two- and three-dimensional figures
4. Understand how ratios and proportions are utilized in preparing and reading scale drawings
5. Define and use sine, cosine, and tangent ratios
6. Solve right triangles

Skills

1. Convert rates within the same measurement system. (9M1)
2. Classify data as single or double variable and as quantitative (measured) or qualitative (categorical) data. (9D1)
3. Create a scatter plot for a set of bivariate (two variable) data, sketch the line of best fit, and interpret the slope of the line of best fit. (9D2)
4. Describe and compare various types of studies (survey, observation, experiment), and identify possible misuses of statistical data. (9D4)
5. Explain how a small relative error in measurement may lead to a large error in calculated results. (10M1)
6. Calculate relative error. (10M2)
7. Explain the difference between absolute error and relative error in measurement.(10M3)
8. Give examples of how the same absolute error can be problematic in one situation but not in another; e.g., compare "accurate to the nearest foot" when measuring the height of a person versus when measuring the height of a mountain. (10M4)

Essential Questions

1. How can measurement be used to order our world?
2. In what ways can the measurable relationships in triangles and other figures help me to solve problems?
3. How can I use measurement to create a better world?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-Test Solving Ratios

Diagnostic: Lab Assignment

Measurement in Various Units

Formative: Observation

Practice Drills with Trig Ratios

Formative: Lab Assignment

Indirect Measurement

Formative: Project

Group Activity: Problem Solving with Trig Ratios

Formative: Homework

Homework Demonstrations

Summative: Test

Written Test

Summative: Project

Create a Scale Drawing

Stage 3: Learning Plan

Learning Experiences

1. Pretest will be used to determine knowledge of rates and ratios.
2. Follow-up demonstration and practice with ratios will improve student proficiency.
3. The measurement activity provides practice with unit conversions.
4. Homework demonstrations and practice drills should be used to assess student understanding and adjustments in instruction should be made accordingly.
5. The activity on indirect measurement provides a hands-on application of similarity where teacher can scaffold concepts.
6. The group activity on problem solving with trigonometric ratios provides experiences with how and where these skills can be used.
7. While the written test measures individual understanding of the concepts, the project will demonstrate the transference of those skills to real-life problems.

Technology Integration

1. A calculator will be used to facilitate unit conversions.
2. Geometer's sketchpad

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. Glencoe Publishing Company [www.glencoe.com](http://www.glencoe.com/)
6. Scientific Calculator: <http://www.mathopenref.com/calculator.html>