Grades 9-12 Mathematics  
Geometry

Foundations of Geometry

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

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).

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

7. Assume personal responsibility (CCC 1914).

Targeted Standards

OH Grade 9-12 OH: OACS-E: Mathematics

G.CO - Congruence

Experiment with transformations in the plane.

G.CO.912.1b Identify points, lines, line segments and angles (right, acute, obtuse, and order by size).

OH HS: Geometry OH: Mathematics (2011)

Congruence

Experiment with transformations in the plane

G.CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.CO.3. Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.4. Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments.

G.CO.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another.

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

Rights and Responsibilities

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.

Summary

Summary of Unit: Students are introduced to many of the basic ideas and
terms in geometry. Classification of angles, relationships between special
pairs of angles, the distance formula, the midpoint formula, the segment
addition postulate, and angle postulates are discussed. Students will also be
introduced to transformations in the coordinate plane (reflection, rotation,
translation).

Unit Goals

1. Understand patterns, relations and functions; represent and analyze mathematical situations and structures using algebraic symbols.
2. Specify locations and describe spatial relationships using coordinate geometry.
3. Analyze characteristics and properties of two-dimensional geometric shapes.
4. Apply appropriate techniques, tools, and formulas to determine measurements.
5. Apply and adapt a variety of appropriate strategies to solve problems, monitor and reflect on the process of mathematical problem solving.

Big Ideas

1.    The building blocks of
geometry - points, lines and planes.

2.    Segments

3.    Types of angles

4.    Midpoint and length of
segment

5.    Transformations in the
coordinate plane

Enduring Understandings

1.    Discovering patterns
and understanding relationships among special pairs of angles help me to
recognize and appreciate the inherent order and beauty of God’s creation.

2.    Points, lines and
planes are the major building blocks used in Geometry.

Content

1.    Terms of
geometry(defined and undefined)

2.    Segment postulates,
midpoint and distance formulas

3.    Angle postulates and
classification of angles

4.    Bisect segments and
angles

5.    Identify vertical angles,
linear pairs,complementary angles, and supplementary angles

6.    Perimeter and area of
common plane figures

7.    Problem-solving plan

Skills

1.    Describe, draw, and
label points, lines, planes, segments and rays.

2.    Measure segments using
segment addition postulate.

3.    Classify angles
according to their measure.

4.    Use a protractor to
measure angles.

5.    Identify adjacent,
vertical, complementary, and supplementary angles and find their measures.

6.    Represent and model
transformations in a coordinate plane and describe results.

Essential Questions

1.    How do points, lines
and planes establish the framework for all of geometry?

2.    How is visualization
essential to the study of geometry?

3.    How does geometry
explain the structure of our world?

4.    In what ways does
understanding relationships between the shapes in geometry help me become a
better problem solver?

Stage 2: Assessment Evidence

Diagnostic Quiz

Diagnostic: Quiz

Students will take a short diagnostic test over the basic
concepts of geometry in order to help the teacher assess what their prior
knowledge.

Quiz

Formative: Quiz

Weekly quizzes on the material covered that week in order to
assess how well students are grasping the material.

Homework

Formative: Homework

Daily homework assignments will be given in order to give the students a
chance to practice the concepts learned that day in class.

Test

Summative: Test

Chapter test will be given at the end of the chapter in order to
assess how well the students understood the material.

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  
Geometry

Logical Reasoning and Proof

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).

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).

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

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).

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

Targeted Standards

OH HS: Geometry OH: Mathematics (2011)

Congruence

Experiment with transformations in the plane

G.CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

Prove geometric theorems

G.CO.9. Prove theorems about lines and angles.

Similarity, Right Triangles, & Trigonometry

G-SRT Prove theorems involving similarity

G-SRT.5. Use triangle congruence and similarity criteria to solve problems and to prove relationships in geometric figures.

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.

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

Rights and Responsibilities

The Rights of Children

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

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

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

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

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

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

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

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

Summary

Summary of Unit: Students are introduced to many of the basic
ideas and terms in geometry. Classification of angles, relationships between
special pairs of angles, the distance formula, the midpoint formula, the
segment addition postulate, and angle postulates are discussed. Students will
also be introduced to transformations in the coordinate plane (reflection,
rotation, translation).

Unit Goals

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

2.    Specify locations and
describe spatial relationships using coordinate geometry.

3.    Analyze
characteristics and properties of two-dimensional geometric shapes.

4.    Apply appropriate
techniques, tools, and formulas to determine measurements.

5.    Apply and adapt a
variety of appropriate strategies to solve problems, monitor and reflect on the
process of mathematical problem solving.

Big Ideas

1.    The building blocks of
geometry - points, lines and planes.

2.    Segments

3.    Types of angles

4.    Midpoint and length of
segment

5.    Transformations in the
coordinate plane

Enduring Understandings

1.    Discovering patterns
and understanding relationships among special pairs of angles help me to
recognize and appreciate the inherent order and beauty of God’s creation.

