

Grade Level:	Algebra
Standard	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.
SMP	MP.2, MP.6
Also See	Students not only simplify problems, they use vocabulary, such as terms, coefficients and degrees, appropriately as they describe their process (MP.6).

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively**
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
- 6. Attend to precision**
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

- Expressions from graphs, tables, etc.
- Story context
- Interpret expressions

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning..
To interpret parts of an expression in context.
To interpret parts of complicated expressions in context.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can define expression, term, factor, and coefficient.
- I can interpret the real world meaning of the terms, factors, and coefficients of an expression in terms of their units.
- I can group the parts of an expression differently in order to better interpret their meaning.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

Grade Level:	Algebra
Standard	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.
SMP	MP.7, MP.8
Also See	Students describe the meaning of parts of an expression, such as a particular term or coefficient and also explain the meaning of the full expression (MP.7). Students fluently manipulate expressions into equivalent forms, based on patterns they have noticed across problems (MP.8).

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. **Look for and make use of the structure**
8. **Look for and express regularity in repeated reasoning**

1. Critical vocabulary and questions as it relates to the standard.

- Expression
- Equivalent form
- Standard form
- Factored form
- Vertex form
- Point-slope form
- Slope-intercept form
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2. Key Implementation Questions and Answers:

Clarifications:

Also in linear and exponential

A.2 (Quadratic example)

Students see $x^4 - y^4$ as $(x^2)^2 - (y^2)^2$, thus recognizing it as a difference of squares factored as $(x^2 - y^2)(x^2 + y^2)$. Additionally, students see there are three commonly used forms for a quadratic expression: • Standard form • Factored form • Vertex form and can identify when one form might be more useful than another.

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...
to interpret the structures of expressions and rewrite in equivalent forms.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can look for and identify clues in the structure of expressions (e.g., like terms, common factors, difference of squares, perfect squares) in order to rewrite it another way.
- I can explain why equivalent expressions are equivalent.
- I can apply models for factoring and multiplying polynomials to rewrite expressions.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this because”

I am learning this because...
This will help me to use equivalent forms to solve problems more efficiently.

Grade Level:	Algebra
Standard	<p>KY.HS.A.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.</p> <p>a. Write the standard form of a given polynomial and identify the terms, coefficients, degree, leading coefficient and constant term.</p> <p>b. Factor a quadratic expression to reveal the zeros of the function it defines.</p> <p>c. Use the properties of exponents to rewrite exponential expressions.</p> <p>d. (+) Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.</p>
SMP	MP.5, MP.7
Also See	<p>Modeling standard</p> <p>Students explain that they need to rewrite quadratic expressions into equivalent factored form in order to find the zeros of the function it defines (MP.7) Using technology, students change the exponents to reinforce their understanding of exponent properties (MP.5)</p>

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
- 5. Use appropriate tools strategically**
6. Attend to precision
- 7. Look for and make use of the structures**
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

- a. Vocab: standard form, term, coefficients, degree, leading coefficient and constant term
- b. Factor, zeros, solving
- c. Exponents rules, properties of exponents
- d. (+) complete the square, maximum & minimum values

2. Key Implementation Questions and Answers:

Clarifications:

3d. Students recognize to complete the square allow them to more easily identify max and min then standard form, there are pros and cons to each form

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...

To rewrite quadratic expressions in equivalent forms to reveal important features.

To rewrite exponential expressions.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can factor a quadratic expression ($ax^2 + bx + c$) to find the zeros of the function it represents
- I can identify and factor perfect square trinomials
- I can complete the square to re-write a quadratic expression $ax^2 + bx + c$ with the form $a(x - h)^2 + k$
- I can predict whether a quadratic will have a minimum or a maximum based on the value of a .
- I can identify the maximum or minimum of a quadratic written in the form $a(x - h)^2 + k$.
- I can define an exponential function $f(x) = ab^x$
- I can rewrite exponential functions using the properties of exponents

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this because”

I am learning this because the equivalent forms of expressions allows me to see properties of the graphs that illustrate the situation more clearly, like the maximum height of a projectile, the time a projectile is in the air, the time it will land.

