Grades 9-12 Mathematics
Math Topics

Sets

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

The Profession of Faith

Students will be able to

1. Recognize God in the world's order, beauty, and goodness (CCC 32).

2. Know that the soul has its origins only in God (CCC 34).

3. Know that the one true God, our Creator and Lord, can be known with certainty from His works, by the natural light of human reason (CCC 47).

4. Understand that God invites us to intimate communion with himself (CCC 54).

5. Understand that God revealed himself to us through Christ, His Son (CCC 65).

6. Know that God is the author of Sacred Scripture (CCC 105).

7. Understand that faith is a gift from God (CCC 552).

8. Understand that the world was made for the glory of God, the Creator of all things (CCC 290; 293).

9. Know that we are created in God's image to serve Him and to rule over all creatures (CCC 380).

10. Know that it is Jesus Christ alone who teaches (CCC 427).

11. Understand that Christ became flesh to save us from sin (CCC 457).

12. Recognize that Mary is the Mother of God (CCC 509).

13. Believe that faith is possible only through the Holy Spirit (CCC 683).

14. Believe in and profess the Holy Trinity: the Father, Son, and Holy Spirit (CCC 685).

15. Know the Holy Spirit through the Church (CCC 688).

16. Know that Christ founded the Church and gave it structure (CCC 763-765).

17. Understand that charity is the soul of holiness to which we are all called (CCC 826).

18. Respond to the call of evangelization (CCC 905).

19. Know that the Church's devotion to the Blessed Virgin is intrinsic to Christian worship (CCC 971).

20. Know that sin separates us from God (CCC 1033).

Life in Christ

Students will be able to

1. Understand that we shape our own life as a result of free will (CCC 1731).

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

3. Cultivate the theological virtues of faith, hope, and charity; and practice the cardinal virtues of prudence, justice, fortitude, and temperance (CCC 1834; 1841).

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

5. Know that sin is an offense against God (CCC 1850).

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

7. Assume personal responsibility (CCC 1914).

8. Practice solidarity and social charity (CCC 1939).

9. Understand that grace is a participation in the life of God (CCC 1997).

10. Follow God's commandments (CCC 2068).

11. Respect all human life (CCC 2318).

12. Respect the integrity of all creation, including animals, plants, and all nature (CCC 2415).

13. Show special regard for the poor (CCC 2443).

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

15. Understand that the fine arts express the infinite beauty of God in works made by human hands (CCC 2513).

The Celebration of the Christian Mystery

Students will be able to

1. Recognize and celebrate one's own adopted childhood through Baptism (CCC 1065).

2. Understand that God blessed all living beings (CCC 1080).

3. Know that Christ acts through the sacraments to communicate His grace (CCC 1084).

4. Celebrate the sacraments to receive God's grace (CCC 1127).

5. Participate in the Church's liturgy (CCC 1090).

6. Recognize that signs and symbols are part of sacramental celebration (CCC 1145).

7. Comprehend that the musical tradition of the universal Church is a treasure of great value (CCC 1156).

8. Know that sacred images represent Christ (CCC 1159).

9. Know that Baptism makes us members of the Church (CCC 1267).

10. Recognize that the Church is a home and family for everyone (CCC 1658).

11. Recognize that the Christian meaning of death is revealed in the light of the death and resurrection of Jesus (CCC 1681).

Christian Prayer

Students will be able to

1. Practice Christian prayer, which is a covenant relationship between God and man in Christ (CCC 2564).

2. Know and practice the four forms of prayer: blessing and adoration, petition, intercession, and thanksgiving (CCC 2625).

3. Pray the Hail Mary (CCC 2676-2677).

5. Pray the Lord's Prayer, the quintessential prayer of the Church (CCC 2776).

Targeted Standards

OH Num/Quantity OH: Mathematics (2011)

Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

OH Stats/Prob OH: Mathematics (2011)

Conditional Probability & the Rules of Probability

Understand independence and conditional probability and use them to interpret data

S-CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (or, and, not).

