Understand the concept of a linear or exponential function and use function notation. Recognize arithmetic and geometric sequences as examples of linear and exponential functions (F.IF.1-3)
Standard I.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)*.
Concepts and Skills to Master
- Understand the definition of a function in terms of mapping elements from one set (domain) to another set (range).   - Explain how a given representation of a function (graph, table, equation, context, geometric model) can be used to identify elements of the domain and corresponding elements of the range (*x, f(x)*).   - Understand the graph of *f* is the graph of the equation *y=f(x)*.

Related Standards: Current Course	Related Standards: Future Courses
All function standards (functions are used throughout high school mathematics courses), I.A.REI.10, I.F.IF.5	All function standards (functions are used throughout high school mathematics courses)

Support for Teachers

Critical Background Knowledge
- A function is a rule that assigns to each input exactly one output (8.F.1)   - Multiple representations (tables, graphs, equations, context, geometric models) (8.F.2)
Academic Vocabulary
Domain, range, function, input, output, corresponding, set, element
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Understand the concept of a linear or exponential function and use function notation. Recognize arithmetic and geometric sequences as examples of linear and exponential functions (F.IF.1-3)
Standard I.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.
Concepts and Skills to Master
- Use function notation   - Evaluate functions, including functions created using arithmetic operations (example: *f(x) + g(x) or f(x) – g(x)*).   - Interpret statements that use function notation in terms of a context (example: given a context, explain *f(5) = 12*)

Related Standards: Current Course	Related Standards: Future Courses
All function standards (function notation is used throughout high school mathematics courses)	All function standards (function notation is used throughout high school mathematics courses)

Support for Teachers

Critical Background Knowledge
Evaluate expressions (6.EE.2c)
Academic Vocabulary
Function notation, evaluate, input, domain, output, range
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Understand the concept of a linear or exponential function and use function notation. Recognize arithmetic and geometric sequences as examples of linear and exponential functions (F.IF.1-3)
Standard I.F.IF.3: Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers. Recognize arithmetic and geometric sequences as examples of linear and exponential functions. *For example, the Fibonacci sequence is defined recursively by* $f(0)=f(1)=1, f(n+1)=f(n)+f(n-1) for n \geq 1$.
Concepts and Skills to Master
- Recognize that sequences are functions (recognize the domain is the number of the term and the range is the value of the term).   - Define and express a recursive sequence as a function.   - Recognize that a sequence has a domain which is a subset of integers.

Related Standards: Current Course	Related Standards: Future Courses
I.F.BF.1a, I.F.BF.2, I.F.LE.1, I.F.LE.2	II.F.BF.1a, III.A.SSE.4

Support for Teachers

Critical Background Knowledge
- Use function notation (I.F.IF.2)   - Understand definition of function (8.F.1 and I.F.IF.1)   - Recognize sequences (taught concurrently with I.F.BF.1, I.F.BF.2)
Academic Vocabulary
Recursive, sequence, functions, domain, range, subset, term
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Interpret linear or exponential functions that arise in applications in terms of a context (F.IF.4-6)
Standard I.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; symmetries; and end behavior.*

Concepts and Skills to Master
- Given a graph, identify key features including x- and y-intercepts; *intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.*   - Given a table of values, identify key features such as x- and y-intercepts; *intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; and end behavior.*   - Use key features to sketch a graph of the function.   - Use interval notation and symbols of inequality to communicate key features of graphs.

