OER Secondary Mathematics
EDITION 1

Module 1

150-Day Topic Pacing Guides

MODULE 1, TOPIC 1 PACING GUIDE

150-Day Pacing

1 Searching for Patterns

TOPIC 1: Quantities and Relationships

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1E, A.1F, A.1G

ELPS: 1.A, 1.B, 1.C, 1.E, 1.F, 2.C, 2.E, 2.I, 3.D, 3.E, 3.H, 4.C, 4.E, 4.G, 4.H, 5.B, 5.F

Topic Pacing: 12 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
	Introduction to the Problem-Solving Model and Learning Resources	Students reflect on learning a new skill and the variety of ways they learn. The problem-solving model, TEKS mathematical process standards, and the Academic Glossary help students complete a problem-solving activity. Students reflect on and summarize the problem-solving process. Since the intent of this lesson is to introduce the problem-solving model and review the TEKS mathematical process standards, the focus is on process not content. Students will need access to the Academic Glossary, Problem-Solving Model Graphic Organizer, Problem-Solving Model Questions to Ask, and TEKS mathematical process standards which are located in the Course Guide. These materials should always be available to students throughout the course. **Materials Needed:** (located in the Course Guide) Academic Glossary, Problem-Solving Model Graphic Organizer, Problem-Solving Model Questions to Ask, TEKS Mathematical Process Standards	**A.3C**	**0**
1	Understanding Quantities and Their Relationships	Students are presented with various scenarios and identify the independent and dependent quantities for each. They then match a graph to the appropriate scenario, label the axes using the independent and dependent quantities, and create the scale for the axes. Students make basic observations about the similarities and differences in the graphs. They then look more deeply at pairs of scenarios along with their graphs to focus on characteristics of the graphs, such as intercepts, increasing and decreasing intervals, and maximum and minimum points. The lesson concludes with students creating their own scenario and a sketch of a graph to model the scenario. **Materials Needed:** Glue Sticks, Scissors	**A.3C** **A.7A** **A.9D**	2
2	Analyzing and Sorting Graphs	Students begin this lesson by cutting out 13 different graphs. They sort the graphs into different groups based on their own rationale, compare their groupings with their classmates, and discuss the reasoning behind their choices. Next, four different groups of graphs are given, and students analyze the groupings and explain possible rationales behind the choices made. Students explore different representations of relations. Students need to keep their graphs as they will be used in lessons that follow. **Materials Needed:** Scissors, Graph Cards (located at the end of the lesson)	**A.3C** **A.7A** **A.9D**	1

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 1, TOPIC 1 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Recognizing Functions and Function Families**	The definitions *function* and *function notation* are introduced in this lesson. For the remainder of the lesson, students use graphing technology to connect equations written in function forms to their graphs and then identify the function family to which they belong. The terms *increasing function*, *decreasing function*, and *constant function* are defined, and students sort the graphs from the previous lesson into these groups and a group labeled for functions that include a combination of increasing, decreasing, and constant intervals. The terms *function family*, *linear function*, and *exponential function* are then defined, and students sort the increasing constant and decreasing functions into one of these families. Next, the terms *absolute minimum* and *absolute maximum* are defined, as well as the term *quadratic function*. Students sort the functions with an absolute minimum or absolute maximum. Students then complete a graphic organizer for each function family that describes the graphical behavior and displays graphical examples. In the final activity, students use their knowledge of the function families to demonstrate how the families differ with respect to their *x*- and *y*-intercepts. Graphing technology is necessary to help students connect some equations and their graphs. **Materials Needed:** Graphs from *Analyzing and Sorting Graphs*, Graphing Technology, Glue Sticks	**A.2A** **A.3C** **A.6A** **A.7A** A.9A **A.9D** A.12A	3
4	**Recognizing Functions by Characteristics**	Given characteristics describing the graphical behavior of specific functions, students name the possible function family/families that fit each description. Students revisit the scenarios and graphs from the first lesson, name the function family associated with each scenario, identify the domain, and describe the graph. Students then write equations and sketch graphs to satisfy a list of characteristics. They conclude by determining that a function or equation, not just a list of characteristics, is required to generate a unique graph. **Materials Needed:** Graphs from *Analyzing and Sorting Graphs*, Problem-Solving Model Graphic Organizer	**A.2A** **A.3C** **A.6A** **A.7A** A.9A **A.9D** A.12A	2
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				**3**

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MODULE 1, TOPIC 1 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the objectives of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.3C**, **A.7A**, **A.9D**		TEKS: **A.3C**, **A.7A**, **A.9D**		TEKS: **A.2A**, **A.3C**, **A.6A**, **A.7A**, A.9A, **A.9D**, A.12A
LESSON 1 Understanding Quantities and Their Relationships GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 1** continued ACTIVITY 2 ✪ TALK THE TALK	**LESSON 2** Analyzing and Sorting Graphs GETTING STARTED ✪ ACTIVITY 1 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 3** Recognizing Functions and Function Families GETTING STARTED ACTIVITY 1 ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
LESSON 3 continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 3** continued ACTIVITY 4 ✪ ACTIVITY 5 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: **A.2A**, **A.3C**, **A.6A**, **A.7A**, A.9A, **A.9D**, A.12A **LESSON 4** Recognizing Functions by Characteristics GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 4** continued ACTIVITY 2 ✪ TALK THE TALK
Day 11	**Day 12**			
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**			

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How can you incorporate Skills Practice with student?

There are three Learning Individually days scheduled within this topic. The placement of these days within the topic is flexible. The intent is to distribute spaced and interleaved practice throughout a topic and throughout the year. It is not necessary for students to complete all Skills Practice for the topic and different students may complete different problem sets. You should use data to strategically assign problem sets aligned to individual student needs. You should analyze student responses from the following embedded assessment opportunities to help assess individual needs: Essential Questions, Talk the Talks, Student Self-Reflections, and End of Topic Assessments. For students who are building their proficiency, you can assign problem sets to target specific skills. For students who have demonstrated proficiency, there are extension problems of varied levels of challenge.

How can you identify whether students are ready for new learning?

The Prepare section of the Lesson Assignments and the Spaced Practice set of Skills Practice can serve as diagnostic tools. Depending on available time, you can assign the Prepare section of the Lesson Assignments as homework or as a warm-up to identify students' prior knowledge for the upcoming lesson's activities. You can also use the Spaced Practice sets of Skills Practice to analyze individual students' level of proficiency on standards from previous topics.

