North Carolina Department of Public Instruction
INSTRUCTIONAL SUPPORT TOOLS
FOR ACHIEVING NEW STANDARDS

This document is designed to help North Carolina educators teach the Common Core (Standard Course of Study). NCDPI staff are continually updating and improving these tools to better serve teachers.

Functions● Unpacked Content

For the new Common Core standards that will be effective in all North Carolina schools in the 2012-13 school year.

What is the purpose of this document?
To increase student achievement by ensuring educators understand specifically what the new standards mean a student must know, understand and be able to do.

What is in the document?
Descriptions of what each standard means a student will know, understand and be able to do. The "unpacking" of the standards done in this document is an effort to answer a simple question "What does this standard mean that a student must know and be able to do?" and to ensure the description is helpful, specific and comprehensive for educators.

How do I send Feedback?
We intend the explanations and examples in this document to be helpful and specific. That said, we believe that as this document is used, teachers and educators will find ways in which the unpacking can be improved and made ever more useful. Please send feedback to us at feedback@dpi.state.nc.us and we will use your input to refine our unpacking of the standards. Thank You!

Interpreting Functions F.IF

Common Core Cluster

Understand the concept of a function and use function notation.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.IF.1 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*. The graph of *f* is the graph of the equation *y=f(x)*.	**F.IF.1** Use the definition of a function to determine whether a relationship is a function given a table, graph or words. **F.IF.1** Given the function *f(x)*, identify *x* as an element of the domain, the input, and *f(x)* is an element in the range, the output. **F.IF.1** Know that the graph of the function, *f*, is the graph of the equation *y=f(x)*.
F.IF.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.	**F.IF.2** When a relation is determined to be a function, use f(x) notation. **F.IF.2** Evaluate functions for inputs in their domain. **F.IF.2** Interpret statements that use function notation in terms of the context in which they are used.

F.IF.3 Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. *For example, the Fibonacci sequence is defined recursively by f(0) = f(1) = 1, f(n+1) = f(n) + f(n-1) for n ≥ 1.*	**F.IF.3** Recognize that sequences, sometimes defined recursively, are functions whose domain is a subset of the set of integers.

Instructional Expectations

In both **pathways**, the Algebra I and Mathematics I expectation is that students should experience a variety of types of situations modeled by functions. Detailed analysis of any particular class of functions at this stage is not advised. Students should apply these concepts throughout their future mathematics courses. Draw examples from linear and exponential functions. In F.IF.3, draw connection to F.BF.2, which requires students to write arithmetic and geometric sequences. Emphasize arithmetic and geometric sequences as examples of linear and exponential functions.

Interpreting Functions F.IF

Common Core Cluster

Interpret functions that arise in applications in terms of the context.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.IF.4 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. Key features include: *intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums;*	**F.IF.4** Given a function, identify key features in graphs and tables including: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity. **F.IF.4** Given the key features of a function, sketch the graph.

*symmetries; end behavior; and periodicity.**	
F.IF.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, *if the function h(n) gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.**	**F.IF.5** Given the graph of a function, determine the practical domain of the function as it relates to the numerical relationship it describes.
F.IF.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.*	**F.IF.6** Calculate the average rate of change over a specified interval of a function presented symbolically or in a table. **F.IF.6** Estimate the average rate of change over a specified interval of a function from the function's graph. **F.IF.6** Interpret, in context, the average rate of change of a function over a specified interval.
Instructional Expectations	
In the **traditional pathway**, the expectation at the **Algebra I** level is for F.IF.4 and 5 to focus on linear and exponential functions. For F.IF.6, focus on linear functions and exponential functions whose domain is a subset of the integers. Unit 5 in the high school Algebra I course and the Algebra II course address other types of functions. In **Algebra II**, emphasize the selection of a model function based on behavior of data and context. In the **international pathway**, the expectation in **Mathematics I** is that F.IF.4 and 5, focus on linear and exponential functions. For F.IF.6, focus on linear functions and exponential functions whose domain is a subset of the integers. N.RN.1 and N.RN. 2 will need to be referenced here before discussing exponential models with continuous domains. In **Mathematics II**, focus on quadratic functions; compare with linear and exponential functions studied in Mathematics I. In Mathematics III, emphasize the selection of a model function based on behavior of data and context.	

