Kentucky Department of Education

Course Standards for 2019-2020 and Beyond

Course Code: 270702

Course Name: Integrated Applied Mathematics 2

Grade Level: 9-12

Course standards documents are designed to show how specific standards align to courses. For instructional planning and assessment, please access the complete *Kentucky Academic Standards for Mathematics* for the full scope of what students should know and be able to do.

If Integrated/Applied Mathematics 1 and 2 are used in place of the traditional series of Algebra 1 and Geometry and the series of Integrated 1 and Integrated 2 collectively allows students the access and opportunity to learn all the required high school Kentucky Academic Standards for Mathematics included in Algebra 1 and Geometry, then students who complete this series have met the high school graduation requirements of Algebra 1 and Geometry. The collective standards for Algebra 1 and Geometry are listed here.

Schools and districts offering this course as a continuation of an integrated sequence that began prior to the 2019-2020 school year will need to ensure the appropriate content is included in the course in order to fulfill the expectations set forth in the *Kentucky Academic Standards for Mathematics*. For guidance regarding the required *KAS for Mathematics*, consult the High School Mathematics Matrix Standards by Course for 2019-2020 document.

Upon course completion students should be able to:

Standards
Standards of Mathematical Practice ➢ Make sense of problems and persevere in solving them. ➢ Reason abstractly and quantitatively. ➢ Construct viable arguments and critique the reasoning of others. ➢ Model with mathematics. ➢ Use appropriate tools strategically. ➢ Attend to precision. ➢ Look for and make use of structure. ➢ Look for and express regularity in repeated reasoning. Modeling Standards: Modeling links classroom mathematics and statistics to everyday life, work, and decision-making. Modeling is the process of choosing and using appropriate mathematics and statistics to analyze empirical situations, to understand them better, and to improve decisions. Quantities and their relationships in physical, economic, public policy, social, and everyday situations can be modeled using mathematical and statistical methods. When making mathematical models, technology is valuable for varying assumptions, exploring consequences, and comparing predictions with data. Modeling is best interpreted

Standards

not as a collection of isolated topics but rather in relation to other standards. Making mathematical models is a Standard for Mathematical Practice, and specific modeling standards appear throughout the high school standards indicated by a star symbol (★).

The high school standards are listed in conceptual categories:

- Number and Quantity (N)
- Algebra (A)
- Functions (F)
- Geometry (G)
- Statistics and Probability (SP)

Conceptual Category Number and Quantity (N) – Standards

KY.HS.N.1
Extend the properties of integer exponents to rational exponents, allowing for the expression of radicals in terms of rational exponents.

KY.HS.N.2
Rewrite expressions involving radicals and rational exponents using the properties of exponents.

KY.HS.N.4
Use units in context as a way to understand problems and to guide the solution of multi-step problems; ★

a. Choose and interpret units consistently in formulas;
b. Choose and interpret the scale and the origin in graphs and data displays.

KY.HS.N.5
Define appropriate units in context for the purpose of descriptive modeling. ★

KY.HS.N.6
Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. ★

Conceptual Category Algebra (A) – Standards

KY.HS.A.1
Interpret expressions that represent a quantity in terms of its context. ★

a. Interpret parts of an expression, such as terms, factors and coefficients.
b. Interpret complicated expressions, given a context, by viewing one or more of their parts as a single entity.

KY.HS.A.2
Use the structure of an expression to identify ways to rewrite it and consistently look for opportunities to rewrite expressions in equivalent forms.

KY.HS.A.3

Standards
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★ a. Write the standard form of a given polynomial and identify the terms, coefficients, degree, leading coefficient and constant term. b. Factor a quadratic expression to reveal the zeros of the function it defines. c. Use the properties of exponents to rewrite exponential expressions.
KY.HS.A.5 Add, subtract and multiply polynomials.
KY.HS.A.7 Identify roots of polynomials when suitable factorizations are available. Know these roots become the zeros (x-intercepts) for the corresponding polynomial function.
KY.HS.A.12 Create equations and inequalities in one variable and use them to solve problems.
KY.HS.A.13 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
KY.HS.A.14 Create a system of equations or inequalities to represent constraints within a modeling context. Interpret the solution(s) to the corresponding system as viable or nonviable options within the context.
KY.HS.A.15 Rearrange formulas to solve a literal equation, highlighting a quantity of interest, using the same reasoning as in solving equations.
KY.HS.A.16 Understand each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
KY.HS.A.18 Solve linear equations and inequalities in one variable, including literal equations with coefficients represented by letters.
KY.HS.A.19

