

Grade 8 Expectations in Mathematics

The Franklin Public School System's grade level expectations for Grade 8 are listed below. They are taken from the Learning Standards from the MA Mathematics Curriculum Framework for the end of Grade 8. All students are expected to master all grade level expectations.

Number Sense and Operations

Curriculum Framework Learning Standard	Impact Course 3 Reference
1. Compare, order, estimate, and translate among integers, fractions and mixed numbers (i.e., rational numbers), decimals, and percents.	Supplemental Materials
2. Define, compare, order, and apply frequently used irrational numbers, such as $\sqrt{2}$ and π.	Chapter 3
3. Use ratios and proportions in the solution of problems, in particular, problems involving unit rates, scale factors, and rate of change.	Supplemental Materials
4. Represent numbers in scientific notation, and use them in calculations and problem situations.	Chapter 3
5. Apply number theory concepts, including prime factorization and relatively prime numbers, to the solution of problems.	Chapter 3
6. Demonstrate an understanding of absolute value, e.g., $-3 = 3 = 3$.	Chapter 4
7. Apply the rules of powers and roots to the solution of problems. Extend the Order of Operations to include positive integer exponents and square roots.	Chapter 3
8. Demonstrate an understanding of the properties of arithmetic operations on rational numbers. Use the associative, commutative, and distributive properties; properties of the identity and inverse elements (e.g., $-7 + 7 = 0$; $3/4 \times 4/3 = 1$); and the notion of closure of a subset of the rational numbers under an operation (E.g., the set of odd integers is closed under multiplication but not under addition).	Chapters 4, 6

9. Use the inverse relationships of addition and subtraction, multiplication and division, and squaring and finding square roots to simplify computations and solve problems, e.g. multiplying by 1/2 or 0.5 is the same as dividing by 2.	Chapter 4
10. Estimate and compute with fractions (including simplification of fractions), integers, decimals, and percents (including those greater than 100 and less than 1).	Supplemental Materials
11. Determine when an estimate rather than an exact answer is appropriate and apply in problem situations.	Chapter 4
12. Select and use appropriate operations—addition, subtraction, multiplication, division, and positive integer exponents—to solve problems with rational numbers (including negatives).	Chapter 4
13. Identify and use the properties of operations on real numbers, including the associative, commutative, and distributive properties; the existence of the identity and inverse elements for addition and multiplication; the existence of nth roots of positive real numbers for any positive integer n; the inverse relationship between taking the nth root of and the nth power of a positive real number; and the density of the set of rational numbers in the set of real numbers.	Chapters 3, 4, 6, 7
14. Simplify numerical expressions, including those involving positive integer exponents or the absolute value, e.g., $3(24 - 1) = 45$, $4 3 - 5 + 6 = 14$; apply such simplifications in the solution of problems.	Chapters 2, 3
15. Find the approximate value for solutions to problems involving square roots and cube roots without the use of a calculator, e.g., $\sqrt{2.8}$.	Chapters 3, 7
16. Use estimation to judge the reasonableness of results of computations and of solutions to problems involving real numbers.	Chapter 10

Patterns, Functions, and Algebra

Curriculum Framework Learning Standard	Impact Course 3 Reference
1. Extend, represent, analyze, and generalize a variety of patterns with tables, graphs, words, and, when possible, symbolic expressions. Include arithmetic and geometric progressions, e.g., compounding.	Chapters 1, 2, 3, 8
2. Evaluate simple algebraic expressions for given variable values, e.g., $3a^2 - b$ for $a = 3$ and $b = 7$.	Chapters 1, 2
3. Demonstrate an understanding of the identity $(-x)(-y) = xy$. Use this identity to simplify algebraic expressions, e.g., $(-2)(-x+2) = 2x - 4$.	Chapters 4, 6
4. Create and use symbolic expressions and relate them to verbal, tabular, and graphical representations.	Chapters 1, 2
5. Identify the slope of a line as a measure of its steepness and as a constant rate of change from its table of values, equation, or graph. Apply the concept of slope to the solution of problems.	Chapter 1
6. Identify the roles of variables within an equation, e.g., $y = mx + b$, expressing y as a function of x with parameters m and b.	Chapter 1
7. Set up and solve linear equations and inequalities with one or two variables, using algebraic methods, models, and/or graphs.	Chapter 4
8. Explain and analyze—both quantitatively and qualitatively, using pictures, graphs, charts, or equations—how a change in one variable results in a change in another variable in functional relationships, e.g., $C = \pi d$, $A = \pi r^2$ (A as a function of r), $A \text{ rectangle} = lw$ ($A \text{ rectangle}$ as a function of l and w).	Chapters 1, 2, 8
9. Use linear equations to model and analyze problems involving proportional relationships. Use technology as appropriate.	Chapter 1