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Care for God's Creation

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.

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

Summary

In this unit, students will explore the nature of sets including: different ways to write a set (roster method, descriptive method, set-builder notation), cardinal number of sets, set equivalence, subsets, complements, union, intersection, set subtraction, and venn diagrams.

Unit Goals

1. Understand the nature of sets.
2. Understand how sets can be combined together through union, intersection and set subtraction.
3. Understand how using ideas of sets can help solve real world problems.

Big Ideas

Set theory

Enduring Understandings

My knowledge of number systems helps me recognize and appreciate the inherent order and beauty of Gods creation.

Content

1. Set theory
2. Venn Diagrams
3. Union, intersection, complement, set subtraction

Skills

1. Use symbols to represent sets and elements of sets.
2. Use Venn diagrams to solve problems.
3. Identify union and intersection of sets.
4. Identify infinite sets of real numbers using interval notation.
5. Identify complement and set subtraction of sets.
6. Identify Cartesian products of sets.
7. Use DeMorgan's Laws of complements.
8. Identify the cardinal number of sets.
9. Find subsets and proper subsets.

Essential Questions

1. How do mathematical concepts relate and build upon each other?
2. How is knowing about set theory going to help me in my every day life?

Stage 2: Assessment Evidence

Diagnostic: Class Discussion

The teacher will lead the students through a class discussion about what they already know about set theory in order to see what their previous knowledge is.

Formative: Homework

Daily homework assignments will be given to the students that covers the concepts learned in class that day so that they students have the chance to practice the skills.

Formative: Quiz

Weekly quizzes will be given to assess how well the students are understanding the material covered that week in class and in homework assignments.

Summative: Test

A written test will be given at the end of the unit in order to assess how well the students learned the concepts covered in the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, work with a partner, and use the graphing calculator to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why.

Technology Integration

Document camera, Apple TV, iPad, TV, PowerPoint slideshows

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows

Grades 9-12 Mathematics
Math Topics

Logic

Stage 1: Desired Results

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Students will be able to

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Catholic Identity

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Life and Dignity of the Human Person

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Care for God's Creation

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Summary

In this unit, students will study logic in terms of symbolic logic. Students will learn how to determine whether arguments are valid or invalid by using truth tables and they will learn how to recognize statements including simple, compound and quantified, and they will learn how to negate these statements properly.

Unit Goals

1. Students will understand how to change a statement from words to all symbols in order to examine its validity.
2. Students will understand the difference between a statement and something that is not a statement.
3. Students will understand how to construct truth tables and their purpose in the study of logic.

Big Ideas

1. Symbolic logic
2. Truth tables

Enduring Understandings

1. Having a strong understanding of logic will help me make good decisions throughout my life.
2. Being able to use logic when faced with an argument will help me understand why the argument is valid or invalid which will help me make better decisions in my everyday life.

Content

1. Simple statements
2. Compound statements
3. Quantified statements
4. Negating statements
5. Truth tables
6. Types of statements (conditional, converse, inverse, contrapositive)
7. DeMorgan's Logic Laws
8. Valid vs. Invalid arguments

Skills

1. Identify statements
2. Identify simple, compound, and quantified statements
3. Write negated statements
4. Write statements in all symbols instead of words
5. Create truth tables
6. Apply DeMorgan's Laws of Logic properly
7. Create truth tables in order to determine in arguments are valid or invalid

Essential Questions

1. How will studying symbolic logic help me in my everyday life?
2. In what ways can I use logic to help me make better decisions?

Stage 2: Assessment Evidence

Diagnostic: Class Discussion

Teacher will have students complete a logic puzzle for homework and then the next day, the teacher will lead the class through a discussion about what logic is and why it is important to know.

Formative: Homework

Students will be assigned daily homework assignments that will give them a chance to practice the concepts learned in class that day.