MODULE 1, TOPIC 2 PACING GUIDE

150-Day Pacing

1 Searching for Patterns

TOPIC 2: Sequences

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1C, A.1D, A.1E, A.1F, A.1G

ELPS: 1.A, 1.C, 1.E, 3.D, 3.E, 3.J, 4.B, 5.A, 5.B, 5.F

Topic Pacing: 10 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Recognizing Patterns and Sequences	Students begin by exploring various patterns in Pascal's triangle. *Sequence* and *term of a sequence* are defined. Given four geometric patterns or contexts, students write a numeric sequence to represent each problem. They are guided to represent each sequence as a table of values and conclude that all sequences are functions. Students then organize the sequences in a table, state whether each sequence is increasing or decreasing, and describe the sequence using a starting value and operation. They determine that all sequences have a domain that includes only positive integers. *Infinite sequence* and *finite sequence* are defined and included as another characteristic for students to consider as they write sequences. **Materials Needed:** Problem-Solving Model Graphic Organizer	A.12A	1
2	Arithmetic and Geometric Sequences	Given eight numeric sequences, students generate several additional terms for each sequence and describe the rule they used for each sequence. They sort the sequences into groups based upon common characteristics of their choosing and explain their rationale. The terms *arithmetic sequence*, *common difference*, *geometric sequence*, and common ratio are then defined, examples are provided, and students respond to clarifying questions. They then categorize the sequences from the beginning of the lesson as arithmetic, geometric, or neither and identify the common difference or common ratio where appropriate. Students begin to create graphic organizers, identifying four different representations for each arithmetic and geometric sequence. In the first activity, they glue each arithmetic and geometric sequence to a separate graphic organizer and label them, and in the second activity, the corresponding graph is added. The remaining representations are completed in the following lessons. This lesson concludes with students writing sequences given a first term and a common difference or common ratio and identifying whether the sequences are arithmetic or geometric. **Materials Needed:** Scissors, Glue, Sequence and Graph Cards (located at the end of the lesson)	A.12A A.12C	1

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MODULE 1, TOPIC 2 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Determining Recursive and Explicit Expressions from Contexts**	Scenarios are presented that can be represented by arithmetic and geometric sequences. Students determine the value of terms in each sequence. The term *recursive formula* is defined and used to generate term values. As the term number increases, it becomes more time consuming to generate the term value. This sets the stage for *explicit formulas* to be defined and used. Students practice using these formulas to determine the values of terms in both arithmetic and geometric sequences. Students write recursive and explicit formulas for sequences and represent sequences as graphs. **Materials Needed:** Graphic Organizers from Lesson 2: *Arithmetic and Geometric Sequences*	A.12C A.12D	4
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				3

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MODULE 1, TOPIC 2 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the learning goals of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: A.12A		TEKS: A.12A, A.12C		TEKS: A.12C, A.12D
LESSON 1 Recognizing Patterns and Sequences GETTING STARTED ACTIVITY 1 ✪ ACTIVITY 2 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Arithmetic and Geometric Sequences GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 3** Determining Recursive and Explicit Expressions from Contexts GETTING STARTED ✪ ACTIVITY 1 ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
LESSON 3 continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 3** continued ACTIVITY 4 ✪	**LESSON 3** continued ACTIVITY 5 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

*Bold TEKS = Readiness Standard

How can you incorporate Skills Practice with students?

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How can you identify whether your students are ready for new learning?

The Prepare section of the Lesson Assignments and the Spaced Practice sets of Skills Practice can serve as diagnostic tools. Depending on available time, you can assign the Prepare questions as homework or as a warm-up to identify students' prior knowledge for the upcoming lesson's activities. You can also use the Spaced Practice sets of Skills Practice to analyze individual students' level of proficiency on standards from previous topics.

OER Secondary Mathematics
EDITION 1

Module 2

150-Day Topic Pacing Guides

MODULE 2, TOPIC 1 PACING GUIDE

150-Day Pacing

2 Exploring Constant Change

TOPIC 1: Linear Functions

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1E, A.1F, A.1G

ELPS: 1.C, 1.D, 1.E, 1.H, 2.C, 2.D, 2.E, 2.G, 3.A, 3.B, 3.C, 4.A, 4.C, 4.D, 4.F, 4.K, 5.E, 5.G

Topic Pacing: 22 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Least Squares Regressions	Students informally determine a line of best fit by visual approximation of a hand-drawn line. They are then introduced to a formal method to determine the linear regression function of a data set using graphing technology; the mathematics behind the calculator function is explained using the related terms *Least Squares Method*, *linear regression function*, and *centroid*. Students then use the linear regression function to make predictions and distinguish between the terms *interpolation* and *extrapolation*. **Materials Needed:** Uncooked Spaghetti, Graphing Technology, Problem-Solving Model Graphic Organizer	**A.3C** A.4C A.12A	2
2	Correlation	This lesson provides several definitions related to correlations. The terms *correlation* and *correlation coefficient* are defined. The formula to compute the correlation coefficient is given; however, students are only required to use technology to determine the value of r or to estimate correlation coefficients from a list of choices. The distinction is then made between the meanings of r and r^2, the coefficient of determination. Students use these terms to make decisions regarding the model that best fits the data. It is suggested that students revisit the modeling process as they solve these problems in context. The terms *causation*, *necessary condition*, and *sufficient condition* are defined. Examples are provided to help students see the difference between correlation and causation. The terms *common response* and *confounding variable* are defined as relationships often mistaken for causation. **Materials Needed:** Graphing Technology, Problem-Solving Model Graphic Organizer	A.4A A.4B A.4C	2

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 2, TOPIC 1 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Making Connections Between Arithmetic Sequences and Linear Functions**	Students are provided two sequences. They must identify each sequence as *arithmetic* or *geometric*, write the explicit formula for the sequence, and graph the sequence. Students then list and compare characteristics of each graphical representation. The remainder of the lesson focuses on connecting arithmetic sequences to linear functions. Students match the explicit formulas for arithmetic sequences and their graphs. A worked example demonstrates how to rewrite an arithmetic sequence in explicit form as a linear function in slope-intercept form. Students then use the context of stacking chairs to make connections among the terms of the explicit formula of a sequence and the linear function that models it. Students compare the terms of each equation and recognize that the common difference and the slope are constant and equal; however, the first term of the sequence is equal to $f(1)$ rather than the y-intercept of the linear function. Using tables of values for this context, *first differences* is defined as a strategy to determine if a relationship is linear. Students move from the concrete example to generalize that the constant difference of an arithmetic sequence is equal to the slope of the corresponding linear function by completing an algebraic proof. Next, *average rate of change* is defined and presented graphically as a method to determine the unit rate using non-consecutive x-values. Students solidify these new concepts by revisiting the sequences from the start of the lesson, practicing their newly-developed skills, and verifying their conclusions. The special case of a constant function is then addressed. Finally, students complete a graphic organizer to summarize the characteristics and representations of linear functions. **Materials Needed:** None	**A.2A** A.2B **A.2C** A.3A **A.3B** A.12D	3
4	**Point-Slope Form of a Line**	Students use the slope formula to derive the point-slope form of a linear equation. They write equations in point-slope and slope-intercept form given different sets of information: a table of values, two points, a context, a slope and the y-intercept, a slope and a point, a graph with a visible y-intercept, and a graph with a non-visible y-intercept. Students explore the slopes, intercepts, and equations of horizontal and vertical lines. Finally, they match equations written in slope-intercept or point-slope form with contexts and tables. **Materials Needed:** Scissors, Problem-Solving Model Graphic Organizer, Representation Cards (located at the end of the lesson)	A.2B **A.2C** A.3A **A.3C**	2