2.    Points, lines and
planes are the major building blocks used in Geometry.

Content

1.    Terms of
geometry(defined and undefined)

2.    Segment postulates,
midpoint and distance formulas

3.    Angle postulates and
classification of angles

4.    Bisect segments and
angles

5.    Identify vertical angles,
linear pairs,complementary angles, and supplementary angles

6.    Perimeter and area of
common plane figures

7.    Problem-solving plan

Skills

1.    Describe, draw, and
label points, lines, planes, segments and rays.

2.    Measure segments using
segment addition postulate.

3.    Classify angles
according to their measure.

4.    Use a protractor to
measure angles.

5.    Identify adjacent,
vertical, complementary, and supplementary angles and find their measures.

6.    Represent and model
transformations in a coordinate plane and describe results.

Essential Questions

1.    How do points, lines
and planes establish the framework for all of geometry?

2.    How is visualization
essential to the study of geometry?

3.    How does geometry
explain the structure of our world?

4.    In what ways does
understanding relationships between the shapes in geometry help me become a
better problem solver?

Stage 2: Assessment Evidence

Diagnostic Quiz

Diagnostic: Quiz

Students will take a short diagnostic test over the basic
concepts of geometry in order to help the teacher assess what their prior
knowledge.

Quiz

Formative: Quiz

Weekly quizzes on the material covered that week in order to
assess how well students are grasping the material.

Homework

Formative: Homework

Daily homework assignments will be given in order to give the
students a chance to practice the concepts learned that day in class.

Test

Summative: Test

Chapter test will be given at the end of the chapter in order to
assess how well the students understood the material.

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  
Geometry

Parallel and Perpendicular Lines

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).

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).

7. Assume personal responsibility (CCC 1914).

Targeted Standards

OH HS: Geometry OH: Mathematics (2011)

Congruence

Experiment with transformations in the plane

G.CO.1. Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

Prove geometric theorems

G.CO.9. Prove theorems about lines and angles.

Make geometric constructions

G.CO.12. Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

Expressing Geometric Properties with Equations

G-GPE Use coordinates to prove simple geometric theorems algebraically

G-GPE.5. Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

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

Rights and Responsibilities

Call to Family, Community, and Participation

The Rights of Children

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

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

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

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

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

Summary

Students will explore the relationships between lines and angles
on a plane and in space. These relationships include angles formed by two
parallel lines and a transversal. Also, students will prove theorems about
perpendicular and parallel lines, construct parallel and perpendicular lines
using a straightedge and a compass, use slopes of lines to determine if they
are parallel or perpendicular, and write equations of parallel and
perpendicular lines in a coordinate plane.

Unit Goals

1. Understand relations; represent and analyzemathematical situations and structures usingalgebraic symbols.
2. Develop mathematical arguments about geometric relationships; specify locations and describe spatial relationships using coordinate geometry.
3. Apply and adapt a variety of appropriate strategies to solve problems; reflect on theprocess of mathematical problem solving.
4. Recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on oneanother to produce a coherent whole; recognize and apply mathematics in contexts outside of mathematics.
5. Create and use representations to organize, record, and communicate mathematical ideas; select, apply, and translate among mathematical representations to solve problems; use representations to model and interpret physical and mathematical phenomena.

Big Ideas

Relationships and Properties of Parallel and Perpendicular Lines

Enduring Understandings

1.    Geometric
relationships provide a means to make sense of a variety of real world
phenomena.

2.    Identifying
relationships between lines and angles help me recognize and appreciate the
inherent order and beauty of God’s creation.

3.    Mathematical thinking
will help me in the workplace and in everyday life.

Content

1.    Parallel and
perpendicular lines and angles associated with them

2.    Proofs using parallel
and perpendicular lines

3.    Properties of parallel
lines

4.    Properties of special
pairs of angles

5.    Constructions of
parallel and perpendicular lines

6.    Parallel lines in the
coordinate plane

7.    Perpendicular lines in
the coordinate

Skills

1.    Distinguish between
parallel lines, perpendicular lines, and skew lines.

2.    Identify the special
angles formed by parallel lines and transverals.

3.    Identify the relationships
among the pairs of angles formed by two parallel lines and a transversal.

4.    Solve numeric and
algebraic problems involving the special angles found in parallel lines.

5.    Prove statements about
parallel and perpendicular lines.

6.    Use slope to identify
parallel and perpendicular lines

Essential Questions

1. To what extent will recognizing pairs of angles formed by two parallel lines and a transversal and knowing the relationships among the pairs help me in my everyday life?
2. Why do I need to prove that two lines are parallel/perpendicular when I can tell by just looking at them?

Stage 2: Assessment Evidence

Class Discussion

Diagnostic: Class Discussion

Teacher will lead class discussion about what students already
know about parallel and perpendicular lines in order assess the students' prior
knowledge on the subject.

Homework

Formative: Homework

Daily homework assignments will be given to the students in
order to give the students a chance to practice the concepts they learned in
class.

Quiz

Formative: Quiz

Weekly quizzes will be given on the concepts covered in class
that week in order to assess how well the students are understanding the
material.

Test

Summative: Test

Students will be given a written test over all the concepts
covered in this unit.