Formative: Quiz

Students will be given weekly quizzes that assess the concepts learned that week. The quizzes will give the teacher an idea of how well the students are understanding the concepts being studied.

Summative: Test

Students will be given a written test at the end of the unit in order to assess how well they learned the concepts presented in the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, and work with a partner to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why. An activity the students will be required to complete will be for them to write their own statements (simple, compound, quantified) with a partner and negate them properly.

Technology Integration

Document camera, Apple TV, iPad, TV, PowerPoint slideshows

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows

Grades 9-12 Mathematics
Math Topics

Probability

Stage 1: Desired Results

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OH Stats/Prob OH: Mathematics (2011)

Conditional Probability & the Rules of Probability

Understand independence and conditional probability and use them to interpret data

S-CP.1. Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (or, and, not).

S-CP.2. Understand that two events A and B are independent if the probability of A and B occurring together is the product of their probabilities, and use this characterization to determine if they are independent.

S-CP.3. Understand the conditional probability of A given B as P(A and B)/P(B), and interpret independence of A and B as saying that the conditional probability of A given B is the same as the probability of A, and the conditional probability of B given A is the same as the probability of B.

S-CP.5. Recognize and explain the concepts of conditional probability and independence in everyday language and everyday situations.

Use the rules of probability to compute probabilities of compound events in a uniform probability model

S-CP.9. (+) Use permutations and combinations to compute probabilities of compound events and solve problems.

Using Probability to Make Decisions

Use probability to evaluate outcomes of decisions

S-MD.6. (+)Use probabilities to make fair decisions

S-MD.7.(+) Analyze decisions and strategies using probability concepts

Catholic Identity

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Rights and Responsibilities

Call to Family, Community, and Participation

Care for God's Creation

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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.

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Summary

In this unit, the students will explore the concepts of probability. Students will be able to find and use permutations and combinations, conditional and empirical probability, make and use both tree diagrams and tables to help in finding probabilities, and understand how odds are different than probability and be able to calculate odds.

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. Permutations and combinations
2. Probability
3. Odds

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. The Fundamental Counting Principle
2. Permutations
3. Combinations
4. Classical Probability
5. Empirical Probability
6. Tree diagrams
7. Sample Spaces
8. Tables
9. Odds

Skills

1. Determine the total number of possible outcomes for mathematical situations using counting techniques and the Fundamental Counting Principle.
2. Calculate classical probabilities and empirical probabilities and be able to explain the difference between the two.
3. Describe, create and analyze a sample space and use it to calculate probability.
4. Differentiate and explain the relationship between the probability of an event and the odds of an event, and compute one given the other.
5. Calculate permutations and combinations and be able to distinguish between the two.

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: Class Discussion

Teacher will lead the students through a class discussion about probability. The teacher will ask the students what they know about probability, where and how it is used and why it is used in order to see what they prior knowledge is on the subject matter.

Formative: Homework

Students will be assigned daily homework assignments in order to give them the chance to practice the skills learned in class that day.

Formative: Quiz

Students will be given weekly quizzes in order to assess how well they are understanding the concepts learned in class that week.

Summative: Test

Students will be given a written test at the end of the unit in order to assess how well they learned the concepts covered in the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, work with a partner, and use the graphing calculator to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why.

Students will also participate in playing Deal or No Deal with the entire class in order to apply the skills they learned about empirical probability and combinations in order to help them decide whether or not the deal the "banker" is offering them is something they should take or not take.

Technology Integration

Document camera, Apple TV, iPad, TV, PowerPoint slideshows, Deal or No Deal online game

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows

Grades 9-12 Mathematics
Math Topics

Statistics

Stage 1: Desired Results

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8. Know that sacred images represent Christ (CCC 1159).

9. Know that Baptism makes us members of the Church (CCC 1267).

10. Recognize that the Church is a home and family for everyone (CCC 1658).

11. Recognize that the Christian meaning of death is revealed in the light of the death and resurrection of Jesus (CCC 1681).

