The mission of the Chardon Local Schools is high achievement for all students where learning is our most important work.

Course of Study — MATH

Revised November 2021

ALGEBRA — MTH100

CHARDON LOCAL SCHOOLS

#WeAreChardon

COS — MATH — *Revised November 2021*

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Strand #1: Linear Functions

Power Objective #1: Understand the aspects of a linear function and what it means to be a function

Learning Standard:	How Taught?
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.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context. A.SSE.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 by viewing one or more of their parts as a single entity. 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 the following: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★ (A2, M3) a. Focus on **linear** and exponential functions. (M1) b. Focus on **linear**, quadratic, and exponential functions. (A1, M2) 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.★ a. Focus on **linear** and exponential functions. (M1)	**Teaching activities may include, but are not limited to:** • Direct Instruction • Cooperative Groups • Stations • Data Driven Instruction • Scaffolding

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b. Focus on **linear**, quadratic, and exponential functions. (A1, M2) 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. (A2, M3) a. Focus on **linear**, quadratic, and exponential functions. (A1, M2) F.BF.4 Find inverse functions. a. Informally determine the input of a function when the output is known. (A1, M1)	
Materials: • Calculator (Desmos, TI-30X IIS) • Guided Notes • Board Adopted Materials	**How Assessed?** **Assessments may include, but are not limited to:** • Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics) • Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics) • Summative Assessments (tests/exams, projects, creative assignments, presentations) **How Re-Taught?** **Re-teaching activities may include, but are not limited to:** • breaking down concept into smaller components • presenting the information again in a different way • Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way • practice activities such as computer tutorials, games, hands-on activities • review sessions

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Strand #1: Linear Functions

Power Objective #2: Understand the processes in solving equations and inequalities in one variable

Learning Standard:

A.REI.1 Explain each step in solving an equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution.

A.REI.3 Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

- Calculator (Desmos, TI-30X IIS)
- Guided Notes
- Board Adopted Materials

How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

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Strand #1: Linear Functions

Power Objective #3: Create equations that describe numbers or relationships

Learning Standard:

A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations and inequalities rising from linear functions.

a. Focus on applying **linear** and simple exponential expressions (A1, M1)

A.CED.2 Create equations in two variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

a. Focus on applying **linear** and simple exponential expressions (A1, M1)

A.CED.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.

a. Focus on formulas in which the variable of interest is **linear** or square. For example, rearrange Ohm's law V = IR to highlight resistance R, or rearrange the formula for the area of a circle A = (pi)r^2 to highlight radius r. (A1)

How Taught?

Teaching activities may include, but are not limited to:

- Direct Instruction
- Cooperative Groups
- Stations
- Data Driven Instruction
- Scaffolding

Materials:

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- Guided Notes
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Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
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	How Re-Taught? **Re-teaching activities may include, but are not limited to:** ● breaking down concept into smaller components ● presenting the information again in a different way ● Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way ● practice activities such as computer tutorials, games, hands-on activities ● review sessions

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Strand #1: Linear Functions

Power Objective #4: Represent and solve equations and inequalities graphically

Learning Standards:

A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A.REI.11 Explain why the x-coordinates of the points where the graph of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, making tables of values, or finding successive approximations.

A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

A.CED.3 Represent constraints by equations or inequalities and by systems of equations and/or inequalities and interpret solutions as viable or non-viable options in a modeling context

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

- Calculator (Desmos, TI-30X IIS)
- Guided Notes
- Board Adopted Materials

How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
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How Re-Taught?

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Strand #1: Linear Functions

Power Objective #5: Create and Analyze Linear Models

Learning Standards:	**How Taught?**
F.LE.1a Distinguish between situations that can be modeled with **linear** functions.★ a. Show that **linear** functions grow by equal differences 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.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.5 Interpret the parameters in a **linear** or exponential function in terms of a context.★ F.IF.7 Graph functions expressed symbolically and indicate key features of the graph, by hand in simple cases and using technology for more complicated cases. Include applications and how key features relate to characteristics of a situation, making selection of a particular type of function model appropriate.★ a. Graph **linear** functions and indicate intercepts.	**Teaching activities may include, but are not limited to:** • **Direct Instruction** • **Cooperative Groups** • **Stations** • **Data Driven Instruction** • **Scaffolding**
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	• Summative Assessments (tests/exams, projects, creative assignments, presentations)
	How Re-Taught? **Re-teaching activities may include, but are not limited to:** • breaking down concept into smaller components • presenting the information again in a different way • Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way • practice activities such as computer tutorials, games, hands-on activities • review sessions