Stage 3: Learning Plan

Learning Experiences

1. Working with a partner, have one partner construct the line parallel to a given line and theother partner construct the line perpendicular tothe given line. Then, have the partners switch as to which type of line that they construct.
2. Working with a partner, students alternate naming or determining the measurement of angles in given diagrams that involve parallel lines and a transversal.
3. Using a straightedge darken any two horizontallines on a piece of notebook paper. Draw atransversal for the lines and label the angles 1through 8. Identify special pairs of angles and state their relationships with one another in regards to their measurements. Thenusing a protractor, measure the eight angles inorder to confirm how you stated that the angleswere related.
4. Given two sets of ordered pairs, determine mathematically if thelines formed by each set are parallel,perpendicular, or neither. Then, graph the setsof ordered pairs and connect the ordered pairsusing a straightedge. Visually, confirm if thesets of ordered pairs formed parallel lines,perpendicular lines, or neither.
5. Identify real-life things that are parallel or perpendicular(e.g. electric lines, telephone poles, parallel streets, perpendicularintersections, architecture)

Technology Integration

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

Resources

Textbook, practice worksheets, document camera visuals,
PowerPoint slideshows

Grades 9-12 Mathematics  
Geometry

Congruent Triangles

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

Life in Christ

Students will be able to

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

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

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

The Rights of Children

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

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

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

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

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

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

Summary

Summary of Unit: Students classify triangles and identify congruent figures and corresponding

parts of figures. Students prove triangles are congruent, use congruent triangles in real-world

problems, and use congruent triangles to write proofs.

Unit Goals

1. Analyze characteristics and properties of two-dimensional geometric shapes and develop mathematical arguments aboutgeometric relationships; use geometric modeling to solve problems.
2. Build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solve problems.
3. Organize and consolidate their mathematical thinking through communication; communicate their mathematical thinking coherently and clearly to peers, teachers, and others; analyze and evaluate the mathematical thinking and strategies of others; use the language of mathematical ideas precisely.
4. Recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; recognize and apply mathematics in contexts outside of mathematics.
5. Create and use representations to organize, record, and communicate mathematical ideas.

Big Ideas

Triangles and Congruence

Enduring Understandings

1. Identifying congruent figures and using congruency in proofs help me recognize and appreciate the inherent order and beauty of Gods creation.
2. Mathematical thinking and problem solving will help me in the workplace and in everyday life.
3. Developing proofs helps me to make informed everyday decisions in order to live more effectively in the world.

Content

1. Classification of triangles
2. Angle measures of triangles
3. Congruence and triangles
4. Proving triangles are congruent by SSS, SAS, ASA, HL, and AAS
5. Congruent triangles and proofs
6. Properties of isosceles, equilateral, and right triangles

Skills

1. Classify triangles by their sides and angles
2. Find angle measures in triangles (10P4)
3. Identify congruent figures and corresponding parts
4. Prove that triangles are congruent by:using corresponding sides and angles, SSS, SAS, ASA, AAS, and HL (10G3)
5. Use congruent triangles to plan and write proofs (10G3)
6. Use properties of isosceles, equilateral, and right triangles to find angle measures and lengths of sides in triangles
7. Use properties of isosceles, equilateral, and right triangles in proofs (10G3)
8. Formally define and explain key aspects of geometric figures, including (10G1) a)Interior and exterior angles of polygons, b) segments related to triangles (median, altitude), c) circles (radius, diameter, chord, circumference, major arc, minor arc, sector, segment, inscribed angle).
9. Construct right triangles, equilateral triangles, parallelograms, trapezoids, rectangles, rhombuses, squares, and kites, using a compass and straightedge, or dynamic geometry software. (10G4)

Essential Questions

1. Why is it necessary to prove that two triangles are congruent?
2. Why do I need to justify statements?

Stage 2: Assessment Evidence

Formative: Teacher Observation

a. Homework b. Group work c. Board work d. Discussions e. Classroom activities

Summative: Test

Diagnostic: Test

Pretest on solving algebraic equations and identifying and stating the relationships among special pairs of angles (vertical, linear pairs, corresponding, alternating interior and exterior, and same-side interior).

Summative: Project

Project such as: (1) Finding pictures of everyday objects that demonstrate various types of triangles (equilateral, isosceles, scalene, acute equiangular, right, and obtuse) (2) Collecting pictures to show how triangles are used in architecture. (3) Using congruent triangles, design and color on graph paper a quilt.