Christian Prayer

Students will be able to

1. Practice Christian prayer, which is a covenant relationship between God and man in Christ (CCC 2564).

2. Know and practice the four forms of prayer: blessing and adoration, petition, intercession, and thanksgiving (CCC 2625).

3. Pray the Hail Mary (CCC 2676-2677).

5. Pray the Lord's Prayer, the quintessential prayer of the Church (CCC 2776).

Targeted Standards

OH Stats/Prob OH: Mathematics (2011)

Interpreting Categorical & Quantitative Data

Summarize, represent, and interpret data on a single count or measurement variable

S-ID.1. Represent data with plots on the real number line (dot plots, histograms, and box plots).

S-ID.2. Use statistics appropriate to the shape of the data distribution to compare center (median, mean) and spread (interquartile range, standard deviation) of two or more different data sets.

S-ID.3. Interpret differences in shape, center, and spread in the context of the data sets, accounting for possible effects of extreme data points (outliers).

Making Inferences & Justifying Conclusions

Understand and evaluate random processes underlying statistical experiments

S-IC.1. Understand that statistics is a process for making inferences about population parameters based on a random sample from that population.

Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

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

Care for God's Creation

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.

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

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

Summary

In this unit, the students will explore measures of central tendency, measures of variation, and measures of position.

Unit Goals

Select and use appropriate statistical methods to analyze data.

Big Ideas

Statistics

Enduring Understandings

1. There are appropriate tools used to create and analyze tabular and graphical displays of data which allow me to communicate effectively across disciplines and cultures.
2. Descriptive statistics connected to applications in workplace and consumer situations will help me in the workplace and in everyday life.

Content

1. Mean, median, mode, midrange
2. Range, variance and standard deviation
3. Percentiles and quartiles

Skills

1. Calculate mean, median, mode, and midrange and use them to interpret the central tendency of a set of data.
2. Calculate range, variance and standard deviation and use them to interpret the variation of a set of data.
3. Use standard deviation results to display how data is dispersed by using a line plot.
4. Calculate percentiles and quartiles and use them to explain how data is positioned (example: class rankings).

Essential Questions

1. How will the measures of central tendency, variation and position of sets of data help me in the workplace and in everyday life?

Stage 2: Assessment Evidence

Diagnostic: Class Discussion

Teacher will lead students through a discussion about what they already know about basic statistics and where they think statistics is used in the real world.

Formative: Homework

Students will be given daily homework assignments that allow them to practice the skills learned in class that day.

Formative: Quiz

Students will be given weekly quizzes that assesses how well they are learning the material presented that week.

Summative: Test

Students will be given a written test at the end of the unit in order to assess how well they learned all the material presented in the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, work with a partner, and use the graphing calculator to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why.

Students will also participate in a group/whole class activity where they are given a bag of MM's and asked to count how many MMs there are total and then count how many there are of each color. They will then write there individual results on the board. Each group will then be assigned a color and need to find the mean, median, mode, midrange, range, and standard deviation for their color. We will display the results on the board for the whole class to analyze together. We will then compare our results to the MMs website that gives the color distribution percentages to see how close our calculations were.

Technology Integration

Document camera, Apple TV, iPad, TV, PowerPoint slideshows, MM website

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows, MM website

Grades 9-12 Mathematics
Math Topics

Graph Theory

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

The Profession of Faith

Students will be able to

1. Recognize God in the world's order, beauty, and goodness (CCC 32).

2. Know that the soul has its origins only in God (CCC 34).

3. Know that the one true God, our Creator and Lord, can be known with certainty from His works, by the natural light of human reason (CCC 47).