Interpreting Functions F.IF

Common Core Cluster

Analyze functions using different representations.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.IF.7 Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.* a. Graph linear and quadratic functions and show intercepts, maxima, and minima. b. Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. c. Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior. d. (+) Graph rational functions, identifying zeros and asymptotes when suitable factorizations are available, and showing end behavior. e. Graph exponential and logarithmic functions, showing intercepts and end behavior, and trigonometric functions, showing period, midline, and amplitude.	**F.IF.7** Graph functions expressed symbolically and show key features of the graph. Graph simple cases by hand, and use technology to show more complicated cases including: **F.IF.7a** Linear functions showing intercepts, quadratic functions showing intercepts, maxima, or minima. **F.IF.7b** Square root, cube root, and piecewise-defined functions, including step functions and absolute value functions. **F.IF.7c** Polynomial functions, identifying zeros when factorable, and showing end behavior. **F.IF.7d** (+) Rational functions, identifying zeros and asymptotes when factorable, and showing end behavior. **F.IF.7e** Exponential and logarithmic functions, showing intercepts and end behavior. **F.IF.7e** Trigonometric functions, showing period, midline, and amplitude.

Instructional Expectations

In the **traditional and international pathways**, the expectation is for F.IF.7a, 7e, and 9 to focus on linear and exponential functions in **Algebra I** and **Mathematics I**. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as y=3n and y=1002. In **Algebra I** and **Mathematics II**, for F.IF.7b, compare and contrast absolute value, step and piecewise- defined functions with linear, quadratic, and exponential functions. Highlight issues of domain, range, and usefulness when examining piecewise- defined functions. In **Algebra II**, relate F.IF.7c to the relationship between zeros of quadratic functions and their factored forms and focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.

Interpreting Functions F.IF

Common Core Cluster

Analyze functions using different representations.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.IF.8 Write a function defined by an expression in different but equivalent forms to reveal and explain different properties of the function. a. Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. b. Use the properties of exponents to interpret expressions for exponential functions. For example, *identify percent rate of change in functions such as* $y = (1.02)^t$, $y = (0.97)^t$, $y = (1.01)^{12t}$, $y = (1.2)^{1/10}$, *and classify them as representing exponential growth or decay.*	**F.IF.8** Write a function in equivalent forms to show different properties of the function. **F.IF.8** Explain the different properties of a function that are revealed by writing a function in equivalent forms. **F.IF.8a** Use the process of factoring and completing the square in a quadratic function to show zeros, extreme values, and symmetry of the graph, and interpret these in terms of a context. **F.IF.8b** Use the properties of exponents to interpret expressions for percent rate of change, and classify them as growth or decay.

F.IF.9 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). For *example, given a graph of one quadratic function and an algebraic expression for another, say which has the larger maximum.*	**F.IF.9** Compare the key features of two functions represented in different ways. For example, compare the end behavior of two functions, one of which is represented graphically and the other is represented symbolically.

Instructional Expectations

In the **traditional pathway**, the **Algebra I** expectation is for F.IF.7a, 7e, and 9 to focus on linear and exponential functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as y=3n and y=1002. Note that unit 5 in **Algebra I**, and in particular in F.IF.8b, extends the work begun on exponential functions with integer exponents. For F.IF.9, focus on expanding the types of functions considered to include, linear, exponential, and quadratic. Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be factored. In **Algebra II**, relate F.IF.7c to the relationship between zeros of quadratic functions and their factored forms and focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.

In the **traditional pathway**, the **Mathematics I** expectation is for F.IF.7a, 7e, and 9 to focus on linear and exponential functions. Include comparisons of two functions presented algebraically. For example, compare the growth of two linear functions, or two exponential functions such as y=3n and y=100 · 2n. In **Math II,** for F.IF.7b, compare and contrast absolute value, step and piecewise-defined functions with linear, quadratic, and exponential functions. Highlight issues of domain, range and usefulness when examining piecewise-defined functions. Note that this unit, and in particular in F.IF.8b, extends the work begun in **Mathematics I** on exponential functions with integer exponents. For F.IF.9, focus on expanding the types of functions considered to include, linear, exponential, and quadratic. Extend work with quadratics to include the relationship between coefficients and roots, and that once roots are known, a quadratic equation can be factored. **Mathematics III** students should focus on applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.

