

Mathematics

Sample Graduation Standards and Performance Indicators

Based on Common Core State Standards in Mathematics (CCSS, 2010). Using the Kentucky Department of Education's "Progress to High School Conceptual Categories" flow chart, domains within K-8 were embedded in the original five high school domains and interpreted as standards within this proficiency-based learning model. Citations follow a distinct format: grade level, domain, standard, and in some cases, descriptor numbers. Modeling is embedded within the content standards as suggested in the CCSS document.

Mathematics Graduation Standard 1

NUMBER AND QUANTITY

Reason and model quantitatively, using units and number systems to solve problems.

Fifth-Grade Performance Indicators

- A. Understand the place value system. (CCSS K.CC.A-C, K.NBT.A.1, 1.NBT.A-B, 2.NBT.A, 4.NBT.A, 5.NBT.A.1-3)
- B. Use place value understanding and properties of operations to add and subtract. (CCSS 1.NBT.C, 2.NBT.B)
- C. Use place value understanding and properties of operations to perform multi-digit arithmetic. (CCSS 3.NBT.A, 4.NBT.B)
- D. Understand fractions as numbers and explain fraction equivalence and ordering. (CCSS 3.NF.A, 4.NF.A)
- E. Use equivalent fractions as a strategy to add and subtract fractions. (CCSS 5.NF.A)
- F. Apply and extend understandings of operations on whole numbers to build fractions from unit fractions. (CCSS 4.NF.B)
- G. Apply and extend understandings of multiplication and division to multiply and divide fractions. (CCSS 5.NF.B)

Eighth-Grade Performance Indicators

- A. Understand ratio concepts and use ratio reasoning to solve problems. (CCSS 6.RP.A)
- B. Analyze proportional relationships and use them to solve real-world and mathematical problems. (CCSS 7.RP.A)
- C. Apply and extend previous understandings of multiplication and division to divide fractions by fractions. (CCSS 6.NS.A)
- D. Apply and extend previous understandings of numbers to the system of rational numbers. (CCSS 6.NS.C)
- E. Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers. (CCSS 7.NS.A)

High School Performance Indicators

- A. Extend the properties of exponents to rational exponents. (CCSS HSN.RN.A)
- B. Use the properties of rational and irrational numbers. (CCSS HSN.RN.B)
- C. Reason quantitatively and use units to solve problems. (CCSS HSN.Q.A)
- D. Perform arithmetic operations with complex numbers. (CCSS HSN.CN.A.1-2)
- E. Use complex numbers in polynomial identities and equations. (CCSS HSN.CN.C.7)



- H. Use decimal notation for fractions and compare decimal fractions. (CCSS 4.NF.C)

Mathematics Graduation Standard 2

ALGEBRA

Interpret, represent, create and solve algebraic expressions.

Fifth-Grade Performance Indicators

- A. Represent and solve problems involving addition, subtraction, multiplication, and division (CCSS 1.OA.A-C, 2.OA.A, 3.OA.A)
- B. Understand and apply properties of operations and the relationship between addition, subtraction, multiplication, and division. (CCSS 2.OA.B-C, 3.OA.B-D)
- C. Identify factors and multiples of whole numbers. (CCSS 4.OA.B)
- D. Use the four operations with whole numbers to solve problems. (CCSS 4.OA.A)
- E. Generate and analyze patterns and relationships. (CCSS 4.OA.C; 5.OA.B)
- F. Write and interpret numerical expressions. (CCSS 5.OA.A)

Eighth-Grade Performance Indicators

- A. Apply and extend previous understandings of arithmetic to algebraic expressions. (CCSS 6.EE.A)
- B. Use properties of operations to generate equivalent expressions. (CCSS 7.EE.A)
- C. Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (CCSS 7.EE.B)
- D. Represent and analyze quantitative relationships between dependent and independent variables. (CCSS 6.EE.C)
- E. Work with radicals and integer exponents. (CCSS 8.EE.A)
- F. Analyze and solve linear equations and pairs of simultaneous linear equations. (CCSS 8.EE.B)
- G. Understand the connections between proportional relationships, lines, and linear equations. (8.EE.C)

High School Performance Indicators

- A. Interpret the structure of expressions. (CCSS HSA.SSE.A)
- B. Write expressions in equivalent forms to solve problems. (CCSS HSA.SSE.B)
- C. Perform arithmetic operations on polynomials. (CCSS HSA.APR.A)
- D. Understand the relationship between zeros and factors of polynomials. (CCSS HSA.APR.B)
- E. Use polynomial identities to solve problems. (CCSS HSA.APR.C.4)
- F. Rewrite rational expressions. (CCSS HSA.APR.D.6)
- G. Create equations that describe numbers or relationships. (CCSS HSA.CED.A)
- H. Understand solving equations as a process of reasoning and explain the reasoning. (CCSS HSA.REI.A)
- I. Solve equations and inequalities in one variable. (CCSS HSA.REI.B)
- J. Solve systems of equations. (CCSS HSA.REI.C.5-7)
- K. Represent and solve equations and inequalities graphically. (CCSS HSA.REI.D)

Mathematics Graduation Standard 3

FUNCTIONS

Interpret, analyze, construct, and solve linear, quadratic, and trigonometric functions.