4. Understand that God invites us to intimate communion with himself (CCC 54).

5. Understand that God revealed himself to us through Christ, His Son (CCC 65).

6. Know that God is the author of Sacred Scripture (CCC 105).

7. Understand that faith is a gift from God (CCC 552).

8. Understand that the world was made for the glory of God, the Creator of all things (CCC 290; 293).

9. Know that we are created in God's image to serve Him and to rule over all creatures (CCC 380).

10. Know that it is Jesus Christ alone who teaches (CCC 427).

11. Understand that Christ became flesh to save us from sin (CCC 457).

12. Recognize that Mary is the Mother of God (CCC 509).

13. Believe that faith is possible only through the Holy Spirit (CCC 683).

14. Believe in and profess the Holy Trinity: the Father, Son, and Holy Spirit (CCC 685).

15. Know the Holy Spirit through the Church (CCC 688).

16. Know that Christ founded the Church and gave it structure (CCC 763-765).

17. Understand that charity is the soul of holiness to which we are all called (CCC 826).

18. Respond to the call of evangelization (CCC 905).

19. Know that the Church's devotion to the Blessed Virgin is intrinsic to Christian worship (CCC 971).

20. Know that sin separates us from God (CCC 1033).

Life in Christ

Students will be able to

1. Understand that we shape our own life as a result of free will (CCC 1731).

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

3. Cultivate the theological virtues of faith, hope, and charity; and practice the cardinal virtues of prudence, justice, fortitude, and temperance (CCC 1834; 1841).

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

5. Know that sin is an offense against God (CCC 1850).

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

7. Assume personal responsibility (CCC 1914).

8. Practice solidarity and social charity (CCC 1939).

9. Understand that grace is a participation in the life of God (CCC 1997).

10. Follow God's commandments (CCC 2068).

11. Respect all human life (CCC 2318).

12. Respect the integrity of all creation, including animals, plants, and all nature (CCC 2415).

13. Show special regard for the poor (CCC 2443).

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

15. Understand that the fine arts express the infinite beauty of God in works made by human hands (CCC 2513).

The Celebration of the Christian Mystery

Students will be able to

1. Recognize and celebrate one's own adopted childhood through Baptism (CCC 1065).

2. Understand that God blessed all living beings (CCC 1080).

3. Know that Christ acts through the sacraments to communicate His grace (CCC 1084).

4. Celebrate the sacraments to receive God's grace (CCC 1127).

5. Participate in the Church's liturgy (CCC 1090).

6. Recognize that signs and symbols are part of sacramental celebration (CCC 1145).

7. Comprehend that the musical tradition of the universal Church is a treasure of great value (CCC 1156).

8. Know that sacred images represent Christ (CCC 1159).

9. Know that Baptism makes us members of the Church (CCC 1267).

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Students will be able to

1. Practice Christian prayer, which is a covenant relationship between God and man in Christ (CCC 2564).

2. Know and practice the four forms of prayer: blessing and adoration, petition, intercession, and thanksgiving (CCC 2625).

3. Pray the Hail Mary (CCC 2676-2677).

5. Pray the Lord's Prayer, the quintessential prayer of the Church (CCC 2776).

Targeted Standards

OH HS: Geometry OH: Mathematics (2011)

Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Care for God's Creation

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.

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

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

Summary

In this unit, students will learn about Graph Theory. They will study Euler paths and circuits, Hamilton paths and circuits, and trees in order to understand how to find the most efficient route.

Unit Goals

1. Students will understand how to find most efficient routes using graph theory ideas.
2. Students will understand the basic concepts of graph theory.

Big Ideas

Graph Theory

Enduring Understandings

1. Understanding graph theory will allow me to appreciate the world God created.
2. Being able to find the most efficient route using graph theory ideas will help me in my every day life.

Content

1. Euler paths and circuits
2. Hamilton paths and circuits
3. Brute force method for finding optimal Hamilton circuit
4. Nearest neighbor method for finding approximate optimal Hamilton circuit
5. Trees, spanning trees, minimum spanning trees
6. Kruskal's Algorithm

Skills

1. Draw graphs from different situations (floor plans, maps, etc.)
2. Find Euler paths and circuits.
3. Find Hamilton paths and circuits.
4. Apply the Brute Force Method and the Nearest Neighbor Method for finding optimal Hamilton circuits.
5. Understand what a tree is in graph theory.
6. Find spanning trees.
7. Apply Kruskal's Algorithm to find minimum spanning trees.