Related Standards: Current Course	Related Standards: Future Courses
I.F.IF.6, I.F.IF.7, F.IF.9, I.F.LE.1, I.F.LE.3	II.F.IF.4, II.F.IF.6, II.F.IF.7, II.F.IF.9, II.F.LE.3, III.F.IF.4, III.F.IF.6, III.F.IF.7

Support for Teachers

Critical Background Knowledge
Ability to graph a linear (8.F.2) or exponential function from a table or equation
Academic Vocabulary
Increasing, decreasing, positive, negative, intervals, intercepts, interval notation, maximum, minimum, symmetry, and end behavior
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Interpret linear or exponential functions that arise in applications in terms of a context (F.IF.4-6)	
Standard I.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.*	
Concepts and Skills to Master	
- Identify domain of a function from any representation. - Relate the domain to context, explaining restrictions as a result of the context.	
Related Standards: Current Course	Related Standards: Future Courses
I.A.CED.2, All functions standards (domain is used throughout high school mathematics courses)	II.A.CED.2, All functions standards (domain is used throughout high school mathematics courses)

Support for Teachers

Critical Background Knowledge
- Familiarity with function notation and domain (I.F.IF.2)   - Understand the definition of function (8.F.1 and I.F.IF.1)   - Independent, dependent variables and input/output (8.F.1)
Academic Vocabulary
Domain, function
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Interpret linear or exponential functions that arise in applications in terms of a context (F.IF.4-6)
Standard I.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. ⬚
Concepts and Skills to Master
• Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Focus on linear and exponential functions. • Estimate the rate of change from a graph.

Related Standards: Current Course	Related Standards: Future Courses
I.F.IF.9, I.F.LE.1, I.F.LE.3, I.S.ID.6, I.S.ID.7	II.F.IF.6, II.F.IF.9, II.F.LE.3, III.F.IF.6, III.F.IF.9, III.F.LE.3

Support for Teachers

Critical Background Knowledge
• Determine the rate of change from a description of a relationship or from two (x,y) values and interpret its meaning (8.F.4) • Explain the slope *m* between any two points on a non-vertical line (8.EE.6)
Academic Vocabulary
Average rate of change, interval
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Analyze linear or exponential functions using different representations (F.IF.7,9)
Standard I.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 functions and show intercepts.
e. Graph exponential functions, showing intercepts and end behavior.

Concepts and Skills to Master
•   Given an equation of a linear or exponential function, create a graph by hand and show key features (intercepts, end behavior).   •   Given an equation of a linear or exponential function, create a graph with technology and show key features (intercepts, end behavior).

Related Standards: Current Course	Related Standards: Future Courses
I.F.IF.4, I.F.IF.5, I.F.IF.6, I.A.REI.6, I.A.REI.11, I.A.REI.12, I.F.BF.3	II.F.IF.4, II.F.IF.7a, b, III.F.IF.4, III.F.IF.7b, c, d, e

Support for Teachers

Critical Background Knowledge
•   Graph linear functions (8.EE.5, 8.F.3, and 8.F.5)
Academic Vocabulary
Linear, exponential, intercept, end behavior
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625

Analyze linear or exponential functions using different representations (F.IF.7,9)
Standard I.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, compare the growth of two linear functions, or two exponential functions such as* $y=3^n$ *and* $y=100\bullet2^n$.

Concepts and Skills to Master

• Compare properties of two functions, keeping the following in mind:
     o properties include rate of change, intercepts, end behavior
     o function pairs include linear to linear, linear to exponential, exponential to exponential
     o representations include algebraically, graphically, numerically in tables, or by verbal descriptions

Related Standards: Current Course	Related Standards: Future Courses
I.F.IF.4, I.F.IF.7, I.F.LE.3, I.S.ID.7	II.F.IF.4, II.F.IF.7, II.F.LE.3, III.F.IF.4, III.F.IF.7, III.F.LE.3

Support for Teachers

Critical Background Knowledge (Activating prior knowledge)
• Compare properties of two functions (linear to linear), each represented in a different way (8.F.2)   • Interpret the equation of *y = mx+b* as defining a linear function (8.F.3)   • Construct a function, determine and interpret a rate of change and initial value of a linear function (8.F.4)   • Analyze graphs (increasing, decreasing, linear or nonlinear) (8.F.5)
Academic Vocabulary
function, slope, rate of change, intercept, interval, growth rate
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5630#71625