10. Use tables and graphs to represent and compare linear growth patterns. In particular, compare rates of change and x- and y-intercepts of different linear patterns.	Chapter 1
11. Describe, complete, extend, analyze, generalize, and create a wide variety of patterns, including iterative, recursive (e.g., Fibonacci Numbers), linear, quadratic, and exponential functional relationships.	Chapters 2, 3, 7, 8, 10
12. Use properties of the real number system to judge the validity of equations and inequalities, to prove or disprove statements, and to justify every step in a sequential argument.	Chapter 4
13. Demonstrate an understanding of relations and functions. Identify the domain, range, dependent, and independent variables of functions.	Chapters 8, 10
14. Translate between different representations of functions and relations: graphs, equations, point sets, and tabular.	Chapters 1, 2, 4, 8, 10
15. Demonstrate an understanding of the relationship between various representations of a line. Determine a line's slope and x- and y-intercepts from its graph or from a linear equation that represents the line. Find a linear equation describing a line from a graph or a geometric description of the line, e.g., by using the "point-slope" or "slope y-intercept" formulas. Explain the significance of a positive, negative, zero, or undefined slope.	Chapter 1
16. Find linear equations that represent lines either perpendicular or parallel to a given line and through a point, e.g., by using the "point-slope" form of the equation.	Chapter 1
17. Add, subtract, and multiply polynomials. Divide polynomials by monomials.	Chapter 6
18. Demonstrate facility in symbolic manipulation of polynomial and rational expressions by rearranging and collecting terms, factoring (e.g., $a^2 - b^2 = (a + b)(a - b)$, $x^2 + 10x + 21 = (x + 3)(x + 7)$, $5x^4 + 10x^3 - 5x^2 = 5x^2(x^2 + 2x - 1)$), identifying and canceling common factors in rational expressions, and applying the	Chapters 6, 7

properties of positive integer exponents.	
19. Find solutions to quadratic equations (with real roots) by factoring, completing the square, or using the quadratic formula. Demonstrate an understanding of the equivalence of the methods.	Chapter 7
20. Solve equations and inequalities including those involving absolute value of linear expressions (e.g., $x - 2 > 5$) and apply to the solution of problems.	Chapter 4
21. Solve everyday problems that can be modeled using linear, reciprocal, quadratic, or exponential functions. Apply appropriate tabular, graphical, or symbolic methods to the solution. Include compound interest, and direct and inverse variation problems. Use technology when appropriate.	Chapters 1, 2, 3, 4, 7, 8, 10
22. Solve everyday problems that can be modeled using systems of linear equations or inequalities. Apply algebraic and graphical methods to the solution. Use technology when appropriate. Include mixture, rate, and work problems.	Chapter 4

Geometry

Curriculum Framework Learning Standard	Impact Course 3 Reference
1. Analyze, apply, and explain the relationship between the number of sides and the sums of the interior and exterior angle measures of polygons.	Supplemental Materials
2. Classify figures in terms of congruence and similarity, and apply these relationships to the solutions of problems.	Chapter 5
3. Demonstrate an understanding of the relationships of angles formed by intersecting lines, including parallel lines cut by a transversal.	
4. Demonstrate an understanding of the Pythagorean Theorem. Apply the theorem to the solution of problems.	Chapter 3

5. Use a straightedge, compass, or other tools to formulate and test conjectures, and to draw geometric figures.	Chapter 5
6. Predict the results of transformations on unmarked or coordinate planes and draw the transformed figure, e.g., predict how tessellations transform under translations, reflections, and rotations.	Chapter 5

Data Analysis, Statistics, and Probability

Curriculum Framework Learning Standard	Impact Course 3 Reference
1. Describe the characteristics and limitations of a data sample. Identify different ways of selecting a sample, e.g., convenience sampling, responses to a survey, random sampling.	Supplemental Materials
2. Select, create, interpret, and utilize various tabular and graphical representations of data, e.g., circle graphs, Venn diagrams, scatter plots, stem-and-leaf plots, box-and-whisker plots, histograms, tables, and charts. Differentiate between continuous and discrete data and ways to represent them.	Chapter 10
3. Find, describe, and interpret appropriate measures of central tendency (mean, median, and mode) and spread (range) that represent a set of data. Use these notions to compare different sets of data.	Supplemental Materials
4. Use tree diagrams, tables, organized lists, basic combinatorics (“fundamental counting principle”), and area models to compute probabilities for simple compound events, e.g. multiple coin tosses or rolls of the dice.	Chapter 10
4. Select, create, and interpret an appropriate graphical representation (e.g., scatter plot, table, stem-and-leaf plots, circle graph, line graph, and line plot) for a set of data and use appropriate statistics (e.g., mean, median, range, and mode) to communicate information about the data. Use these notions to compare different sets of data.	Chapters 1, 10

5. Approximate a line of best fit (trend line) given a set of data (e.g., scatter plot). Use technology when appropriate.	Chapter 10
6. Describe and explain how the relative sizes of a sample and the population affect the validity of predictions from a set of data.	Chapter 9

Measurement

Curriculum Framework Learning Standard	Impact Course 3 Reference
1. Select, convert (within the same system of measurement), and use appropriate units of measurement or scale.	Supplemental Materials
2. Given the formulas, convert from one system of measurement to another. Use technology as appropriate.	Supplemental Materials
3. Demonstrate an understanding of the concepts and apply formulas and procedures for determining measures, including those of area and perimeter/circumference of parallelograms, trapezoids, and circles. Given the formulas, determine the surface area and volume of rectangular prisms, cylinders, and spheres. Use technology as appropriate.	Supplemental Materials
4. Use ratio and proportion (including scale factors) in the solution of problems, including problems involving similar plane figures and indirect measurement.	Chapter 5
5. Use models, graphs, and formulas to solve simple problems involving rates, e.g., velocity and density.	Chapter 1