

Math Curriculum

Eighth Grade

By the end of eighth grade students have mastered the concepts of computation and understand the properties of real numbers. They have applied and adapted a variety of appropriate strategies to solve problems. They understand the use of letters and symbols to translate problems into algebraic form. They can solve and graph linear equations and inequalities. In applying the Pythagorean Theorem, they have solved quadratic equations. They understand and use the slope of a line. They can compute the perimeter, area, circumference, surface area, and volume of geometric objects. They understand and solve problems using the properties of angles, triangles and other polygons. They understand and can apply the concepts of probability.

Archdiocese of Santa Fe Standard 1:

Numbers and Operations:

Students understand numbers, ways of representing numbers, relationships among numbers, and number systems; understand meanings of operations and how they relate to one another; and compute fluently and make reasonable estimates. NCTM

Critical for Mastery in Grade 8

LEARNING OUTCOMES (What students will be able to do, know, understand and value)	SAMPLE ASSESSMENTS/STRATEGIES (What evidence will demonstrate that students have achieved the Learning Outcome)	BEST PRACTICES
A. Number Sense: Understand numbers, ways of representing numbers, relationships among numbers, and number systems.		
1. Use mental math to multiply and divide decimals by powers of ten.	<ul style="list-style-type: none"> • Use a timed drill to verify students can compute answers. 	
2. Compute using order of operations.	<ul style="list-style-type: none"> • Have students work problems on the board in teams in a “relay race” format. 	
3. Evaluate exponents, square roots, and cube roots.	<ul style="list-style-type: none"> • Use number clues to create a math “crossword” puzzle. 	
4. Approximate the value of irrational numbers.	<ul style="list-style-type: none"> • Use calculators, tables or approximation methods to find square roots of non-perfect 	

	squares.	
5. Express prime factorization in exponential form.	<ul style="list-style-type: none"> Have students fill in missing numbers of a factor tree. 	
6. Express numbers in scientific notation using positive and negative exponents.	<ul style="list-style-type: none"> Have students fill out a place value chart using powers of ten. 	
7. Find the absolute value in a variety of situations.	<ul style="list-style-type: none"> Have students evaluate several numerical expressions. Students then list the answers in order greatest to least. 	
8. Define real numbers including rational and irrational numbers.	<ul style="list-style-type: none"> Make a chart and sort numbers according to their properties. 	
B. Addition and Subtraction: Compute fluently and make reasonable estimates.		
1. Add and subtract rational numbers (i.e., decimals, fractions, and signed numbers).	<ul style="list-style-type: none"> Students practice adding and subtracting positive and negative decimals and fractions in addition to integers. 	
2. Make reasonable estimates of the sum and difference of rational numbers.	<ul style="list-style-type: none"> Estimate a family's monthly food budget. 	
C. Multiplication and Division: Compute fluently and make reasonable estimates.		
1. Use and apply the divisibility rules for 2,3,4,5,6,9,10.	<ul style="list-style-type: none"> Have students write the divisibility rules in their own words. 	
2. Find LCM and GCF.	<ul style="list-style-type: none"> Find GCF and LCM of two monomials. 	
3. Multiply and divide rational numbers (i.e., decimals, fractions, and signed numbers).	<ul style="list-style-type: none"> Students solve multiplication/division problems. Correct answers lead to clues that complete a word or phrase. 	
4. Use scientific notation in multiplication and division.	<ul style="list-style-type: none"> Apply exponent rules to multiply and divide numbers in scientific notation. 	
5. Make reasonable estimates of the product and quotient of rational numbers.	<ul style="list-style-type: none"> Estimate the amount of food needed for a sports banquet. Then estimate the cost per person. 	
D. Properties: Understand the meaning of operations and		

how they relate to one another.		
1. Identify and use commutative, associative, distributive, identity, and inverse properties of addition and multiplication.	<ul style="list-style-type: none"> Match the properties to a list of examples. 	
E. Decimals/Fractions/Ratios/Percents: Understand the meaning of operations and how they relate to one another.		
1. Convert between fractions, decimals, and percents.	<ul style="list-style-type: none"> Students color a pattern (hidden picture) based on equivalent fractions, decimal of percents. 	
2. Calculate percentages and solve problems involving percents (i.e., discounts, taxes, interest, tip, etc.).	<ul style="list-style-type: none"> Plan a shopping trip for school supplies. Students are given a maximum amount they can spend and a list of what they must buy. Students will list the items purchased, calculate sale price after a discount and add sales tax. 	
3. Recognize and find the percent, part or whole of a percent problem.	<ul style="list-style-type: none"> Use a proportion or equation to find percent, part or whole. 	
4. Use proportions to solve a variety of problems.	<ul style="list-style-type: none"> Solve ratios, scale factor problems, conversion of measurements, etc. 	
5. Use unit rates in a variety of situations.	<ul style="list-style-type: none"> Use to convert miles per hour to feet per second. Compare unit cost to find the better buy. 	

