BENCHMARKS WITH EXAMPLES REPORT
MATHEMATICS GRADE 8

ARCHDIOCESE CHICAGO CATHOLIC SCHOOLS

Key: **Status** = Benchmarks designated as "Focus" are aligned to the Terra Nova, third edition. Benchmarks designated "Supporting" are not.

OCS Code = The benchmark code. Consists of Grade (K-8), Domain (2-3 character alpha code), Strand (1-3 character alpha code), Standard (1-9), Benchmark Number (1 or 1-1 and up), and Complexity (a, b, c).

CCSS Code = Common Core State Standards, developed by National Governors Association Center for Best Practices, Council of Chief State School Officers (www.corestandards.org).

CRS Strand = ACT College Readiness Standards developed by ACT, Inc. (www.act.org).

The CRS Strands are: BOA = Basic Operations & Applications, PSD = Probability/Statistics/Data, NCP = Numbers/Concepts/Properties, XEI = Expression/Equation & Inequality, GRE = Graphical Representations, PPF = Properties of Plane Figures, MEA = Measurement, FUN = Functions.

DOMAIN: Standards for Mathematical Content					
Status:	**OCS Code:**	**Strand: *The Number System (NS)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMC.NS.1	**Know that there are numbers that are not rational, and approximate them by rational numbers.**			
Supporting	8.SMC.NS.1.1-1.a	Show that numbers that are not rational are irrational		8.NS.A.1	NCP
Supporting	8.SMC.NS.1.1-2.a	Show that every number has a decimal expansion		8.NS.A.1	NCP
Supporting	8.SMC.NS.1.1-3.a	Show that for rational numbers the decimal expansion repeats eventually		8.NS.A.1	NCP
Supporting	8.SMC.NS.1.1-4.a	Convert a decimal expansion which repeats eventually into a rational number		8.NS.A.1	NCP
Supporting	8.SMC.NS.1.2-1.b	Compare rational approximations of irrational numbers to the size of irrational numbers	e.g., By truncating the decimal expansion of √2, show that √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.2	NCP
Supporting	8.SMC.NS.1.2-2.b	Locate rational approximations of irrational numbers on a number line diagram	e.g., By truncating the decimal expansion of √2, show that √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.2	GRE
Supporting	8.SMC.NS.1.2-3.b	Estimate the value of expressions by using rational approximations of irrational numbers	e.g., By truncating the decimal expansion of √2, show that √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.2	NCP
Status:	**OCS Code:**	**Strand: *Expressions and Equations (EE)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMC.EE.1	**Work with radicals and integer exponents.**			
Supporting	8.SMC.EE.1.1-1.a	Show that the properties of integer exponents generate equivalent numerical expressions	e.g., 32 × 3–5 = 3–3 = 1/33 = 1/27	8.EE.A.1	NCP
Supporting	8.SMC.EE.1.1-2.a	Apply the properties of integer exponents to generate equivalent numerical expressions	e.g., 32 × 3–5 = 3–3 = 1/33 = 1/27	8.EE.A.1	NCP
Supporting	8.SMC.EE.1.2-1.b	Use square root symbols to represent solutions to equations of the form x2 = p, where p is a positive rational number		8.EE.A.2	XEI
Supporting	8.SMC.EE.1.2-2.b	Use cube root symbols to represent solutions to equations of the form x3 = p, where p is a positive rational number		8.EE.A.2	XEI
Supporting	8.SMC.EE.1.2-3.b	Evaluate square roots of small perfect squares	Note: This benchmark only applies to rational numbers.	8.EE.A.2	NCP
Supporting	8.SMC.EE.1.2-4.b	Evaluate cube roots of small perfect cubes	Note: This benchmark only applies to rational numbers.	8.EE.A.2	NCP
Supporting	8.SMC.EE.1.3-1.b	Estimate large or small quantities using numbers expressed in the form of a single digit times a whole-number power of 10	e.g., Estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger	8.EE.A.3	NCP
Supporting	8.SMC.EE.1.3-2.b	Compare large quantities to small quantities expressed in the form of a single digit times a whole-number power of 10	e.g., Estimate the population of the United States as 3 times 108 and the population of the world as 7 times 109, and determine that the world population is more than 20 times larger	8.EE.A.3	NCP
Supporting	8.SMC.EE.1.4-1.c	Perform operations with numbers expressed in scientific notation	e.g., Include problems where both decimal and scientific notation are used	8.EE.A.4	NCP
Supporting	8.SMC.EE.1.4-2.c	Choose units of appropriate size for measurements of large or small quantities using scientific notation	e.g., Use millimeters per year for seafloor spreading	8.EE.A.4	NCP
Supporting	8.SMC.EE.1.4-3.c	Interpret numbers that have been expressed in scientific notation which have been generated by technology		8.EE.A.4	NCP
	8.SMC.EE.2	**Understand the connections between proportional relationships, lines, and linear equations.**			
Supporting	8.SMC.EE.2.1-1.b	Graph proportional relationships		8.EE.B.5	GRE