Standards
Solve quadratic equations in one variable. a. Solve quadratic equations by taking square roots, the quadratic formula and factoring, as appropriate to the initial form of the equation. **KY.HS.A.20** Solve systems of linear equations in two variables. a. Understand a system of two equations in two variables has the same solution as a new system formed by replacing one of the original equations with an equivalent equation. b. Solve systems of linear equations with graphs, substitution and elimination, focusing on pairs of linear equations in two variables. **KY.HS.A.23** Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. **KY.HS.A.24** Justify that the solutions of the equations f(x) = g(x) are the x-coordinates of the points where the graphs of y = f(x) and y = g(x) intersect. Find the approximate solutions graphically, using technology or tables. ★ **KY.HS.A.25** Graph linear inequalities in two variables. a. Graph the solutions to a linear inequality as a half-plane (excluding the boundary in the case of a strict inequality). b. Graph the solution set to a system of linear inequalities as the intersection of the corresponding half-planes.
Conceptual Category Functions (F) – Standards
KY.HS.F.1 Understand properties and key features of functions and the different ways functions can be represented. a. Understand that a function from one set (called the domain) to another set (called the range) assigns to each element of the domain exactly one element of the range. If f is a function and x is an element of its domain, then f(x) denotes the output of f corresponding to the input x. b. Using appropriate function notation, evaluate functions for inputs in their domains and interpret statements that use function notation in terms of a context. c. For a function that models a relationship between two quantities, interpret key features of graphs and tables in terms of the quantities and sketch graphs showing key features given a verbal description of the relationship.

Standards

d. Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes.

e. Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions).

KY.HS.F.2

Recognize that arithmetic and geometric sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

KY.HS.F.3

Understand average rate of change of a function over an interval.

a. Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval.

b. Estimate the rate of change from a graph. ★

KY.HS.F.4

Graph functions expressed symbolically and show key features of the graph, with and without using technology (computer, graphing calculator). ★

Graph linear and quadratic functions and show intercepts, maxima and minima.

KY.HS.F.5

Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function.

a. Identify zeros, extreme values and symmetry of the graph within the context of a quadratic function.

b. Use the properties of exponents to interpret expressions for exponential functions and classify the exponential function as representing growth or decay.

KY.HS.F.6

Write a function that describes a relationship between two quantities. ★

a. Determine an explicit expression, a recursive process, or steps for calculation from a context.

b. Combine standard function types using arithmetic operations.

KY.HS.F.7

Use arithmetic and geometric sequences to model situations and scenarios.

a. Use formulas (explicit and recursive) to generate terms for arithmetic and geometric sequences.

Standards
b. Write formulas to model arithmetic and geometric sequences and apply those formulas in realistic situations. ★ **KY.HS.F.11** Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Recognize and justify that linear functions grow by equal differences over equal intervals and that exponential functions grow by equal factors over equal intervals. b. Recognize situations in which one quantity changes at a constant rate per unit interval relative to another. c. Recognize situations in which a quantity grows or decays by a constant percent rate per unit interval relative to another. **KY.HS.F.12** Construct linear and exponential functions, including arithmetic and geometric sequences, given a graph, a description of a relationship, or two input-output pairs (include reading these from a table). **KY.HS.F.13** Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function. **KY.HS.F.14** Interpret the parameters in a linear or exponential function in terms of a context.
Conceptual Category Geometry (G) – Standards
KY.HS.G.1 Know and apply precise definitions of the language of Geometry: a. Understand properties of line segments, angles and circle. b. Understand properties of and differences between perpendicular and parallel lines. **KY.HS.G.2** Representing transformations in the plane. a. Describe transformations as functions that take points in the plane as inputs and give other points as outputs b. Compare transformations that preserve distance and angle measures to those that do not.