Archdiocese of Santa Fe Standard 2:

Measurement:

Students understand measurable attributes of objects and the units, systems and processes of measurement; and apply the appropriate techniques, tools, and formulas to determine measurements. NCTM

Critical for Mastery in Grade 8

LEARNING OUTCOMES (What students will be able to do, know, understand and value)	SAMPLE ASSESSMENTS/STRATEGIES (What evidence will demonstrate that students have achieved the Learning Outcome)	BEST PRACTICES

A. Using Customary Units:		
1. Memorize the unit equivalence in the customary units in measuring length, capacity, weight (e.g., 1 ft. = 12 in.).	<ul style="list-style-type: none"> • Timed drills of equivalent facts. 	
2. Convert within the customary units in measuring length, capacity, weight.	<ul style="list-style-type: none"> • Convert square feet into square inches. 	
3. Measure objects using customary units.	<ul style="list-style-type: none"> • Measure the dimensions of the playground areas on campus. 	
4. Regroup when adding or subtracting in length, weight and capacity calculations.	<ul style="list-style-type: none"> • Find the total amount of trim needed for a bulletin board border. 	
B. Using Metric System:		
1. Memorize the unit equivalence in the metric system (e.g., 1 km = 1000 m).	<ul style="list-style-type: none"> • Complete a conversion table. 	
2. Convert within the metric system in measuring length, capacity and weight.	<ul style="list-style-type: none"> • Match equivalent measurements from a list of measurements using different units. 	
3. Measure objects using metric units.	<ul style="list-style-type: none"> • Measure classroom objects using centimeters and millimeters. 	
4. Approximate the relationship between customary and metric measurement systems.	<ul style="list-style-type: none"> • Keep a log of miles traveled in a week. Tell about how many kilometers this is. 	
5. Convert between metric and customary systems (i.e., degrees Celsius to Fahrenheit, kilometers to miles).	<ul style="list-style-type: none"> • Convert the number of liters in a water bottle to fluid ounces. Compare the amount listed on the label to the calculated amount. 	
C. Time: Understand measurable attributes of objects, and the units, systems, and processes of appropriate measurement.		
1. Convert units of time (e.g., 1 yr = 12 mo).	<ul style="list-style-type: none"> • Calculate the number of hours left until 8th grade graduation given the number of days completed. 	

Archdiocese of Santa Fe Standard 3:

Algebra and Problem Solving:

Students understand patterns, relations, and functions; represent and analyze mathematical situations and structures using algebraic symbols; use mathematical models to represent and understand quantitative relationships; analyze change in various contexts; and apply and adapt a variety of appropriate strategies to solve problems. NCTM

Critical for Mastery in Grade 8

LEARNING OUTCOMES (What students will be able to do, know, understand and value)	SAMPLE ASSESSMENTS/STRATEGIES (What evidence will demonstrate that students have achieved the Learning Outcome)	BEST PRACTICES
A. Variables and Expressions: Represent and analyze mathematical situations and structures using algebraic symbols.		
1. Recognize variables, constants, and expressions.	<ul style="list-style-type: none"> Students give examples of variables, constants, numerical expressions and variable expressions. 	
2. Recognize mathematical symbols for various operations.	<ul style="list-style-type: none"> Students create problems for each other to solve. 	
3. Translate phrases into mathematical expressions.	<ul style="list-style-type: none"> Using cards with phrases and expressions, students play a “Memory” –type matching game. 	
4. Evaluate expressions applying the correct order of operations using substitution.	<ul style="list-style-type: none"> E.g., $3x^2 + c$ when $x = 4$ and $c = -2$. 	
5. Recognize and combine like terms.	<ul style="list-style-type: none"> Simplify $3x^2 + 7x - 5x^2 + 1$ to $-2x^2 + 7x + 1$ 	
6. Use laws of exponents to multiply and divide monomials.	<ul style="list-style-type: none"> $(2x^3)(5x^5) = 10x^8$ 	
B. Equations: Use mathematical models to represent and understand quantitative relationships.		
1. Recognize the difference between expressions and equations.	<ul style="list-style-type: none"> Students create expressions or equations for a given problem situation. 	
2. Translate sentences into mathematical equations.	<ul style="list-style-type: none"> Solve a “crossword” puzzle with the sentences as clues and the equations fill in 	