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Strand #1: Linear Functions

Power Objective #6: Perform arithmetic operations on polynomials

Learning Standards:

A.APR.1a Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

a. Focus on polynomial expressions that simplify to forms that are **linear** or quadratics. (A1, M2)

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

- Calculator (Desmos, TI-30X IIS)
- Guided Notes
- Board Adopted Materials

How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

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Strand #1: Linear Functions

Power Objective #7: Use statistics and probability to analyze data

Learning Standards:

S.ID.5 Summarize categorical data for two categories in two-way frequency tables. Interpret relative frequencies in the context of the data (including joint, marginal, and conditional relative frequencies). Recognize possible associations and trends in the data.

S.ID.6c Represent data on two quantitative variables on a scatter plot, and describe how the variables are related. ★

a. Fit a **linear** function for a scatterplot that suggests a linear association.

S.ID.7 Interpret the slope (rate of change) and the intercept (constant term) of a **linear** model in the context of the data.

S.ID.8 Compute (using technology) and interpret the correlation coefficient of a **linear** fit.

How Taught?

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- **Data Driven Instruction**
- **Scaffolding**

Materials:

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- Board Adopted Materials

How Assessed?

Assessments may include, but are not limited to:

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- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
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How Re-Taught?

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Strand #2: Systems of Equations

Power Objective #1: Solve systems of equations

Learning Standard:

A.REI.5 Verify that, given a system of two equations in two variables, replacing one equation by the sum of that equation and a multiple of the other produces a system with the same solutions.

A.REI.6 Solve systems of linear equations algebraically and graphically.

a. Limit to pairs of linear equations in two variables

A.CED.3 Represent constraints by equations or inequalities and by systems of equations and/or inequalities and interpret solutions as viable or non-viable options in a modeling context

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

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- presenting the information again in a different way

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Strand #2: Systems of Equations

Power Objective #2: Represent and solve equations and inequalities graphically

Learning Standard:

A.REI.10 Understand that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane, often forming a curve (which could be a line).

A.REI.11 Explain why the x-coordinates of the points where the graph of the equations y = f(x) and y = g(x) intersect are the solutions of the equation f(x) = g(x); find the solutions approximately, e.g., using technology to graph the functions, making tables of values, or finding successive approximations.

A.REI.12 Graph the solutions to a linear inequality in two variables as a half-plane (excluding the boundary in the case of a strict inequality), and graph the solution set to a system of linear inequalities in two variables as the intersection of the corresponding half-planes.

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
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Materials:

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How Re-Taught?

Re-teaching activities may include, but are not limited to:

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Strand #3: Sequences

Power Objective #1: Understand the concept of a function and use function notation

Learning Standard:

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 $n \geq 1$

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. ★
b. Focus on linear, quadratic, and exponential functions. (A1, M2)

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

- Calculator (Desmos, TI-30X IIS)
- Guided Notes
- Board Adopted Materials

How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

- breaking down concept into smaller components

	• presenting the information again in a different way • Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way • practice activities such as computer tutorials, games, hands-on activities • review sessions

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Strand #3: Sequences

Power Objective #2: Build a function that models a relationship between two quantities

Learning Standard:

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. ★

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

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How Assessed?

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How Re-Taught?

Re-teaching activities may include, but are not limited to:

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Strand #3: Sequences

Power Objective #3: Create Linear and Exponential Models from multiple representations

Learning Standard:

F.LE.1 Distinguish between situations that can be modeled with linear functions and with exponential functions. ★

a. Show 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.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.3 Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly or quadratically. ★

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

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How Re-Taught?

Re-teaching activities may include, but are not

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Strand 4: Exponential Functions

Power Objective #1: Interpret functions that arise in applications in terms of the context

Learning Standard:

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 the following: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★ (A2, M3)

b. Focus on linear, quadratic, and exponential functions. (A1, M2)

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.★

b. Focus on linear, quadratic, and exponential functions. (A1, M2)

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
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- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

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Assessments may include, but are not limited to:

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How Re-Taught?