Stage 3: Learning Plan

Learning Experiences

1. Given two congruent triangles, pairs of students take turns identifying to each other all pairs of congruent corresponding parts.
2. Using complete sentences, students are to write their explanations as to why the two other angles of a right triangle must be acute angles.
3. Given a worksheet of diagrams that contain given information, students work in pairs to find indicated values. The students should describe to each other what they know and what they can find using the information they have.
4. Give the students diagrams of two triangles with given information and have them write in complete sentences if they have enough information to prove the two triangles congruent and how they would prove the congruency. Plus, if they do not have enough information, explain what information is needed.
5. Have the students draw two congruent triangles and label enough information on their diagrams that supports that the triangles are congruent. Have students switch papers and write proofs using the given information that would justify that the two triangles are congruent.
6. As a writing assignment, have students compare and contrast any two of the congruence postulates.
7. As a demonstration about the measures of the three interior angles of a triangle, make cut-outs of three different shaped triangles. Tear each triangles three angles at the corners and place them adjacent to each other.
8. Have each student draw a triangle on a piece of paper and measure two of the angles. Write the measurement next to each angle. Exchange papers among the students and have each student find the missing angle measure without measuring. Then have them check their work by using a protractor.
9. In developing SSS, SAS, ASA, AAS triangle congruence theorems, use protractors, sticky-tack, and pre-cut strips of posterboard representing segment lengths. Send 3+ pairs of students to board to create triangles with the given materials: 1st)3+ sets of same S-S-S pieces 2nd) 3+ sets of same S \_ S pieces with given included angle measure. 3rd) Adapt for ASA 4th) Adapt for AAS
10. Once 3+ sticky-tacked triangles are created, lifted into position of corresponding parts, and re-tacked to board, triangle congruence will be established.
11. Vocabulary crossword puzzles.

Technology Integration

1. I-Pad for displaying different architectural types.

Resources

Congruent Triangles: <http://www.mathopenref.com/congruenttriangles.html>

congruent triangles and special triangles: <http://library.thinkquest.org/20991/geo/ctri.html>

proving triangles congruent: <http://regentsprep.org/Regents/mathb/1c/preprooftriangles.htm>

Grades 9-12 Mathematics  
Geometry

Properties of Triangles

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

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).

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

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

The Dignity of Work and the Rights of Workers

Solidarity

The Rights of Children

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

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

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

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

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

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

Summary

Summary of Unit: Properties of triangles will be examined. These properties include perpendicular and angle bisectors, medians and altitudes, midsegments, correlation between angle size and side length in a triangle, and the hinge theorem.

Unit Goals

1. Analyze characteristics and properties of two dimensional geometric shapes;
2. Develop mathematical arguments about geometric relationships;
3. Use visualization, spatial reasoning, and geometric modeling to solve problems.

Big Ideas

1. 1. Properties of Triangles

Enduring Understandings

1. Understanding geometric properties and relationships oflines and segments of triangles help me to recognize and appreciate the inherent order and beauty of God's creation.
2. Inductive and deductive reasoning and problem solving will help me in the workplaceand in everyday life.

Content

1. Perpendicular and Angle Bisectors
2. Bisectors of a Triangle
3. Medians and Altitudes of a Triangle
4. Midsegment Theorem
5. Inequalities in One Triangle
6. Indirect Proof and Inequalities in Two Triangles

Skills

1. Use properties of perpendicular bisectors ofsegmentsand angle bisectors; (10G1)
2. Use properties of perpendicular and angle bisectors of a triangle; (10G1b)
3. Use properties of medians, altitudesand midsegmentsof a triangle; (10G1b, 10G1c)
4. Compare triangle measurements to determine relationships between angle measures and side lengths; (10G3)
5. Use the triangle inequality theorem; (10G3)
6. Read and write indirect proofs. (10G3)

Essential Questions

1. How does learning howparts of a triangleare related to one another help me to make sense of the world around me?
2. Why do I need to learn how to prove statements which I already know are true?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-Test on constructing bisectors of segments and angles. Also, given a segment on the coordinate plane, the student should be able to find its midpoint, length, slope, and the slope of a segment perpendicular to the given segment.

Formative: Observation

a. Homework b. Group work c. Board work d. Discussions e. Classroom activities

Summative: Project

Balancing Shapes Have students find the balancing point of various triangles, squares, rectangles, parallelograms, and rhombuses.

Summative: Test

Test on Properties of Triangles

Stage 3: Learning Plan

Learning Experiences

1. Have students construct a line perpendicular to a given line through a point, a perpendicular bisector, an angle bisector.
2. Have students measure segments and angles to determine the properties of perpendicular bisectors and angle bisectors.
3. Have students work with a partner to complete a proof involving angle bisectors and perpendicular bisectors.
4. Working with a partner have students construct the perpendicular bisectors of all three sides of a triangle and find the point of concurrency.
5. Have students construct the angle bisectors of a triangle and identify the point of concurrency (the incenter.)
6. Have students work with a partner to construct the medians of a triangle and the point of concurrency (the centroid.)
7. Have students measure the segments that are formed and determine the relationship between the lengths.
8. Have students work with a partner to construct the altitudes of a triangle and determine the point of concurrency (the orthocenter.
9. Have students work with a partner to determine the properties when three midsegments are drawn in a triangle.
10. Given three segment lengths have students determine if it is possible to draw a triangle.
11. Have students work with a partner to complete indirect proofs.

Technology Integration

1, Internet

Resources

Math warehouse: <http://www.mathwarehouse.com/geometry/triangles/>

Tutorial: <http://www.analyzemath.com/Geometry/properties_triangles.html>

Grades 9-12 Mathematics  
Geometry

Polygons and Quadrilaterals

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).