Standards
c. Given a rectangle, parallelogram, trapezoid, or regular polygon, formally describe the rotations and reflections that carry it onto itself, using properties of these figures.
KY.HS.G.4
Understand the effects of transformations of geometric figures.
a. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure.
b. Specify a sequence of transformations that will carry a given figure onto another.
c. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure. Given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent.
KY.HS.G.5
Know and apply the concepts of triangle congruence:
a. Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.
b. Explain how the criteria for triangle congruence (ASA, SAS and SSS) follow from the definition of congruence in terms of rigid motions.
KY.HS.G.6
Apply theorems for lines, angles, triangles, parallelograms.
KY.HS.G.7
Prove theorems about geometric figures.
a. Construct formal proofs to justify theorems for lines, angles and triangles.
KY.HS.G.8
Create and apply geometric constructions.
a. Make formal geometric constructions with a variety of tools and methods.
b. Apply basic construction procedures to construct more complex figures.
KY.HS.G.9
Understand properties of dilations.
a. Verify the properties that result from that dilations given by a center and a scale factor.
b. Verify that a dilation produces an image that is similar to the pre-image.

Standards

KY.HS.G.10

Apply the properties of similarity transformations to establish the AA criterion for two triangles to be similar.

KY.HS.G.11

Understand theorems about triangles.

a. Apply theorems about triangles.

c. Use similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

KY.HS.G.12

Understand properties of right triangles.

a. Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles (sine, cosine and tangent).

b. Explain and use the relationship between the sine and cosine of complementary angles.

c. Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

KY.HS.G.15

Verify using dilations that all circles are similar.

KY.HS.G.16

Identify and describe relationships among angles and segments within the context of circles involving:

a. Recognize differences between and properties of inscribed, central and circumscribed angles.

b. Understand relationships between inscribed angles and the diameter of a circle.

c. Understand the relationship between the radius of a circle and the line drawn through the point of tangency on that radius.

KY.HS.G.19

Understand the relationship between the algebraic form and the geometric representation of a circle.

Standards

a. Write the equation of a circle of given center and radius using the Pythagorean Theorem.

KY.HS.G.21

Use coordinates to justify and prove simple geometric theorems algebraically.

KY.HS.G.22

Justify and apply the slope criteria for parallel and perpendicular lines and use them to solve geometric problems.

KY.HS.G.23

Find measurements among points within the coordinate plane.

a. Use points from the coordinate plane to find the coordinates of a midpoint of a line segment and the distance between the endpoints of a line segment.
b. Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

KY.HS.G.24

Use coordinates within the coordinate plane to calculate measurements of two dimensional figures.

a. Compute the perimeters of various polygons.
b. Compute the areas of triangles, rectangles and other quadrilaterals.★

KY.HS.G.25

Analyze and determine the validity of arguments for the formulas for the various figures and shapes.

a. Finding the circumference and area of a circle.
b. Finding the volume of a sphere, prism, cylinder, pyramid and cone.

KY.HS.G.27

Use volume formulas to solve problems for cylinders, pyramids, cones, spheres, prisms. ★

KY.HS.G.28

Identify the shapes of two-dimensional cross-sections of three-dimensional objects and identify three-dimensional objects generated by rotations of two-dimensional objects.

KY.HS.G.29

Standards
Use geometric shapes, their measures and their properties to describe objects in real world settings. **KY.HS.G.30** Apply concepts of density based on area and volume in modeling situations, using appropriate units of measurement. **KY.HS.G.31** Apply geometric methods to solve design problems. ★
Conceptual Category Statistics and Probability★ (SP) – Standards
KY.HS.SP.6 Represent data on two quantitative variables on a scatter plot and describe how the explanatory and response variables are related. a. Calculate an appropriate mathematical model, or use a given mathematical model, for data to solve problems in context. b. Informally assess the fit of a model (through calculating correlation for linear data, plotting, calculating and/or analyzing residuals). **KY.HS.SP.7** Interpret the slope (rate of change) and the intercept (constant term) of a linear model in the context of the data. **KY.HS.SP.8** Understand the role and purpose of correlation in linear regression. a. Use technology to compute correlation coefficient of a linear fit. b. Interpret the meaning of the correlation within the context of the data. c. Describe the limitations of correlation when establishing causation.