Supporting	8.SMC.EE.2.1-2.b	Interpret the unit rate as the slope of a graph showing a proportional relationship		8.EE.B.5	GRE
Supporting	8.SMC.EE.2.1-3.b	Compare two different proportional relationships represented in different ways	e.g., Compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed	8.EE.B.5	GRE
Supporting	8.SMC.EE.2.2-1.b	Use similar triangles to show that the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane		8.EE.B.6	GRE
Supporting	8.SMC.EE.2.2-2.b	Derive the equation y = mx for a line through the origin		8.EE.B.6	GRE
Supporting	8.SMC.EE.2.2-3.b	Derive the equation y = mx + b for a line intercepting the vertical axis at b		8.EE.B.6	GRE
	8.SMC.EE.3	**Analyze and solve linear equations and pairs of simultaneous linear equations.**			
Supporting	8.SMC.EE.3.3-1.b	Create linear equations in one variable with one solution	Note: Successively transform the given equation into simpler forms, until an equivalent equation of the form x = a results.	8.EE.C.7a	XEI
Supporting	8.SMC.EE.3.3-2.b	Create linear equations in one variable with infinitely many solutions	Note: Successively transform the given equation into simpler forms, until an equivalent equation of the form a = a results.	8.EE.C.7a	XEI
Supporting	8.SMC.EE.3.3-3.b	Create linear equations in one variable with no solutions	Note: Successively transform the given equation into simpler forms, until an equivalent equation of the form a = b results, where a and b are different numbers.	8.EE.C.7a	XEI
Supporting	8.SMC.EE.3.3-4.c	Solve linear equations with rational number coefficients	Note: Include equations whose solutions require expanding expressions using the distributive property and collecting like terms.	8.EE.C.7b	XEI
Supporting	8.SMC.EE.3.4-1.b	Show how solutions to a system of two linear equations in two variables correspond to points of intersection of their graph	Note: Points of intersection satisfy both equations simultaneously.	8.EE.C.8a	GRE
Supporting	8.SMC.EE.3.4-2.b	Solve systems of two linear equations in two variables algebraically		8.EE.C.8b	XEI
Supporting	8.SMC.EE.3.4-3.b	Estimate solutions of two linear equations by graphing the equations		8.EE.C.8b	GRE
Supporting	8.SMC.EE.3.4-4.b	Solve simple cases of systems of two linear equations by inspection	e.g., 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6	8.EE.C.8b	XEI
Supporting	8.SMC.EE.3.4-5.c	Solve real world and mathematical problems leading to two linear equations in two variables	e.g., Given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair	8.EE.C.8c	XEI
Status:	**OCS Code:**	**Strand: *Functions (F)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMC.F.1	**Define, evaluate, and compare functions.**			
Supporting	8.SMC.F.1.1-1.a	Recognize that a function is a rule that assigns to each input exactly one output		8.F.A.1	FUN
Supporting	8.SMC.F.1.1-2.a	Relate the graph of a function to the set of ordered pairs consisting of an input and the corresponding output		8.F.A.1	GRE
Supporting	8.SMC.F.1.2.b	Compare properties of two functions each represented in a different way	e.g., Different ways include algebraically, graphically, numerically in tables, or by verbal descriptions. 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.2	FUN
Supporting	8.SMC.F.1.3-1.c	Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line		8.F.A.3	GRE
Supporting	8.SMC.F.1.3-2.c	Construct examples of functions that are not linear	Note: The function A = s2 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.	8.F.A.3	GRE
	8.SMC.F.2	**Use functions to model relationships between quantities.**			
Supporting	8.SMC.F.2.1-1.b	Construct a function to model a linear relationship between two quantities		8.F.B.4	GRE
Supporting	8.SMC.F.2.1-2.b	Determine the rate of change and initial value of the function from a description of a relationship		8.F.B.4	GRE
Supporting	8.SMC.F.2.1-3.b	Determine the rate of change and initial value of the function from two (x, y) values	e.g., Include reading the rate of change from a table or graph	8.F.B.4	GRE