	the puzzle.	
3. Use variables to create and solve equations representing problem situations.	<ul style="list-style-type: none"> E.g., Using a verbal model to create an expression for the length of a rectangle is twice its width. Create an equation for the given perimeter and solve. 	
4. Solve multi-step equations with one variable.	<ul style="list-style-type: none"> Solve a series of equations using the previous answer to solve the next equation (e.g., $2x-1 = 6$. Then use $x = 3.5$ to solve $4y + x = 10$). 	
5. Solve equations with variables on both sides of the equations.	<ul style="list-style-type: none"> Students work a problem like $8x - 9 = 5x+10$ where one student writes the first step to solving it on the board and another student must write next step and this continues until the answer is found. 	
6. Use formulas to solve problems.	<ul style="list-style-type: none"> Students use a formula like “Force = mass x acceleration” and transform it to “mass = Force/acceleration.” 	
7. Define and find the slope of a line.	<ul style="list-style-type: none"> Given the coordinates of two points, students calculate the slope. 	
8. Use the coordinate plane to graph linear equations using a variety of techniques including slope-intercept, using intercepts, and input/output tables.	<ul style="list-style-type: none"> Given an equation, students choose how to draw the correct line. 	
9. Solve systems of two linear equations with two variables.	<ul style="list-style-type: none"> Graph the two equations and find the intersection or solve by elimination. 	
C. Inequalities: Represent and analyze mathematical situations and structures using algebraic symbols.		
1. Translate sentences into mathematical inequalities.	<ul style="list-style-type: none"> Students make up a situation described by the inequality $x > -5$. 	
2. Solve one and two-step inequalities.	<ul style="list-style-type: none"> Use inverse operations to solve. Reverse the inequality sign when necessary. 	
3. Graph inequalities.	<ul style="list-style-type: none"> Graph a linear inequality and test a point. 	
D. Patterns, Sequences and Functions:		

Understand change in various contexts.		
1. Describe the pattern of a series of numbers or pictures.	<ul style="list-style-type: none"> Students create their own design using a repeating pattern. 	
2. Find the next term(s) in a series of numbers or pictures.	<ul style="list-style-type: none"> Find the next term in a more complex series (e.g., multiply by 3 then subtract 1 to get the next term: 1, 2, 5, 14). 	
3. Describe the rule used in a simple function.	<ul style="list-style-type: none"> Write the rule from the above series (e.g., $3n-1$). 	
4. Use function notation.	<ul style="list-style-type: none"> Use $f(x) = x + 3$. 	
5. Graph non-linear functions.	<ul style="list-style-type: none"> Complete a table of values for $y = x^3$ and plot the points. 	

Archdiocese of Santa Fe Standard 4:

Geometry:

Students analyze characteristics and properties of two-and-three dimensional geometric shapes and develop mathematical arguments about geometric relationships; specify locations and describe spatial relationships using coordinate geometry and other representational systems; apply transformations and use symmetry to analyze mathematical situations; and use visualization, spatial reasoning, and geometric modeling to solve problems. NCTM

Critical for Mastery in Grade 8

LEARNING OUTCOMES (What students will be able to do, know, understand and value)	SAMPLE ASSESSMENTS/STRATEGIES (What evidence will demonstrate that students have achieved the Learning Outcome)	BEST PRACTICES
A. Geometric Terms: Specify locations and describe spatial relationships using coordinate geometry and other representational systems.		
1. Know basic geometric terms.	<ul style="list-style-type: none"> Students create a dictionary or flash cards with terms and definitions or examples. 	
2. Identify parallel, perpendicular, intersecting, and transversal lines.	<ul style="list-style-type: none"> Identify lines in a tile pattern. 	
3. Identify vertical, adjacent, corresponding,	<ul style="list-style-type: none"> Name the specified angles from a given 	

complementary, and supplementary angles.	diagram.	
4. Identify arc, chord, and semicircle.	<ul style="list-style-type: none"> • Draw and label the parts of a circle. 	
5. Identify the parts of a right triangle.	<ul style="list-style-type: none"> • Students label the hypotenuse, legs and right angle of a right triangle. 	
B. Identify and Classify Shapes: Analyze characteristics and properties of 2-D and 3-D shapes and development mathematical arguments.		
1. Know properties of 2 and 3 dimensional geometric figures.	<ul style="list-style-type: none"> • Draw 3D figures in 2 dimensions. Graph ordered pairs and ordered triplets. 	
2. Use properties of similar and congruent figures.	<ul style="list-style-type: none"> • Find missing measurements given two similar or congruent figures. 	
3. Understand angle relationships formed by parallel lines cut by a transversal.	<ul style="list-style-type: none"> • Find alternate interior and exterior angles. 	
4. Use the properties of vertical, corresponding, complementary and supplementary angles and the sum of the angles of polygons to determine the measure of an unknown angle.	<ul style="list-style-type: none"> • Find the angle measures of several angles in a given drawing. 	
5. Know how to find the perimeter and area of polygons.	<ul style="list-style-type: none"> • Draw an irregular polygon on graph paper. Find the area and perimeter. 	
6. Find the circumference and area of circles.	<ul style="list-style-type: none"> • Use the correct formula and express answer in terms of pi, and use $\pi = 3.14$ or $\frac{22}{7}$. 	
7. Find the volume of rectangular prisms, cylinders, pyramids, and cones.	<ul style="list-style-type: none"> • Students calculate the volume of their lockers after measuring the dimensions. 	
8. Find surface area of prisms, cylinders, pyramids.	<ul style="list-style-type: none"> • Students find the amount of paper needed to make a label for a can. 	
9. Recognize, explain, and perform transformations that include rotation, reflection, translation and dilation.	<ul style="list-style-type: none"> • Draw a figure on graph paper. Transform using translation, reflection, dilation, etc. 	
10. Apply the Pythagorean Theorem to find the unknown length of a side of a right triangle.	<ul style="list-style-type: none"> • Find the diagonal measurement of a piece of paper. Compare this measurement to the calculated hypotenuse. 	