Life in Christ

Students will be able to

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

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

The Dignity of Work and the Rights of Workers

Call to Family, Community, and Participation

The Rights of Children

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

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

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

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

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

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

Summary

Summary of Unit: Properties of polygons and quadrilaterals will be examined. Topics include identifying, naming, and describing polygons, using theorems for interior and exterior angles, determining if a quadrilateral is a parallelogram, using coordinate geometry with parallelograms, using properties of special quadrilaterals, proving that a figure is a speciific type of quadrilateral, and finding areas of triangles and quadrilaterals.

Unit Goals

1. Analyze characteristics and properties of two-dimensional shapes;
2. Develop mathematical arguments about geometric relationships;
3. Use geometric modeling to solve problems.

Big Ideas

1. Properties of Polygons and Quadrilaterals

Enduring Understandings

1. Understanding properties of polygons and quadrilaterals helpsme to analyze real-life problems in areas such as architecture, design, and construction.
2. Properties of quadrilaterals andpolygons play a central role in the cultural, recreational, and aesthetic aspects of my life

Content

1. Polygons
2. Properties of Parallelograms
3. Proving Quadrilaterals and Parallelograms
4. Rhombuses, Rectangles, and Squares
5. Trapezoids and Kites
6. Special Quadrilaterals
7. Interior and Exterior Angles of Polygons
8. Areas of Regular Polygons

Skills

1. Identify, name, and describe polygons; (10G1)
2. Use properties of parallelograms; (10G3c)
3. Prove that a quadrilateral is a parallelogram based on side lengths, angle measures, diagonals, and parallelism;(9G3, 10G1a)
4. Use coordinate geometry with parallelograms; (9G3)
5. Use properties of sides, angles, and diagonalsof rhombuses, rectangles, and squares; (10G3, 10G4)
6. Use properties of trapezoids and kites; (10G4)
7. Find the measurements of interior and exterior angles of polygons. (10G3)

Essential Questions

1. To what extentdoes understanding properties of polygons and quadrilaterals help me to make informed decisions in order to live more effectively in the world?
2. Why do I need to know the properties of polygons and quadrilaterals?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-Test on polygons and quadrilaterals

Formative: Observation

a. Homework b. Group work c. Board work d. Discussions e. Classroom activities

Summative: Test

Test on polygons and quadrilaterals

Stage 3: Learning Plan

Learning Experiences

1. Have students work with a partner and classify shapes based on the way the figure is formed.
2. Have students identify the type of polygon a figure is based on its number of sides.
3. Have students measure the interior angles of regular polygons and determine the relationship between the number of sides and the measure of each angle.
4. Have students find the sum of the measures of the exterior angles of a polygon (always 360 degrees.)
5. Have students measure the interior angles of a parallelogram and determine the relationships between consecutive angles and opposite angles.
6. Have students work with a partner to develop two-column proofs using the properties of parallelograms.
7. Have students construct squares, rectangles, and rhombuses and measure the lengths of the diagonals and the angles and segment lengths formed and draw conclusions about the properties of each figure.
8. Have students work with a partner to determine missing segment lengths in trapezoids and kites (midsegments, diagonals, etc.)
9. Have students create a chart of the properties for each type of quadrilateral (parallelogram, rectangle, rhombus, square, kite, trapezoid.)
10. Have students find the ares of rectangles, kites, parallelograms, squares, triangles, trapezoids, and rhombuses.
11. Have students draw a hexagon using a protractor and divide the figure into triangles using segments from one vertex. Have the students determine the sum of the angles in the hexagon. Have the students create a chart for a triangle, quadrilateral, pentagon, hexagon, etc. with the sums of the angle measures for each. Have students generalize the formula for an n-gon.

Technology Integration

1. Internet

Resources

1. Congruent Polygons: [http://www.mathopenref.com/congruentpolygons.htmlhttp://www.mathopenref.com/congruentpolygons.html](http://www.mathopenref.com/congruentpolygons.html)

Grades 9-12 Mathematics  
Geometry

Similarity

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).

Life in Christ

Students will be able to

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

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

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Rights and Responsibilities

The Rights of Children

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

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

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

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

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

Summary

Summary of Unit: Similarity will be examined. Topics include simplifying ratios, using proportions, identifying similar polygons, using properties of similar polygons, proving triangle similarity, and using proportions to solve problems.

Unit Goals

1. Represent and analyze mathematical situations and structures using algebraic symbols;
2. Analyze characteristics and properties of two dimensional geometric shapes;
3. Apply appropriate techniques, tools, and formulas to determine measurements.

Big Ideas

1. Properties of Similar Polygons

Enduring Understandings

1. Similarity plays a central role in the cultural, recreational, and aesthetic aspects of my life.
2. Understanding and using similarity will give me the opportunity to make the world a better place.