Supporting	8.SMC.F.2.1-4.b	Interpret the rate of change and initial value of a linear function in terms of the situation it models		8.F.B.4	GRE
Supporting	8.SMC.F.2.1-5.b	Interpret the rate of change and initial value of a linear function in terms of its graph		8.F.B.4	GRE
Supporting	8.SMC.F.2.1-6.b	Interpret the rate of change and initial value of a linear function in terms of a table of values		8.F.B.4	GRE
Supporting	8.SMC.F.2.2-1.c	Describe qualitatively the functional relationship between two quantities by analyzing a graph	e.g., Where the function is increasing or decreasing, linear or nonlinear	8.F.B.5	GRE
Supporting	8.SMC.F.2.2-2.c	Graph the qualitative features of a function that has been described verbally		8.F.B.5	GRE
Status:	**OCS Code:**	**Strand: *Geometry (G)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMC.G.1	**Understand congruence and similarity using physical models, transparencies, or geometry software.**			
Supporting	8.SMC.G.1.1-1.b	Verify experimentally the properties of rotations, reflections, and translations, when lines are taken to lines		8.G.A.1a	PPF
Supporting	8.SMC.G.1.1-2.b	Verify experimentally the properties of rotations, reflections, and translations, when line segments are taken to line segments of the same length		8.G.A.1a	PPF
Supporting	8.SMC.G.1.1-3.b	Verify experimentally the properties of rotations, reflections, and translations, when angles are taken to angles of the same measure		8.G.A.1b	PPF
Supporting	8.SMC.G.1.1-4.b	Verify experimentally the properties of rotations, reflections, and translations, when parallel lines are taken to parallel lines		8.G.A.1c	PPF
Supporting	8.SMC.G.1.2-1.b	Show 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		8.G.A.2	MEA
Supporting	8.SMC.G.1.2-2.b	Describe a sequence that exhibits the congruence between two congruent figures		8.G.A.2	MEA
Supporting	8.SMC.G.1.3-1.b	Describe the effect of dilations on two-dimensional figures using coordinates		8.G.A.3	GRE
Supporting	8.SMC.G.1.3-2.b	Describe the effect of translations on two-dimensional figures using coordinates		8.G.A.3	GRE
Supporting	8.SMC.G.1.3-3.b	Describe the effect of rotations on two-dimensional figures using coordinates		8.G.A.3	GRE
Supporting	8.SMC.G.1.3-4.b	Describe the effect of reflections on two-dimensional figures using coordinates		8.G.A.3	GRE
Supporting	8.SMC.G.1.4-1.b	Relate one two-dimensional figure as similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations		8.G.A.4	MEA
Supporting	8.SMC.G.1.4-2.b	Describe a sequence that exhibits the similarity between two similar two-dimensional figures		8.G.A.4	MEA
Supporting	8.SMC.G.1.5-1.c	State informal arguments to establish facts about the angle sum of triangles	e.g., Arrange three copies of the same triangle so that the sum of the three angles appears to form a line	8.G.A.5	PPF
Supporting	8.SMC.G.1.5-2.c	State informal arguments to establish facts about the exterior angle of triangles		8.G.A.5	PPF
Supporting	8.SMC.G.1.5-3.c	State informal arguments to establish facts about the angles created when parallel lines are cut by a transversal		8.G.A.5	PPF
Supporting	8.SMC.G.1.5-4.c	State informal arguments to establish facts about the angle-angle criterion for similarity of triangles	e.g., Arrange three copies of the same triangle so that the sum of the three angles appears to form a line	8.G.A.5	PPF
	8.SMC.G.2	**Understand and apply the Pythagorean Theorem.**			
Supporting	8.SMC.G.2.1-1.b	Explain a proof of the Pythagorean Theorem		8.G.B.6	PPF
Supporting	8.SMC.G.2.1-2.b	Explain a proof of the converse of the Pythagorean Theorem		8.G.B.6	PPF