Building Functions F.BF

Common Core Cluster

Build a function that models a relationship between two quantities.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.BF.1 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. For example, *build a function that models the temperature of a cooling body by adding a constant function to a decaying exponential, and relate these functions to the model.* *c.* (+) Compose functions. For example, *if T(y) is the temperature in the atmosphere as a function of height, and h(t) is the height of a weather balloon as a function of time, then T(h(t)) is the temperature at the location of the weather balloon as a function of time.*	**F.BF.1a** From context, either write an explicit expression, define a recursive process, or describe the calculations needed to model a function between two quantities. **F.BF.1b.** Combine standard function types, such as linear and exponential, using arithmetic operations. **F.BF.1c** Compose functions.
F.BF.2 Write arithmetic and geometric sequences both recursively and with an explicit formula, use them to model situations, and translate between the two forms.*	**F.BF.2** Write arithmetic sequences recursively and explicitly, use the two forms to model a situation, and translate between the two forms. **F.BF.2** Write geometric sequences recursively and explicitly, use the two forms to model a situation, and translate between the two forms. **F.BF.2** Understand that linear functions are the explicit form of recursively-defined arithmetic sequences and that exponential functions are the explicit form of recursively-defined geometric sequences.
Instructional Expectations	

In the **traditional pathway**, the **Algebra I** expectation is to limit F.BF.1a, 1b, and 2 to linear and exponential functions. In F.BF.2, connect arithmetic sequences to linear functions and geometric sequences to exponential functions. In Algebra II, the expectation is to develop models for more complex or sophisticated situations than in previous courses.

In the **international pathway**, the **Mathematics I** expectation is to limit F.BF.1a, 1b, and 2 to linear and exponential functions. In F.BF.2, connect arithmetic sequences to linear functions and geometric sequences to exponential functions. In **Mathematics II**, focus on situations that exhibit a quadratic or exponential relationship. The expectation in **Mathematics III** is to develop models for more complex or sophisticated situations than in previous courses.

Building Functions F.BF

Common Core Cluster

Build new functions from existing functions.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.BF.3 Identify the effect on the graph of replacing f(x) by f(x) + k, k f(x), f(kx), and f(x + k) for specific values of k (both positive and negative); find the value of k given the graphs. Experiment with cases and illustrate an explanation of the effects on the graph using technology. *Include recognizing even and odd functions from their graphs and algebraic expressions for them.*	**F.BF.3** Identify, through experimenting with technology, the effect on the graph of a function by replacing f(x) with f(x) + k, k•f(x), f(kx), and f(x + k) for specific values of k (both positive and negative). **F.BF.3** Given the graphs of the original function and a transformation, determine the value of (k). **F.BF.3** Recognize even and odd functions from their graphs and equations.
F.BF.4 Find inverse functions. a. Solve an equation of the form f(x) = c for a simple function f that has an inverse and write an expression for the inverse. For example, $f(x) = 2x^3$ or $f(x) = (x+1)/(x–1)$ for $x \neq 1$.	**F.BF.4a** Solve a function for the dependent variable and write the inverse of a function by interchanging the values of the dependent and independent variables. **F.BF.4b** Verify that one function is the inverse of another by illustrating that $f^{-1}(f(x)) = f(f^{-1}(x)) = x$. **F.BF.4c** Read values of an inverse function from a graph or table.

b. (+) Verify by composition that one function is the inverse of another. c. (+) Read values of an inverse function from a graph or a table, given that the function has an inverse. d. (+) Produce an invertible function from a non-invertible function by restricting the domain.	**F.BF.4d** Find the inverse of a function that is not one-to-one by restricting the domain.
F.BF.5 (+) Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.	**F.BF.5** Understand the inverse relationship between exponents and logarithms and use this relationship to solve problems involving logarithms and exponents.

Instructional Expectations

In the **traditional pathway**, **Algebra I** focuses on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard. For F.BF.3, focus on quadratic functions, and consider including absolute value functions. For F.BF.4a, focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as $f(x) = x^2$, $x>0$. In **Algebra II**, use transformations of functions to find models as students consider increasingly more complex situations. For F.BF.3, note the effect of multiple transformations on a single graph and the common effect of each transformation across function types. Extend F.BF.4a to simple rational, simple radical, and simple exponential functions; connect F.BF.4a to F.LE.4.