Content

1. Ratio and Proportion
2. Problem Solving in Geometry with Proportions
3. Similar Polygons
4. Similar Triangles
5. Proving Triangles are Similar
6. Proportions and Similar Triangles
7. Perimeters and Areas of Similar Figures

Skills

1. Find and simplify the ratio of two numbers; (8N6, 10P4)
2. Use proportions, properties of proportions and similar polygonsto solve real-life problems; (9M3, 10G5, 10P4)
3. Identify similar polygons and similar triangles; (10G3)
4. Use similarity theorems to prove that two triangles are similar;(10G3)
5. Use proportionality theorems to calculate segment lengths; (9M3)

Essential Questions

1. To what extent will understanding the concept of similarity help me in my life?
2. Why is it important to be able to recognize similar figures?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-Test on Similarity including: a. finding the perimeter of a figure b. finding the slope of a line that passes through two points

Formative: Observation

a. Homework b. Group work c. Board work d. Discussions e. Classroom activities

Summative: Test

Test on Similarity

Stage 3: Learning Plan

Learning Experiences

1. Have students measure the circumference of their thumb, neck, and wrist and compute the ratios of wrist to thumb and neck to wrist and compare the resultant ratios.
2. Have students work at the board simplifying ratios and using cross multiplication to solve proportions.
3. Have students find missing side lengths in triangles and trapezoids using ratio and proportion.
4. Given two figures have students complete a chart with segment lengths and angle measures and draw conclusions about the two similar figures.
5. Have students use ratio and proportion to calculate missing side lengths and angle measures in similar figures.
6. Have students complete a chart with corresponding angles and sides for similar triangles and then write statements of proportion using the corresponding sides and statements of congruence using the corresponding angles.
7. Have students write proofs using the triangle similarity theorems.
8. Have students construct a segment parallel to one of the sides of a triangle, calculate the ratios of the segments formed, and draw conclusions about the relationships between the segments.
9. In pairs have students determine the length of a segment using proportionality theorems.

Technology Integration

1. Internet

Resources

1. Math.com [http://wwwhttp://regentsprep.org/Regents/math/sim-figs/pracSimF.htm.math.com/school/subject3/lessons/S3U3L2GL.html](http://www.math.com/school/subject3/lessons/S3U3L2GL.html)
2. Regents: <http://regentsprep.org/Regents/math/sim-figs/pracSimF.htm>

Grades 9-12 Mathematics  
Geometry

Circles

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).

Life in Christ

Students will be able to

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

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Rights and Responsibilities

Call to Family, Community, and Participation

The Rights of Children

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

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

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

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

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

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

Summary

Summary of Unit: Circles will be examined. Topics include segments and lines related to circles, properties of tangents, arcs, chords of circles, inscribed angles, inscribed polygons, angles formed by tangents, chords and segments, lengths of tangents, chords and segments and lines that intersect a circle, graphing the equation of a circle, and drawing loci that satisfy one or more condition.

Unit Goals

1. Analyze characteristics and properties of two dimensional geometric shapes;
2. Apply appropriate tools, techniques, and formulas to determine measurements.

Big Ideas

1. Circles
2. Angle Relationships
3. Properties of segments that intersect circles

Enduring Understandings

1. Knowing relationships in circles will help me in the workplace and in everyday life.
2. Circles and their properties help me recognize and appreciate the inherent order and beauty of God's creation.

Content

1. Tangents to Circles
2. Arcs and Chords
3. Inscribed Angles
4. Other Angle Relationships in Circles
5. Segment Lengths in Circles
6. Equations of Circles
7. Loci
8. Circumference and Arc Length

Skills

1. Identify segments and lines related to circles; (10G1d)
2. Use properties of tangents to a circle; (10G1d)
3. Use properties of arcs and chords of circles;(10G10)
4. Use inscribed angles to solve problems; (10G1d)
5. Use properties of inscribed polygons;(10G10)
6. Use angles formed by tangents, chords and lines that intersect a circle to solve problems; (10G10)
7. Find the lengths of segments of chords, tangents and secants;(10G10)
8. Write the equation of a circle and use the equation to solve problems; (10P8)
9. Draw the locus of points that satisfy given conditions; (10G5)
10. Find circumference and arc length; (10P4)
11. Determine measures of central and inscribed angles and their associated major and minor arcs.(10M5)

Essential Questions

1. Why is it beneficial to know the relationships between the parts of a circle?
2. To what extent can I find the properties ofcircles in nature and the real world?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-Test on Circles: a. solving quadratic equations b. solving systems of equations c. solving right triangles d. finding coordinates of the midpoint e. circle vocabulary - center. radius, diameter, chord, secant, tangent

Formative: Written Assessment

worksheets on constructions and measurement of circles, arcs, angles, and chords.

Formative: Quiz

short homework and sections quizzes

Formative: Homework

Summative: Test

chapter test

Stage 3: Learning Plan

Learning Experiences

1. Given a circle with parts shown, have students label the center, radius, diameter, chord, secant, and tangent.

2. Have students measure the angle formed with a radius drawn to the point of tangency.

3. Have students work in partners to find the length of segments that aretangent to two circles.

4. Have students draw two chords that are equidistant from the center of a circle, measure the chords and draw a conclusion about the relationship.

5. Have students work with a partner to find the missing segment lengths given chords that are equidistant from the center of a circle.