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MODULE 2, TOPIC 1 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
5	**Using Linear Equations**	Students use three different forms of a linear equation to graph linear relationships. First, they learn how to use the slope-intercept and point-slope forms of a line to graph. Students explore the standard form of a linear equation and connect relationships among the coefficients of the standard form with the *x*-intercept, *y*-intercept, and slope of a line. They then practice writing and graphing equations in standard form. Finally, students identify the slope and intercept of linear equations in different forms and evaluate the usefulness of each form of a linear equation. **Materials Needed:** Straightedges	A.2B **A.2C** A.3A **A.3C**	3
6	**Making Sense of Different Representations of a Linear Function**	Students determine whether tables of values with non-consecutive input values represent linear functions. They evaluate functions and analyze worked examples that demonstrate how to solve equations algebraically and graphically. For the remainder of the lesson, students deal with a context, a graph, and two translations of the graph based on additions to the context. They focus on two equivalent linear functions, one written in general form, $f(x) = ax + b$, and the other written in factored form, $f(x) = a(x - c)$. Students interpret the meaning of the terms of each function and analyze their structure. The form $f(x) = ax + b$ relates to the slope-intercept form of a line, while $f(x) = a(x - c)$ connects with the slope and zero of the function. Linear functions are placed within the wider framework of polynomial functions. The terms *polynomial*, *degree*, *leading coefficient*, and *zero of a function* are defined, setting a frame of reference for future work with other functions. Students use a graphic organizer to summarize four representations—general form, factored form, graph, and table—of a linear function. **Materials Needed:** Problem-Solving Model Graphic Organizer	**A.2C** A.2D A.3A **A.3C** A.3E A.3F A.12A A.12B	3
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				6

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MODULE 2, TOPIC 1 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the learning goals of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.3C**, A.4C, A.12A			TEKS: A.4A, A.4B, A.4C	
LESSON 1 Least Squares Regression GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 1** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Correlation GETTING STARTED ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 2** continued ACTIVITY 3 ✪ ACTIVITY 4 ✪ TALK THE TALK ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: **A.2A**, A.2B, **A.2C**, A.3A, **A.3B**, A.12D **LESSON 3** Making Connections Between Arithmetic Sequences and Linear Functions GETTING STARTED ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 3** continued ACTIVITY 4 ✪ ACTIVITY 5 TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*
Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
TEKS: A.2B, **A.2C**, A.3A, **A.3C**			TEKS: A.2B, **A.2C**, A.3A, **A.3C**	
LESSON 4 Point-Slope Form of a Line GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 4** continued ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 5** Using Linear Equations GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 5** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪

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MODULE 2, TOPIC 1 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

Day 16	Day 17	Day 18	Day 19	Day 20
		TEKS: **A.2C**, A.2D, A.3A, **A.3C**, A.3E, A.3F, A.12A, A.12B		
LESSON 5 continued ACTIVITY 4 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 6** Making Sense of Different Representations of a Linear Function GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 6** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 6** continued ACTIVITY 4 ✪ TALK THE TALK ✪

Day 21	Day 22
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

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MODULE 2, TOPIC 2 PACING GUIDE

150-Day Pacing

2 Exploring Constant Change

TOPIC 2: Transforming and Comparing Linear Functions

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1D, A.1E, A.1F, A.1G

ELPS: 1.D, 1.E, 2.D, 2.G, 2.H, 2.I, 3.C, 3.E, 3.F, 4.A, 4.F, 4.K

Topic Pacing: 10 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	**Transforming Linear Functions**	Students identify key characteristics of several linear functions. A graph and a table of values for the parent linear function $f(x) = x$ is provided, and they investigate $f(x) + d$ and $a \cdot f(x)$. Given a function $g(x)$ in terms of $f(x)$, students graph $g(x)$ and describe each transformation on $f(x)$ to produce $g(x)$. They prove algebraically that a line and its translation are parallel to one another and write equations of lines parallel to a given line through a given point. Finally, students use their knowledge of linear function transformations to test a video game that uses linear functions to shoot targets. They write the function transformations several ways and identify the domains, ranges, slopes, and y-intercepts of the new functions. **Materials Needed:** Masking Tape, Markers, Problem-Solving Model Graphic Organizer	**A.2A** **A.2C** A.2E **A.3C** A.3E	**2**
2	**Vertical and Horizontal Transformations of Linear Functions**	Students identify key characteristics of several linear functions. A graph and a table of values for the parent linear function $f(x) = x$ is provided, and students will translate this function horizontally and vertically to determine which transformations affect the input and output values. They will also dilate the function $f(x) = x$ horizontally and vertically. Students will generalize about equivalent translations for the parent function $f(x) = x$, and determine that these relationships do not hold true for all linear functions. Given a function $g(x)$ in terms of $f(x)$, students will graph $g(x)$ and describe each transformation on $f(x)$ to produce $g(x)$. **Materials Needed:** None	**A.2A** **A.2C** **A.3C** A.3E	2
3	**Determining Slopes of Perpendicular Lines**	Students rotate a line segment on the coordinate plane in increments of 90° counterclockwise and recognize patterns in the slopes and coordinates of the endpoints of the images. They analyze a proof of a theorem stating that if two lines are perpendicular, the slopes of the lines are negative reciprocals. Students then explore relationships between vertical and horizontal lines. Finally, they write the equation of a line perpendicular to a given a line that passes through a given point. **Materials Needed:** Patty Paper, Straightedges, Problem-Solving Model Graphic Organizer	A.2F A.2G	2

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MODULE 2, TOPIC 2 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
4	**Comparing Linear Functions in Different Forms**	Students analyze functions represented as tables, graphs, equations, and verbal descriptions. They explore slope with particular attention to parallelism and perpendicularity in different representations. Students compare properties, such as slope, *y*-intercept, and the units for independent and dependent quantities, all in terms of the situations they represent. Students also identify the scale and origin on the graph of a function given a situation description. Finally, they generate and compare their own linear functions using tables, graphs, and equations. **Materials Needed:** Problem-Solving Model Graphic Organizer	A.3A **A.3C** A.12B	0
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				**3**

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MODULE 2, TOPIC 2 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the learning goals of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.2A**, **A.2C**, A.2E, **A.3C**, A.3E **LESSON 1** Transforming Linear Functions GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 1** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ ACTIVITY 4 ✪ ACTIVITY 5 TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: **A.2A**, **A.2C**, **A.3C**, A.3E **LESSON 2** Vertical and Horizontal Transformations of Linear Functions GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 2** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: A.2F, A.2G **LESSON 3** Determining Slopes of Perpendicular Lines GETTING STARTED ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

*Bold TEKS = Readiness Standard

How can you incorporate Skills Practice with students?