Fifth-Grade Performance Indicators

Not applicable

Eighth-Grade Performance Indicators

- A. Define, evaluate and compare functions. (CCSS 8.F.A)
- B. Use functions to model relationships between quantities. (CCSS 8.F.B)

High School Performance Indicators

- A. Understand the concept of a function and use function notation. (CCSS HSF.IF.A)
- B. Interpret functions that arise in applications in terms of the context. (CCSS HSF.IF.B)
- C. Analyze functions using different representations. (CCSS HSF.IF.C.7A-C,E,8-9)
- D. Build a function that models a relationship between two quantities. (CCSS HSF.BF.A.1A-B,2)
- E. Build new functions from existing functions. (CCSS HSF.BF.B.3,4A)
- F. Construct and compare linear, quadratic, and exponential models and solve problems. (CCSS HSF.LE.A)
- G. Interpret expressions for functions in terms of the situation they model. (CCSS HSF.LE.B)
- H. Extend the domain of trigonometric functions using the unit circle. (CCSS HSF.TF.A.1-2)
- I. Model periodic phenomena with trigonometric functions. (CCSS HSF.TF.B.5)
- J. Prove and apply trigonometric identities. (CCSS HSF.TF.C8)

Mathematics Graduation Standard 4

GEOMETRY

Prove, understand, and model geometric concepts, theorems, and constructions to solve problems.

Fifth-Grade Performance Indicators

- A. Identify and describe shapes. (CCSS K.G.A)
- B. Analyze, compare, create and compose shapes. (CCSS K.G.B)
- C. Reason with shapes and their attributes. (CCSS 1.G.A, 2.G.A, 3.G.A)
- D. Draw and identify lines and angles, and classify shapes by properties of their lines and angles. (CCSS 4.G.A)
- E. Graph points on the coordinate plane to solve real-world and mathematical problems. (CCSS 5.G.A)
- F. Classify two-dimensional figures into categories based on their properties. (CCSS 5.G.B)

Eighth-Grade Performance Indicators

- A. Solve real-world and mathematical problems involving area, surface area, volume, and angle measure. (CCSS 6.G.A, 7.G.B)
- B. Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres. (CCSS 8.G.C)
- C. Draw, construct, and describe geometrical figures and describe the relationships between them. (CCSS 7.G.A)
- D. Understand congruence and similarity using physical models, transparencies, or geometry software. (CCSS 8.G.A)
- E. Understand and apply Pythagorean Theorem. (CCSS 8.G.B)

High School Performance Indicators

- A. Experiment with transformations in the plane. (CCSS HSG.CO.A)
- B. Understand congruence in terms of rigid motions. (CCSS HSG.CO.B)
- C. Prove geometric theorems. (CCSS HSG.CO.C)
- D. Make geometric constructions. (CCSS HSG.CO.D)
- E. Understand similarity in terms of similarity transformations. (CCSS HSG.SRT.A)
- F. Prove theorems involving similarity. (CCSS HSG.SRT.B)
- G. Define trigonometric ratios and solve problems involving right triangles. (CCSS HSG.SRT.C)
- H. Understand and apply theorems about circles. (CCSS HSG.C.A.1-3)
- I. Find arc lengths and areas of sectors of circles. (CCSS HSG.C.B)
- J. Translate between the geometric description and the equation for a conic section. (CCSS HSG.GPE.A.1-2)
- K. Use coordinates to prove simple geometric theorems algebraically. (CCSS HSG.GPE.B)
- L. Explain volume formulas and use them to solve problems. (CCSS HSG.GMD.A.1,3)
- M. Visualize relationships between two-dimensional and three-dimensional objects. (CCSS HSG.GMD.B)
- N. Apply geometric concepts in modeling situations. (HSG.MG.A)

Mathematics Graduation Standard 5

STATISTICS & PROBABILITY

Interpret, infer and apply statistics and probability to analyze data and reach and justify conclusions.

Fifth-Grade Performance Indicators

- A. Measure, compare and estimate lengths in length units and standard units. (CCSS K.MD.A, 1.MD.A, 2.MD.A-B)
- B. Represent and interpret data. (CCSS K.MD.B, 1.MD.C, 2.MD.D, 3.MD.B, 4.MD.B, 5.MD.B)
- C. Tell and write time. (CCSS 1.MD.B, 2.MD.C.7)
- D. Solve word problems involving money. (CCSS 2.MD.C.8)
- E. Geometric measurement: recognize perimeter as an attribute of plane figures and distinguish between linear and area measures. (CCSS 3.MD.D)
- F. Geometric measurement: understand concepts of area and volume and relate to multiplication and to addition. (CCSS 3.MD.C, 5.MD.C.3-4)
- G. Geometric measurement: understand concepts of angle and measure angles. (CCSS 4.MD.C)
- H. Solve problems involving measurement and estimation of intervals of time, liquid volumes, and masses of objects. (CCSS 3.MD.A)
- I. Solve problems involving measurement and conversion of measurements within a given measurement system. (CCSS 4.MD.A, 5.MD.A)

Eighth-Grade Performance Indicators

- A. Develop understanding of statistical variability. (CCSS 6.SP.A)
- B. Summarize and describe distributions. (CCSS 6.SP.B)
- C. Use random sampling to draw inferences about a population. (CCSS 7.SP.B)
- D. Investigate chance processes and develop, use, and evaluate probability models. (CCSS 7.SP.C)
- E. Investigate patterns of association in bivariate data. (CCSS 8.SP.A)

High School Performance Indicators

- A. Summarize, represent, and interpret data on a single count or measurement variable. (CCSS HSS.ID.A)
- B. Summarize, represent, and interpret data on two categorical and quantitative variables. (CCSS HSS.ID.B)
- C. Interpret linear models. (CCSS HSS.ID.C)
- D. Understand and evaluate random processes underlying statistical experiments. (CCSS HSS.IC.A)
- E. Make inferences and justify conclusions from sample surveys, experiments, and observational studies. (CCSS HSS.IC.B)
- F. Understand independence and conditional probability and use them to interpret data. (CCSS HSS.CP.A)
- G. Use the rules of probability to compute probabilities of compound events in a uniform probability model. (CCSS HSS.CP.B.6-7)