6. Have students find the measures of major arcs and minor arcs using central and inscribed angles.

7. Working in pairs, have students use theorems to find the lengths of segments formed by intersecting chords.

8. Given the graph of a circle have students identify the center and radius and write the equation of the circle.

9. Given the equation of a circle, have students identify the center and radius.

10. Have students draw a picture based on a description of the locus of points.

Technology Integration

1. Graphing Calculators
2. Geometry Sketchpad

Resources

1. Cool Math:

<http://www.coolmath.com/reference/circles-geometry.html>

2. Regents:

<http://www.regentsprep.org/Regents/math/geometry/GP15/PcirclesN.htm>

Grades 9-12 Mathematics  
Geometry

Right Triangles and Trigonometry

Stage 1: Desired Results

Catholic Standards

DOC All Grades DOC: Catholic Standards

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).

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

7. Assume personal responsibility (CCC 1914).

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

The Rights of Children

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

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

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

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

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

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

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

Summary

Summary of Unit: Students solve problems that involve similar right triangles using the geometric mean and indirect measurement. Also, students solve problems by using the Pythagorean Theorem and its converse. Plus, the lengths of sides of special right triangles are examined and used to solve problems.

Finally, students find trigonometric ratios and use them in solving real-life problems.

Unit Goals

1. Understand numbers, ways of representing numbers, relationships among numbers, and number systems; understand meanings of operations and how they relate to one another; compute fluently and make reasonable estimates.
2. Understand patterns, relations and functions; represent and analyze mathematical situations and structures using algebraic symbols
3. Analyze characteristics and properties of two-dimensional geometric shapes and develop mathematical arguments about geometric relationships; use geometric modeling to solve problems.
4. Build new mathematical knowledge through problem solving; solve problems that arise in mathematics and in other contexts; apply and adapt a variety of appropriate strategies to solveproblems; monitor and reflect on the process of mathematical problem solving.
5. Recognize and use connections among mathematical ideas; understand how mathematical ideas interconnect and build on one another to produce a coherent whole; recognize and apply mathematics in contexts outside of mathematics.

Big Ideas

Properties and relationships of right triangles including trigonometry

Enduring Understandings

1. Mathematical thinking and problem solving will help me in the workplace and in everyday life.
2. Learning how to solve problems by using right triangles is satisfying, enjoyable, and gives me self-confidence.

Content

1. Similar right triangles
2. Pythagorean Theorem
3. Converse of the Pythagorean Theorem
4. Special right triangles
5. Trigonometric ratios
6. Solving right triangles

Skills

1. Solve problems involving similar right triangles formed by the altitude drawn to the hypotenuse of a right triangle. (10G1) (10P4)
2. Solve problems using the geometric mean(10P4)
3. Prove the Pythagorean Theorem (10G3)
4. Solve real-world problems using the Pythagorean Theorem (10P4) (10P10)
5. Solve problems using the converse of the Pythagorean Theorem
6. Classify triangles as right, acute, or obtuse by using side lengths and the Pythagorean Theorem
7. Find the side lengths of special right triangles (10N1) (10P5)
8. Solve real-world problems using special right triangles (10N1)
9. Find the sine, cosine, and tangent of an acute angle
10. Solve real-world problems using trigonometric ratios (10P4)
11. Determine the measures of all six parts of aright triangle using the Pythagorean Theorem and trigonometric ratios
12. Solve real-world problems that involve right triangles (10P4) (10P10)
13. Use scale drawings and right triangle trigonometry to solve problems that include unknown distances and angle measures. (9M4)
14. Define the basic trigonometric ratios in right triangles: sine, cosine and tangent. (9G1)
15. Apply proportions and right triangle trigonometric ratios to solve problems involving missing lengths and angle measurements in similar figures. (9G2)
16. Use algebraic representations and functions to describe and generalize geometric properties and relationships. (10P4)
17. Describe the relationship between slope of a line through the origin and the tangent function of the angle created by the line and the positive x-axis. (10P12)

Essential Questions

1. Why do I need to know if a triangle is a right triangle?
2. To what extent am I going to use trigonometry in my life?

Stage 2: Assessment Evidence

Diagnostic: Test

Pretest on proportions, simplifying radicals, simplifying radical expressions, and solving quadratic equations of the form ax2 + c = 0.

Formative: Teacher Observation

a. Homework b. Group work c. Board work d. Discussions e. Classroom activities

Summative: Written Assessment

Writing assignment such as explaining how trigonometry is used in fields like aviation and architecture.

Summative: Project

Project such as measuring indirectly the heights of objects like a flagpole and a tree by using a hypsometer (an instrument that measures angles of elevation). A hypsometer may be constructed using a straw and protractor. Have the students draw pictures of the objects measured and the diagram of the right triangle used in determining the height of the object. Plus, students should show the math used to solve for the heights of the various objects.