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How can you identify whether students are ready for new learning?

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OER Secondary Mathematics
EDITION 1

Module 3

150-Day Topic Pacing Guides

MODULE 3, TOPIC 1 PACING GUIDE

150-Day Pacing

3 Modeling Linear Equations and Inequalities

TOPIC 1: Linear Equations and Inequalities

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1D, A.1F, A.1G

ELPS: 1.H, 2.B, 2.C, 2.H, 3.A, 4.B, 4.D, 4.J, 5.D, 5.E

Topic Pacing: 10 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Solving Linear Equations	Students start with a simple solution statement and create more complex equations by performing the same operation on each side of the equation. They then analyze different equations created by two students and reason about how to verify that the equations have the same solution as the original equation. The properties of equality and some basic number properties are reviewed before students practice solving linear equations and justifying their steps. They also compare the different properties two students used to solve the same equation. Next, students investigate a mathematical statement that is always true and a mathematical statement that is always false. The terms *no solution* and *infinite solutions* are defined. Finally, students play Tic-Tac-Bingo as they work together to create equations with given solution types from assigned expressions. They then summarize strategies for determining if an equation has no solution or infinite solutions. **Materials Needed:** Expressions Cards	**A.5A**	1
2	Literal Equations	Students begin with a perimeter problem in context to address solving formulas for different variables. They then identify the slope, *x*-intercept, and *y*-intercept of linear equations in slope-intercept, point-slope, and standard form and consider which form is most efficient in determining these characteristics. Next, the term *literal equation* is defined. The common literal equation for converting degrees Fahrenheit to degrees Celsius is provided. Students rewrite the formula to convert degrees Celsius to degrees Fahrenheit, identify errors in student work when rewriting the formula, and interpret equivalent equations written in standard form. The lesson concludes by having students solve various literal equations for specific variables. **Materials Needed:** None	A.2B A.3A A.12E	2

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 3, TOPIC 1 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Modeling Linear Inequalities**	Students begin with a scenario and table that can be modeled by a *linear inequality* with a positive rate of change. They then analyze a graph that models the situation. Students use that graph to solve inequalities and graph the solution set on a number line. Next, the term *solve an inequality* is defined, and students write and solve inequalities algebraically, taking into account the context of the problem situation. They then analyze an inequality with a negative rate of change to make sense of how the sign of the solution to the inequality is affected. Lastly, students analyze methods to solve more complex linear inequalities: ones with the variable on both sides of the equation and ones that require the Distributive Property. **Materials Needed:** None	**A.2C** A.5B	3
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				3

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 3, TOPIC 1 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the objectives of this lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.5A**		TEKS: A.2B, A.3A. A.12E		
LESSON 1 Solving Linear Equations GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2 ✪ ACTIVITY 3 TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Literal Equations GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 2** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
TEKS: **A.2C**, A.5B				
LESSON 3 Modeling Linear Inequalities GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 3** continued ACTIVITY 4 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

*Bold TEKS = Readiness Standard

Skills Practice Guidance

There are three Learning Individually days scheduled within this topic. The placement of these days within the topic is flexible. The intent is to distribute spaced and interleaved practice throughout a topic and throughout the year. It is not necessary for students to complete all Skills Practice problem sets for the topic and different students may complete different problem sets. You should use data to strategically assign problem sets aligned to individual student needs. You should analyze student responses from the following embedded assessment opportunities to help assess individual needs: Essential Questions, Talk the Talks, Student Self-Reflections, and End of Topic Assessments. For students who are building their proficiency, you can assign problem sets to target specific skills. For students who have demonstrated proficiency, there are extension problems of varied levels of challenge.

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MODULE 3, TOPIC 2 PACING GUIDE

150-Day Pacing

3 Modeling Linear Equations and Inequalities

TOPIC 2: Systems of Linear Equations and Inequalities

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1F, A.1G

ELPS: 1.D, 2.B, 2.D, 2.H, 2.I, 3.A, 3.B, 3.C, 3.F, 4.A, 4.B, 4.G, 5.E

Topic Pacing: 18 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Using Graphing to Solve Systems of Equations	Students write an equation in standard form to represent a scenario and determine a solution to the scenario and equation. They graph the linear equation using intercepts and then analyze a second graph with the independent and dependent variables reversed. A new relationship between the quantities is then provided, and students write the equation expressing the relationship. Finally, they graph the new equation on two separate coordinate planes showing the graphed lines from the original scenario, creating a system of linear equations. Students solve the system both graphically and using technology, checking the solution by substituting the values back into the original equations. Next, they are provided three related scenarios in which they write systems of equations in slope-intercept form and solve the systems graphically. This activity demonstrates that a system of two linear equations may have no solution, one solution, or an infinite number of solutions. The related terms *consistent systems* and *inconsistent systems* are defined. **Materials Needed:** Graphing Technology	**A.2A** **A.2C** **A.2I** A.3F A.3G **A.5C**	2
2	Using Substitution to Solve Linear Systems	Students use the substitution method to solve systems of linear equations. They use substitution to solve systems of linear equations, including those with no solution or with infinite solutions. Students define variables, write systems of equations, solve systems, and interpret the meaning of the solution in terms of the problem context. In the last activity, they are given four systems of linear equations and solve each system using the substitution method. **Materials Needed:** Problem-Solving Model Graphic Organizer	**A.2I** A.3F A.3G **A.5C**	**2**