Archdiocese of Santa Fe Standard 5:

Data Analysis, Statistics and Probability:

Students formulate questions that can be addressed with data and collect, organize, and display relevant data to answer them; select and use appropriate statistical methods to analyze data; develop and evaluate inferences and predictions based on data; and understand and apply basic concepts of probability. NCTM

Critical for Mastery in Grade 8

LEARNING OUTCOMES (What students will be able to do, know, understand and value)	SAMPLE ASSESSMENTS/STRATEGIES (What evidence will demonstrate that students have achieved the Learning Outcome)	BEST PRACTICES
A. Statistics: Select and use appropriate statistical methods to analyze data.		
1. Find mean, median, mode and range.	<ul style="list-style-type: none"> Find the mean, median, mode and range for gas prices at ten local gas stations. 	
2. Construct various forms of display for data sets, including stem-and-leaf plot, box-and-whisker plot, scatter plots, line graph, bar graph.	<ul style="list-style-type: none"> Students draw or make computer generated graphs based on their science projects. 	
B. Probability: Understand and apply basic concepts of probability.		
1. Identify outcomes, events and experiments.	<ul style="list-style-type: none"> Using a deck of cards, identify the number of outcomes for drawing a red face card. 	
2. Use the counting principle to determine outcomes.	<ul style="list-style-type: none"> Find out how many outfits can be created from three shirts, four pants and two types of shoes. 	
3. Determine the probability of simple and compound events.	<ul style="list-style-type: none"> Roll two different dice. Find the probability of rolling a number greater than six. Express probabilities in fractions, decimals or percents. 	
4. Make predictions based on theoretical probability. Then conduct an appropriate simulation to find the experimental probability of a real world event and	<ul style="list-style-type: none"> Using a spinner, predict how many times it will land on a certain number out of 100 spins. Then spin the spinner 100 times and record the results. Compare the theoretical 	

compare it to the theoretical probability.	to the experimental probability.	
5. Explain the relationship between probability and odds.	<ul style="list-style-type: none"> Given the probability of an event, students can calculate the odds for or against the event. 	
D. Data Analysis: Develop and evaluate inferences and predictions that are based on data.		
1. Read information from a variety of graphs.	<ul style="list-style-type: none"> Using graphs from newspapers, magazines, or internet find information about the most popular type of car in the United States. 	
2. Draw conclusions from data on graphs.	<ul style="list-style-type: none"> Identify trends in car sales for the past five years and give some reasons for those trends. 	
3. Make predictions from data on graphs.	<ul style="list-style-type: none"> Predict whether sales of a particular type of car will increase or decrease in the next few years. 	
4. Evaluate reasonableness and inconsistencies of data on published graphs and charts.	<ul style="list-style-type: none"> Students use other sources to verify data from a graph. 	
5. Recognize and interpret misleading information.	<ul style="list-style-type: none"> Know if the sample group will show bias. Is the scale used appropriate? 	

Archdiocese of Santa Fe Standard 6:

Mathematical Processes:

With opportunities integrated throughout the curriculum, students develop mathematical practices and processes such as solving problems, making connections, understanding multiple representations of mathematical ideas, communicating their thought processes, and justifying their reasoning appropriate to grade level. NCTM

Mathematical Processes and Practices:	Teacher Notes:
1. Students make sense of problems and persevere in solving them.	
2. Students select and use various types of reasoning and methods of proof.	
3. Students construct viable arguments and critique the reasoning of others.	
4. Students evaluate the reasonableness of predictions, estimations and solutions.	
5. Students use a variety of tools and strategies in problem solving.	
6. Students attend to accuracy and precision and proof their work.	
7. Students use a variety of mathematical representations to organize, record and communicate mathematical ideas.	
8. Students apply mathematical knowledge and skills routinely in other content areas and practical situations.	