

EIGHTH GRADE

Mathematics Standards for the Archdiocese of Detroit

The Number System		
Know that there are numbers that are not rational, and approximate them by rational		
numbers.		
8.NS.A.1	Know that numbers that are not rational are called irrational. Understand that every number has a decimal expansion; for irrational numbers show that they are non-repeating nor terminating.	
8.NS.A.2	Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2 falls between 9 and 10). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.	
8.NS.A.3	Understand the meaning of a square root of a number and its connection to the square whose area is the number; understand the meaning of a cube root and its connection to the volume of a cube.	
Expression	s & Equations	
Expressions a	nd Equations Work with radicals and integer exponents.	
8.EE.A.1	Know and apply the properties of integer exponents to generate equivalent numerical expressions. For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.	
8.EE.A.1a	Understand meanings for zero and negative integer exponents.	
8.EE.A.2	Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.	
8.EE.A.3	Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. For example, estimate the population of the United States as 3 times 10 ⁸ and the population of the world as 7 times 10 ⁹ , and determine that the world population is more than 20 times larger.	
8.EE.A.4	Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.	
Understand the connections between proportional relationships, lines, and linear		
equations.		
8.EE.B.5	Graph proportional relationships, interpreting the unit rate as the slope of	

the graph. Compare two different proportional relationships represented different ways. <i>For example, compare a distance-time graph to a distance-time graph grap</i>		
different ways. For example, compare a distance-time graph to a distan		
time equation to determine which of two moving objects has greater spectrum.8.EE.B.6Use similar triangles to explain why the slope m is the same between an arrangement.		
two distinct points on a non-vertical line in the coordinate plane; derive		
equation $y = mx$ for a line through the origin and the equation $y = mx + mx$		
for a line intercepting the vertical axis at b .	υ	
Analyze and solve linear equations and pairs of simultaneous linear equations.		
8.EE.C.7 Solve linear equations in one variable.		
8.EE.C.7a Give examples of linear equations in one variable with one solution,		
infinitely many solutions, or no solutions. Show which of these		
possibilities is the case by successively transforming the given equation	l	
into simpler forms, until an equivalent equation of the form $x = a$, $a = a$		
a = b results (where a and b are different numbers).	,	
8.EE.C.7b Solve linear equations with rational number coefficients, including		
equations whose solutions require expanding expressions using the		
distributive property and combining like terms.		
8.EE.C.8 Analyze and solve pairs of simultaneous linear equations (systems of		
equations).		
8.EE.C.8a Understand that solutions to a system of two linear equations in two		
variables correspond to points of intersection of their graphs, because		
points of intersection satisfy both equations simultaneously.	_	
8.EE.C.8b Solve systems of two linear equations in two variables algebraically, an	d	
estimate solutions by graphing the equations. Solve simple cases by		
inspection. For example, $3x + 2y = 5$ and $3x + 2y = 6$ have no solution		
because 3x + 2y cannot simultaneously be 5 and 6.8.EE.C.8c Solve simultaneous linear equations in two variables by graphing, by		
substitution, and by linear combination; estimate solutions using graphs		
include examples with no solutions and infinitely many solutions.	,	
8.EE.C.8d Solve real-world and mathematical problems leading to two linear		
equations in two variables. For example, given coordinates for two pair	rs of	
points, determine whether the line through the first pair of points inters		
the line through the second pair.		
8.EE.C.9 Analyze and solve pairs of simultaneous linear inequalities.		
8.EE.C.9a Solve linear inequalities in one and two variables, and graph the solution	n	
sets.		
8.EE.C.9b Set up and solve applied problems involving simultaneous linear equation	ons	
and linear inequalities.		
Functions		
Define, evaluate, and compare functions.		
8.F.A.1 Understand that a function is a rule that assigns to each input exactly or	ne	
output. The graph of a function is the set of ordered pairs consisting of	an	
input and the corresponding output. For example, Use the vertical line		
8.F.A.2 Compare properties of two functions each represented in a different wa	y	