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Strand 4: Exponential Functions

Power Objective #2: IAnalyze functions using different representations

Learning Standard:	**How Taught?**
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 the following: intercepts; intervals where the function is increasing, decreasing, positive, or negative; relative maximums and minimums; symmetries; end behavior; and periodicity.★ (A2, M3) c. Focus on linear, quadratic, and exponential functions. (A1, M2) 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.★ c. Focus on linear, quadratic, and exponential functions. (A1, M2)	**Teaching activities may include, but are not limited to:** ● **Direct Instruction** ● **Cooperative Groups** ● **Stations** ● **Data Driven Instruction** ● **Scaffolding**
Materials: ● Calculator (Desmos, TI-30X IIS) ● Guided Notes ● Board Adopted Materials	**How Assessed?** **Assessments may include, but are not limited to:** ● Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics) ● Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics) ● Summative Assessments (tests/exams, projects, creative assignments, presentations)
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Strand 4: Exponential Functions

Power Objective #3: Create equations and expressions that describe numbers or relationships

Learning Standard:

A.CED.1 Create equations and inequalities in one variable and use them to solve problems. Include equations and inequalities rising from linear, quadratic, simple rational, and exponential functions.

a. Focus on applying linear and simple exponential expressions (A1, M1)

A.CED.2 Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.

a. Focus on applying linear and simple exponential expressions (A1, M1)

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

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

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How Assessed?

Assessments may include, but are not limited to:

- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

- breaking down concept into smaller components
- presenting the information again in a different way

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	• Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way • practice activities such as computer tutorials, games, hands-on activities • review sessions

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Strand 4: Exponential Functions

Power Objective #4: Write expressions in equivalent forms to solve problems

Learning Standard:

A.SSE.3 Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. ★

c. Use the properties of exponents to transform expressions for **exponential** functions. For example, 8^t can be written as 2^{3t}

How Taught?

Teaching activities may include, but are not limited to:

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- **Stations**
- **Data Driven Instruction**
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Materials:

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How Assessed?

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- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?

Re-teaching activities may include, but are not limited to:

- breaking down concept into smaller components
- presenting the information again in a different way
- Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way
- practice activities such as computer tutorials, games, hands-on activities
- review sessions

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Strand 4: Exponential Functions

Power Objective #5: Build a function that models a relationship between two quantities

Learning Standard:

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 context.
  - i. Focus on linear and **exponential** functions. (A1, M1)
  - ii. Focus on situations that exhibit quadratic or **exponential** relationships. (A1, M2)

F.BF.4a Find inverse functions.
- a. Informally determine the input of a function when the output is known

How Taught?

Teaching activities may include, but are not limited to:
- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:
- Calculator (Desmos, TI-30X IIS)
- Guided Notes
- Board Adopted Materials

How Assessed?

Assessments may include, but are not limited to:
- Pre-Assessments (pre-tests, observation, anticipation guide, questioning, diagnostics)
- Formative Assessments (entry/exit slips, group work, reflections, discussions, homework/classwork, self and peer evaluations, observations, conferences, rubrics)
- Summative Assessments (tests/exams, projects, creative assignments, presentations)

How Re-Taught?

Re-teaching activities may include, but are not limited to:
- breaking down concept into smaller components
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Strand 4: Exponential Functions

Power Objective #6: Analyze Exponential Models from multiple representations

Learning Standard:

F.LE.1 Distinguish between situations that can be modeled with linear functions and with **exponential** functions. ★

a. Show 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.3 Observe using graphs and tables that a quantity increasing **exponentially** eventually exceeds a quantity increasing linearly or quadratically. ★

F.LE.5 Interpret the parameters in a linear or **exponential** function in terms of a context. ★

How Taught?

Teaching activities may include, but are not limited to:

- **Direct Instruction**
- **Cooperative Groups**
- **Stations**
- **Data Driven Instruction**
- **Scaffolding**

Materials:

- Calculator (Desmos, TI-30X IIS)
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How Re-Taught?

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	Re-teaching activities may include, but are not limited to: ● breaking down concept into smaller components ● presenting the information again in a different way ● Universal Design for Learning principles offering students opportunities to experience and engage material in new and different way ● practice activities such as computer tutorials, games, hands-on activities ● review sessions