Essential Questions

1. How will graph theory help me in my every day life?
2. How will graph theory help me appreciate the world God created?

Stage 2: Assessment Evidence

Diagnostic: Class Discussion

Teacher will ask students what they think Graph Theory will be about. Then the teacher will tell the students the story about how Graph Theory came about with the Koenigsberg Bridge Problem.

Formative: Homework

Students will be given daily homework assignments where they will be asked to practice the skills learned in class that day.

Formative: Quiz

Students will be given weekly quizzes that assess what they have learned that week so far in order to give the teacher an idea of how well the students are understanding the concepts presented in class.

Summative: Test

Students will be given a unit test over Graph Theory at the end of the unit in order to assess how well they learned all the information presented in the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, work with a partner, and use the graphing calculator to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why.

Technology Integration

Apple TV, iPad, document camera, PowerPoint, graphing calculator

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows

Grades 9-12 Mathematics
Math Topics

Base Number Systems

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

The Profession of Faith

Students will be able to

1. Recognize God in the world's order, beauty, and goodness (CCC 32).

2. Know that the soul has its origins only in God (CCC 34).

3. Know that the one true God, our Creator and Lord, can be known with certainty from His works, by the natural light of human reason (CCC 47).

4. Understand that God invites us to intimate communion with himself (CCC 54).

5. Understand that God revealed himself to us through Christ, His Son (CCC 65).

6. Know that God is the author of Sacred Scripture (CCC 105).

7. Understand that faith is a gift from God (CCC 552).

8. Understand that the world was made for the glory of God, the Creator of all things (CCC 290; 293).

9. Know that we are created in God's image to serve Him and to rule over all creatures (CCC 380).

10. Know that it is Jesus Christ alone who teaches (CCC 427).

11. Understand that Christ became flesh to save us from sin (CCC 457).

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13. Believe that faith is possible only through the Holy Spirit (CCC 683).

14. Believe in and profess the Holy Trinity: the Father, Son, and Holy Spirit (CCC 685).

15. Know the Holy Spirit through the Church (CCC 688).

16. Know that Christ founded the Church and gave it structure (CCC 763-765).

17. Understand that charity is the soul of holiness to which we are all called (CCC 826).

18. Respond to the call of evangelization (CCC 905).

19. Know that the Church's devotion to the Blessed Virgin is intrinsic to Christian worship (CCC 971).

20. Know that sin separates us from God (CCC 1033).

Life in Christ

Students will be able to

1. Understand that we shape our own life as a result of free will (CCC 1731).

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

3. Cultivate the theological virtues of faith, hope, and charity; and practice the cardinal virtues of prudence, justice, fortitude, and temperance (CCC 1834; 1841).

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

5. Know that sin is an offense against God (CCC 1850).

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

7. Assume personal responsibility (CCC 1914).

8. Practice solidarity and social charity (CCC 1939).

9. Understand that grace is a participation in the life of God (CCC 1997).

10. Follow God's commandments (CCC 2068).

11. Respect all human life (CCC 2318).

12. Respect the integrity of all creation, including animals, plants, and all nature (CCC 2415).

13. Show special regard for the poor (CCC 2443).

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

15. Understand that the fine arts express the infinite beauty of God in works made by human hands (CCC 2513).

The Celebration of the Christian Mystery

Students will be able to

1. Recognize and celebrate one's own adopted childhood through Baptism (CCC 1065).

2. Understand that God blessed all living beings (CCC 1080).

3. Know that Christ acts through the sacraments to communicate His grace (CCC 1084).

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5. Participate in the Church's liturgy (CCC 1090).