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 3, TOPIC 2 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Using Linear Combinations to Solve a System of Linear Equations**	Students are given a problem scenario and use reasoning to determine the two unknowns. They then write a system of linear equations in standard form to represent a problem situation. Students analyze two solution paths, one using substitution and one using the *linear combinations method* in its most basic form, prior to its formal definition later in the activity. They practice the linear combinations method with systems in which the coefficients of one variable are additive inverses. Next, worked examples guide students to multiply one, and then both, equations by a constant to create equations in which a variable has coefficients that are additive inverses. Students concentrate on creating coefficients that are additive inverses with several systems without entirely solving the system, and then they solve two problems in context, one with fractional coefficients. The lesson concludes with students addressing when it is appropriate to use the graphing, substitution, or linear combinations methods. **Materials Needed:** Problem-Solving Model Graphic Organizer	**A.2I** **A.5C**	3
4	**Graphing Inequalities in Two Variables**	Students explore a linear inequality in two variables through a scenario. They write an inequality, complete a table of values, graph the coordinate pairs from the table, and determine which parts of the graph are solutions to the inequality. Students then formalize the process of graphing inequalities through practice without context; they graph the corresponding equation of an inequality as a boundary line, determine whether the line should be solid or dashed, and identify which half plane to shade by testing the point (0, 0) in the original inequality. Students also match inequalities to graphs and write inequalities presented as graphs. They then solve a problem in context, where they use a table of values to write and graph a linear inequality and refer to the inequality and/or its graph to respond to questions. Finally, students summarize the difference between the graphs of linear equations and linear inequalities and compare the solution sets of linear equations and linear inequalities. **Materials Needed:** None	A.2H **A.3D**	2

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MODULE 3, TOPIC 2 PACING GUIDE

150-Day Pacing

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
5	**Systems of Linear Inequalities**	Students represent a scenario with a system of linear inequalities and graph the system. Overlapping shaded regions identify the possible solutions to the system. Students then practice graphing several systems of inequalities and representing the solution set. A different scenario is given that students model with a system of linear inequalities. They then graph the system, determine two different solutions, and algebraically prove that the solutions satisfy both constraints defined by the system. Finally, students match systems, graphs, and possible solutions of systems that have identical terms with different inequality symbols. **Materials Needed:** None	A.2H **A.3D** A.3H	3
6	**Solving Systems of Equations and Inequalities**	Students solve problems in context requiring a system of linear equations. While most problems can be modeled by a system of two equations, they are guided through the process of solving a system of four equations, and another context can be modeled by a system of three equations. Students have the opportunity to solve the systems using any method and sometimes must respond in the format of an email or proposal. Solutions involve making a decision based upon inputs that lie before or after the point of intersection, thus requiring solutions written as inequalities. **Materials Needed:** Problem-Solving Model Graphic Organizer	A.2H **A.2I** **A.3D** A.3H **A.5C**	**0**
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				**5**

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MODULE 3, TOPIC 2 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the objectives of this lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.2A**, **A.2C**, **A.2I**, A.3F, A.3G, **A.5C**			TEKS: **A.2I**, A.3F, A.3G, **A.5C**	
LESSON 1 Using Graphing to Solve Systems of Equations GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 1** continued ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Using Substitution to Solve Systems of Equations GETTING STARTED ACTIVITY 1 ✪	**LESSON 2** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
	TEKS: **A.2I, A.5C**			
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 3** Using Linear Combinations to Solve a System of Linear Equations GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 3** continued ACTIVITY 4 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*
Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
TEKS: A.2H, **A.3D**			TEKS: A.2H, **A.3D**, A.3H	
LESSON 4 Graphing Inequalities in Two Variables GETTING STARTED ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 4** continued ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 5** Systems of Linear Inequalities GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 5** continued ACTIVITY 2 ✪ ACTIVITY 3

*Bold TEKS = Readiness Standard

Day 16	Day 17	Day 18
LESSON 5 continued ACTIVITY 4 TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

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Skills Practice Guidance

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OER Secondary Mathematics
EDITION 1

Module 4

150-Day Topic Pacing Guides

MODULE 4, TOPIC 1 PACING GUIDE

150-Day Pacing

4 Investigating Growth and Decay

TOPIC 1: Introduction to Exponential Functions

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1E, A.1F, A.1G
ELPS: 1.B, 1.E, 1.G, 2.A, 2.D, 2.H, 2.I, 3.B, 3.D, 3.F, 3.H, 4.C, 5.B, 5.C, 5.D, 5.E

Topic Pacing: 15 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Properties of Powers with Integer Exponents	The terms *power*, *base of a power*, and *exponent of a power* are defined. Students write and evaluate expressions with positive integer exponents. They begin with a context using the power with a base of 2. Students then investigate positive and negative integer bases where the negative sign may or may not be raised to a power depending on the placement of parentheses. Some expressions also contain variables. **Materials Needed:** Calculator	**A.11B**	3
2	Analyzing Properties of Powers	Students use the properties of powers to justify each step when rewriting expressions with exponents. They solve additional practice problems and examine student work. Students demonstrate their understanding of the properties of powers by creating graphic organizers. **Materials Needed:** Scissors	**A.11B**	2
3	Geometric Sequences and Exponential Functions	In Module 2, Topic 1, *Lesson 3: Making Connections Between Arithmetic Sequences and Linear Functions*, students rewrote the explicit form of an arithmetic sequence as a linear function and proved algebraically that the common difference in a linear function is the slope of the line. This lesson follows a similar process, where they revisit geometric sequences as a launch to exponential functions. Students know that all geometric sequences are functions, and through investigation, they learn that some geometric sequences are exponential functions, while others are not. They identify the fact that the constant ratio must be positive for a geometric sequence to be an exponential function. Through a context, student work, and a Worked Example, students use properties of exponents to rewrite the explicit form of a geometric sequence as a function in the form $f(x) = ab^x$ and make connections between the two forms. Students then explore a situation modeled by an exponential function. They are guided to demonstrate that the ratio between consecutive output values of any exponential function is constant and is represented by the variable b in the function form $f(x) = ab^x$, and the y-intercept is represented by the ordered pair $(0, a)$. Students then solve a problem in context that is represented by a decreasing exponential function. **Materials Needed:** Problem-Solving Model Graphic Organizer	A.9B **A.9C** **A.9D** **A.11B** A.12D **A.12C**	2