Grade Level:	Algebra
Standard	KY.HS.A.4 (+) Derive the formula for the sum of a finite geometric series (when the common ratio is not 1) and use the formula to solve problems.
SMP	MP.1, MP. 4

Standard for Mathematical Practice (select and highlight)
<ol style="list-style-type: none"> 1. Make sense of problems and persevere in solving them. 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others. 4. Model with mathematics 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of the structure 8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this
--

because”

Grade Level:	Algebra I
Standard	KY.HS.A.5 Add, subtract and multiply polynomials.
SMP	MP.7, MP.8
Also See	Attending to the standards for mathematical practice: Students flexibly rewrite expressions in equivalent forms using algebraic properties, including properties of addition, subtraction and multiplication. (MP.7) When multiplying binomials, students identify and describe shortcuts after noticing that calculations are repeated (MP.8)

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. **Look for and make use of the structure**
8. **Look for and express regularity in repeated reasoning**

1. Critical vocabulary and questions as it relates to the standard.

- Combine like terms
- Algebraic Properties
- Distributive property
- Sum and difference
- Multiply Binomials

2. Key Implementation Questions and Answers:

Clarifications:

Students combine like terms and make use of the distributive property when adding, subtracting and multiplying polynomials

How can the properties of the real numbers be useful when working with polynomial operations?

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...
to perform arithmetic operations on polynomials.

4. Establish success criteria by identifying strong and weak work. *Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”*

- I can add and subtract polynomials.
- I can multiply polynomials.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *“I am learning this because”*

I am learning this because polynomials model the same properties and operations of number concepts from elementary and middle school. This will lead to real world problems in economics, projectile (rockets and football) and planetary motion

Grade Level:	Algebra
Standard	KY.HS.A.6 (+) Know and apply the Remainder Theorem.
SMP	MP.1, MP.8

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. *Describe the standard and/or element(s) as statements of intended learning. “I am learning”*

4. Establish success criteria by identifying strong and weak work. *Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”*

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *“I am learning this because”*

Grade Level:	Algebra
Standard	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.
SMP	MP.2, MP.5, MP.7
Also See	Attending to the standards for mathematical practice: Students reason quantitatively as they select a method for finding roots and justify why they selected and applied a particular method (MP 2). Students use technology to identify the X intercepts from a polynomial graph and explain that the X intercepts are zeros and therefore groups of the polynomials. (MP 5)

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
- 2. Reason abstractly and quantitatively**
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
- 5. Use appropriate tools strategically**
6. Attend to precision
- 7. Look for and make use of the structure**
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

- Roots
- Zeros
- X-intercept
- Factors
- coefficient

2. Key Implementation Questions and Answers:

3. Develop "Learning Intention" statements. Describe the standard and/or element(s) as statements of intended learning. "I am learning"

I am learning...
to understand the relationship between zeros and factors of polynomials,
to understand the relationship between algebraic and graphical solutions.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics

of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can identify the zeros of factored polynomials
- I can identify the multiplicity of the zeros of a factored
- I can explain how the multiplicity of the zeros provides a clue as to how the graph will behave when it approaches and leaves the X intercept
- I can sketch a rough graph, using the zeros of the polynomial and other easily identifiable points, such as the y-intercept

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *“I am learning this because”*

I am learning this because it is important to see the connection between factors of a polynomial and the x intercept(s) of its graph. With projectile motion, the x intercepts would represent where the projectile starts and where it hits the ground.

Grade Level:	Algebra
Standard	KY.HS.A.8 (+) Prove polynomial identities and use them to describe numerical relationships.
SMP	MP.2, MP.3, MP.6

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this because”

Grade Level:	Algebra
Standard	KY.HS.A.9 (+) Know and apply the Binomial Theorem for the expansion of $(x + y)^n$ in powers of x and y for a positive integer n , where x and y are any numbers, with coefficients determined for example by Pascal's Triangle.
SMP	MP.7, MP.8

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop "Learning Intention" statements. Describe the standard and/or element(s) as statements of intended learning. "I am learning"

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. "I will know that I learned it when"

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) "I am learning this because"

Grade Level:	Algebra
Standard	KY.HS.A.10 (+) Rewrite simple rational expressions in different forms.
SMP	MP.7, MP.8
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this because”

Grade Level:	Algebra
Standard	KY.HS.A.11 (+) Add, subtract, multiply and divide rational algebraic expressions.
SMP	MP.2, MP.3

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this because”

Grade Level:	Algebra
Standard	KY.HS.A.12 Create equations and inequalities in one variable and use them to solve problems.
SMP	MP.1, MP.4

Standard for Mathematical Practice (select and highlight)