6. Recognize that signs and symbols are part of sacramental celebration (CCC 1145).

7. Comprehend that the musical tradition of the universal Church is a treasure of great value (CCC 1156).

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1. Practice Christian prayer, which is a covenant relationship between God and man in Christ (CCC 2564).

2. Know and practice the four forms of prayer: blessing and adoration, petition, intercession, and thanksgiving (CCC 2625).

3. Pray the Hail Mary (CCC 2676-2677).

5. Pray the Lord's Prayer, the quintessential prayer of the Church (CCC 2776).

Targeted Standards

OH Num/Quantity OH: Mathematics (2011)

Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

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

Care for God's Creation

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.

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

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

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

Summary

In this unit, the students will study how to use different base number systems. They will be able to convert from base 10 to different bases and be able to add, subtract, multiply and divide in different base number systems.

Unit Goals

Convert and use different base number systems.

Big Ideas

Base Number Systems

Enduring Understandings

1. Understanding different base number systems will help me see the beauty in God's world.
2. Learning different base number systems will help me understand how the techonology I use every day works.

Content

1. Convert from base 10 to different number systems.
2. Convert from different number systems to base 10.
3. Add, subtract, multiply and divide in different base number systems.

Skills

1. The students will be able to convert to and from different base numbers systems starting or ending in base 10.
2. The students will be able to add, subract, multiply and divide in different base number systems.

Essential Questions

1. How will learning how to use different base number systems help me in my life?
2. Where are different base number systems used in the real world?

Stage 2: Assessment Evidence

Diagnostic: Class Discussion

Teacher will lead a class discussion on what base number systems are and why they are significant in our world in order to give the students an idea of why they are learning the topic. The teacher will also ask if any students are in or have ever taken a technology class here that used base number systems.

Formative: Homework

Students will be given daily homework assignments that give them the opportunity to practice the skills learned in class that day.

Formative: Quiz

Students will be given weekly quizzes that assess what they have learned that week in order to give the teacher an idea of how well the students are learning the material presented.

Summative: Test

Students will be given a written test at the end of the unit in order to assess how well they learned all the material presented in the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, work with a partner, and use the graphing calculator to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why.

Technology Integration

Document camera, Apple TV, iPad, TV, PowerPoint slideshows

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows

Grades 9-12 Mathematics
Math Topics

The Real Number System

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

The Profession of Faith

Students will be able to

1. Recognize God in the world's order, beauty, and goodness (CCC 32).

2. Know that the soul has its origins only in God (CCC 34).

3. Know that the one true God, our Creator and Lord, can be known with certainty from His works, by the natural light of human reason (CCC 47).

4. Understand that God invites us to intimate communion with himself (CCC 54).

5. Understand that God revealed himself to us through Christ, His Son (CCC 65).

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7. Understand that faith is a gift from God (CCC 552).

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9. Know that we are created in God's image to serve Him and to rule over all creatures (CCC 380).

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13. Believe that faith is possible only through the Holy Spirit (CCC 683).

14. Believe in and profess the Holy Trinity: the Father, Son, and Holy Spirit (CCC 685).

15. Know the Holy Spirit through the Church (CCC 688).

16. Know that Christ founded the Church and gave it structure (CCC 763-765).

17. Understand that charity is the soul of holiness to which we are all called (CCC 826).

18. Respond to the call of evangelization (CCC 905).

19. Know that the Church's devotion to the Blessed Virgin is intrinsic to Christian worship (CCC 971).

20. Know that sin separates us from God (CCC 1033).

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

5. Know that sin is an offense against God (CCC 1850).

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

7. Assume personal responsibility (CCC 1914).

8. Practice solidarity and social charity (CCC 1939).

9. Understand that grace is a participation in the life of God (CCC 1997).

10. Follow God's commandments (CCC 2068).

11. Respect all human life (CCC 2318).

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13. Show special regard for the poor (CCC 2443).