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
4	Rewriting Square Roots	Students analyze perfect square models and models of non-perfect squares in terms of their areas and side lengths. Students understand that the areas of the squares represent radicands, and the side lengths represent the square roots of those radicands. They write the side lengths of square models both as single square roots and as multiplication expressions. This allows students to model the simplification of square roots and make observations leading to the properties of radicals. Students then use the properties to multiply, divide, and simplify square roots by extracting perfect squares and by using prime factorization. Students discuss strategies for efficiently simplifying radicals. **Materials Needed:** None	A.11A	1
5	Rational Exponents and Graphs of Exponential Functions	Students explore a context modeled by an exponential function, first with output that are between two integers, then with output values that are rational exponents. This helps students make sense of the fact that $\sqrt{a} = a^{\frac{1}{2}}$. They then expand upon this idea to learn that the Properties of Powers apply to expressions with rational exponents, rewrite expressions with rational exponents as radicals, and then connect the two concepts to perform and justify operations involving radicals. Students explore the effects of a negative exponent, learn the meaning of a *horizontal asymptote*, and analyze this idea of end behavior on several graphs. **Materials Needed:** None	A.9A A.9B **A.9C** **A.9D** A.11A **A.11B** A.12B	3
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				3

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MODULE 4, TOPIC 1 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the learning goals of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.11B**				TEKS: **A.11B**
LESSON 1 Properties of Powers with Integer Exponents GETTING STARTED ACTIVITY 1 ACTIVITY 2 ✪	**LESSON 1** continued ACTIVITY 3 ✪ ACTIVITY 4 ✪	**LESSON 1** continued ACTIVITY 5 ✪ ACTIVITY 6 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Analyzing Properties of Powers GETTING STARTED ACTIVITY 1 ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
	TEKS: A.9B, **A.9C, A.9D, A.11B,** A.12D, A.12C			TEKS: A.11A
LESSON 2 continued ACTIVITY 2 ✪ TALK THE TALK ✪	**LESSON 3** Geometric Sequences and Exponential Functions GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 3** continued ACTIVITY 3 ✪ ACTIVITY 4 ✪ TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 4** Rewriting Square Roots GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2 ✪ TALK AND TALK ✪
Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
TEKS: A.9A, A.9B, **A.9C, A.9D,** A.11A, **A.11B,** A.12B				
LESSON 5 Rational Exponents and Graphs of Exponential Functions GETTING STARTED ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 5** continued ACTIVITY 3 ✪ ACTIVITY 4 ✪	**LESSON 5** continued ACTIVITY 5 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

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How can you identify whether students are ready for new learning?

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MODULE 4, TOPIC 2 PACING GUIDE

150-Day Pacing

4 Investigating Growth and Decay

TOPIC 2: Using Exponential Equations

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1E, A.1G

ELPS: 1.A, 1.C, 1.D, 2.A, 2.C, 2.G, 3.C, 4.D, 4.K

Topic Pacing: 10 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Exponential Equations for Growth and Decay	Students begin this lesson by analyzing the structure of linear and exponential functions to sort them as either increasing or decreasing functions. Students compare linear and exponential functions in the context of simple interest and compound interest situations. They then identify the values in the exponential function equation that indicate whether it is a growth or decay function and apply this reasoning in context. Finally, for a situation modeled by an exponential decay function, students write the function, sketch its graph, and then use the graph to answer a question about the problem situation. **Materials Needed:** Graphing Technology, Problem-Solving Model Graphic Organizer	**A.3B** **A.3C** A.9B **A.9C** **A.9D** A.12B	2
2	Interpreting Parameters in Context	Students begin by using what they know about exponential functions to match four exponential equations to their graphs. Next, for a scenario based on exponential depreciation, students write the function, complete a table of values, and graph the function. They recall how to solve an equation graphically by graphing both sides of the equation and determining the point of intersection. They use this strategy to solve exponential equations and answer questions about given scenarios. Given a function that represents an annual increase in a mutual fund, students use the properties of exponents to rewrite the function to reveal approximate equivalent rates for the monthly and quarterly increases. Finally, they use what they know about the structure of exponential equations to identify equations that model a given situation and justify why others do not. **Materials Needed:** Problem-Solving Model Graphic Organizer	**A.9A** A.9B **A.9C** **A.9D** **A.11B**	2
3	Modeling Using Exponential Functions	For each of the two new data sets, students create a scatterplot, write a regression model, use the function to calculate output values, and interpret the reasonableness of a prediction based upon the scenario. In the first scenario, students are told to use an exponential function to model the scenario; in the second scenario, students must decide whether the scenario is best modeled by a linear or exponential function. The lesson concludes with students making a list of contexts from this module and generalizing what they have in common that identifies them as best modeled by exponential functions. They also describe the shape of a scatterplot representing an exponential function and sketch possible graphs of exponential functions. **Materials Needed:** Graphing Technology	A.9A **A.9D** A.9E	2
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				3

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MODULE 4, TOPIC 2 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the learning goals of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.3B, A.3C,** A.9B, **A.9C, A.9D,** A.12B			TEKS: A.9A, A.9B, **A.9C, A.9D, A.11B**	
LESSON 1 Exponential Equations for Growth and Decay GETTING STARTED ACTIVITY 1 ✪	**LESSON 1** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Interpreting Parameters in Context GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 2** continued ACTIVITY 2 ✪ TALK THE TALK ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
	TEKS: A.9A, **A.9D,** A.9E			
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 3** Modeling Using Exponential Functions GETTING STARTED ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

*Bold TEKS = Readiness Standard

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OER Secondary Mathematics
EDITION 1

Module 5

150-Day Topic Pacing Guides

MODULE 5, TOPIC 1 PACING GUIDE

150-Day Pacing

5 Maximizing and Minimizing

TOPIC 1: Introduction to Quadratic Functions

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1E, A.1F, A.1G
ELPS: 1.A, 1.H, 2.D, 2.F, 2.G, 2.I, 3.B, 3.F, 4.G, 4.K, 5.B, 5.E, 5.F

Topic Pacing: 15 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Exploring Quadratic Functions	Students are introduced to quadratic functions through a sequence of pennies. They are then provided four different contexts that can be modeled using quadratic functions. The first context involves area and is used to compare and contrast linear and quadratic relationships, to define the term *parabola*, and to begin identifying key characteristics of the graphs of quadratic functions. The second context involves handshakes with a parabola that has a minimum. The third context involves a function written in standard form using the vertical motion formula. The final context involves revenue and demonstrates that a quadratic function can be written as the product of two linear functions. It is expected that students use technology to graph each function, allowing them to explore the key characteristics of the graphs of quadratic functions and interpret them in terms of their corresponding context. Students will revisit these same scenarios in the next lesson. **Materials Needed:** Graphing Technology	**A.6A** **A.7A**	**2**
2	Key Characteristics of Quadratic Functions	Students revisit the four scenarios from the previous lesson as a way to introduce equivalent quadratic equations with different structures to reveal different characteristics of their graphs. They learn that a table of values represents a quadratic function if its second differences are constant. The terms *standard form* and *factored form* are defined. Students analyze the effect of the leading coefficient on whether the parabola opens upward or downward. They identify the axis of symmetry and vertex for graphs using the equations in each form. Finally, students determine the *x*- and *y*-intercepts along with intervals of increase and decrease, using a combination of technology, symmetry, and equations. **Materials Needed:** Patty Paper, Problem-Solving Model Graphic Organizer	**A.6A** A.6C **A.7A**	3