Summative: Test

Stage 3: Learning Plan

Learning Experiences

1. On a worksheet, draw a right triangle. Have the students draw the altitude to the hypotenuse of the right triangle. Have the students label and measure the angles of the two triangles formed and the original triangle.
2. On a worksheet, draw diagrams of overlapping or embedded triangles. Have the students break the original diagrams into separate triangles.
3. Have students form groups of three. Each member of the group should construct an isosceles right triangle. The length of a leg of the triangle should be 3, 4, or 5 centimeters. Each person in the group should choose a different length. Then, use the Pythagorean Theorem to find the length of the hypotenuse.Write the length in simplest radical form. Compare the results within the group.
4. Have students form groups of three. Each member should construct an equilateral triangle with side lengths of 4, 6, or 8 centimeters. Each person should choose a different length. Then, construct the altitude from one of the vertices. The equilateral triangle will be divided into two congruent right triangles whose angle measuresare 30, 60, and 90 degrees. Find the side lengths of one of the right triangles. Write each length in simplest radical form.
5. As a writing assignment, have the students explain how the tangent of one acute angle of a right triangle is related to the tangent of the other acute angle. Also, have the students explain how the sine and the cosine of one acute angle of a right triangle are related to the sine and the cosine of the other acute angle?
6. Orally, have students explain how to find the remaining side measures of a 30-60-90 degree triangle when the measure of one side is known.

Technology Integration

1. Graphing calculators.

Resources

Right triangles and the Pythagorean Theorem: <http://mathforum.org/~sarah/hamilton/ham.rttriangle>

Right triangles and special triangles:

<http://www.math.com/school/subject3/practice/S3U3L4/S3U3L4Pract.html>

trigonometry: <http://regentsprep.org/Regents/math/rtritrig/MikePrac2.htm>

Grades 9-12 Mathematics  
Geometry

Area, Surface Area, and Volume

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).

Life in Christ

Students will be able to

7. Assume personal responsibility (CCC 1914).

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

Targeted Standards

Catholic Identity

DOC All Grades Catholic Identity

Catholic Social Justice Teachings

Life and Dignity of the Human Person

Rights and Responsibilities

Call to Family, Community, and Participation

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.

Summary

Summary of Unit: Area, surface area, and volume will be examined. Topics include areas of regular polygons, perimeters and areas of similar figures, circumference and arc length, areas of circles and sectors, surface area of prisms, cylinders, pyramids and cones, volume of prisms, cylinders, pyramids, and cones, and surface area and volume of spheres.

Unit Goals

1. Use mathematical models to represent and understand quantitative relationships;
2. Analyze characteristics and properties of two- and three-dimensional geometric shapes;
3. Understand measurable attributes of objects.

Big Ideas

1. Area, Surface Area and Volume

Enduring Understandings

1. Understanding surface area and volume helps me make informed decisions in order to live more effectively in the world.
2. Knowing how to use surface area and volume is satisfying and gives me self-confidence.

Content

1. Areas of Triangles and Quadrilaterals
2. Areas of Regular Polygons
3. Perimeters and Areas of Similar Figures
4. Circumference and Arc Length
5. Areas of Circles and Sectors
6. Geometric Probability
7. Surface Area of Prisms and Cylinders
8. Surface Area of Pyramids and Cones
9. Volume of Prisms and Cylinders
10. Volume of Pyramids and Cones
11. Surface Area and Volume of Spheres

Skills

1. Find the areas of squares, rectangles, parallelograms, triangles, trapezoids, kites, and rhombuses. (8M4)
2. Find the area of regular polygons. (10P4)
3. Compare perimeters and areas of similar figures and use the relationships to solve real-life problems. (10G3)
4. Find the area of a circle or sector of a circle; (8M4)
5. Find geometric probabilities; (10D7)
6. Find the surface areas and volumes of a prisms and cylinders; (11M4)
7. Find the surface areas and volumesof a pyramids and cones;(11M4)
8. Find the surface area and volume of a sphere. (11M4)

Essential Questions

1. To what extent do I need area, surface area and volume in my everyday activities?
2. How can I figure out how many cans of paint I need to paint my bedroom?

Stage 2: Assessment Evidence

Diagnostic: Test

Pre-test on surface area and volume: a. finding scale factors in similar polygons b. finding the areas of polygons

Formative: Visual Arts Project

Creating Nets Have students calculate surface area based upon nets drawn on graph paper.

Formative: Observation

a. Homework b. Group work c. Board work d. Discussions e. Classroom activities

Summative: Test

Test on surface area and volume

Stage 3: Learning Plan

Learning Experiences

1. Have students use a protractor to draw a regular hexagon and find the number of triangles that can be formed using one vertex as a starting point. Have students find the area of each triangle and find the total area of the hexagon.

Have students find the perimeter and area of the school parking lot, lobby area, classroom, etc.

Have students design a circular pen for a dog and calculate its circumference and area.

Given a picture of a polyhedron, have students identify the parts: faces, edges, vertex.

Given several polyhedra, have students name each type: prism, pyramid, cone, cylinder, and sphere.

Given a worksheet have students calculate surface areas of right rectangular prisms.

Have students calculate the surface area and volume of a kleenex box, a can of soup, and an ice cream cone.

Have students complete an experiment, filling a cone and a cylinder with water (given the same diameter and height) taking 3 cones-full to fill the cylinder.

Technology Integration

1. Geometer's Sketchpad

Resources

1. Surface area of prisms: <http://www.teacherschoice.com.au/Maths_Library/Area%20and%20SA/area_9.htm>
2. Surface area and volume - 3 dimensional shapes htt[p://www.learner.org/interactives/geometry/area.html](http://www.learner.org/interactives/geometry/area.html)