

Jackson Area Catholic Schools
Mathematics Academic Standards
for
Eighth Grade

Number and Operations

A. Understand real number concepts

- N.ME.08.01 The student will 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.
- N.ME.08.02 The student will understand meanings for zero and negative integer exponents.
- N.ME.08.03 The student will understand that in decimal form, rational number either terminate or eventually repeat, and that calculators truncate or round repeating decimals; locate rational numbers on the number line; know fraction forms of common repeating decimals (e.g., $0.\overline{1} = 1/9$; $0.\overline{3} = 1/3$).
- N.ME.08.04 The student will understand that irrational numbers are those that cannot be expressed as the quotient of two integers, and cannot be represented by terminating or repeating decimals; approximate the position of familiar irrational numbers (e.g., $\sqrt{2}$, $\sqrt{3}$, π) on the number line.
- N.FL.08.05 The student will estimate and solve problems with square roots and cube roots using calculators.
- N.FL.08.06 The student will find square roots of perfect squares and approximate the square roots of non-perfect squares by locating between consecutive integers (e.g., $\sqrt{130}$ is between 11 and 12).

B. Solve problems

- N.MR.08.07 The student will understand percent increase and percent decrease in both sum and product form (e.g., 3% increase of a quantity x is $x + .03x = 1.03x$).
- N.MR.08.08 The student will solve problems involving percent increases and decreases.
- N.FL.08.09 The student will solve problems involving compounded interest or multiple discounts.
- N.MR.08.10 The student will calculate weighted averages such as course grades, consumer price indices, and sports ratings.
- N.FL.08.11 The student will solve problems involving ration units, such as miles per hour, dollars per pound, or persons per square mile.
- N.FL.08.12 The student will estimate and solve problems involving scientific notation and exponential notation.

Algebra**A. Understand the concept of non-linear functions using basic examples**

- A.RP.08.01 The student will identify and represent linear functions, quadratic functions, and other simple functions including inversely proportional relationships ($y = k/x$); cubics ($y = ax^3$); roots ($y = \sqrt{x}$); and exponentials ($y = a^x$, $a > 0$); using tables, graphs, and equations.
- A.PA.08.02 The student will for basic function (e.g., simple quadratics, direct and indirect variation, and population growth) describe how changes in one variable affect the others.
- A.PA.08.03 The student will recognize basic functions in problem context (e.g., area of a circle is πr^2 , volume of a sphere is $4/3 \pi r^3$) and represent them using tables, graphs, and formulas.
- A.RP.08.04 The student will use the vertical line test to determine if a graph represents a function in one variable.

B. Understand and represent quadratic functions

- A.RP.08.05 The student will relate quadratic functions in factored form and vertex form to their graphs, and vice versa; in particular, note that solutions of a quadratic equation are the x-intercepts of the corresponding quadratic function.
- A.RP.08.06 The student will graph factorable quadratic functions, finding where the graph intersects the x-axis and the coordinates of the vertex; use words “parabola” and “roots”, include function in vertex form and those with leading coefficient -1 [e.g., $y = x^2 - 36$, $y = (x - 2)^2 - 9$; $y = -x^2$; $y = -(x - 3)^2$].

C. Recognize, represent, and apply common formulas

- A.FO.08.07 The student will recognize and apply the common formulas: $(a + b)^2 = a^2 + 2ab + b^2$, $(a - b)^2 = a^2 - 2ab + b^2$, $(a + b)(a - b) = a^2 - b^2$; represent geometrically.
- A.FO.08.08 The student will factor simple quadratic expressions with integer coefficients (e.g., $x^2 + 6x + 9$, $x^2 + 2x - 3$, and $x^2 - 4$); solve simple quadratic equations (e.g., $x^2 = 16$ or $x^2 = 5$ by taking square roots; $x^2 - x - 6 = 0$, $x^2 - 2x = 15$ by factoring); verify solution by evaluation.
- A.FO.08.09 The student will solve applied problems involving simple quadratic equations.

D. Understand solutions and solve equations simultaneous equations, and linear inequalities

- A.FO.08.10 The student will understand that to solve the equation $f(x) = g(x)$ means to find all values of x for which the equation is true (e.g., determine whether a given value or values from a given set, is a solution of an equation [0 is a solution of $3x^2 + 2 = 4x + 2$, but 1 is not a solution]).
- A.FO.08.11 The student will 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.

D Understand solutions and solve equations simultaneous equations, and linear inequalities (cont.)

- A.FO.08.12 The student will solve linear inequalities in one and two variables, and graph the solution sets.
- A.FO.08.13 The student will set up and solve applied problems involving simultaneous linear equations and linear inequalities.

Geometry**A. Understand and use the Pythagorean Theorem**

- G.GS.08.01 The student will 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 problems.
- G.GS.08.02 The student will 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.

B. Solve problems about geometric figures

- G.SR.08.03 The student will understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.
- G.SR.08.04 The student will find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles).
- G.SR.08.05 The student will solve applied problems involving areas of triangles, quadrilaterals, and circles.

C. Understand concepts of volume and surface area, and apply formulas

- G.SR.08.06 The student will know the volume formulas for generalized cylinders ((area of base) \times height), generalized cones and pyramids ($1/3$ (area of base) \times height), and spheres ($4/3\pi$ (radius)³) and apply them to solve problems.
- G.SR.08.07 The student will understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.
- G.SR.08.08 The student will sketch a variety of two-dimensional representations of three-dimensional solids including orthogonal views (top, front, and side), picture views (projective or isometric), and nets; use such two-dimensional representations to help solve problems.

D. Understand and apply concepts of transformation and symmetry

- G.TR.08.09 The student will understand the definition of a dilation from a point in the plane, and relate it to the definition of similar polygons.
- G.TR.08.10 The student will understand and use reflective and rotational symmetries of two-dimensional shapes and relate them to transformations to solve problems.

Data and Probability

A. Draw, explain, and justify conclusions based on data

- D.AN.08.01 The student will determine which measure of central tendency (mean, median, mode) best represents a data set (e.g., salaries, home prices) for answering certain questions; justify the choice made.
- D.AN.08.02 The student will recognize practices of collecting and displaying data that may bias the presentation or analysis.

B. Understand probability concepts for simple and compound events

- D.PR.08.03 The student will conduct simple probability experiments and collect data. Compute the relative frequencies from the table of experimental results. Interpret the results using relationship of probability to relative frequency.
- D.PR.08.04 The student will apply the Basic Counting Principle to find total number of outcomes possible for independent and dependent events, and calculate the probabilities using organized lists or tree diagrams.
- D.PR.08.05 The student will find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event.
- D.PR.08.06 The student will understand the difference between independent and dependent events, and recognize common misconceptions involving probability (e.g., 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).