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Quadratic Function Transformations**	Students are already familiar with the general shape of the graphs of quadratic functions, and they have studied transformations of linear functions. In this lesson, students experiment with the quadratic function family. They expand their understanding of transformations to include quadratic functions and interpret functions in the form $f(x) = a(x - c) + d$. They distinguish between the effects of changing values inside the argument of the function (the c-value) and changing values outside the function (the a- and d-values). Finally, students consider different ways to rewrite and interpret equations of function transformations. **Materials Needed:** Graphing Technology	**A.7A** **A.7C**	2
4	**Horizontal Transformations and Vertex Form**	Students explore horizontal dilations (b-value transformations). They sketch a graph of the transformation, compare characteristics of the transformed graph with the graph of the parent function, and represent the transformation using coordinates. Students practice writing quadratic functions in vertex form, standard form, and factored form and convert from one form to another to reveal properties of the function it defines. They identify the location of the zeros, the vertex, and the orientation of the parabola from the equation of the function. Students write quadratic equations in vertex form using the coordinates of the vertex and another point on the graph and in factored form using the zeros and another point on the graph. **Materials Needed:** Graphing Technology	A.6B A.6C **A.7A** **A.7C**	3
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				4

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 5, TOPIC 1 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the objectives of the lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.6A, A.7A** **LESSON 1** Exploring Quadratic Functions GETTING STARTED ACTIVITY 1 ✪ ACTIVITY 2 ✪	**LESSON 1** continued ACTIVITY 3 ✪ ACTIVITY 4 ✪ TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: **A.6A,** A.6C, **A.7A** **LESSON 2** Key Characteristics of Quadratic Functions GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 2** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
LESSON 2 continued ACTIVITY 4 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: **A.7A, A.7C** **LESSON 3** Quadratic Function Transformations GETTING STARTED ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*
Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
TEKS: A.6B, A.6C, **A.7A**, **A.7C** **LESSON 4** Transformations of Quadratic Functions GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 4** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 4** continued ACTIVITY 4 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

*Bold TEKS = Readiness Standard

How can you incorporate Skills Practice with students?

There are four Learning Individually days scheduled within this topic. The placement of these days within the topic is flexible. The intent is to distribute spaced and interleaved practice throughout a topic and throughout the year. It is not necessary for students to complete all Skills Practice for the topic, and different students may complete different problem sets. You should use data to strategically assign problem sets aligned to individual student needs. You should analyze student responses from the following embedded assessment opportunities to help assess individual needs: Essential Questions, Talk the Talks, Student Self-Reflections, and End of Topic Assessments. For students who

are building their proficiency, you can assign problem sets to target specific skills. For students who have demonstrated proficiency, there are extension problems of varied levels of challenge.

How can you identify whether your students are ready for new learning?

The Prepare section of the Lesson Assignments and the Spaced Practice sets of Skills Practice can serve as diagnostic tools. Depending on available time, you can assign the Prepare section of the Lesson Assignments as homework or as a warm-up to identify students' prior knowledge for the upcoming lesson's activities. You can also use the Spaced Practice sets of Skills Practice to analyze individual students' level of proficiency on standards from previous topics.

MODULE 5, TOPIC 2 PACING GUIDE

150-Day Pacing

5 Maximizing and Minimizing

TOPIC 2: Polynomial Operations

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1C, A.1D, A.1E, A.1F, A.1G

ELPS: 1.E, 2.A, 3.G, 3.I, 3.J, 4.J, 5.D, 5.G

Topic Pacing: 10 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	**Adding and Subtracting Polynomials**	Students begin the lesson with an open-ended sort of twelve mathematical expressions prior to being given the formal definitions regarding polynomials. The terms *polynomial*, *monomial*, *binomial*, *trinomial*, and *degree of a polynomial* are defined. The graphs of two functions in context provide meaning to subtraction of functions and introduce the concept of performing addition and subtraction of polynomial functions. Students add and subtract functions both graphically and algebraically within a context. They analyze polynomial expressions that have been rewritten incorrectly and write them correctly. **Materials Needed:** Scissors, Glue	A.10A A.10D	**2**
2	**Multiplying Polynomials**	Students begin the lesson analyzing a Worked Example that shows how to multiply two binomials using algebra tiles. They then use algebra tiles and multiplication tables to multiply binomials. Students compare two methods to multiply polynomials: an area model and the distributive property. They practice multiplying polynomials and apply what they learned to rewrite quadratic functions in vertex or factored form into standard form. Finally, students investigate patterns in special products to recognize perfect square trinomials and the difference of two squares expressed both in their standard form and as the linear factors that produce them. **Materials Needed:** Algebra Tiles (located at the end of the lesson), Graphing Technology	A.10B A.10D	**2**

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Polynomial Division**	Students analyze the graph of a quadratic function that appears to have two real zeros. The factor theorem is stated and a Worked Example demonstrates how to determine whether a linear expression is a factor of the quadratic function. Polynomial long division is introduced and a Worked Example is provided. They perform polynomial long division to determine the linear function that is the other factor and use this information to determine the zeros and rewrite the quadratic function as a product of linear factors. The Remainder Theorem is stated and students use the theorem to answer questions involving polynomial division with remainders. **Materials Needed:** None	A.10C	2
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				3

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

MODULE 5, TOPIC 2 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the objectives of this lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: A.10A, A.10D **LESSON 1** Adding and Subtracting Polynomials GETTING STARTED ✪ ACTIVITY 1 ✪ ACTIVITY 2	**LESSON 1** continued ACTIVITY 3 ACTIVITY 4 ✪ TALK THE TALK	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: A.10B, A.10D **LESSON 2** Multiplying Polynomials GETTING STARTED ACTIVITY 1 ACTIVITY 2 ✪	**LESSON 2** continued ACTIVITY 3 ✪ ACTIVITY 4 ✪ TALK THE TALK ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	TEKS: A.10C **LESSON 3** Polynomial Division GETTING STARTED ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**

*Bold TEKS = Readiness Standard

How can you incorporate Skills Practice with students?

There are three Learning Individually days scheduled within this topic. The placement of these days within the topic is flexible. The intent is to distribute spaced and interleaved practice throughout a topic and throughout the year. It is not necessary for students to complete all Skills Practice for the topic and different students may complete different problem sets. You should use data to strategically assign problem sets aligned to individual student needs. You should analyze student responses from the following embedded assessment opportunities to help assess individual needs: Essential Questions, Talk the Talks, Student Self-Reflections, and End of Topic Assessments. For students who are building their proficiency, you can assign problem sets to target specific skills. For students who have demonstrated proficiency, there are extension problems of varied levels of challenge.