1. **Make sense of problems and persevere in solving them.**
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. **Model with mathematics**
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...
to create equations that describe numbers or relationships.
to create inequalities that describe numbers or relationships.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can identify the variables and quantities represented in a real world problem
- I can determine the best model for the real world problem (linear equation, linear inequality, quadratic equation, quadratic inequality, rational equation, exponential equation)
- I can write the equation or any quality that best models the problem
- I can solve the equation or any quality

I can interpret the solution in the context of the problem.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

Grade Level:	Algebra
Standard	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.
SMP	MP.2, MP.5
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

To create equations in two or more variables to represent relationships between quantities.
To graph equations on coordinate axes with labels and scales.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can identify the variables and quantities represented in a real world
- I can determine the best model for the real world problem (e.g., linear, quadratic)
- I can write the equation the best manners the problem
- I can set up coordinate axes, using inappropriate scale and label the axes.

I can graph equations on coordinate axes with appropriate labels and scales

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

Grade Level:	Algebra
Standard	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.
SMP	MP.4, MP.5
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. *Describe the standard and/or element(s) as statements of intended learning. “I am learning”*

I am learning...

To create a system of equations to represent constraints within a modeling context.

To create a system of inequalities to represent constraints within a modeling context.

To interpret the solutions within the context of the model.

4. Establish success criteria by identifying strong and weak work. *Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”*

I will know that I learned it when...

- I can identify the variables and quantities represented in a real world problem

- I can determine the best models for the real world problem (linear equation linear inequality quadratic equation quadratic inequality)
- I can write the system of equations and or any qualities that best models the problem
- I can graph the system on coordinate axes with appropriate labels and scales
- I can interpret solutions in the context of the situation modeled and decide if they are reasonable
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5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

Grade Level:	Algebra I and Algebra II
Standard	KY.HS.A.15 Rearrange formulas to solve a literal equation, highlighting a quantity of interest, using the same reasoning as in solving equations.
SMP	MP.2, MP.7
Also See	Standards A.12-A.15 are under a modeling standard heading. Students explain when they would opt for different equivalent forms of an equation MP.7

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. **Reason abstractly and quantitatively**
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. **Look for and make use of the structure**
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

Literal Equations
Solve Equations
Associative , Commutative, Transitive,
Multiplicative Identity, Additive Identity, and
Reflexive Properties

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning to rearrange real-world formulas to highlight a quantity of interest.
I am learning to apply the same reasoning as solving equations

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can solve formulas for a specified variable.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

I am learning this because I am developing an understanding of why I need to write formulas in different ways and what the benefits would be for the various real-world formulas.

Grade Level:	Algebra
Standard	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.
SMP	MP.1, MP.3
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning ...
To use properties to justify the steps in solving an equation.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can apply order of operations and inverse operations to solve equations
- I can construct an argument to justify my solution process



5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *“I am learning this because”*

Grade Level:	Algebra
Standard	<p>KY.HS.A.17 Solve and justify equations in one variable. Justify the solutions and give examples showing how extraneous solutions may arise.</p> <p>a. Solve rational equations written as proportions in one variable.</p> <p>b. Solve radical equations in one variable.</p>
SMP	MP.3, MP.5, MP.7
Also See	Priority Algebra 2

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
- 3. Construct viable arguments and critique the reasoning of others.**
4. Model with mathematics
- 5. Use appropriate tools strategically**
6. Attend to precision
- 7. Look for and make use of the structure**
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

Radical, radicand, index, square root, cube root, fourth root, coefficient, extraneous

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...

To solve and justify rational equations in one variable

To solve and justify radical equations in one variable

4. Establish success criteria by identifying strong and weak work. Identify the characteristics

of strong and weak work related to the standard and/or element(s). Identify common misconceptions. "I will know that I learned it when"

I will know that I learned it when...

- I can define extraneous solution
- I can solve a rational equation in one
- I can determine which numbers cannot be solutions of a rational equation, and explain why they cannot be solutions
- I can generate examples of rational equations with extraneous
- I can solve a radical equation in one variable
- I can determine which numbers cannot be solutions of a radical equation and explain why they cannot be solutions
- I can generate examples of radical equations with extraneous solutions

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *"I am learning this because"*

I am learning this because...

It will help me analyze a problem to correctly determine a solving method. It will allow me to see why not all solutions are true solutions.