In the **international pathway**, in **Mathematics I**, the expectation is to focus on vertical translations of graphs of linear and exponential functions. Relate the vertical translation of a linear function to its y-intercept. While applying other transformations to a linear graph is appropriate at this level, it may be difficult for students to identify or distinguish between the effects of the other transformations included in this standard. In **Mathematics II**, for F.BF.3, focus on quadratic functions and consider including absolute value functions.. For F.BF.4a, focus on linear functions but consider simple situations where the domain of the function must be restricted in order for the inverse to exist, such as f(x) = x2, x>0. In **Mathematics III**, Use transformations of functions to find more optimum models as students consider increasingly more complex situations. For F.BF.3, note the effect of multiple transformations on a single function and the common effect of each transformation across function types. Include functions defined only by a graph. Extend F.BF.4a to simple rational, simple radical, and simple exponential functions; connect F.BF.4a to F.LE.4.

Linear, Quadratic, and Exponential Models* F.LE

Common Core Cluster

Construct and compare linear, quadratic, and exponential models and solve problems.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. a. Prove 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.	**F.LE.1** Given a contextual situation, describe whether the situation in question has a linear pattern of change or an exponential pattern of change. **F.LE.1a** Show that linear functions change at the same rate over time and that exponential functions change by equal factors over time. **F.LE.1b** Describe situations where one quantity changes at a constant rate per unit interval as compared to another. **F.LE.1c** Describe situations where a quantity grows or decays at a constant percent rate per unit interval as compared to another.
F.LE.2 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).	**F.LE.2** Create linear and exponential functions given the following situations: - arithmetic and geometric sequences - a graph - a description of a relationship - two points, which can be read from a table

Instructional Expectations

Linear, Quadratic, and Exponential Models* F.LE

Common Core Cluster

Construct and compare linear, quadratic, and exponential models and solve problems.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.LE.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.	**F.LE.3** Make the connection, using graphs and tables, that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or any other polynomial function.
F.LE.4 For exponential models, express as a logarithm the solution to $ab^{ct} = d$ where a,c, and d are numbers and the base b Is 2,10,or e; evaluate the logarithm using technology.	**F.LE.4** Express logarithms as solutions to exponential functions using bases 2, 10, and e. **F.LE.4** Use technology to evaluate a logarithm.

Instructional Expectations
In the **traditional pathway**, in **Algebra I**, for F.LE.3, limit to comparisons between linear and exponential models. In constructing linear functions in F.LE.2, draw on and consolidate previous work in Grade 8 on finding equations for lines and linear functions (8.EE.6, 8.F.4). In **Algebra II**, consider extending this unit to include the relationship between properties of logarithms and properties of exponents, such as the connection between the properties of exponents and the basic logarithm property that log xy = log x +log y. In the **international pathway**, the expectation for **Mathematics I** is for F.LE.3, limit to comparisons between exponential and linear models. In **Mathematics II**, compare linear and exponential growth studied in Mathematics I to quadratic growth. In **Mathematics III**, consider extending this unit to include the relationship between properties of logarithms and properties of exponents, such as the connection between the properties of exponents and the basic logarithm property that log xy = log x + log y.

Linear, Quadratic, and Exponential Models* F.LE

Common Core Cluster

Interpret expressions for functions in terms of the situation they model.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.LE.5 Interpret the parameters in a linear or exponential function in terms of a context.	**F.LE.5** Based on the context of a situation, explain the meaning of the coefficients, factors, exponents, and/or intercepts in a linear or exponential function.

Instructional Expectations
Limit exponential functions to those of the form $f(x) = b^x + k$.

Trigonometric Functions F.TF

Common Core Cluster

Extend the domain of trigonometric functions using the unit circle.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.TF.1 Understand radian measure of an angle as the length of the arc on the unit circle subtended by the angle.	**F.TF.1** Know that if the length of an arc subtended by an angle is the same length as the radius of the circle, then the measure of the angle is 1 radian. **F.TF.1** Know that the graph of the function, *f*, is the graph of the equation *y=f(x)*.
F.TF.2 Explain how the unit circle in the coordinate plane enables the extension of trigonometric functions to all real numbers, interpreted as radian measures of angles traversed counterclockwise around the unit circle.	**F.TF.2** Explain how radian measures of angles rotated counterclockwise in a unit circle are in a one-to-one correspondence with the nonnegative real numbers, and that angles rotated clockwise in a unit circle are in a ont-to-one correspondence with the non-positive real numbers.
F.TF.3 (+) Use special triangles to determine geometrically the values of sine, cosine, tangent for π/3, π/4 and π/6, and use the unit circle to express the values of sine, cosines, and tangent for x, π+x, and 2π–x in terms of their values for x, where x is any real number.	**F.TF.3** Use 30º-60º-90º and 45º-45º-90º triangles to determine the values of sine, cosine, and tangent for values of $\frac{\pi}{3}$, $\frac{\pi}{4}$, and $\frac{\pi}{6}$.