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Students will be able to

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Targeted Standards

OH Functions OH: Mathematics (2011)

Building Functions

Build a function that models a relationship between two quantities.

F-BF.2. Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.

OH Grade 8 OH: Mathematics (2011)

Expressions & Equations

Work with radicals and integer exponents.

8.EE.2. Use square root and cube root symbols to represent solutions to equations of the form x2 = p and x3 = p, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that 2 is irrational.

OH Num/Quantity OH: Mathematics (2011)

Mathematical Practice

The Standards for Mathematical Practice describe varieties of expertise that mathematics educators at all levels should seek to develop in their students.

1. Make sense of problems and persevere in solving them.

2. Reason abstractly and quantitatively.

3. Construct viable arguments and critique the reasoning of others.

4. Model with mathematics.

5. Use appropriate tools strategically.

6. Attend to precision.

7. Look for and make use of structure.

8. Look for and express regularity in repeated reasoning.

The Real Number System

Use properties of rational and irrational numbers.

N-RN.3. Explain why the sum or product of two rational numbers is rational; that the sum of a rational number and an irrational number is irrational; and that the product of a nonzero rational number and an irrational number is irrational.

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Call to Family, Community, and Participation

Care for God's Creation

The Rights of Children

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

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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.

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

Summary

In this unit, the students will review some concepts about the real number system from Algebra 1 and Algebra 2 such as simplifying, adding, subtracting, multiplying, dividing square roots and rationalizing the denominator. They will also review exponent rules and scientific notation. Finally, the students will learn about arithmetic and geometric sequences.

Unit Goals

1. Students demonstrate number sense, including an understanding of number systems and operations and how they relate to one another.
2. Students use patterns, relations and functions to model, represent and analyze problem situations that involve variable quantities.

Big Ideas

The real number system

Sequences

Enduring Understandings

1. Learning to rationalize an irrational denominator and the nature of a conjugate is satisfying, enjoyable, and gives me self-confidence.
2. Understand the operations and characteristics of power functions and how they compare to other functions will give me opportunities to make the world a better place.
3. Model and solve real world problems with power functions helps me recognize and appreciate the inherent order and beauty of God's creation.

Content

1. Simplify radicals
2. Add/subtract/multiply/divide radicals
3. Rationalize the denominator involving radicals
4. Exponents rules
5. Scientific notation
6. Arithmetic and Geometric sequences

Skills

1. The students will be able to simplify radicals
2. The students will be able to add/subtract/multiply and divide with radicals
3. The students will be able to rationalize the denominator
4. The students will be able to solve real world problems involving radicals
5. The students will be able to apply exponent rules
6. The students will be able to convert to and from scientific notation and use it with operations.
7. The students will be able to produce arithmetic and geometric sequences using formulas.

Essential Questions

1. How will understanding a power function give me opportunities to make the world a better place?
2. To what extent does solving a equation with a radical give me the power to make informed everyday decisions?
3. How will solving problems using factorials, exponents, and recursive functions help me in the workplace and in everyday life?

Stage 2: Assessment Evidence

Diagnostic: Class Discussion

Teacher will lead a class discussion to see what the students remember about radicals, exponents, scientific notation and sequences. The teacher will inform the students that they will need to know these concepts for College math placement exams.

Formative: Homework

Students will be given daily homework assignments that will allow them to practice the skills learned in class that day.

Formative: Quiz

Students will be given weekly quizzes in order to assess how well they are learning the material from that week so far.

Summative: Test

Students will be given a written test at the end of the unit in order to assess how well they learned all the material from the unit.

Stage 3: Learning Plan

Learning Experiences

In this unit, students will take notes, do practice problems at the board, work in groups, work independently, work with a partner, and use the graphing calculator to help them solve problems. Students will be able to solve real-world applications and explain/show how they reached their answer and why.

Technology Integration

Document camera, Apple TV, iPad, TV, PowerPoint slideshows

Resources

Textbook, practice worksheets, document camera visuals, PowerPoint slideshows