Grade Level:	Algebra I
Standard	KY.HS.A.18 Solve linear equations and inequalities in one variable, including literal equations with coefficients represented by letters.
SMP	MP.2, MP.7
Also See	Students reason about which symbolic representation is needed in order to focus on a particular feature and then efficiently rewrite literal equations to feature that characteristic (MP.2)

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. **Reason abstractly and quantitatively**
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. **Look for and make use of the structure**
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

Equation
 Literal equation
 Variable
 Integer coefficients
 Rational coefficients
 Distributive property
 Combining like terms

2. Key Implementation Questions and Answers:

Clarifications: Students use all properties of both equations and inequalities to solve for one variable. (students will build on the skills from previous grades to interact with more complex equations)

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning to solve equations and inequalities in one variable
 I am learning to solve literal equations for a specific variable

4. Establish success criteria by identifying strong and weak work. *Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”*

I will know that I learned it when...

- I can solve linear equations in one variable, including equations with coefficients represented by the letters
- I can solve linear inequalities in one variable, including equations with coefficients represented by letters

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *“I am learning this because”*

In almost every situation we encounter, there is an unknown value (predicting profit, determining income over time, calculating miles per gallon). These situations can be represented with an equation.

Grade Level:	Algebra
Standard	<p>KY.HS.A.19 Solve quadratic equations in one variable.</p> <p>a. Solve quadratic equations by taking square roots, the quadratic formula and factoring, as appropriate to the initial form of the equation. Recognize when the quadratic formula gives complex solutions and write them as $a \pm bi$ for real numbers a and b.</p> <p>b. (+) Use the method of completing the square to transform any quadratic equation in x into an equation of the form $(x - p)^2 = q$ that has the same solutions. Derive the quadratic formula from this form.</p> <p>c. (+) Solve quadratic equations by completing the square.</p>
SMP	MP.1, MP.8
Also See	

Standard for Mathematical Practice (select and highlight)

1. **Make sense of problems and persevere in solving them.**
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. **Look for and express regularity in repeated reasoning**

1. Critical vocabulary and questions as it relates to the standard.

Solve
quadratic
quadratic formula
factoring
square roots
complex solutions

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning to solve quadratic equations in one variable.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can identify a quadratic expression, $ax^2 + bx + c$
- I can identify a perfect square trinomial by first, noticing if a and C are perfect squares and if $b = 2ac$
- I can factor a perfect square trinomial
- I can complete the square of $ax^2 + bx + c$ to write a quadratic in the form $(x - p)^2 = q$
- I can derive the quadratic formula by completing the square $ax^2 + bx + c$
- I can determine the best method to solve a quadratic equation in one variable
- I can solve quadratic equations by inspection
- I can solve quadratic equations by finding square roots
- I can solve equations by completing the square
- I can solve quadratic equations using the quadratic formula
- I can explain that complex solutions result when the radicand is negative in the quadratic ($b^2 - 4ac < 0$)
- I can write complex number solutions for a quadratic equation in the form $a + bi$ by using $i = \sqrt{-1}$

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) “I am learning this because”

I am learning this because it will allow me to see relationships between the different solving methods and graphing to find solutions. The solving methods are tools to find solutions of complex quadratics that more accurately describe real world situations.

Grade Level:	Algebra I
Standard	<p>KY.HS.A.20 Solve systems of linear equations in two variables.</p> <p>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.</p> <p>b. Solve systems of linear equations with graphs, substitution and elimination, focusing on pairs of linear equations in two variables.</p>
SMP	MP.3, MP.6

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. **Construct viable arguments and critique the reasoning of others.**
4. Model with mathematics
5. Use appropriate tools strategically
6. **Attend to precision**
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

Solutions
 Linear equations
 Linear systems
 two variables equations and inequalities
 Graphical solutions
 Algebraic solutions with substitution & elimination

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...
 to solve a system of linear equations in two variables

4. Establish success criteria by identifying strong and weak work. *Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”*

I will know that I learned it when...