Instructional Expectations
In the traditional pathway, F.TF.1 and F.TF.2 are in **Algebra II**. In the international pathway, F.TF.1 and F.TF.2 are in **Mathematics III**. F.TF.3 and F.TF.4 are reserved for a fourth math course in both pathways.

Trigonometric Functions F.TF

Common Core Cluster

Extend the domain of trigonometric functions using the unit circle.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.TF.4 (+) Use the unit circle to explain symmetry (odd and even) and periodicity of trigonometric functions.	**F.TF.4** Use the unit circle and periodicity to find values of sine, cosine, and tangent for any value of θ, such as $\pi + \theta$, $2\pi + \theta$, where θ is a real number. **F.TF. 4** Use the values of the trigonometric functions derived from the unit circle to explain how trigonometric functions repeat themselves. **F.TF.4** Use the unit circle to explain that f(x) is an even function if f(-x) = f(x), for all x, and an odd function if f(-x) = -f(x). Also know that an even function is symmetric about the y-axis.

Instructional Expectations
F.TF.4 is reserved for a fourth math course.

Trigonometric Functions F.TF

Common Core Cluster

Model periodic phenomena with trigonometric functions.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.TF.5 Choose trigonometric functions to model periodic phenomena with specified amplitude, frequency, and midline.*	**F.TF.5** Use sine and cosine to model periodic phenomena such as the ocean's tide or the rotation of a Ferris wheel. **F.TF.5** Given the amplitude; frequency; and midline in situations or graphs, determine a trigonometric function used to model the situation.
F.TF.6 (+) Understand that restricting a trigonometric function to a domain on which it is always increasing or always decreasing allows its inverse to be constructed.	**F.TF.6** Know that the inverse for a trigonometric function can be found by restricting the domain of the function so it is always increasing or decreasing.
F.TF.7 (+) Use inverse functions to solve trigonometric equations that arise in modeling contexts; evaluate the solutions using technology, and interpret them in terms of the context.*	**F.TF.7** Use the inverse of trigonometric functions to solve equations that arise in real-world contexts. **F.TF.7** Use technology to evaluate the solutions to the inverse trigonometric functions, and interpret their meaning in terms of the context.

Instructional Expectations
In the traditional pathway, F.TF.5 is in **Algebra II**, and F.TF.6 and F.TF.7 are reserved for a fourth math course. In the international pathway, F.TF.5 is in **Mathematics III**, and F.TF.6 and F.TF.7 are reserved for a fourth math course.

Trigonometric Functions F.TF

Common Core Cluster

Prove and apply trigonometric identities.

Common Core Standard	Unpacking What does this standard mean that a student will know and be able to do?
F.TF.8 Prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ and use it to calculate trigonometric ratios.	**F.TF.8** Use the unit circle to prove the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$. **F.TF.8** Given the value of the $\sin(\theta)$ or $\cos(\theta)$, use the Pythagorean identity $\sin^2(\theta) + \cos^2(\theta) = 1$ to calculate other trigonometric ratios.
F.TF.9 (+) Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems.	**F.TF.9** Prove the addition and subtraction formulas $\sin(\alpha \pm \beta)$, $\cos(\alpha \pm \beta)$, and $\tan(\alpha \pm \beta)$. **F.TF.9** Use the addition and subtraction formulas to determine exact trigonometric values such as $\sin(75^o)$ or $\cos(\frac{\pi}{12})$.

Instructional Expectations
In the traditional pathway, F.TF.8 is in **Algebra II**, however an Algebra II course with an additional focus on trigonometry could include the (+) standard F.TF.9: Prove the addition and subtraction formulas for sine, cosine, and tangent and use them to solve problems. This could be limited to acute angles in Algebra II