How can you identify whether students are ready for new learning?

The Prepare section of the Lesson Assignments and the Spaced Practice sets of Skills Practice can serve as diagnostic tools. Depending on available time, you can assign the Prepare questions as homework or as a warm-up to identify students' prior knowledge for the upcoming lesson's activities. You can also use the Spaced Practice sets of Skills Practice to analyze individual students' level of proficiency on standards from previous topics.

MODULE 5, TOPIC 3 PACING GUIDE

150-Day Pacing

5 Maximizing and Minimizing

TOPIC 3: Solving Quadratic Equations

1 DAY PACING = 45-MINUTE SESSION

TEKS Mathematical Process Standards: A.1A, A.1B, A.1C, A.1D, A.1E, A.1F, A.1G
ELPS: 1.D, 1.E, 1.H, 2.B, 2.C, 3.A, 3.B, 3.D, 4.A, 4.D, 4.F, 4.I, 4.J, 5.B

Topic Pacing: 19 Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
1	Representing Solutions to Quadratic Equations	Students investigate how to solve quadratic equations using graphs and writing solutions in terms of their respective distances from the axis of symmetry. They also use their knowledge of square roots to solve basic quadratic equations algebraically. The axis of symmetry is used to express solutions to basic quadratic equations, with solutions situated symmetrically to the right and to the left of the vertical line. Students also identify double roots, estimate square roots, and extract perfect roots, where possible. They show graphically that a quadratic function is the product of two linear functions and use the zero product property to explain that the zeros of a quadratic function are the same as the zeros of its linear factors. Students also generalize what they know about the difference of two squares to rewrite any quadratic as the product of two linear factors. **Materials Needed:** None	**A.7A** A.7B **A.8A** A.10F A.11A	2
2	Solutions to Quadratic Equations in Vertex Form	In the previous lesson, students solved quadratic functions of the form $f(x) = ax^2 - c$. In this lesson, they learn to determine the roots of any quadratic function written in vertex form. Students make sense of the solution process as they analyze increasingly complex transformations of the parent quadratic function, from $y = (x - c)^2$, to $y = a(x - c)^2$, to $y = a(x - c)^2 + d$. For each form of the function, they solve equations and generalize about the solutions. Students also learn that a quadratic function can have one unique real zero, two real zeros, or no real zeros, and how the number of real zeros relates to the graph of the function. **Materials Needed:** Problem-Solving Model Graphic Organizer	**A.7A** **A.7C** **A.8A**	2

*Bold TEKS = Readiness Standard; Bold Pacing = Reduced Number of Days

Lesson	Lesson Title	Highlights	TEKS*	Pacing*
3	**Factoring and Completing the Square**	Students learn to solve quadratic equations of the form $y = ax^2 + bx + c$. First, they factor trinomials using a multiplication table and then solve quadratic equations by factoring and using the zero product property. Students are introduced to the method of completing the square both conceptually and procedurally. They practice solving equations that are not factorable by completing the square. Students analyze a worked example that converts a quadratic equation in standard form, $f(x) = ax^2 + bx + c$, into vertex form, proving that the vertex of any quadratic equation is located at $\left(\frac{-b}{2a}, \frac{c - b^2}{4a}\right)$. Students complete the square to rewrite equations in vertex form, graph the function, and identify the zeros in terms of the axis of symmetry. **Materials Needed:** Problem-Solving Model Graphic Organizer	**A.7A** **A.8A** **A.10E**	4
4	**The Quadratic Formula**	Students are guided through a worked example to derive the quadratic formula. They then use the quadratic formula to solve problems in and out of context and analyze common student errors. They connect the terms of the quadratic formula to its symmetric graph and repeat the process with numeric solutions. The term *discriminant* is defined, and students use the discriminant to identify the number of real roots for a quadratic equation. **Materials Needed:** Graphing Technology	**A.7A** **A.8A** A.11A	3
5	**Using Quadratic Functions to Model Data**	Students begin the lesson by determining a quadratic regression model for sets of data and use the regression model to make estimates and predictions. Throughout the lesson, students identify the independent and dependent quantities and domain and range of functions. **Materials Needed:** Graphing Technology, Problem-Solving Model Graphic Organizer	**A.6A** **A.7A** A.8B	2
End of Topic Assessment				1
Learning Individually with Skills Practice *Schedule these days strategically throughout the topic to support student learning.*				5

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MODULE 5, TOPIC 3 PACING GUIDE

150-Day Pacing

1 DAY PACING = 45-MINUTE SESSION

✪ *This activity highlights a key term or concept that is essential to the objectives of this lesson.*

Day 1	Day 2	Day 3	Day 4	Day 5
TEKS: **A.7A,** A.7B, **A.8A,** A.10F, A.11A			TEKS: **A.7A, A.7C, A.8A**	
LESSON 1 Representing Solutions to Quadratic Equations GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 1** continued ACTIVITY 2 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 2** Solutions to Quadratic Equations in Vertex Form GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 2** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪ TALK THE TALK ✪
Day 6	**Day 7**	**Day 8**	**Day 9**	**Day 10**
	TEKS: **A.7A, A.8A, A.10E**			
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 3** Factoring and Completing the Square GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 3** continued ACTIVITY 2 ✪	**LESSON 3** continued ACTIVITY 3 ✪	**LESSON 3** continued ACTIVITY 4 ✪ ACTIVITY 5 ✪ TALK THE TALK ✪
Day 11	**Day 12**	**Day 13**	**Day 14**	**Day 15**
	TEKS: **A.7A, A.8A,** A.11A			
LEARNING INDIVIDUALLY Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**LESSON 4** The Quadratic Formula GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 4** continued ACTIVITY 2 ✪ ACTIVITY 3 ✪	**LESSON 4** continued ACTIVITY 4 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*
Day 16	**Day 17**	**Day 18**	**Day 19**	
TEKS: **A.6A, A.7A,** A.8B				
LESSON 5 Using Quadratic Functions to Model Data GETTING STARTED ✪ ACTIVITY 1 ✪	**LESSON 5** continued ACTIVITY 2 ✪ TALK THE TALK ✪	**LEARNING INDIVIDUALLY** Skills Practice *This is a suggested placement. Move based on student data and individual needs.*	**END OF TOPIC ASSESSMENT**	

*Bold TEKS = Readiness Standard

How can you incorporate Skills Practice with students?

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