- I can recall that equivalent equations results when an equation is multiplied by the same number on both sides of the equal sign
- I can solve a system of two equations in two variables by elimination
- I can demonstrate that replacing one equation with the sum of that equation in a multiple of the other, create a system with the same solutions as the original system
- I can explain why some linear systems have no solutions and identify linear systems that have no solution
- I can explain why some linear systems have infinitely many solutions and identify linear systems that have infinitely many
- I can solve a system of linear equations algebraically (by substitution or elimination) to find an exact solution
- I can create a linear equation on the coordinate plane
- I can determine the approximate solution to a system of linear equations by graphing both equations, and estimating the point of intersection

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *“I am learning this because”*

Grade Level:	Algebra
Standard	KY.HS.A.21 Solve a simple system consisting of a linear equation and a quadratic equation in two variables algebraically and graphically.
SMP	MP.3, MP.6
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

Solve, system, linear, quadratic, two variables, algebraically, graphically

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...
To solve a simple system consisting of a linear equation and a quadratic equation in two variables.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can distinguish between equations that are linear and those that are quadratic.
- I can use substitution to solve a system of equations in which one equation is quadratic.
- I can graph a linear equation on a coordinate plane.
- I can graph a quadratic equation on a coordinate plane.

I can determine the approximate solution of a system of equations in which one equation is linear and one equation is quadratic and estimating the point(s) of intersection.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

Grade Level:	Algebra
Standard	<p>KY.HS.A.22 (+) Use matrices to solve a system of equations.</p> <p>a. Represent a system of linear equations as a single matrix equation in a vector variable.</p> <p>b. Find the inverse of a matrix if it exists.</p> <p>c. Use matrices to solve systems of linear equations (using technology for matrices of dimension 3×3 or greater).</p>
SMP	MP.4, MP.7

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop "Learning Intention" statements. Describe the standard and/or element(s) as statements of intended learning. "I am learning"

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. "I will know that I learned it when"

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *"I am learning this because"*

Grade Level:	Algebra
Standard	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.
SMP	MP.1, MP.4
Also See	Supporting standard in equations, inequalities, exponential and quadratic

Standard for Mathematical Practice (select and highlight)

1. **Make sense of problems and persevere in solving them.**
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. **Model with mathematics**
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. *Describe the standard and/or element(s) as statements of intended learning. “I am learning”*

I am learning...
 The graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane.

4. Establish success criteria by identifying strong and weak work. *Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”*

I will know I learned it when...

- I can explain that every point (x,y) on the graph of an equation represents values x and y that make the equation true.
- I can verify that any point on a graph will result in a true equation when their coordinates are substituted into the equation.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***

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Grade Level:	Algebra
Standard	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.
SMP	MP.3, MP.5
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. **Construct viable arguments and critique the reasoning of others.**
4. Model with mathematics
5. **Use appropriate tools strategically**
6. Attend to precision
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...

To justify the solutions of $f(x) = g(x)$ are the x-coordinates.
To approximate solutions, graphically, using technology or tables.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

I can explain that a point of intersection on the graph of a system of equations $y = f(x)$ and $y = g(x)$, represents a solution to both equations.

- I can infer that since $y = f(x)$ and $y = g(x)$, $f(x) = g(x)$ by the substitution property.
- I can infer that the x coordinate of the points of intersection for $y = f(x)$ and $y = g(x)$ are also solutions for $f(x) = g(x)$.
- I can use the graphing calculator to determine the approximate solutions to a systems of equations, $f(x)$ and $g(x)$.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) *"I am learning this because"*

Grade Level:	Algebra
Standard	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.
SMP	MP.5, MP.6
Also See	

Standard for Mathematical Practice (select and highlight)

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics
- 5. Use appropriate tools strategically**
- 6. Attend to precision**
7. Look for and make use of the structure
8. Look for and express regularity in repeated reasoning

1. Critical vocabulary and questions as it relates to the standard.

2. Key Implementation Questions and Answers:

3. Develop “Learning Intention” statements. Describe the standard and/or element(s) as statements of intended learning. “I am learning”

I am learning...
 Graph the solutions to a linear inequality.
 Graph the solution set to a system of linear inequalities.

4. Establish success criteria by identifying strong and weak work. Identify the characteristics of strong and weak work related to the standard and/or element(s). Identify common misconceptions. “I will know that I learned it when”

I will know that I learned it when...

- I can define linear inequality, shaded region, and boundary.
- I can graph a linear inequality on a coordinate plane, resulting in a boundary line (solid or

dashed) and a shaded region.

- I can graph a system of linear inequalities on a coordinate plane.
- I can explain that the solution set for a system of linear inequalities is the intersection of the shaded regions of both inequalities.
- I can check points in the intersection of the shaded regions to verify that they represent a solution to the system.

5. Ideas for Relevance (Authentic Work with a Connection to Real-World) ***"I am learning this because"***