	(algebraically, graphically, numerically in tables, or by verbal	
	descriptions). For example, given a linear function represented by a table	
	of values and a linear function represented by an algebraic expression,	
	determine which function has the greater rate of change.	
8.F.A.3	Interpret the equation $y = mx + b$ as defining a linear function, whose	
	graph is a straight line; give examples of functions that are not linear. For	
	example, the function $A = s^2$ giving the area of a square as a function of its	
	side length is not linear because its graph contains the points $(1,1)$, $(2,4)$	
	and (3,9), which are not on a straight line.	
Use functions	to model relationships between quantities	
8.F.B.4	Construct a function to model a linear relationship between two quantities.	
	Determine the rate of change and initial value of the function from a	
	description of a relationship or from two (x, y) values, including reading	
	these from a table or from a graph. Interpret the rate of change and initial	
	value of a linear function in terms of the situation it models, and in terms	
	of its graph or a table of values.	
8.F.B.5	Describe qualitatively the functional relationship between two quantities	
	by analyzing a graph (e.g., where the function is increasing or decreasing,	
	linear or nonlinear). Sketch a graph that exhibits the qualitative features of	
	a function that has been described verbally.	
	epresent, and Apply Common Formulas	
8.F.C.6	Recognize and preform operations with polynomials. Understand FOIL	
	method.	
8.F.C.6a	Factor simple quadratic expressions with integer coefficients, Ex. $x^2 + 6x + 6$	
	$9, x^2 + 2x - 3$, and $x^2 - 4$; solve simple quadratic equations Ex. $x^2 = 16$ or x^2	
	= 5 (by taking square roots); $x^2 - x - 6 = 0$, $x^2 - 2x = 15$ (by factoring);	
	verify solutions by evaluation.	
8.F.C.6b	Recognize and apply the common formulas:	
	$(a+b)^2 = a^2 + 2ab + b^2$	
	$(a - b)^2 = a^2 - 2ab + b^2$	
77 1 . 1	$(a+b) (a-b) = a^2 - b^2; \text{ represent geometrically}$	
	nd represent quadratic functions	
8.F.C.7	Solve applied problems involving simple quadratic equations.	
8.F.C.7a	Graph factorable quadratic functions, finding where the graph intersects	
	the x-axis and the coordinates of the vertex; use words "parabola" and	
	"roots"; include functions in vertex form and those with leading coefficient	
	-1 ex. $y=x^2-36$, $y=(x-2)^2-9$; $y=-x^2$, $y=-(x-3)^2$.	
Geometry		
Understand co	ongruence and similarity using physical models, transparencies, or	
geometry software.		
8.G.A.1	Verify experimentally the properties of rotations, reflections, and	
	translations.	
8.G.A.1a	Lines are taken to lines, and line segments to line segments of the same	
	length.	
8.G.A.1b	Angles are taken to angles of the same measure.	

8.G.A.1c	Parallel lines are taken to parallel lines.
8.G.A.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.
8.G.A.3	Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.
8.G.A.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.
8.G.A.5	Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.
8.G.A.6	Understand at least one proof of the Pythagorean Theorem; use the Pythagorean Theorem and its converse to solve applied problems including perimeter, area, and volume problem.
8.G.A.7	Find the distance between two points on the coordinate plane using the distance formula; recognize that the distance formula is an application of the Pythagorean Theorem.
Statistics &	& Probability
Investigate pa	atterns of association in bivariate data.
8.SP.A.1	Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.
8.SP.A.2	Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line.
8.SP.A.3	Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.
8.SP.A.4	Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. For example, collect data from students in your class on whether or not they have a curfew on school nights and whether

	or not they have assigned chores at home. Is there evidence that those who
	have a curfew also tend to have chores?
8.SP.A.5	Determine which measure of central tendency (mean, median, mode) best
	represents a data set (salaries, home prices, for answering certain
	questions); justify the choice made.
8.SP.A.6	Recognize practices of collecting and displaying data that may bias the
	presentation or analysis.
8.SP.A.7	Find and/or compare the theoretical probability, the experimental
	probability, and/or the relative frequency of a given event.
8.SP.A.8	Understand the difference between independent and dependent events, and
	recognize common misconceptions involving probability (Alice rolls a 6
	on a die three times in a row: she is just as likely to roll a 6 on the fourth
	roll as she was on any previous roll).