Supporting	8.SMC.G.2.2-1.c	Solve real world and mathematical problems in two dimensions using the Pythagorean Theorem to determine unknown side lengths in right triangles		8.G.B.7	PPF
Supporting	8.SMC.G.2.2-2.c	Solve real world and mathematical problems in three dimensions using the Pythagorean Theorem to determine unknown side lengths in right triangles		8.G.B.7	PPF
Supporting	8.SMC.G.2.3.c	Find the distance between two points in a coordinate system using the Pythagorean Theorem		8.G.B.8	PPF
	8.SMC.G.3	**Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.**			
Supporting	8.SMC.G.3.1-1.b	Solve real world and mathematical problems using the formula for the volume of cones		8.G.C.9	MEA
Supporting	8.SMC.G.3.1-2.b	Solve real world and mathematical problems using the formula for the volume of cylinders		8.G.C.9	MEA
Supporting	8.SMC.G.3.1-3.b	Solve real world and mathematical problems using the formula for the volume of spheres		8.G.C.9	MEA
Status:	**OCS Code:**	**Strand: *Statistics and Probability (SP)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMC.SP.1	**Investigate patterns of association in bivariate data.**			
Supporting	8.SMC.SP.1.1-1.a	Construct scatter plots for bivariate measurement data		8.SP.A.1	PSD
Supporting	8.SMC.SP.1.1-2.a	Analyze patterns of association between two quantities on a scatter plot of bivariate measurement data	Note: Analyze patterns such as clustering, outliers, positive or negative association, linear association, or nonlinear association.	8.SP.A.1	PSD
Supporting	8.SMC.SP.1.2-1.b	Assess the proximity of data points to a line on a scatter plot in order to determine its linear association	Note: Straight lines are widely used to model relationships between two quantitative variables.	8.SP.A.2	PSD
Supporting	8.SMC.SP.1.2-2.b	Assess the model fit to a line on a scatter plot by judging the closeness of the data points to a line		8.SP.A.2	PSD
Supporting	8.SMC.SP.1.3.b	Solve problems by interpreting the slope and intercept of bivariate measurement data by using the equation of a linear model	e.g., 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.3	PSD
Supporting	8.SMC.SP.1.4-1.c	Analyze patterns of association of categorical data displayed in a two-way frequency and relative frequency table		8.SP.A.4	PSD
Supporting	8.SMC.SP.1.4-2.c	Construct a two-way table summarizing data on two categorical variables collected from the same subjects		8.SP.A.4	PSD
Supporting	8.SMC.SP.1.4-3.c	Analyze summary data from a two-way frequency table to describe the association between two categorical variables	e.g., 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.4	PSD
DOMAIN: Standards for Mathematical Practices					
Status:	**OCS Code:**	**Strand: *Solve Problems (MP1)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.1	**1. Make sense of problems and persevere in solving them.**			
Supporting	8.SMP.1.c	Make sense of problems and persevere in solving them		MP1	
Status:	**OCS Code:**	**Strand: *Reason (MP2)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.2	**2. Reason abstractly and quantitatively.**			
Supporting	8.SMP.2.c	Reason abstractly and quantitatively		MP2	
Status:	**OCS Code:**	**Strand: *Construct Arguments (MP3)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.3	**3. Construct viable arguments and critique the reasoning of others.**			
Supporting	8.SMP.3.c	Construct viable arguments and critique the reasoning of others		MP3	
Status:	**OCS Code:**	**Strand: *Model (MP4)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.4	**4. Model with mathematics.**			

Supporting	8.SMP.4.c	Model with mathematics		MP4	
Status:	**OCS Code:**	**Strand: *Use Tools (MP5)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.5	**5. Use appropriate tools strategically.**			
Supporting	8.SMP.5.c	Use appropriate tools strategically		MP5	
Status:	**OCS Code:**	**Strand: *Attend to Precision (MP6)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.6	**6. Attend to precision.**			
Supporting	8.SMP.6.c	Attend to precision		MP6	
Status:	**OCS Code:**	**Strand: *Use Structure (MP7)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.7	**7. Look for and make use of structure.**			
Supporting	8.SMP.7.c	Look for and make use of structure		MP7	
Status:	**OCS Code:**	**Strand: *Express Regularity (MP8)***	**Examples and Notes:**	**CCSS Code:**	**CRS Strand:**
	8.SMP.8	**8. Look for and express regularity in repeated reasoning.**			
Supporting	8.SMP.8.c	Look for and express regularity in repeated reasoning		MP8	